Strategic innovation navigation system for growth innovation

L Bouwer

Orcid.org 0000-0001-7447-8582

Thesis accepted in fulfilment of the requirements for the degree *Doctor of Philosophy in Development and Management Engineering* at the North-West University

Promoter: Prof JH Wichers

Graduation: May 2020

Student number: 10085696

PREFACE

Life is not about reaching destinations but about how you experience the journey.

This PhD research project has been a 10-year journey since 2008, when I started to attend classes at Caltech in California USA. There are so many people who assisted me to make the completion of this PhD thesis a reality:

Dr Roy John Britten at Caltech, who took me under his mentorship where I had the opportunity to conduct research with him as an assistant for almost 2 years at the most prestigious university in the world. Dr Britten not only taught me about research but also about life and to believe in my instincts as a researcher. Dr Britten was almost fearless to "swim" against mainstream philosophy to change the status quo of thinking, which of course allowed him to find the existence of "transposable elements", which used to be known as "junk DNA". I completely embraced his philosophy with the ambition to deliver something of significant value for the world as my appreciation to honor the memories working with him, and hope to be the same inspiration for other researchers.

Prof Harry Wichers at NWU for his open-mindedness, who understood and supported the vision and approach I had for my research. Will always be thankful for the extreme special opportunity which enabled me to complete my PhD research with him.

My son Louis III who served as my research apprentice with whom I regularly tested new models and theories, he will become a great researcher. Our youngling Francois, who brought his expert knowledge of the blistering pace of innovation within the Personal Computer (PC) Gaming Industry.

My wife who supported our family as a working mother while I was completing this PhD thesis full-time.

My parents, friends and colleagues all over the world who had some part in sculpting my thoughts and being.

The "Strategic Corporate Innovation Navigation (SCINav) Systems Model" was developed to serve as a guide (or a map) for corporate executives who seek a fundamental and practical strategic innovation management theory to accomplish sustainable organic and economic growth for their corporations.

ABSTRACT

Overview

The global economic environment is becoming ever more competitive and corporations have a harder time to secure growth or even survival. Many corporations still do not implement “Strategic Innovation Management” due to a lack of fundamental knowledge, “Shareholder Capitalism” to deliver on highly anticipated TSR (Total Shareholder Return) percentages as a top priority for the corporation (and thus focus primarily on short-term low-risk incremental innovation which became “ideation” innovation programs) or financial limited budgetary reasons to rather invest in operations or shareholder dividends.

There is of course an enormous hype about innovation and innovation management, but due to various academic and social reasons it is still not yet completely well accepted as a corporate function.

Challenge

The challenge is that 94% of corporations are still dissatisfied with their innovation performance, even though the concept of modern innovation is almost 100 years old. Very few companies are successful to consistently and sustainably create value for customers and consumer, wealth for employees and growth for shareholders. This will be referred to as the “Corporate Innovation Performance Challenge”.

Vision

In order to solve the “Corporate Innovation Performance Challenge” and to support sustainable corporate growth (will be referred to as “Growth Innovation”), the vision was to develop a “paradigm shifting” novel system for corporate executives that will simplify the understanding, development, management and implementation of “Strategic Corporate Innovation”.

Method

This research took a Systems Thinking (Forrester, 1995) (Meadows and Wright, 2008) approach in combination with Systems Engineering (Bahill and Gissing, 1998a) principles. An intensive literature research study (especially for empirical data) was undertaken to understand the social and economic reasons (or forces) why corporate executives are not satisfied with the performance of their corporate innovation programs.

Only after the core of the problem had been well defined, could the research advance to investigate all possible frameworks, models and theories from a wide range of subject areas to collect insights and to synthesize (design, develop and analyze) new systems models.

Solution

Following Figure 1, the "Strategic Corporate Innovation Navigation (SCINav) Systems Model" is a Dynamic Multidimensional Contextual Based Corporate Innovation Strategy Formulation System modelled as a Relational Multidimensional Vector of Matrixes, to function as a guide for corporate executives when they need to develop innovation strategies.

Outcome

For this PhD thesis the Strategic Corporate Innovation Navigation (SCINav) Systems Model (as in Figure 1) will be the deliverable "product".

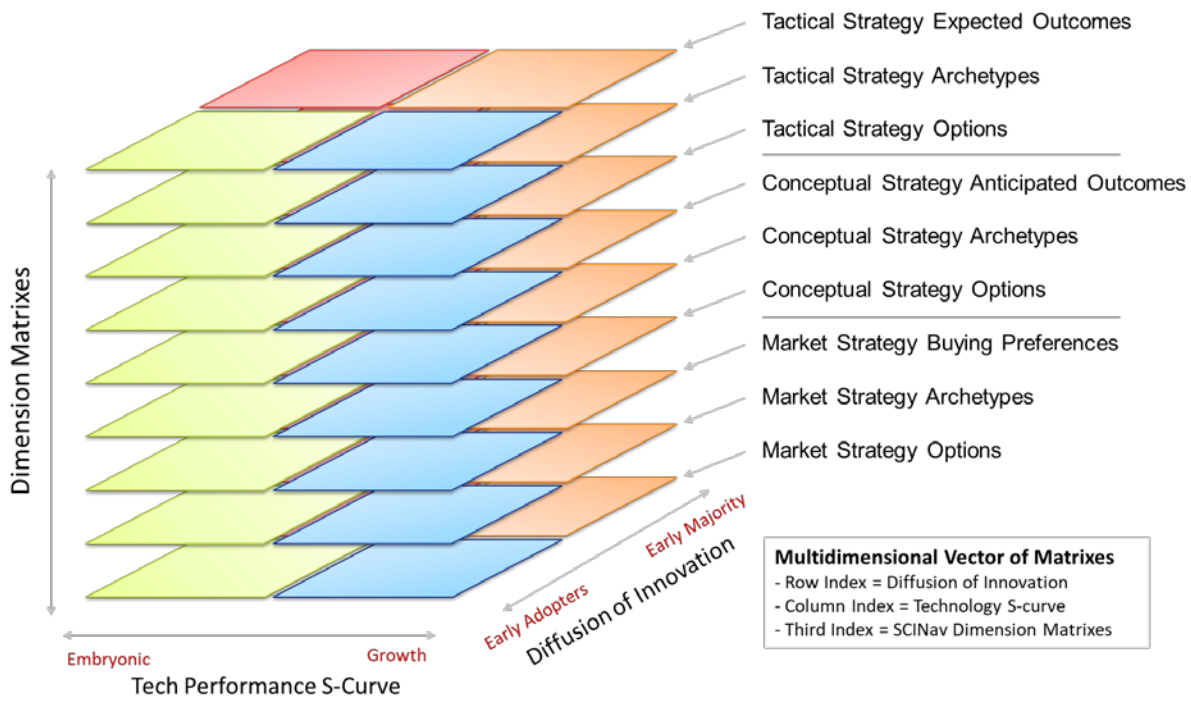


Figure 1: Strategic Corporate Innovation Navigation (SCINav) Systems Model

Key Terms: Innovation, Innovation Management, System, Strategy, Dominant Design.

OPSOMMING

Oorsig

Die globale ekonomiese omgewing word steeds meer mededingend en korporasies het 'n moeiliker tyd om groei of selfs oorlewing te verseker. Baie maatskappye implementeer nog steeds nie "Strategiese Innovasiebestuur" nie as gevolg van 'n gebrek aan fundamentele kennis, aandeelhouerkapitalisme of finansiële redes.

Daar is natuurlik 'n enorme opgewondenheid oor innovasie- en innovasiebestuur, maar as gevolg van verskeie akademiese en sosiale redes word dit nog steeds nie algemeen aanvaar as korporatiewe funksie nie.

Uitdaging

Die uitdaging tans is dat 94% van die korporasies steeds ontevrede is met hul innovasieprestasie, alhoewel die konsep van moderne innovasie amper 100 jaar oud is. Slegs ‘n klein persentasie van maatskappye is suksesvol om konsekwent en volhoubaar waarde te skep vir kliënte en verbruikers, welvaart vir werknemers en groei vir aandeelhouers. Dit sal verwys word na die “Korporatiewe Innovasie Prestasie Uitdaging”.

Visie

Om ‘n oplossing te bewerkstellig vir die “Korporatiewe Innovasie Prestasie Uitdaging” en ten einde volhoubare korporatiewe groei deur innovasie te ondersteun (wat hierdie proefskrif "Groeiinnovasie" sal noem), is die visie om 'n nuwe stelsel te ontwikkel vir korporatiewe bestuurders om die begrip, ontwikkeling, bestuur en implementering van 'n "Strategiese Korporatiewe Innovasiebestuurs Stelsel" te vergemaklik.

Metode

Hierdie navorsing het 'n stelsel denke (Forrester, 1995) (Meadows and Wright, 2008) benadering in kombinasie met stelsel ingenieurswese (Bahill en Gissing, 1998) geneem. ‘n Intensiewe literatuurnavorsingsstudie (veral van empiriese data) is geloods om die sosiale en ekonomiese redes (of kragte) te verstaan waarom korporatiewe bestuurders nie tevrede is met die prestasie van hul korporatiewe innovasieprogramme nie.

Eers nadat die kern van die probleem goed gedefinieer kon word, het die navorsing gevorder om alle moontlike raamwerke, modelle en teorieë te ondersoek om insig in te samel van 'n wye verskeidenheid onderwerpe om nuwe stelsel modelle te ontwikkel.

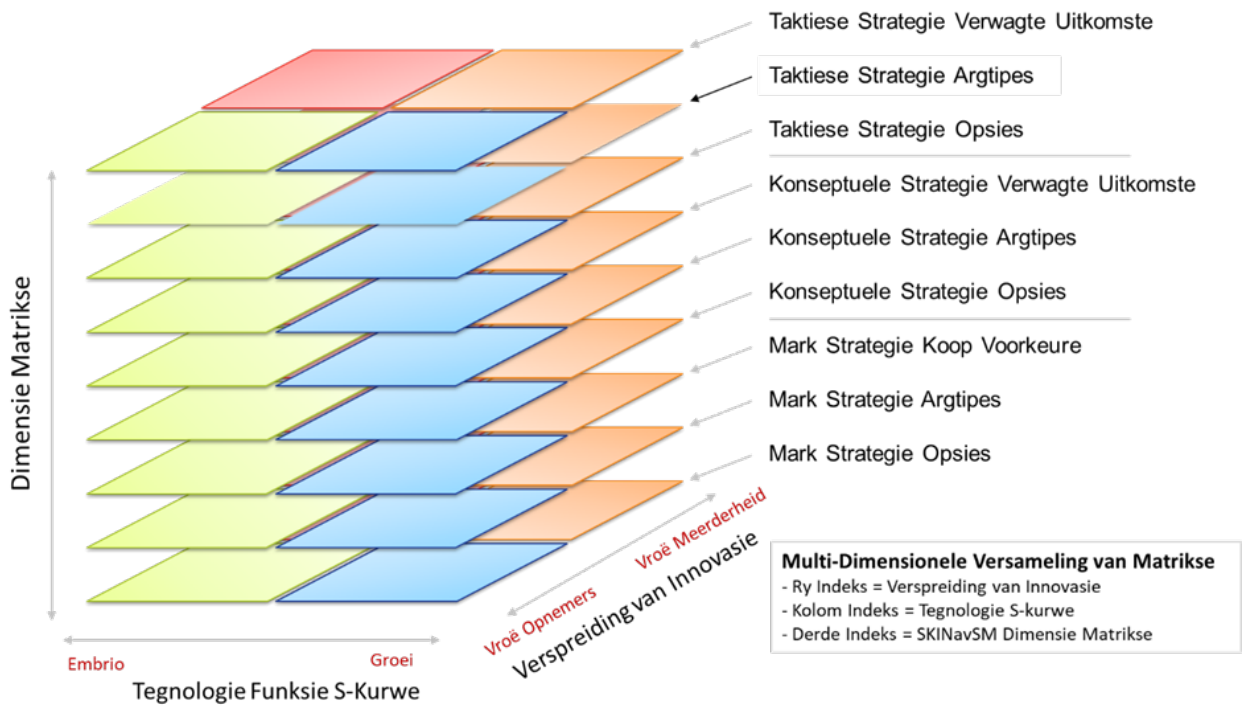
Oplossing

Na aanleiding van Figuur 1 het hierdie navorsing die "Strategiese Intelligente Korporatiewe Innovasiebestuurs Stelsel” (met die ekosisteem) uit akademiese literatuur en empiriese data gemodelleer.

Die "Strategiese Korporatiewe Innovasie Navigasie (SKINav) Stelsel Model" is ‘n Dinamiese Multidimensionele Konteks Gebaseerde Korporatiewe Strategie Formulase Besluitneming Ondersteunings Stelsel gemoduleer as ‘n Multidimensionele Vektor van Matrikse, as ‘n gids vir korporatiewe bestuurders wanneer hulle innovasiestrategieë moet ontwikkel.

Produk

Die "Strategiese Korporatiewe Innovasie Navigasie (SKINav) Stelsel Model" (soos in Figuur 1) word beskou as die produk wat hierdie PhD navorsings studie afgelewer het.



Figuur 1: Strategiese Korporatiewe Innovasie Navigasie (SKINav) Stelsel Model

Sleutelterme: Innovasie, Innovasiebestuur, Stelsels, Strategie.

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CHAPTER 1: RESEARCH CHALLENGE

1.1 Introduction

Very recently two highly acclaimed academic researchers, Prof Christensen (Christensen *et al*., 2016) and Dr Hamel (Hamel and Tennant, 2015) both referenced data from a McKinsey report that "**only 6%** of executives are satisfied with their corporation's innovation performance", which was confirmed where McKinsey & Company posted the result of their strategy and corporate finance web page as shown in Figure 2. Alternatively stated, 94% of corporate executives were dissatisfied with their "Corporate Innovation Performance" with "very few (executives) who know what exactly the problem is, and how to improve in innovation and R&D" (Anonymous, 2018). This thesis will define this phenomenon as the "**Corporate Innovation Performance Challenge**".

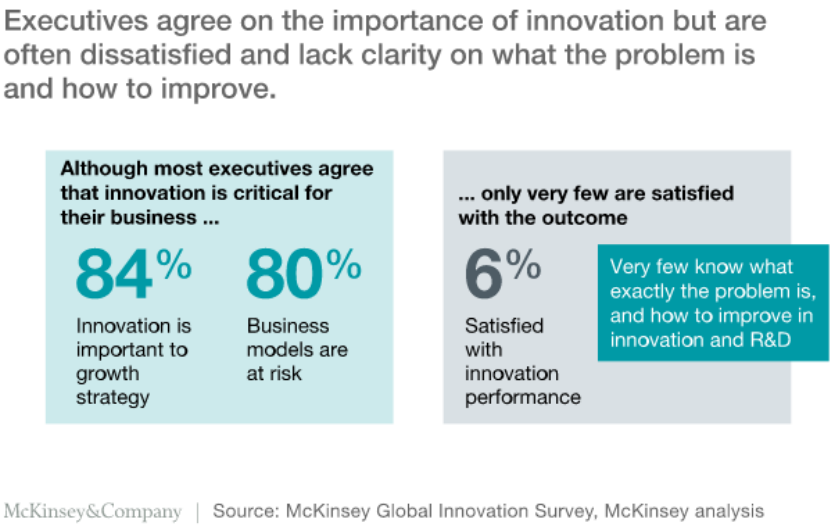


Figure 2: McKinsey Reports on the Current State of Corporate Innovation Performance

Secondly, Nagji and Tuff also found that "mature companies attempting to enter new businesses **fail as often as 99%** of the time" (Nagji and Tuff, 2012).

In the third related problem, from the empirical research done by "PricewaterhouseCoopers (doing business as PwC) Strategy&" (Jaruzelski et al., 2005) and McKinsey (Kutcher et al., 2014), they

found no correlation between the amount of money that was being spent on Research and Development (R&D), innovation and growth.

"There is **no relationship** between R&D spending and the primary measures of economic or corporate success, such as growth, enterprise profitability, and shareholder return."(Jaruzelski et al., 2005).

Independent research by Bain & Company (Zook and Allen, 2016) determined that the challenge with corporate growth is primarily due to internal obstacles within the corporation (rather than from external forces) such as the: appointment of talent, conceptual distance to the customer and complexity of decisions:

"85% of the executives we surveyed, and a full 94% of those running companies with more than $5 billion in revenue, said that **internal obstacles**, not external ones, keep their companies from growing profitably." (Zook and Allen, 2016).

Regarding "internal obstacles", many corporations still consider innovation as an activity-based linear process where some (or all) employees are considered to be natural creative "ideators" (or inventors) who has to come up with new and exciting ideas. A small "innovation management team" will sift through all the ideas to select the best one which they then pass on to the lucky department to get the fortunate (or unfortunate) task to implement it. With this, many corporations (and shareholder activists) can check the box on the management agenda that the corporation is building an innovative culture.

Unfortunately, "A lack of good ideas is not the problem. The problem is the absence of a robust, **repeatable process** for creating and nurturing **new growth businesses**." (Christensen et al., 2002) (Allen and Zook, 2012).

Prof Pisano at Harvard Business School also added that "The problem is that an organization's capacity for innovation stems from an **innovation system**" (Pisano, 2015), a concept that is also supported by some other researchers such as Prof Peter Drucker. (Drucker, 1985a) (Taylor and Wagner, 2014) (Petzov, 2017).

From empirical research it was actually determined that "Organizations that have a **holistic, formal system** in place for **innovation** report better outcomes and **higher levels of satisfaction** from their innovation investment." (Koetzier and Alon, 2013)

Even if corporations believe to have a formal innovation system in place, the question then still remains: “How do large corporations bring about strategic innovation, and what kind of strategic management in (and between) leading companies is needed to **achieve sustainable growth**?” (Kodama, 2017)

Prof Pisano suggested that “The problem with innovation improvement efforts is rooted in the lack of an **innovation strategy**.” (Pisano, 2015).

The above-mentioned logic will be discussed and investigated in more detail in Chapter 2. Empirical data will be analyzed to provide sufficient evidence that inadequate or insufficient “Corporate Innovation Strategies” that are currently being developed and implemented within corporations may just be one of the primary causes for the “Corporate Innovation Performance Challenge”.

1.2 Research Purpose

This research argues that the current corporate challenge is not so much as to have a "**Corporate Innovation Strategy**" in place that is only aligned with corporate growth (even though that is a legitimate challenge as well), but the actual hidden challenge is to have a comprehensive, holistic and dynamic "Strategic Corporate Innovation" system in place to support the formulation of a "Corporate Innovation Strategy".

Therefore, the **vision** for this PhD research project was to solve the "Corporate Innovation Performance Challenge" with an elegant, novel, simple and pragmatic solution that will initiate a "paradigm shift" as to how academics and corporate executives think about "Strategic Corporate Innovation".

The **mission** was to design and develop a system (as a guide) that will enable corporate executives (who are responsible for the Strategic Corporate Innovation function) to integrate multidisciplinary knowledge, skills and resources to deliver unique insights as valuable solutions which customer and consumers will appreciate in such a way that it will (1) generate brand recognition in the market, (2) create wealth for employees and (3) sustain organic growth for shareholders.

The **goal** was to integrate all applicable theories and empirical data into a single "Dynamic Multidimensional Contextual Systems Model" as a reference guide (or map) that can assist corporate executives to develop and manage Corporate Innovation Strategy.

The primary **objective** was to apply Systems Thinking (and as secondarily, Systems Engineering) principles as a theory building research methodology.

The **outcome** of this research project delivered the Strategic Corporate Innovation Navigation (SCINav) Systems Model that was constructed as a Relational Multidimensional Vector of Matrixes (see Figure 1).

1.3 Model Requirements

The systems model design and development (collectively known as systems modelling) **requirements** for this research project will be as follows:

1. Aggregate, curate, integrate, connect and correlate various frameworks, models and theories for innovation and corporate strategy into a single Systems Model.

2. Apply Systems Thinking and Systems Engineering principles.

3. Design and Develop a novel “Strategic Corporate Innovation Navigation Systems Model” that can support corporate executives with the formulation of a “Corporate Innovation Strategy”.

4. Guide corporate executives to “Manage Corporate Innovation Strategically” as a solution for the “Corporate Innovation Performance Challenge”.

1.4 Performance Requirements

The expected performance outcomes for the “Strategic Corporate Innovation Navigation Systems Model”, is to assist and enable corporate executives to deliver unique insights as valuable solutions which customers and consumers will appreciate in such a way that the corporation will:

1. Deliver several new technological products with successful adoption in the market.

2. Generate brand recognition in the market.

3. Create wealth for employees.

4. Sustain economic growth for shareholders.

1.5 Thesis Guide

Table 1: Thesis Guide Table

Chapter	Summary
Chapter 1	**Research Challenge** Short introduction of the "Corporate Innovation Challenge" this research identified and a suggested approach to solve this challenge.
Chapter 2	**Research Context** This is a high-level holistic and contextual overview of this PhD research project and an introduction to the novelty of the outcome of this research.
Chapter 3	**Research Methodology** Short introduction to Systems Thinking as the primary methodological approach to develop the desired solution for this research project.
Chapter 4	**Literature Study** The relevant foundational frameworks, models and theories identified during the literature study are discussed in more detail. It was also normalized in preparation for the SCINav systems model design process.
Chapter 5	**Literature Definitions and Concepts** To assist bridging the intellectual transition from System Design and Development (in Chapter 6) to System Dynamics (in Chapter 7), a few important existing and newly developed concepts will be discussed**.**
Chapter 6	**System Model Design** Applying the Systems Thinking research methodology, the SCINav Systems Model was designed as a "Dynamic Multidimensional Contextual Based Corporate Innovation Strategy Formulation Support Systems" that was constructed as a "Relational Multidimensional Vector of Matrixes". This is the primary intellectual novel contribution of this PhD thesis.
Chapter 7	**System Dynamics Development** Since the SCINav Systems Model is a dynamic contextual framework, the specific transitions among various "innovation stages" will be discussed to provide clarity on indicators: where a specific technological or service innovation exist within the framework, when it should transition to another stage and how it should be done.
Chapter 8	**System Verification, Validation and Assessment** Since Tesla Corp was and still is one of the fastest growing corporations with both significant breakthrough and disruptive innovations within various areas within the transport and eventually energy industries, it was selected to serve as a case study to verify and validate the SCINav Systems Model.
Chapter 9	**Conclusions and Recommendations** The overall assessment of the SCINav Systems Model's success to be applied in industry.
Chapter 10	**Bibliography**

1.6 Abbreviations

BCG – Boston Consulting Group

CEO – Chief Executive Officer

CINO – Chief Innovation Officer

CIO – Chief Information Officer

Corp – Corporation

EV – Electric Vehicle

FMECG – Fast Moving Electronics Consumer Goods

IEEE – Institute of Electrical and Electronics Engineers

IP – Intellectual Property

JTBD – Jobs to be Done

NPD – New Product Development

NIS – National Innovation System

ODI – Outcome Driven Innovation

PC – Personal Computer

R&D – Research and Development

SCINav – Strategic Corporate Innovation Navigation

SCIM – Strategic Corporate Innovation Management

TSR – Total Shareholder Return

1.7 Conclusion

From the literature presented in this chapter, it was identified that the majority of corporate executives are still very dissatisfied with their corporations' innovation performance, a phenomenon this research termed as the "Corporate Innovation Performance Challenge".

The research approach to invent a solution will primarily be based on Systems Thinking fundamentals and secondarily on Systems Engineering concepts.

The basic expectations for the design and development is a novel "Strategic Corporate Innovation Navigation Systems Model" that can support corporate executives with the formulation of a "Corporate Innovation Strategy" and guide them to "Manage Corporate Innovation Strategically" as a solution for the "Corporate Innovation Performance Challenge".

The expected performance outcomes for the "Strategic Corporate Innovation Navigation Systems Model" is to assist and enable corporate executives to deliver unique insights as valuable solutions which customers and consumers will appreciate in such a way that the corporation will: (1) deliver several new technological products with successful adoption in the market, (2) generate brand recognition in the market, (3) create wealth for employees and (4) sustain economic growth for shareholders.

A guide for the conceptual logical flow of the chapters for this thesis was provided for the reader in the format of a table.

Chapter 2 will continue to discuss the scope, importance, hypothesis and novelty of this research project's solution for the "Corporate Innovation Performance Challenge".

CHAPTER 2: RESEARCH CONTEXT

2.1 Introduction

In Chapter 1 it was pointed out that approximately 94% of corporate executives are still dissatisfied with their corporation's innovation performance.

From literature overview presented, it was suggested that the cause for the "Corporate Innovation Performance Challenge" originated from "Internal Obstacles" within the corporation. The lack of a "Strategic Corporate Innovation System" was proposed, and more specifically within this innovation system the lack of an adequate "Corporate Innovation Strategy".

This chapter will discuss the scope, importance, hypothesis and novelty of this research project as a solution for the "Corporate Innovation Performance Challenge".

With the development of the research hypothesis in this chapter, the suggested causes (from the literature mentioned in Chapter 1) for the "Corporate Innovation Performance Challenge" will be researched and investigated in more detail with the support from empirical data.

2.2 Scope

The overarching **vision** of this research project was to solve the "Corporate Innovation Performance Challenge" as defined in Chapter 1. This research project started by investigating every aspect of innovation, innovation management and innovation systems.

Discovery: The existence of various Innovation Management Ecosystem levels was discovered from initial literature studies. These levels were categorized to be as follows: Business Unit, Corporate, Industry and Federal. The conceptual representation of the four Innovation Management Ecosystem levels with some associated academic theories is available in Figure 3.

To solve the "Corporate Innovation Performance Challenge", the decision was made to define the **scope** of this research project to be at the **Corporate Innovation Management Ecosystem** level (from Figure 3) as the best area to solve the "Corporate Innovation Performance Challenge".

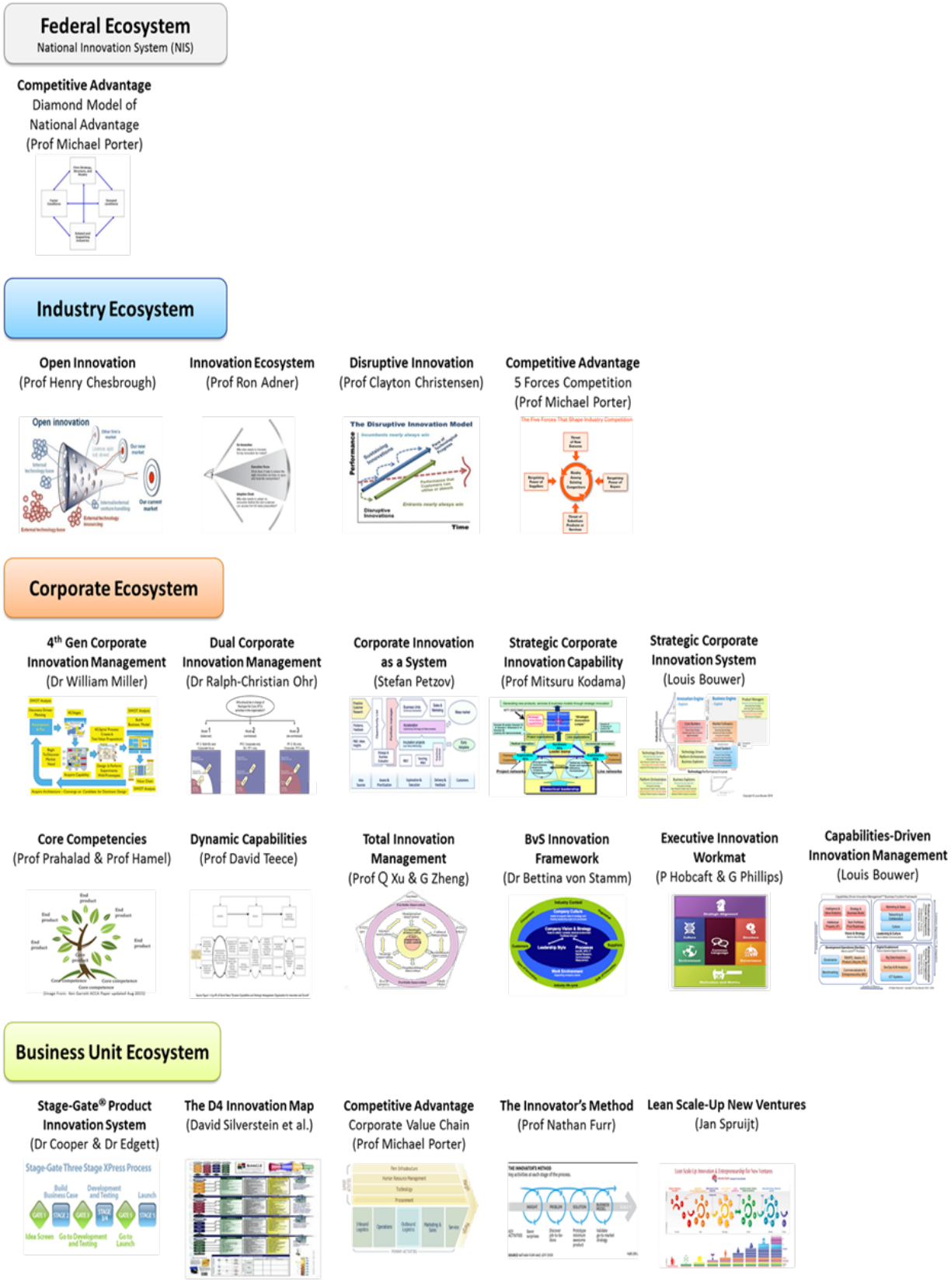


Figure 3: Various Levels of Innovation Management Ecosystems

2.3 Importance

2.3.1 Overview

To understand the importance of corporate innovation to obtain a state where corporations generate brand recognition in the market, create wealth for employees and sustain growth for shareholders (a concept that will be referred to as “Growth Innovation”), this research takes three distinctive views to determine the importance of this research:

1. Foster Corporate Longevity Wave from an economics and innovation position-based view.
2. Corporate Core Competence Evolution from a competitive advantage-based view.
3. Corporate Innovation Hype from an innovation management capabilities-based view.

2.3.2 Corporate Longevity Shortens

This research started to investigate the **corporate ecosystem** and therefore economic trends at the highest possible level. The Foster Corporate Longevity Wave (Foster and Kaplan, 2001a), represented as vertical bars in dark blue in Figure 4, is a very good confirmation the increasingly challenge for corporations to stay listed on the S&P 500 index. This makes it even more critical for corporate executives to deal with the “Corporate Innovation Performance Challenge” as described in Chapter 1.

Observations from Figure 4 are the following:

1. The wavelengths are shortening with time, which indicates that innovation and economic prosperity cycles are “shortening”. This implies that corporations must become more proactive to manage its corporate innovation strategically according to future innovation or economic waves, or get left behind on an old wave and cease to exist.
2. Most alarming from the Foster Corporate Longevity Wave (vertical bar graphs in blue starting from 1930s) is how short the lifespan (or existence) of corporations has become on the S&P 500 index. The Foster Corporate Longevity Wave has a consistent delta reduction in wave amplitude as indicated in Table 2.

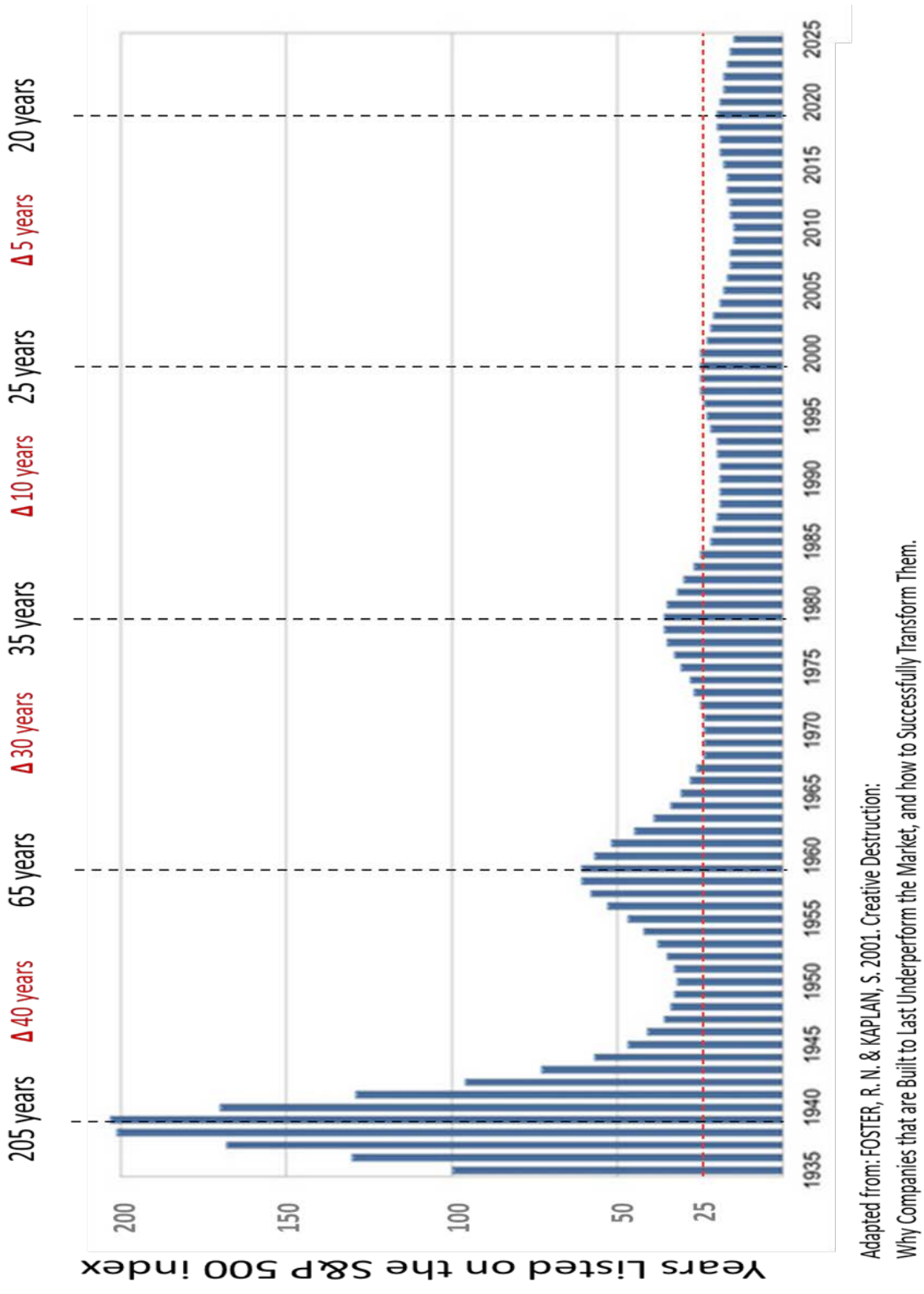


Figure 4: Integrated Illustration of Kondratieff vs. Schumpeter vs. Foster Waves.

Sources: (Foster and Kaplan, 2001a)

Table 2: Foster Corporate Longevity Wave Characteristics Analysis

Year	Longevity Wave Amplitude	Longevity Wavelength
1939	205 years	
1959	65 years	40 years
1979	35 years	30 years
1999	25 years	10 years
2019	20 years	5 years

Discovery: Strategic Corporate Innovation Management (SCIM) should become an increasingly important Core Competence of the Corporation (Prahalad and Hamel, 1990) to sustain corporate longevity, which includes the formulation of a robust Corporate Innovation Strategy.

2.3.3 Evolution of Strategic Corporate Core Competence

History and evolutionary development are always essential knowledge to create the necessary insight and possible foresight regarding the elements and structure of a system.

For this purpose, a "**Strategic Corporate Core Competence Evolution Framework**" was constructed as in Table 3. With this table the primary core competence that could provide a corporation with a competitive advantage was identified for each decade since 1960s. The developed core competences are also accumulative, meaning that the mastery of all previous core competences must still be maintained and also continuously be improved upon while new core competences are being discovered and implemented.

Various corporate management theories were classified into the following groups:

1. Innovation Theory.
2. Organization Theory.
3. Strategy Theory.

Special attention was given to the following theories:

1. Greiner's Phases of Corporate Growth. (Greiner, 1972) (Greiner, 1998)
2. Porter's Competitive Advantage. (Porter, 1985) (Porter, 1987)
3. Prahalad and Hamel's Core Competence of the Corporation. (Prahalad and Hamel, 1990)
4. Hobday-Rothwell Generations of Innovation Models. (Rothwell, 1994) (Hobday, 2005)

Additional indicators were also developed and postulated from theory to provide additional information:

1. Focus at industry, corporate and business level.
2. Competitive Advantage for the specific decades extrapolated from the focus indicators.
3. Corporate Innovation Management Growth based on Greiner's Corporate Growth model.
4. Corporate Innovation Capabilities Growth based on Greiner's Corporate Growth model.

Discovery: The identified "Strategic Corporate Core Competences" were matched with the decade when the academic literature became mainstream and thus not the actual adoption and implementation by the majority of corporations. This research discovered there is a 20-year (two decades) delay between academic publication and corporate adoption of "Strategic Corporate Core Competences".

Table 3: Strategic Corporate Core Competence Evolution Framework

Decade	1960s	1970s	1980s	1990s	2000s	2010s	2010s
Core Competence	**QUALITY**	**EFFICIENCY**	**GLOBALIZATION**	**DIGITIZATION**	**INNOVATION**	**M-CAP GROWTH**	**ECOSYSTEMS**
Corporate Focus	**Customer Value**	**Customer Value**	**Shareholder Value**	**Shareholder Value**	**Shareholder Value**	**Shareholder Value**	**Ecosystem Value**
Business Focus	**Growth**	**Efficiency**	**Growth**	**Efficiency**	**Growth**	**Efficiency**	**Growth**
Competitive Advantage	Reliability Advantage	Cost Advantage	Market Advantage	Convenience Advantage	Innovation Advantage	Growth Advantage	Ecosystem Advantage
Corporate Function	Chief Operating Officer	Chief Financial Officer	Chief Marketing Officer	Chief Digital Officer	Chief Innovation Officer	Chief Growth Officer	Chief Ecosystem Officer
Innovation Theory	**Diffusion of Innovation**	**Dynamics of Innovation**	**Systemic Disciplined Innovation**	**Disruptive Innovation**	**Open Innovation**	**Frugal Innovation**	**Innovation Ecosystems**
Originating Researcher	Prof Everett Rogers	Prof James Utterback	Prof Peter Drucker	Prof Clayton Christensen	Prof Henry Chesbrough	Navi Radjou Jaideep Prabhu	Prof Ron Adner
Organization Theory	**Industrial Dynamics & Systems**	**Corporate Growth Model**	**Positioning and Marketing Warfare**	**Core Competencies**	**Business Model Innovation**	**JTBD Growth Strategy Matrix**	**Digital Platform Business Model**
Originating Researcher	Prof Jay Forrester	Prof Larry Greiner	Al Ries Jack Trout Steve Rivkin	Prof C.K. Prahalad Dr Gary Hamel	Dr Alexander Osterwalder Prof Yves Pigneur	Anthony Ulwick	Prof Geoffrey Parker Prof David Rogers
Strategy Theory	**Corporate Strategy**	**Strategic Management**	**Strategic Competitiveness**	**Strategic Innovation**	**Systemic Strategic Innovation Management**	**Strategic Growth**	**Strategic Ecosystems**
Originating Researcher	Prof Harry Igor Ansoff	Prof Harry Igor Ansoff	Prof Michael Porter	Prof Constantinos Markides	Prof Qingrui Xu Dr William Miller Dr Bettina von Stamm Dr Nancy Tennant Snyder	Dr Chris Zook	TBD
Greiner 5+1 Phases of Corporate Growth	**Creativity (Leadership Crisis)**	**Direction (Autonomy)**	**Delegation - Distributed (Control)**	**Coordination - Centralized (Red Tape Bureaucracy)**	**Collaboration (Growth)**		**Alliances (TBD)**
Bouwer 5+1 Stages of Corporate Innovation Management Growth (How Being Managed?)	Creative Intention	Directed Activities	Delegated Groups	Coordinating Executives	Collaborative Function		Alliances Ecosystem
Bouwer 5+1 Stages of Corporate Innovation Capabilities Growth (How Being Done?)	Invention	Innovation	Intelligent Innovation	Strategic Intelligent Innovation	Strategic Intelligent Innovation Management System		Digital Platforms for Open Innovation Ecosystems
Hobday-Rothwell 5 Generations of Innovation Models	Technology Push	Market Pull	Coupling Model	Integrated Model	Systems Integration and Networking Model		[Platform Model]

From Table 3 it is quite evident that the “Core Competence” within the industry conceptually has changed every decade. A few generalized observations are worth mentioning:

1. The “**Strategic Corporate Core Competence**” is accumulative, meaning that a new corporation will need to grow innovation capabilities similar to the “Greiner Phases of Corporate Growth” (Greiner, 1972) to develop all the required corporate capabilities to be competitive.

2. There is most certainly a difference between innovation at corporate level and innovation at business unit level. This research proposes a (most certainly controversial) distinction in such a manner that “Innovation Management” (of new technologies and business models) is considered to be at a corporate level and “Product Management” (of improved products and services) is then at the business unit level. This then results in the need for an “**Ambidextrous Organization**” structure where two very different innovation activities (exploration and exploitation) with very different cycle timeframes can co-exist within the same corporation.

3. A phenomenon was observed from Table 3 that provided evidence that it will take approximately 20 years (two decades) from the time when a significant group of academic researchers publish knowledge on a new corporate core competence and until it will be adopted by the “Early Majority” group of corporations within industry, thus crossing the innovation adoption chasm (Moore, 1991).

4. It was observed that interest in the “**Digitization**” competence already started in the 1990s, predominantly with process automation etc. At the time a majority of corporations had already appointed a Chief Information Officer (CIO), which may have had a distracting influence on the development of this competitive advantage. However, corporations only got serious about “Corporate Digital Transformation” almost two decades later. From empirical observations the appointment of “Chief Digital Officers” only started from approximately after 2010.

5. From observations regarding the “**Innovation**” competence within corporations, this research observed that the same phenomenon can also be applied to “**Corporate Innovation Management**” which was initiated in the 2000s with some good research on corporate innovation frameworks (Von Stamm, 2003) and even with the suggestion that corporations should start to appoint a Chief Innovation Officer (CINO) (Miller, 2001). At the time corporations only started with **Ideation** and a decade later added **Design Thinking** to their innovation programs primarily at the business unit level. This research

predicts that "**Strategic Corporate Innovation Management**" (SCIM) will only become a "Corporate Hype" (Fenn and Raskino, 2008) with a serious effort to appoint CINOs (Chief Innovation Officers) from 2020 and onwards.

Discovery: From the "Strategic Corporate Core Competence Evolution Framework" as in Table 3, corporations should already have started since the beginning of the 21st century to invest time and resources to develop "Strategic Corporate Innovation" as a "Core Competence" for their corporations, as the literature suggested at the time.

Even though there were several publications out to promote the concept of a Chief Innovation Officer (CINO or CInO) the past decade, it was never really adopted by the majority of corporations (Wedell-Wedellsborg, 2014) (Di Fiori, 2014) (Miller, 2001). The latest literature indicates that the position to drive innovation in corporations will most likely become the responsibility of the Chief Strategy Officer (CSO) (Rangen, 2018) (Birshan et al., 2015) (Powell and Angwin, 2012) (Breene et al., 2007). The is because "Strategy Management" is a well-known program within business schools and is a familiar topic within corporations, while "Innovation Management" is still not a mainstream program at business schools and corporations still struggle with what innovation is or should be according to the "Corporate Innovation Performance Challenge" phenomenon.

"Strategic Corporate Innovation Transformation" should soon (from 2020) become a serious sought-after competence within corporations with the appointment of Chief Innovation Officers (CINO) or the Chief Strategy Officer (CSO) to take charge of such a corporate business function, based on evidence from "Digital Transformation" and the appointment of "Chief Digital Officers" (CDO) in industry.

This implies that corporations will very soon need well-founded research that can assist the newly appointed CINOs (or CSOs) to establish and manage the "Strategic Corporate Innovation Management Function".

2.3.4 Corporate Innovation Hype

To support the predicted importance of "Strategic Corporate Innovation Transformation" (especially from 2020), as suggested in the previous paragraph, this research applied the "Gartner Hype Cycle" (Fenn and Raskino, 2008) to actual empirical observations accordingly to determine if it could be duplicated through another approach.

The "Five Stages of Corporate Innovation Management Growth" (another hypothesis from background research) based on Greiner's "Five Phases for Corporate Growth" (Greiner, 1972) model, was conceptually mapped onto the "Gartner Hype Cycle" (Fenn and Raskino, 2008), with the construction of the graph in Figure 5.

The **blue** line graph represents the "hype level" of enthusiasm the majority of corporate executives are actively managing innovation within their corporations.

There is a difference in the "time frames" between Table 3 and Figure 5 because the sources of the data are different. Table 3 kept track of the introduction of new academic theories and Figure 5 followed the actual adoption of new theories by corporate executives within industry. This means there will be a significant difference between the time a new theory was introduced and when it actually became a "corporate hype" with a majority of corporations within industry.

Discovery: According to Figure 5, it also indicated that the majority of corporations should now start to appoint a Chief Innovation (or Strategy) Officer as a "Coordinating Executive" to initiate the transition the Corporate Core Competence from "Business Unit Co-Creation" to "Strategic Corporate Innovation".

Figure 5: Mapping the Evolution of Corporate Innovation Management to the Gartner Hype Cycle

2.4 Research Hypothesis

2.4.1 Overview

As mentioned in Chapter 1, "only 6% of executives are satisfied with their corporation's innovation performance" (Christensen et al., 2016b) (Hamel and Tennant, 2015). Alternatively stated, 94% of corporate executives were dissatisfied with their "Corporate Innovation Performance" with "very few (executives) who know what exactly the problem is, and how to improve in innovation and R&D" (Anonymous, 2018). This thesis will define this phenomenon as the "**Corporate Innovation Performance Challenge**".

For this research project, "**Corporate Innovation Performance**" will be defined as the (1) generation of brand recognition in the market, (2) creation of wealth for employees and (3) sustainable economic growth for shareholders. These metrics will later be used to validate the proposed solution from this research project.

2.4.2 Innovation Performance Paradox

In order to gain a better and deeper understanding of what the "Corporate Innovation Performance Challenge" phenomenon might look like, various different quantitative empirical data points related to the topic were collected from a range of global empirical studies that were published during the past decade. From this collection of data, a Systems Thinking Diagram was modelled (using Kumu systems modelling software), with a conceptual representation thereof available in Figure 6. The functional interactive Systems Thinking Diagram with detailed data is available for further analysis at https://embed.kumu.io/fd511cf51eeb0555329ad60e7d5331a3.

The circular data point elements in Figure 6 were conceptually ordered in descending order based on percentage values from left to right. The legend defines the colors that were used for specific year groups. Data elements that represented similar concepts were connected to follow the changes from left to right and also to be able to following change in time according to color groups.

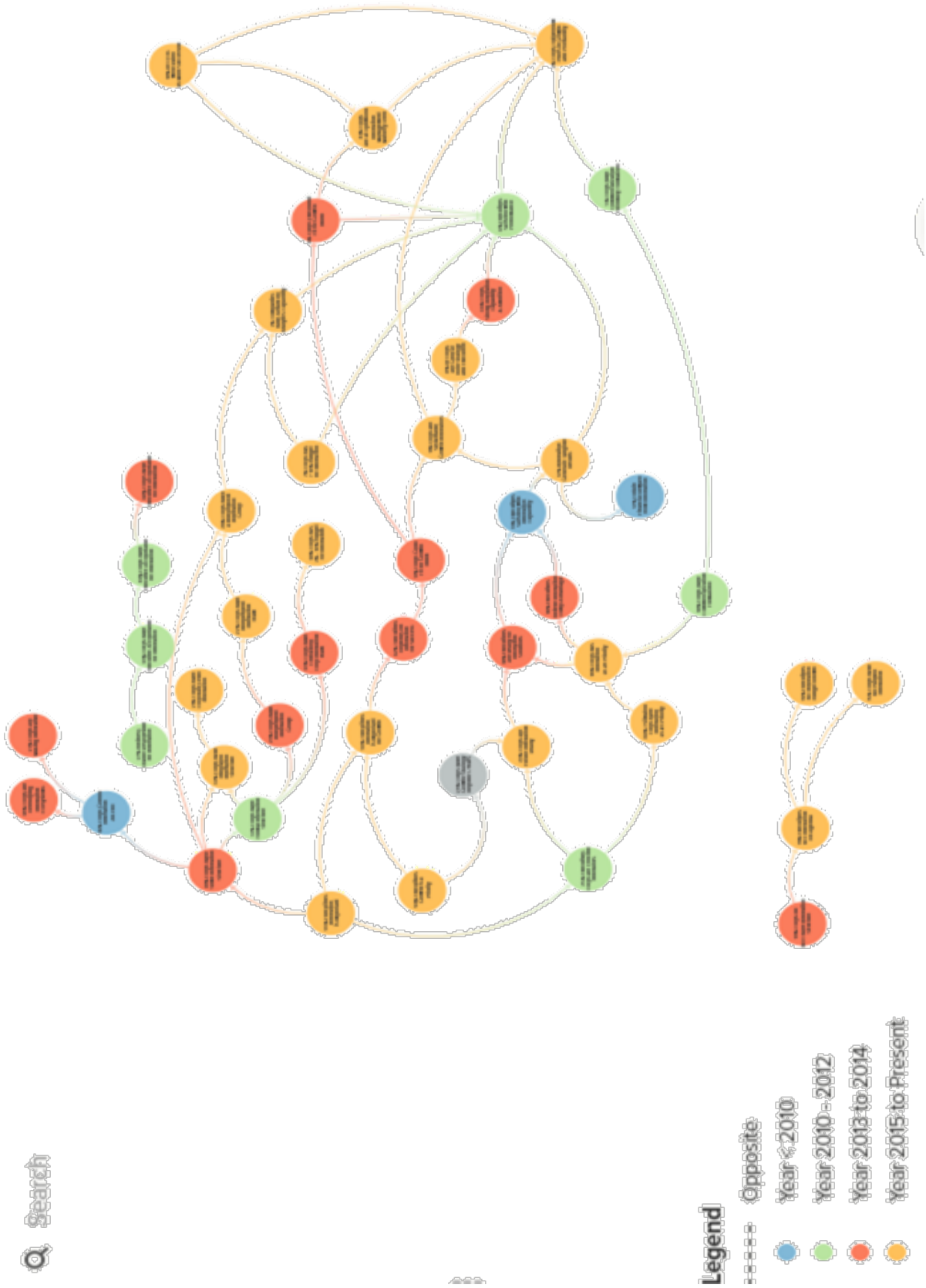


Figure 6: Quantitative Empirical Data Systems Thinking Diagram.

Original Data Source: https://embed.kumu.io/fd511cf51eeb0555329ad60e7d5331a3

The most significant and relevant quantitative empirical data points were listed in Table 4 for further discussion.

Table 4: Quantitative Empirical Data for Corporate Innovation Performance Challenge

95% of executives believe **innovation** is important.
94% of executives believe **growth** is important.
93% of executives believe that **innovation** is important for **growth**.
67% of executives depend on **innovation** for **corporate success**.
17% of corporations were measured as "**Good for Growth**" with PwC's "**Fit for Growth Index**".
11% of corporations measured as "**Sustainable Value Creators (SVCs)**" by Bain & Company.
7.6% of corporations measured with a "strong innovation capability and ambition" by BCG.
7% of corporations allocate **more than 10%** of their budget to R&D or innovation.
7% of companies have Advanced Analytics Capability.
6% of corporates measured as "**Excellent for Growth**" with the PwC "**Fit for Growth Index**".
6% of corporate executives are satisfied with their corporations' innovation performance.
5% of corporations have an extremely **formalized commercialization** process or system.
0.1% of gross revue is contributed by **corporate ideation** programs.

The data from Table 4 revealed that the majority of corporate executives (almost 95%) shared high importance for innovation and growth and the requirement for Strategic Corporate Innovation for growth (percentage values in **blue**).

Unfortunately, only a small minority (approximately 6% to 7%) of corporations have innovation capabilities in place for sustainable growth (with percentage values in **red**).

Discovery: With the empirical evidence brought forth from the previous paragraphs, this research discovered that even though a high percentage of corporate executives believe (to the point where it can be considered a fact) that Corporate Innovation is important for a corporation to be successful when measured against various financial performance metrics. In contrast, only a very small percentage of corporations; (1) have the required innovation management capabilities in place, (2) will be able to sustain corporate growth or (3) have executives that are satisfied with the innovation performance of the corporation. This discrepancy will be referred to as the "**Corporate Innovation Performance Paradox**".

2.4.3 Innovation Obstacles

Independent research by Bain & Company (Zook and Allen, 2016) determined that the challenge with corporate growth is primarily due to Internal Obstacles within the corporation (rather than from external forces) such as the: (1) appointment of talent, (2) conceptual distance from executive management to the customer and (3) complexity of decisions:

"85% of the executives we surveyed, and a full 94% of those running companies with more than $5 billion in revenue, said that **internal obstacles**, not external ones, keep their companies from growing profitably." (Zook and Allen, 2016).

This research scouted 21 reports with empirical qualitative data based on corporate innovation performance obstacles and that was also published within the past decade. Each report ranked innovation performance obstacles according to what corporate executives considered to be the biggest contributing factors (or reasons) for the Corporate Innovation Performance Challenge.

With a deep analysis of the empirical qualitative corporate innovation performance obstacles dataset, seven (7) categories could be identified to classify the ranked obstacles from each report accordingly.

The seven identified categories of corporate innovation performance obstacles were then scored with a weighted value (according to its ranking in each report), with the final cumulative quantitative scoring result presented in Table 5.

Table 5: Scoring of Empirical Qualitative Data for Innovation Performance Obstacles

Score	Innovation Obstacle Category
51	Executive Commitment
62	**Strategy Formulation**
71	**Strategy Intelligence**
83	Management Confusion
91	Ambidextrous Organization
107	Culture of Fear for Risk
112	**Strategy Implementation (or Execution)**

The cumulative quantitative scoring of all empirical qualitative corporate innovation performance obstacles in Table 5 was obtained as follows:

1. This research scouted 21 reports through the past decade with empirical data where corporations identified obstacles with the management of innovation.

2. Each report also ranked the identified obstacles in ascending order, with the first obstacle as the most important (which received a correlating weighted value of 1).

3. This research then classified each obstacle as one of seven common obstacles.

4. Each corporate innovation management obstacle was counted (or added) with the (weighted) number it was ranked in the original published report.

5. Thus, each obstacle for managing corporate innovation was calculated with a “weighted score”.

6. Finally, a list in ascending order according to the scoring was established.

7. The obstacle with the lowest score was considered to be the most important (or challenging) obstacle.

The list in Table 5 is quite illuminating with “Strategy Implementation” ranked as the least important or challenging obstacle (with the highest allocated value), while almost every corporation primarily focuses on the implementation of an “Innovation Culture” (ranked as the second least challenging or important obstacle) through corporate wide “ideation”, “co-creation”

and “Design Thinking” programs (Figure 5). This research contributes this current phenomenon to an economic force this research termed “Shareholder Capitalism”, more information is available in paragraph 5.16.

Unfortunately, quantitative empirical data (see Table 4) has shown that “Ideation Programs” at a corporate level failed as a solution to solve the “Corporate Innovation Performance Challenge or Paradox”, which can also explain why corporate executives are dissatisfaction with their corporations’ innovation performance.

It is now possible to state that “Strategy Implementation” has very little leverage and a better approach is to focus on is “Strategy Formulation” as a strategic lever to driver a “Strategic Corporate Innovation Management System” as a solution for the “Corporate Innovation Performance Challenge or Paradox”.

Discovery: This research defined the “**Corporate Innovation Obstacles**” with the lowest calculated values as the best enabling corporate mechanisms (or drivers) with the most leverage to implement and institutionalize a “Strategic Corporate Innovation Management (SCIM) System” across the corporation.

The ranking of “Corporate Innovation Obstacles” in Table 5 resulted in the identification of “**Strategy Formulation**” with the second lowest score, and thus the second-best activity with leverage to influence “Corporate Innovation Performance” within a corporation.

“Executive Commitment” was ranked as the top influential driver.

2.4.4 Innovation Strategy Paradox

With the analysis from “Innovation Obstacles” in the previous paragraph, this research can fully support the point made by Prof Pisano that the problem with innovation improvement within corporations is the “causal effect” from the lack of an “Innovation Strategy” (Pisano, 2015).

To gain a better understanding on the current state of “Corporate Innovation Strategy” within corporations, additional quantitative empirical data was collected for further analysis.

Data presented and extrapolated from Figure 7 (and Table 6) indicates that almost 80% of corporations should have some form of a “Corporate Innovation Strategy” in place for 2019, which is very promising for the future of corporate innovation.

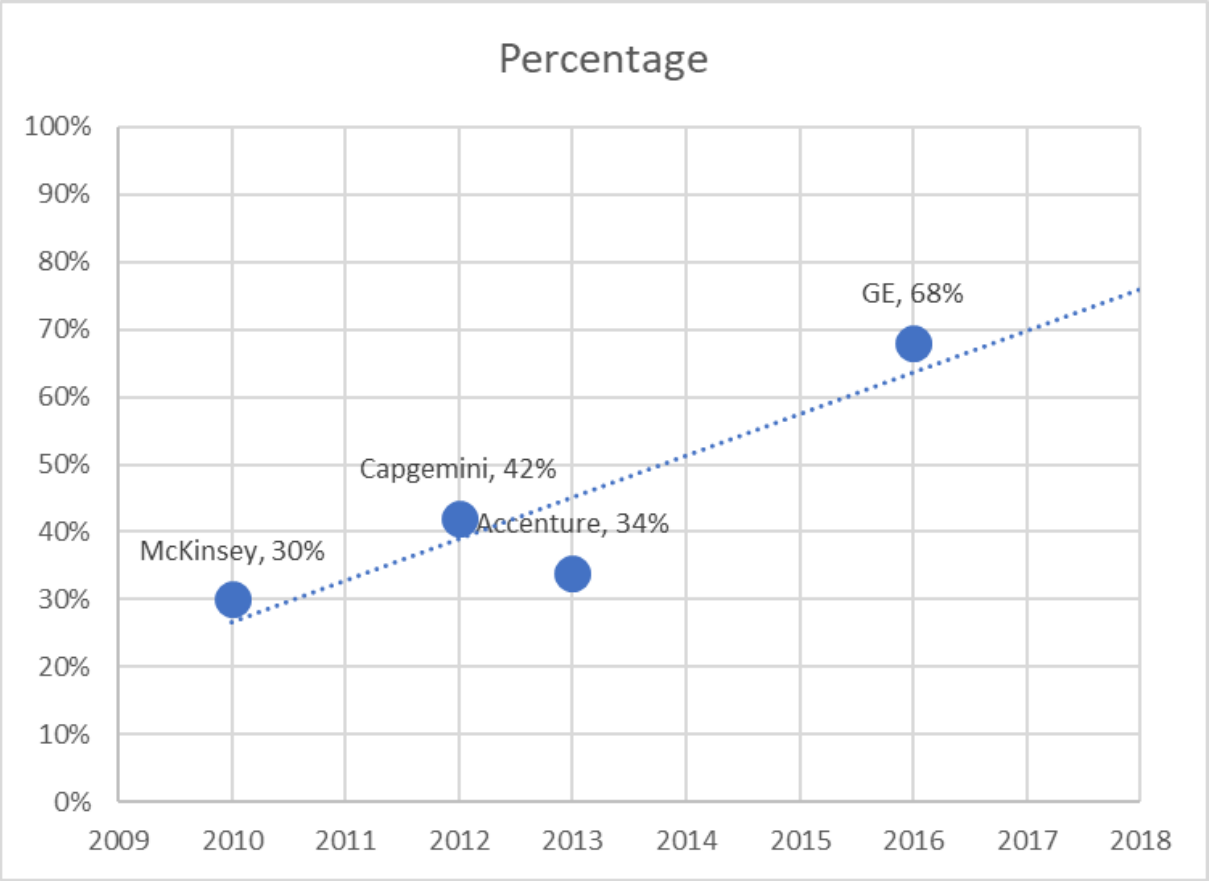


Figure 7: Percentage of Corporations That Have an Innovation Strategy

Table 6: Percentage of Corporations That have an Innovation Strategy

Corporations that have an Innovation Strategy			
Percentage	**Year**	**Report**	**Title**
68%	2016	GE	Global Innovation Barometer
34%	2013	Accenture	Why Low Risk Innovation is Costly
42%	2012	Capgemini	Innovation Leadership Study
30%	2010	McKinsey	Innovation and Commercialization

Also, from additional quantitative empirical data (presented in Table 7), it is possible to conclude that "Corporate Innovation Strategy" is:

- Mostly well understood only by corporate board members (75%).
- Fairly well aligned with corporate growth goals (52%).

The challenge with the Corporate Innovation Strategy is that it is:

- Barely understood across the corporation (83%).
- Not well aligned with the rest of the corporation's capabilities (78%).

Table 7: Qualitative Empirical Dimensions for Corporate Innovation Strategy

Corporate Strategy is NOT well Understood Across Organization			
83% (17%)	2014	Strategy&	Fit for Growth Index Profiler Survey
Corporate Strategy is NOT well Aligned with Capabilities			
78% (22%)	2014	Strategy&	Fit for Growth Index Profiler Survey
Innovation Strategy is NOT well Understood by Board Members			
25% (75%)	2016	Deloitte	GBS Radical Innovation and Growth
Innovation Strategy and Corporate Growth Goals are NOT Fully Aligned			
48% (52%)	2016	Deloitte	GBS Radical Innovation and Growth

In summary, the empirical data from Table 7 indicated that while top executives have their "Corporate Innovation Strategies" fairly well aligned with corporate board members and corporate growth goals, it is actually not well propagated in corporate business units and not aligned with the rest of the corporation.

Discovery: While the majority (at least 80%) of corporations have a "Corporate Innovation Strategy" and with corporate executives satisfied with it, it is not aligned with the required innovation capabilities or even well understood through the rest of the corporation. This research will term this phenomenon as the "**Corporate Innovation Strategy Paradox**".

The "Corporate Innovation Strategy Paradox" can also explain why the majority of corporate executives are disappointed with their "Corporate Innovation Performance". Even though a "Corporate Innovation Strategy" may be in place and well aligned with corporate growth, it is not adequately structured to align or integrate the rest of the corporation to create a "**Repeatable Strategic Corporate Innovation System**" (Pisano, 2015) (Koetzier and Alon, 2013) (Allen and Zook, 2012) (Christensen et al., 2002).

2.4.5 Innovation Strategy Theory Paradigms

From a working paper titled "Innovation Management Theory Evolution Map" (Bouwer, 2017), six innovation management theory paradigms were identified as listed in Table 8.

The "order" of the six innovation management theory paradigms was based on when (time frame) a cluster of theories was published, in descending order from the earliest to the latest theory paradigms in Table 8.

Table 8: Six Identified Innovation Management Theory Paradigms

Order	Innovation Obstacle Category
1	Corporate (infirm) Competencies and Capabilities (Development Ops).
2	**Value Innovation (Strategy Formulation).**
3	**Diffusion of Innovation (Strategy Formulation).**
4	Innovation as a System (Systems Management).
5	Open Innovation Ecosystems (Organization Network).
6	Open Digital Innovation Platform Ecosystems (Systems Management).

Discovery: "**Value Innovation**" and "**Diffusion of Innovation**" as innovation research theory paradigms were both categorized as "**Innovation Strategy Formulation**", based on research from the "Innovation Management Theory Evolution Map" (Bouwer, 2017).

This implies that any adequately defined "Corporate Innovation Strategy" will have to focus significantly on "Value Innovation" and the "Diffusion of Innovation".

Even though "Value Innovation" is predominantly accepted as defining product requirements specifications to provide a value proposition for the customer as "Product Innovation", this research thesis also considers "Value Innovation" as "Business Model Innovation" where a profitable proposition for the business is also necessary.

With the evidence presented, "Innovation Strategy Formulation" is not only about setting growth targets and selecting technologies, but should also include support for "Value Innovation" and the "Diffusion of Innovation". This means, "Innovation Strategy Formulation" must provide a future plan of how to develop value and to deliver that value to customers as unique solutions in such a way that it will generate brand recognition in the market, create wealth for employees and sustain growth for shareholders.

At the business unit level, Ulwick (2014) stated that the Outcome-Driven Innovation (ODI) Systems Model assisted with "Value Innovation" to proactively and strategically "matched" the delivery of new products with target market Jobs to be Done (JTBD) needs segments with an

86% success rate (Ulwick, 2014). Applying "Value Innovation" at the corporate level integrated in a "Corporate Innovation Strategy" should also deliver positive outcomes with the strategic planning of new capabilities, technologies or businesses.

Discovery: From the work presented in this paragraph, this research argues that "**Innovation Strategy Formulation**", as a primary corporate innovation performance enabler after "Executive Commitment", requires two approaches to be successful: "**Value Innovation**" and "**Diffusion of Innovation**". The definitions of these themes will be discussed in paragraphs 5.19 and 5.11 respectively.

Discovery: From the definition this thesis developed for "Corporate Innovation" (see paragraph 5.6), it states that at the core "unique insights are delivered as valuable solutions". As self-evident; (1) "are delivered" correlates with "Diffusion of Innovation" and (2) "valuable solutions" correlates with "Value Innovation".

2.4.6 Innovation Marketing Mix

Supporting the above-mentioned hypothesis that "Innovation Strategy Formulation" is not about setting growth target, but has to define and drive "Value Innovation" and the "Diffusion of Innovation", subsequently it is worth investigating the "Marketing Mix" as the most well-known and de-facto theoretical approach to drive "Value Innovation" and the "Diffusion of Innovation" for products to eventually "Cross the Innovation Adoption Chasm" (Moore, 1991).

The Marketing Mix is known as the "7Ps" (or "7Cs"), and are described as follows:

1. **Place** (Channel): The location the consumer will acquire the product.
2. **Price** (Cost): This is the perceived value the product measured in currency.
3. **Promotion** (Communication): The activity to inform and acquire new customers.
4. **People** (Circumstances): The staff who comes in contact with the customer.

5. **Process** (Corporation): The business operations to deliver the product to the customer.
6. **Physical** (Consumer): The physical interaction the consumer will experience.
7. **Product** (Commodity): This is the expected product the consumer needs to acquire.

The evolution of the "Marketing Mix" model and how it is associated with "Types of Innovation" can be reviewed in Table 9 below.

Table 9: Marketing Mix Correlation with Innovation Types Dataset

2018	2013	1960	1973	1979	1981	1990
Innovation Mix	Ten Types of Innovation	Marketing Mix 4Ps	Marketing Mix 4Cs	7Cs Compass Model	Marketing Mix 7Ps	Marketing Mix 4Cs
Louis Bouwer	Larry Keeley	Prof E. Jerome McCarthy	Prof Koichi Shimizu	Prof Koichi Shimizu	Booms and Bitner	Robert F. Lauterborn
Value Innovation	Profit Model	Price	Cost	Cost	Price	Cost
Corporate Innovation	Structure & Network			Corporation - COS		
Product Innovation	Product Offering	Product	Commodity	Commodity	Product	
Logistics Innovation	Channel	Place	Channel	Channel	Place	Convenience
Business Innovation	Process				Process	
Diffusion Innovation	Engagement	Promotion	Communication	Communication	Promotion	Communication
Brand Innovation	Brand Experience			Consumer - NSEW	Physical Evidence	Consumer
Services Innovation	Customer Services			Cicumstances - NSEW	People	

From Table 9 it is then evident that the Marketing Mix most certainly supports "Value Innovation" and the "Diffusion of Innovation" with "Price" and "Promotion" marketing activities respectively, but the "Marketing Mix" approach barely supports "Corporate Innovation" and "Business Innovation". This implies that the "Marketing Mix" approach is an excellent theory to deliver products to the market, but is not positioned to support corporate executives at a corporate level with long-term strategic thinking.

Since the “4Ps” or “4Cs” “Marketing Mix” approach is still very much taught at business schools, the majority of corporate executives will most certainly apply it as a methodology to develop a “Corporate Innovation Strategy”. This can then also explain why such a large percentage of corporate executives are still dissatisfied with their “Corporate Innovation Performance”.

Discovery: With the evidence presented, “**Marketing Mix**” needs to be replaced by a new mechanism defined as “**Strategic Corporate Innovation**” that can assist corporate executive to formulate “Value Innovation” and the “Diffusion of Innovation” at a corporate level for new core capabilities, technologies, business or markets.

2.4.7 Hypothesis Framework

From the discussions in the previous paragraphs, the thesis hypothesis for the research project was constructed as follows:

1. The “**Corporate Innovation Performance Challenge**” was defined as a phenomenon where a significant large proportion of corporate executives are dissatisfied with their “Corporate Innovation Performance” and with “very few (executives) who know what exactly the problem is, and how to improve in innovation and R&D” (Anonymous, 2018).

2. “**Corporate Innovation Performance**” was defined (for this thesis) as the (1) generation of brand recognition in the market, (2) creation of wealth for employees and (3) sustainable organic growth for shareholders.

3. The “**Corporate Innovation Performance Paradox**” was defined as a phenomenon where a high percentage of corporate executives believe (to the point where it can be considered a fact) that Corporate Innovation is important for a corporation to be successful when being measured against various financial performance metrics. In contrast, only a very small percentage of corporations; (1) have the required innovation management capabilities in place, (2) will be able to sustain corporate growth or (3) have executives that are satisfied with the innovation performance of the corporation.

4. With the ranking of “**Corporate Innovation Obstacles**” in Table 5, it resulted in the identification of “**Strategy Formulation**” with the second lowest score, and thus the second-best activity (or driver) with leverage to influence “Corporate Innovation

Performance" within a corporation. Only "Executive Commitment" was ranked as a better driver with leverage.

5. The "**Corporate Innovation Strategy Paradox**" was defined as a phenomenon where the majority (at least 80%) of corporations have a "Corporate Innovation Strategy" and with corporate executives satisfied with it, it is not aligned with the required innovation capabilities or even well understood through the rest of the corporation. This makes it impossible for corporate executives to nurture the development of a "**Repeatable Strategic Corporate Innovation System**".

6. "**Value Innovation**" and "**Diffusion of Innovation**" as innovation research theory paradigms were both categorized as "**Innovation Strategy Formulation**", based on research from the "Innovation Management Theory Evolution Map" (Bouwer, 2017). This implies that any adequately defined "Corporate Innovation Strategy" will have to focus significantly on "Value Innovation" and the "Diffusion of Innovation".

7. Finally, "**Strategic Corporate Innovation**" must replace "Marketing Mix" as a new mechanism that can guide corporate executives with the formulation of "Value Innovation" and "Diffusion of Innovation" at a corporate level for new core capabilities, technologies, business or markets.

Hypothesis: To solve the "Corporate Innovation Performance Challenge" this research hypothesized that corporate executives need a "**Strategic Corporate Innovation Mechanism**" that can guide them to formulate an adequately defined "Corporate Innovation Strategy".

This research proposed the required "**Mechanism**" to be a "**Dynamic Multidimensional Contextual Based Systems Model**".

2.5 Research Novelty

2.5.1 Overview

The following paragraphs will discuss the novel aspects of the artifact that resulted from this research project, which was termed the "**Strategic Corporate Innovation Navigation (SCINav) Systems Model**".

Research on "Corporate Innovation Management" is still very new and as expected there are many theoretical constructs to define and explain the phenomenon of innovation management, each with its own personality and approach. This most likely explains why the terms "innovation" and "innovation management" are so widely used within corporations with various meanings associated with it.

This research identified no less than 80 frameworks, models or theories applicable to the domain for "Strategic Corporate Innovation Management" (Bouwer, 2017) (Spruijt, 2016).

As an attempt to test academic and industry opinion, a working paper with the title "**Innovation Management Theory Evolution Map**" (Bouwer, 2017), as a systems model representing the current set of theories within the related subject matter domain, was published to gather peer-reviewed opinions. With over 15,000 reads, it was overwhelmingly **accepted as much needed work** within the domain of innovation management theory (all peer-reviewed comments were collected within the "Thesis Working Paper Peer Review Comments"):

- "Thanks a lot Louis, for this wonderful effort and something which has been badly needed in the field. Being an academic, I feel it is indeed valuable to discuss the theoretical anchors of this continuously evolving area of inquiry." Dr. Mohammad Saud Khan at Victoria University.

- "Thanks, Louis, for sharing! Your timeline is very helpful for those like me working in academia. It gives us a whole view in the field." Prof Maria Cristina Hernandez at Universidad EAFIT.

- "What an inspiring, grounding and detailed share, a lot of work's gone into that. Thank you for sharing. At first glance I was interested but didn't like the thought of theory tying down

innovation academically, then I actually read it, explored a bit and saw it's an amazing collection and quite a reference. Awesome. Opens minds." Colin Bennett, Head of Digital and Distribution IT at GAM.

From this feedback it was concluded that the development of Systems Models as abstractions of the current set of prominent theories within the subject matter domain of "**Strategic Corporate Innovation Management**" is much needed.

2.5.2 Strategy Formulation

As previously mentioned, this research wants to assist corporate executives to overcome the "Corporate Innovation Performance Challenge" to create wealth for employees and sustain growth for shareholders.

To sustain growth, corporate executives will need to navigate through three phases to formulate a "Corporate Innovation Strategy", which are the following (see as in Figure 8):

1. **Market Strategy**: Clearly articulate what industries or markets existing or future business should be in, and secondly what market segment(s) must be targeted? Why are we doing what we do, and for whom?

2. **Conceptual Strategy**: Technology, product and business model development innovation portfolio and roadmap. How are we going to do it?

3. **Tactical Strategy**: Resource allocation plan. What exactly will we do?

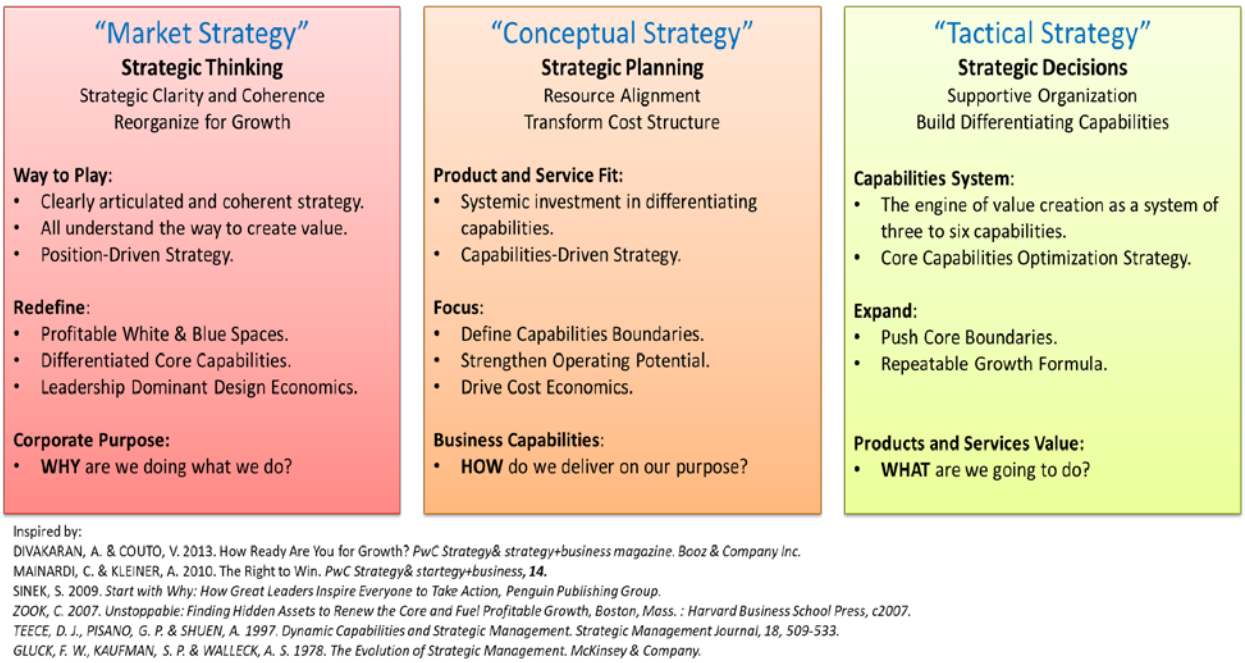


Figure 8: Phases for Corporate Innovation Strategy Formulation

With the "Three Phases for Corporate Innovation Strategy Formulation" identified, the further research and development of a systems model for "Strategic Corporate Innovation" resulted in a "Relational Multidimensional Vector of Matrixes" where the identified dimensions could be classified within these three phases.

2.5.3 Systems Model

The mechanism this research project delivered as a solution for the "Corporate Innovation Performance Challenge" was a "Dynamic Multidimensional Contextual Circumstance-Based Corporate Innovation Strategy Formulation Systems Model" that took the structure of a "Relational Multidimensional Vector of Matrixes" which this research termed the "Strategic Corporate Innovation Navigation (SCINav) Systems Model" as the required mechanism (or guide) corporate executives can use to formulate an adequate "Corporate Innovation Strategy".

The SCINav Systems Model consists of "Nine Relational Dimensions", each represents a different perspective for what is required to formulate a "Corporate Innovation Strategy". As a physical

structure, each “Relational Dimension” is represented by a Two-Dimensional Matrix structure with “Two Axial Dimensions” (X-Axis and Y-Axis) and four color-coded areas as “Contextual Spatial Quadrants”.

A conceptual graphical presentation of the **SCINav Systems Model** as a “Relational Multidimensional Vector of Matrixes” is available in Figure 9.

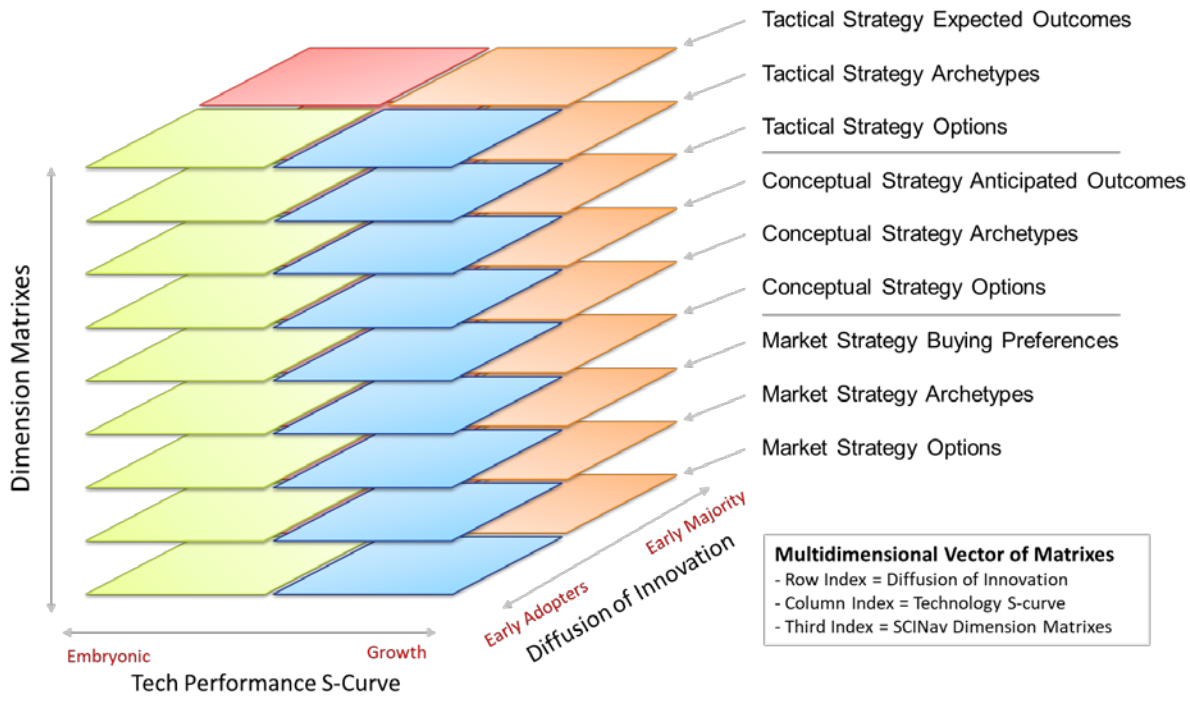


Figure 9: Relational Multidimensional Vector of Matrixes Structure

Each one of four colors (green, red, orange and blue) on each Dimensional Matrix represents a “Contextual Innovation Lifecycle Spatial Quadrant” that is associated with a specific “Innovation Strategy Framework, Model or Theory” to serve as a guide. The same color on each Dimension Matrix represents a correlating relationship with the other Dimensional Matrixes.

The relevant literature, design, development and modelling of the “SCINav Systems Model” will be discussed in **Chapters 4 to 6** of this thesis, as outlined in Table 1.

The primary and default dimension matrix for the "**SCINav Systems Model**" is the "**Tactical Innovation Strategy Archetypes Dimension Matrix**", which is also the biggest matrix since it has more than the standard four quadrant areas. The graphical presentation is in Figure 10.

The relevant "SCINav Systems Model" dynamics, verification and validation will be discussed in **Chapters 7 and 8** (as outlined in Table 1), where the "Tactical Innovation Strategy Archetypes Dimension Matrix" will be selected as the primary default dimension to be referenced as a conceptual representation of the other related dimensions and the SCINav Systems Model as a whole.

Figure 10: SCINav Systems Model's Tactical Strategy Archetypes Dimension Matrix

2.5.4 System Novelty Claims

The independent primary novelty claims for the “Strategic Corporate Innovation Navigation (SCINav) Systems Model” are the following:

1. A “Dynamic Multidimensional Contextual Circumstance-Based Corporate Innovation Strategy Formulation Mechanism” applicable in any industry for strategic corporate innovation which corporate executive can use as a guide from fundamental concepts to support them through the development of a “Corporate Innovation Strategy”.

2. A “Systems Model” to proactively anticipate the “Dynamic and Contextual Diffusion of Innovation” strategically at a corporate level to deliver perpetual and sustainable growth through purposeful and focused “Creative Construction” of new businesses.

3. A “Relational Multidimensional Vector of Matrixes” structure where each matrix has four color-coded “Contextual Innovation Lifecycle Spatial Quadrants” with related “Contextual Innovation Strategies” supported by a set of theories.

4. The “SCINav Systems Model” consist of three categories of Innovation Strategy Formulation Dimension Matrixes, which correlates with the “Three Phases for Strategic Corporate Innovation Navigation”:

    - **Market Strategies**: why are we doing what we do?

    - **Conceptual Strategies**: how are we going to do it?

    - **Tactical Strategies**: what exactly will we do?

As dependent secondary claims, the following frameworks, models and declarations are also novel concepts that were required to design and develop the **SCINav Systems Model**.

5. There exist two very different levels of innovation within a corporation (or enterprise):

    - “**Business Innovation Management**” is at the **Corporate Level,** taking care of “New Technology and Business Innovations”.

    - “**Product Innovation Management**” is at the Business Unit Level, taking care of “New Product and Service Innovations”.

6. The different levels of innovation in claim 5 creates the need for "**Ambidextrous Organization Structure**" as follows:

    - Corporate Level: Technology and Business Unit Innovation according to Long-Term Foresight that requires a Position-Based Strategic Approach.

    - Business Unit Level: Product and Service Innovation according to Short-Term Operations Excellence that requires a Resource-Based Strategic Approach.

7. Six "**Corporate Innovation Strategy Elements**" were identified which the "SCINav Systems Model" will have to provide, which are as follows:

    - Define Alignment with Business Purpose and Aspiration.

    - Define Which Customers to Serve.

    - Define Value Proposition for Customer.

    - Define Value Model for Business.

    - Define Value Creation Capabilities Portfolio that will Deliver the Value.

    - Define the Value Transformation Roadmap.

2.6 Conclusion

To support corporate executives with their "Corporate Innovation Performance Challenge", this chapter provided the critical contextual background information as follows:

1. **Research Scope Boundaries**: To provide a solution for this research challenge, the scope (or boundaries) was clearly defined to be at the **corporate ecosystem** level.

2. **Research Importance**: A strong requirement for this research project was that it's knowledge contribution to the world should be extremely **important, practical and valuable** for corporate executives to deliver economic prosperity for their customers, employees and shareholders. This was successfully proved to be the case via three different perspectives: corporate longevity wave, corporate competence evolution and corporate innovation hype.

3. **Research Hypothesis**: "Corporate Innovation Strategy Formulation" was determined as a critical enabler with significant leverage for corporate executives to influence "Corporate Innovation Performance" within their corporations. With additional research it was also defined that the "Corporate Innovation Strategy" should be a **systems-based** solution with two diverse innovation strategy elements: "**Value Innovation**" to define "Why?" the corporation is in a market and "What?" value it is going to deliver, while the "**Diffusion of Innovation**" as the dynamic mechanism to define "How?" the value will be delivered. Thus, to solve the "Corporate Innovation Performance Challenge" this research project must invent a "**Strategic Corporate Innovation Mechanism**" that can guide corporate executive to developed adequate "Corporate Innovation Strategies".

4. **Research Novelty**: The "**Strategic Corporate Innovation Navigation (SCINav) Systems Model**" was introduced as a "Dynamic Contextual Circumstance-Based Strategy Formulation Guide" for corporate executives. Novelty claims were written in a fashion very similar to that of patent applications.

Now that it is well understood what the research is about, the next chapter will discuss the research (Systems Thinking) methodology that was followed to design and develop the "SCINav Systems Model" to assist corporate executives to overcome their "Corporate Innovation Performance Challenge".

CHAPTER 3: RESEARCH METHODOLOGY

3.1 Introduction

The previous chapter discussed the "**Corporate Innovation Performance Challenge**" and the "SCINav Systems Model" as a guide (or map) to assist corporate executives to develop a comprehensive "Corporate Innovation Strategy".

This chapter will discuss **Systems Thinking** as the primary research methodology with Systems Engineering as a supporting framework for the theory building process, to develop a solution for the "Corporate Innovation Performance Challenge".

The purpose for this chapter is not to provide any background or overview of what systems are, how to model it or even how to analyze it. Some researchers who published books and articles that promoted Systems Thinking were for example:

- **Prof Jay Forrester** at MIT who established his systems research with "**Industrial Dynamics**" (Forrester, 1958), then his research team's "**World Dynamics**" (Forrester, 1971) and who eventually focused on "**Systems Dynamics**" (Forrester, 1995) (Forrester, 2007), which deals with the simulation of interactions between elements that coexist within the same system. His extensive research is extremely important for Systems Thinking science since Systems Dynamics is basically the "stock and flow" dynamics of a system.

- **Prof Russell Ackoff** at the Wharton School researched the "**Science of Purposeful Systems**" (Ackoff, 1973) in the early 1970s and eventually promoted Systems Thinking at the turn of the 21st century. (Ackoff, 2006) (Ackoff, 2008)

- **Prof Peter Senge** also from MIT (who may have been influenced by Prof Forrester in the 1970s) describes **Systems Thinking** as the fifth discipline (Senge, 1990) required for "**Learning Organizations**" (Senge and Sterman, 1992) as the key to flexibility and to sustain a competitive advantage. Coincidentally his book was published the same year Prahalad and Hamel published their HBR article "Core Competence of the Corporation" (Prahalad and Hamel, 1990) also as a Learning System to obtain flexibility to sustain a competitive advantage.

- **Dr Donella Meadows** who worked with Prof Jay Forrester at MIT (on World Dynamics) was famous for her work on the "**Limits of Growth**" (Meadows et al., 1972). She eventually published the foundational book "**Thinking in Systems**" (Meadows and Wright, 2008).

- **Dr Leyla Acaroglu** published a few internet blog articles in 2017 in which she summarized **Systems Thinking** extremely well in a nutshell (Acaroglu, 2017c) (Acaroglu, 2017b) (Acaroglu, 2017a)

3.2 Systems Thinking

3.2.1 Overview

Regarding the importance of Systems Thinking within corporations, a quote from Dr Waguih Ishak, the division VP and Chief Technologist at Corning Research and Development Corporation shared the following insight: "R&D leaders need to hire people who are willing to join multiple projects and to move from one to another as needed. Call them ambidextrous; call them system thinkers. These are people who want to solve problems that matter and that take them from invention to final product. They constantly push for improvements and create their own luck by sensing what is happening in their field and then applying their observations and experience to problems" (Ishak, 2017).

The purpose and science of Systems Thinking is to enable "a set of synergistic analytical skills used to improve the capability of identifying and understanding systems, predicting their behaviours, and devising modifications to them in order to produce desired effects." (Arnold and Wade, 2015).

The set of skills that construct the systems thinking system are (Arnold and Wade, 2015):

- Recognize interconnections.

- Identify and understand feedback.

- Understand the system structure.
- Differentiate between types of stock, flows and variables.
- Identify and understand non-linear relationships.
- Understand dynamic behavior.
- Reduce complexity by modelling systems conceptually.
- Understand systems at different levels of ecosystems.

In principle, Systems Thinking is in itself “systems thinking about systems” with both the analysis of existing systems and the construction of new systems. The outcome is to understand existing systems’ purpose, boundary, surrounding ecosystem, internal elements, interconnections and dynamic interactions in order to be able to predict it’s behavior and be able to change it or construct new systems for a similar to a different ecosystem (Arnold and Wade, 2015).

This research project will apply a Systems Thinking approach based on the Systems Engineering SIMILAR (State, Investigate, Model, Integrate, Launch, Assess, Re-evaluate) process as proposed by Terry Bahill and Bruce Gissing with their IEEE publication (Bahill and Gissing, 1998b); see Figure 11 for the SIMILAR conceptual systems engineering process. The combined Systems Thinking SIMILAR process can include the following activities (Acaroglu, 2017b) (Acaroglu, 2017c):

1. **State** the **Problem Boundary**.
    - Of a system and sub-systems for a specific purpose (or function) and outcome it should deliver.
    - Define ecosystem and dependent interactions.
2. **Investigate** (Explore or Scout) the Collection of Elements.
    - Objects or elements within specific properties and categorized order.
    - Relationships (interconnected, interdependent and interactive)
3. **Model** the System.

- Stocks, circular feedback (positive or negative) loops.
- Identify correlations and causalities.
- Simulate causalities when possible.
- Identify problems and issues.

4. **Design**, **Develop & Integrate** Solutions as New Systems Models.
   - Specify system requirements and specifications.
   - Design new concepts.
   - Develop new prototypes.
5. **Launch** the System.
   - Integrate sub-systems.
   - Verify, validate and demonstrate new system.
   - Deliver system into production and the market.

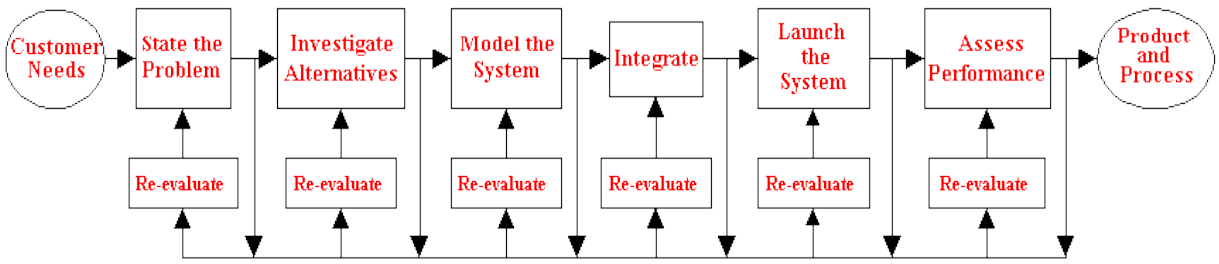


Figure 11: SIMILAR Process for Systems Engineering Approach

Source: (Bahill and Gissing, 1998b)

Systems Thinking allows for a specific process where both **divergent** and **convergent** research are equally important. Therefore, it acknowledges the importance of studying the question environment itself as a research project.

This allows the opportunity to define the problem (and solution) as a system (or even as a system of sub-systems), **divergently** exploring all possible elements that coexist within the system.

Once a question can be modelled as a system, then **convergent** thinking can be applied to study dynamic relationships and modify the existing modelled system or adjust ecosystem to bring about the desired outcome from the system under investigation.

The Systems Thinking approach is for sure not for everyone and requires intense patience. It requires an enormous amount of upfront work, which may appear to have no relevance to get to the solution. But, once a system has been designed and developed for the challenge under investigation, it delivers the following advantages (Acaroglu, 2017a):

- Building systems models is an exploratory experience to learn and understand the complete ecosystem of the phenomenon at an absolute stratospheric level to define system boundaries.

- Delve into microscopic properties to understand interdependent relationships that can initiate the design of a systems model.

- Understanding dynamic interactions among systems elements allows for the further development of a systems model.

- With a systems model it is possible to visualize all possible interconnected relationships and dynamic interactions, which may identify various correlations and causalities within the system or externally from the ecosystem.

- Thus, once a new systems model has been designed and developed it should have identified various interactions into consideration and therefore can solve many challenges within a system simultaneously.

3.2.2 Research Methodology

Very early on with the start of this research project, it was determined that the general academic mainstream only accepted the “Experiment Based” research approach (as strongly advocated by business schools), was not going to help to meet the set goal for this research project to develop a “Systems Model”.

From the outset, the goal of this research project was very specific in what needs to be done: explore everything there is to know about innovation management, then design and develop a systems model of the phenomenon under investigation in order to conceptually analyze it to obtain new insights and foresight to make required improvements.

3.2.3 Theory Building Process

The research received some extremely insightful advice from a highly respected researcher in the academic field of innovation management was: "Generally, my advice is double: (1) focus, focus, focus; and (2) be prepared to do an extensive amount of field research with actual companies. In the field of innovation management, companies (not academics) are ahead." Email received: 08 September 2014 03:31 PM. Emer. Prof. Jean-Philippe Deschamps (IMD)

The interpretation of "Dumpster Diving" is further explained as: "The breakthroughs that lead from categorization to an understanding of fundamental causality generally come not from crunching ever more data but from highly detailed field research when researchers crawl inside companies to observe carefully the causal processes at work." (Christensen and Raynor, 2003)

From the initial above-mentioned advice, Systems Thinking as a Theory Building process was developed with the following three phases, see Figure 12:

1. **Static Data Taxonomy – Divergent Systems Thinking**: Study the ecosystem of the phenomenon under investigation to collect all possible data elements, to be curated for the construction of a Data Taxonomy. This stage is also considered as the; (1) "Empirical Dumpster Diving" (Christensen and Raynor, 2003) and (2) "Literature Research". This has been documented in Chapter 4.

2. **Relational Systems Frameworks – Convergent Systems Thinking**: From the Data Taxonomy, it will become possible to visualize possible correlations and relationships to model Relational Systems Frameworks. This has been documented in Chapter 5.

3. **Dynamic Systems Models – Dynamic Systems Thinking**: The modeling of Systems Thinking Diagrams (as Systems Models) from which dynamic interactions, feedback loops

and causal flows can be identified and analyzed, will make it possible to predict dynamic system behavior and thus the conception of a theoretical "construct". This has been documented in Chapter 7.

Note: For the remainder of this thesis, "Systems Model" will be used to reference a "Dynamic Systems Model", as a matter of simplification.

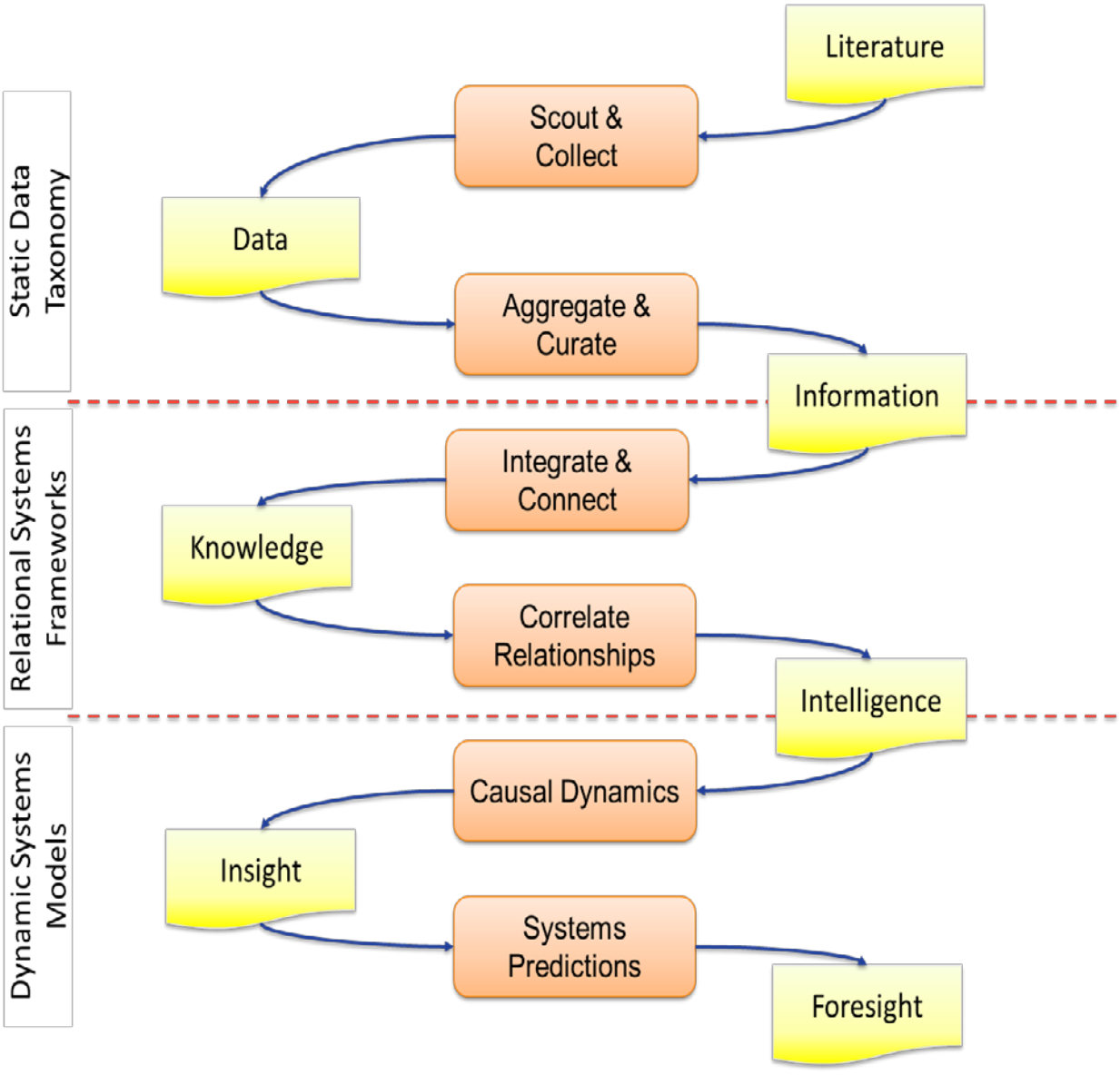


Figure 12: Phases of Systems Thinking as a Theory Building Process

3.3 Experience with Systems Thinking

3.3.1 Divergent Systems Thinking

Two approaches were applied as “dumpster diving” data collection:

1. The researcher spent twenty (20) years in high-tech industry where he worked in highly successful corporations (IBM, SIEMENS, UEI, Microsoft), a top academic research institution (Caltech) and also at absolutely unsuccessful innovation institutions.

2. The researcher meticulously scouted, collected, curated, categorized, connected, aggregated, integrated and synthesized data from literature as empirical research reports that have been published the past decade from various highly acclaimed research consulting firms. This was extremely laborious and a time-consuming process since none of this work could be automated due to the requirement to have a contextual understanding what the data meant in correlation with authors, evolutionary timeframe to identify possible influence and evolutionary development of strategic corporate innovation management. This meant that the researcher had to make sure that the captured data was correctly interpreted to be correctly classified.

3.3.2 Convergent Systems Thinking

With Systems Thinking this is the Design and Development phase of a systems model, which progressed as follows: (see Figure 13):

1. The basic research started fairly stable while system elements (as knowledge objects) were being identified, collected, curated, categorized and integrated with little or no obvious correlations.

2. As more elements (with this research project the systems elements were academic theories) were added to the knowledge base and being categorized, a categorization framework started to evolve and became more unstable as more elements were being added. During this phase it was quite common to redesign the framework or to develop more frameworks on a very regular and continuous basis.

3. At some point there were enough elements (as frameworks, models or theories) within the categorization framework to identify correlating, interrelated, interdependent or interactive relationships to transition to a systems model design. This phase is also extremely unstable as more relationships were being identified and implemented.

4. As systems model was continuously redesigned and evaluated as more clusters of elements and relationships were added into the systems model, the design eventually started to stabilize.

5. Finally, it was possible to verify and validate the systems model.

6. None of the above happened in a linear process but in several spirals as suggested for the SIMILAR process (Bahill and Gissing, 1998a) in Figure 11.

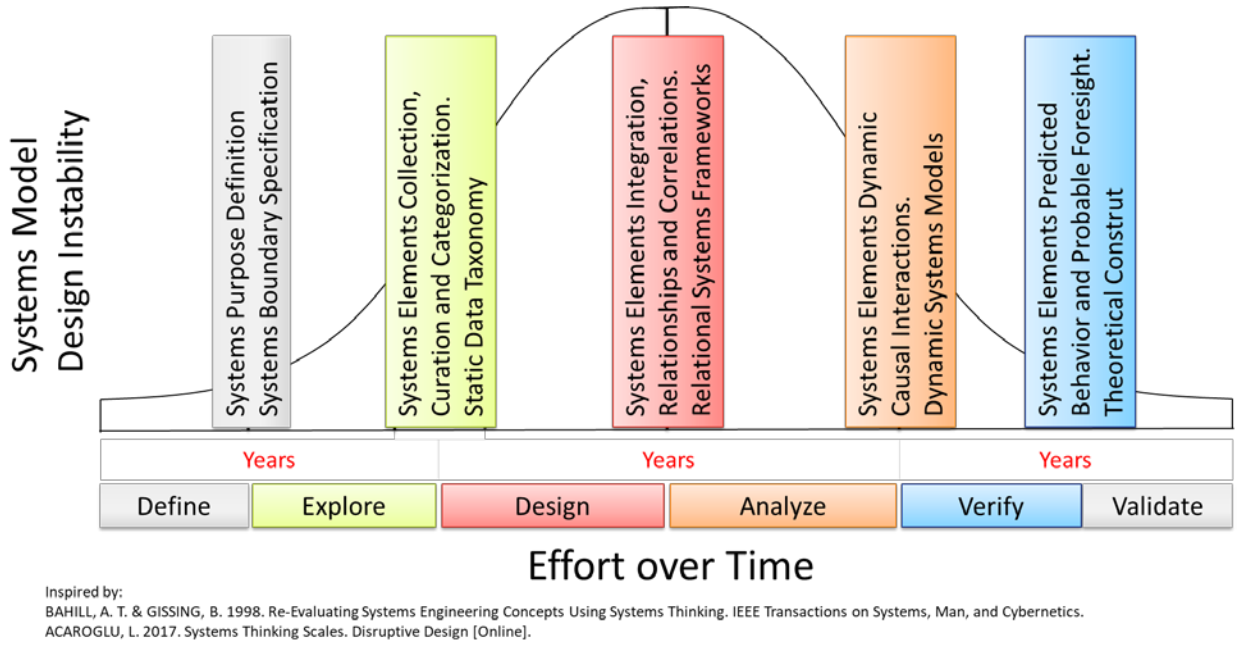


Figure 13: Theory Building with Systems Thinking Methodology

3.3.3 SCINav Systems Modelling Process

The actual time and effort it took to develop the various frameworks and systems models are presented in Figure 14. The diagram clearly demonstrates that with the Systems Thinking Methodology (approach) there is an enormous amount of upfront divergent research to understand the challenge, boundaries, elements and ecosystem before any attempt could be made to design the system.

With this approach, it took almost 3 years to collect, curate, categorize, integrate and synthesize the data into frameworks before the systems model design could be initiated. This means that it was impossible to know what the outcome could be for many years, and whether it even would have been possible to design a systems model as a solution.

As demonstrated in Figure 14, it took another 3 years of continues modelling of several frameworks and systems models before it was stable enough to finalize the "Strategic Corporate Innovation Navigation (SCINav) Systems Model".

This research method is for sure high risk and suggests the method is for the extremely curious minded researchers with unshaken determination and endless patience.

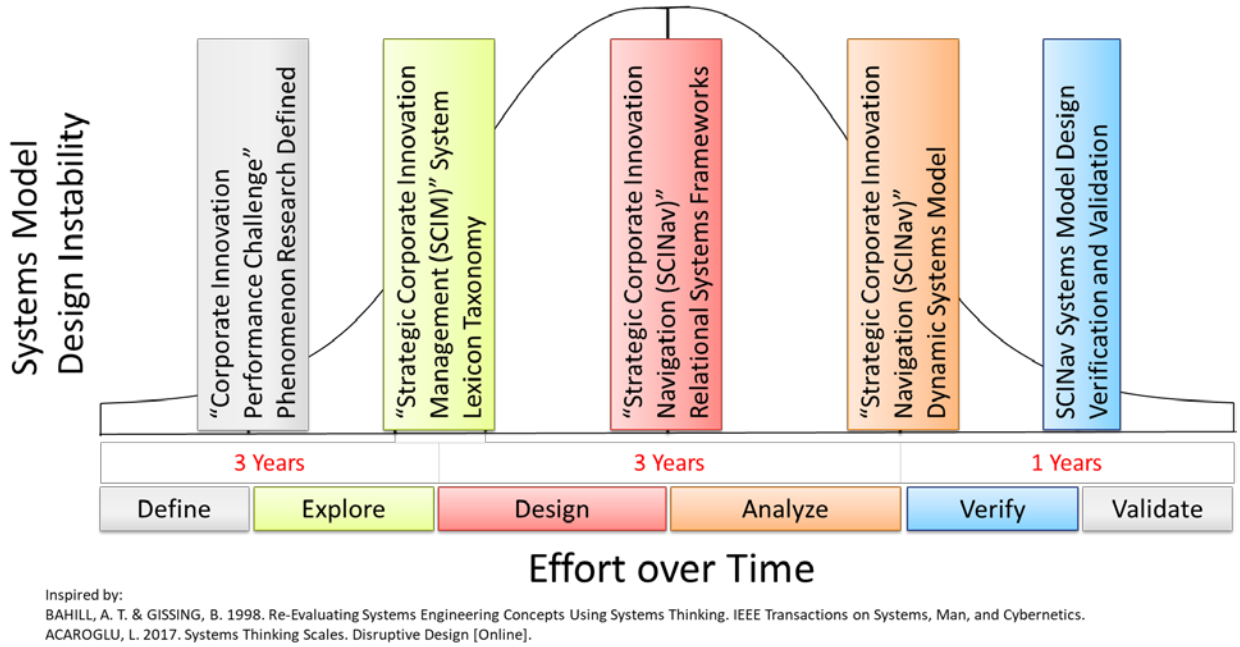


Figure 14: Conceptually Estimated Timeline for this Research Project

3.4 Conclusion

To solve a challenge as complex as the “Corporate Innovation Performance Challenge”, this research resorted to Systems Thinking as a methodology to design and develop a solution to assist corporate executives.

The purpose of this chapter was not to discuss Systems, Systems Modelling or Systems Thinking as a literature study, but rather to discuss the possible use of these concepts as a research methodology and the possibility to develop new theoretical construct.

This PhD research project’s experience with Systems Thinking and Systems Modelling was briefly discussed to provide some background how the postulated “**Strategic Corporate Innovation Navigation (SCINav) Systems Model**” was conceived.

CHAPTER 4: LITERATURE STUDY

4.1 Introduction

"I believe that the first one – Innovation management models or frameworks – is probably the least covered in the literature. In itself, this is a plus because you will have the chance to do an original piece of work. On the other hand, you may have problems establishing your literature review." Email received: 08 September 2014 03:31 PM. Emer. Prof. Jean-Philippe Deschamps (IMD)

Since innovation management at corporate level is a fairly new area of research, there is not much literature to work from and many fundamental questions and foundational systems models had to be borrowed from related research areas.

The purpose of this chapter is to summarize the journey that was experienced in scouting, collecting, curating, aggregating, connecting, integrating and correlating academic literature and empirical industry data according to the "Systems Thinking" methodology as described in Chapter 3.

From the research hypothesis statements in chapter 2, this research needs to solve the "Corporate Innovation Performance Challenge" through a "**Dynamic Contextual Circumstance-Based Corporate Innovation Strategy Formulation Systems Model**" that can support both "Value Innovation" and the "Diffusion of Innovation" subject matter concept requirements.

With the discovery for existing knowledge (frameworks, models or theories), this research constructed a "**Strategic Corporate Innovation Theory Evolution Map**" (Bouwer, 2017) with a Systems Thinking approach, that includes an exhaustive collection of existing literature as "knowledge elements" in Figure 15.

The original data source for the “Strategic Corporate Innovation Theory Evolution Map” Systems Thinking Diagram (in Figure 15) can be viewed with readable detailed information for further review and evaluation at: https://embed.kumu.io/657bdd73fd0d07aa90eb45ce2491861d .

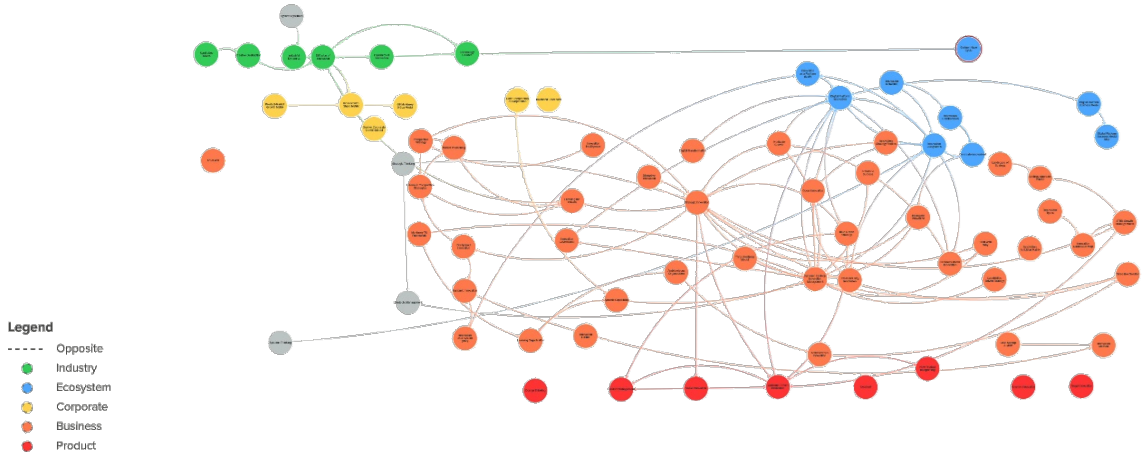


Figure 15: Strategic Corporate Innovation Theory Evolution Map (Conceptual Representation)

Original Data Source: https://embed.kumu.io/657bdd73fd0d07aa90eb45ce2491861d

Inspired by: (Bouwer, 2017)

The collection of theory paradigm themes that could be related to the topic “**Strategic Corporate Innovation**” were listed in Table 10 (on next page).

Table 10: List of Strategic Corporate Innovation Theory Paradigm Themes

Theme	Year	Level	Researcher
Systems Theory	1950	Industry	Ludwig von Bertalanffy (Prof)
System Dynamics	1956	Industry	Jay Wright Forrester (Prof)
Industrial Dynamics	1958	Industry	Jay Wright Forrester (Prof)
Corporate Strategy	1965	Corporate	Harry Igor Ansoff (Prof) Frederick W. Gluck
Strategic Management	1979	Corporate	Harry Igor Ansoff (Prof) Frederick W. Gluck
Strategic Thinking	1979	Corporate	Roger Morrison James G. Lee Benjamin B. Tregoe John W. Zimmerman
Competitive Strategy	1980	Business	Michael Porter (Prof) Rita Gunther McGrath (Prof)
Innovation Intelligence	1985	Business	Michael Porter (Prof)
Disciplined Innovation	1985	Business	Peter Drucker (Prof)
Systemic Innovation	1985	Business	Peter Drucker (Prof) Nathan Furr (Prof) Jeffrey H. Dyer (Prof)
Strategic Innovation	1997	Business	Constantinos Markides (Prof) Jean-Philippe Deschamps (Prof) Geoffrey Moore (Dr) Nancy T. Snyder (Dr) Mitsuru Kodama (Prof) Soren Kaplan (Dr) Derrick Palmer Vijay Govindarajan (Prof) Michael L. Tushman (Prof) Richard St. John
Systemic Innovation Management	2002	Business	Bettina von Stamm (Dr) Qingrui Xu (Prof) Scott D. Anthony Soren Cohn (Dr) Robert Cooper (Dr) Scott Edgett (Dr) Paul Hobcraft Jeffrey Phillips
Intelligent Innovation	2005	Business	Richard Hauser John Cogliandro

From Table 10, three of the "**Strategic Corporate Innovation Theory Paradigm Themes**" were identified to be at corporate level that could best support the development of a "Strategic Corporate Innovation Systems Model", and thus further research will be continued on the following themes:

1. Corporate Strategy.
2. Strategic Management.
3. Strategic Thinking.

From this initial "Strategic Corporate Innovation Theory Evolution Mapping" exercise, **Prof Harry Igor Ansoff** was considered to be the first researcher to have looked at Corporate Strategy (since this research's scope is focused on corporations) with his "Product-Market Growth Strategy Matrix".

For this literature study, Prof Igor Ansoff's matrix was used as the foundational initiating theory that can meet both the requirements for "Value Innovation" and the "Diffusion of Innovation" theoretical models.

4.2 Theory Selection

Within the selected "Strategic Corporate Innovation Theory Paradigm Themes", fifteen (15) very specific frameworks, models or theories that could be used to design and develop a "Strategic Corporate Innovation Systems Model" were identified and selected as elements for future systems modelling. The complete list is available for review in Table 11.

Table 11: Strategic Corporate Innovation Frameworks, Models and Theories Dataset

Harvard Business Review	Bonston Consulting Group	McKinsey	Harvard Business Review	Orion	Strategy & Leadership	MIT Sloan School	PwC Strategy&
Stategies for Diversification **Ansoff Product Market Strategies for Growth Matrix** 1957	The Product Portfolio **BCG Henderson Growth Share Matrix** 1970	The Evolution of Strategic Management **McKinsey Gluck Nine Box Matrix** 1978	Five Competitive Forces That Shape Strategy **Porter 3 Generic Competitive Strategies** 1980	The Alchemy Of Growth **Three Horizons Model** 1999	Diff Leadership Skills for Diff Innovation Strategies **Typology of Innovation by Strategic Focus** 2005	Strategic Management Frameworks **Hax Delta Model Integrative Strategy** 2006	The Customer Connection **Innovation Strategy Profiles** 2007
Market vs Product	Market vs Prodcut	Industry vs Business Unit	Market vs Product	Price vs Time	Bussiness vs Product	NA	NA
Prof Igor Ansoff	Bruce Henderson	Frederick Gluck	Prof Michael Porter	Mehrdad Baghai Stephen Coley David White	Prof Jean Philippe Deschamps	Prof Arnoldo Hax	Barry Jaruzelski Kevin Dehoff
Market Penetration - Same Product - Same Market - Lowest Cost	**Star** - High Growth - High Market Share	**Invest Fully** Drive Growth	**Cost Focus** - Serving a Selective Group of Users Extremely Well. - Product Differentiation - Low Cost	**Horizon 0** - Defend Core Business - Drive Commercial Excellence	**New / Improved** - Product or Process - Service Offering	**Operational Effectiveness**	**Market Readers** - These companies watch their markets carefully, but they maintain a more cautious approach, focusing largely on creating value through incremental change.
Market Development - Same Product - New Market - Demographics - Globalization	**Question** - High Growth - Low Market Share - Low Profit Margins	**Invest Selective** Drive Grow	**Cost Leadership** - Efficiency and Scale to Reduce Product Costs and Increase Market Share. - Lowest Cost	**Horizon 1** - Extend Core Business - Drive Operational Excellence	**New / Improved** - Customer Solution - Customer System	**Business Model**	**Need Seekers** - These companies actively engage current and potential customers to shape new products, services, and processes; they strive to be first to market with those products.
Product Development - New Product - Existing Market	**Cow** - Low Growth - High Market Share - High Profit Margins	**Invest Selective** Drive Earnings	**Differentiation Focus** Very Unique Products from Rest of Industry. - Product Differentiation - High Cost	**Horizon 2** - Build Emerging Businesses - M&A to Consolidate and Diversify	**Totally New** - Product Category - Service Offering	**Customer Targeting**	
Diversification - New Product - New Market	**Dogs** - Low Growth - Low Market Share		**Differentiation Leadership** - Very Different Technologies from Rest of Industry. - Technology Differentiation - Highest Cost	**Horizon 3** - Create Viable Options - Drive White Space Business	**Totally New** - Business Model - System Business	**Innovation** -Inventions	**Technology Drivers** - These companies follow the direction suggested by their technological capabilities, leveraging their investment in R&D to drive breakthrough innovation.
			Stuck in the Middle - Marginal Lower Cost - Incremental Product Differentiation				

Continue on next page …

PwC Strategy&	Harvard Business Review	Harvard Business Review	Harvard Business Review	Harvard Business Review	Stratygen	CycleFund
The Right to Win **Landscape of Strategy Concepts.** 2010	You Strategy Needs a Strategy **Strategy Formulation Approaches Palette** 2012	Managing Your Innovation Portfolio **The Innovation Ambition Matrix** 2012	Satell 4 Types of Innovation and Problems They Solve **4 Innovation Types** 2013	You Need an Innovation Strategy **Innovation Landscape Map** 2015	Ulwick JTBD Growth Strategy Matrix **Growth Strategy Matrix** 2016	Strategic Innovation and Evolution Framework Strategic Innovation Positioning Matrix 2016
	Market vs Product	Market vs Product	Market vs Product	Business Model vs Tech	Product vs Price	Consumer vs Mobility
Cesare Mainardi Art Kleiner	Martin Reeves Knut Haanaes Janmejaya Sinha	Bansi Nagji Geoff Tuff	Greg Satell	Prof Gary Pisano	Anthony Ulwick	Dr Mark Cummings
Adaptation - Act Quickly and Creatively in Response to Events. - Organization Learning. - Winners Develop an Overall Direction Through Experimentation and Rapid Change. - New Market. - Position-Based View.	**Adaptive** - Experiment for Serial Temporary Advantage. - Be Fast. - Differentiate, Select and Scale Up. - Volatile Growth. - Limited Concentration. - Young Industry. - High Technology Change. - Unpredictable Industry. - Restricted Infuence.	**Core** - Optimize Existing Offerings	**Sustaining Innovation** - Improve existing capabilities in existing markets. - Known Market Need. - Known Technology.	**Architectural** - Combine Tech & Business. - New Technology. - New Business Model.	**Dominant Strategy** - Better and less expensive - Win all types of customers	**Luxury Mass Market** - Low Cost Premium Products
Execution - Align People and Processes for Operational Excellence. - Quality Movement. - Winners Gain Advantage Through Operational Excellence. - Core Market. - Resource-Based.	**Shaping** - Collaborate with Ecosystem to Build and Grow Market. - Be the Orchestrator. - Engage, Orchestrate and Evolve. - Fragmented Market. - Shapeable Regulation. - Unpredictable Industry. - Can Change It.	**Adjacent** - Expand to New Businesses	**Disruptive Innovation** - Business Model Innovation. - Low Cost Solution for non or low consumption market. - Unknown Market Need. - Known Technology.	**Disruptive** - New Business Model. - Existing Technology.	**Disruptive Strategy** - Worse and less expensive - Win overserved customers and nonconsumers	**Mass Market** - Low Cost Products
Position - Exploit, Create and Hold a Distinctive Position. - Market-backed Strategy. - Winners Select Favorable Markets as Defined by External Forces. - New Market. - Position-Based View.	**Visionary** - Creation of New Industries and Markets. - Be First in the Market. - Envisage, Build and Persist. - High Growth Potential. - White Space. - Limited Regulation. - Predictable Industry. - Can Change It.	**Build** - Breakthrough Technologies	**Breakthrough Innovation** - Explore unconventional skill domains. - Open Innovation. - Known Market Need. - Unknown Technology.	**Radical** - Opposite of Disruptive. - Existing Business Model. - New Technology.	**Differentiated Strategy** - Better and more expensive - Win underserved customers only	**Luxury Market** - High Cost Premium Products
Concentration - Focus on Current Core Business. - Private Equity. - Winners Make the Most of Current Core Strengths and Businesses. - Core Market. - Resource-Based View.	**Renewal** - Survive and Pivot. - Be Viable. - Anticipate, Economize and Grow. - Restricted Financing. - Harsh Industry. - Limited Resources.	**Transform** - Breakthrough Inventions	**Basic Research** - Discovery of New Phenomena. - Unknown Market Need. - Unknown Technology.	**Inventive**	**Discrete Strategy** - Worse and more expensive - Win customers with limited options	**Test Market** - Innovative Market
	Classical - Position Optimally in Attractive Market. - Be Big. - Analyze, Plan and Execute. - Low Growth. - High Concentration. - Mature Industries. - Stable Regulation. - Predictable Industry. - Restricted Unfluence.			**Routine** - Sustaining or Efficiency. - Existing Business Model. - Existing Technology.	**Sustaining Strategy** - Only win existing customers	

The scouted "**Strategic Corporate Innovation Frameworks, Models and Theories**" as listed in Table 11 will be discussed in more detail and the axial dimensions will be normalized accordingly in the following paragraphs in the rest of this chapter.

4.3 Theory Normalization

Since the selected "Strategic Corporate Innovation Frameworks, Models and Theories" from Table 11 do not all use the same axial dimensions, it was necessary to "**normalize**" (or adapt) the axial dimensions of the models and theories to be able to integrate (or synthesize) them for future systems modelling (as design and development) and analysis.

Therefore, the normalization of the various models and theories were also done in this chapter where each model or theory will be discussed in the following paragraphs.

With the normalization of the axial dimensions according to "Value Innovation" and the "Diffusion of Innovation", they were defined as follows:

- **Y-axis**: "**Diffusion of Innovation**" within the "**Market**".
- **X-axis**: "**New Technology**" to be delivered as a perceived "**Value to Customers**".

The in-depth study of how this research designed these axial dimensions is available in Chapter 5.

4.4 Ansoff Product Market Strategies for Business Growth Matrix (1957)

The statement "A product mission is a description of the job which the product is intended to perform." (Ansoff, 1957) makes Prof Ansoff the founding father for the rather new "concentrate on meeting customer's needs rather than on selling products" (Levitt, 1960) and the "Jobs to be Done (JTBD)" (Ulwick, 2005) (Ulwick and Osterwalder, 2016) (Christensen et al., 2016b) concepts.

Ansoff's primary concern was how to assist a company to **grow market share**. One may imply that the "Product Market Strategies for Business Growth" can be considered as a "**Position-Based Strategy**" to answer the question as to which direction a company should go.

Ansoff suggested focusing the mission of the product on alternative markets rather than on a customer. With this, he devised the correlating "**Product Market Strategies for Business Growth**" matrix as in Figure 16, with the following four options:

1. **Market Penetration** means you do not change the product nor the market segment. This can include, price reduction, aggressive marketing campaigns, adding additional services to existing products to increase convenience, etc.

    - This became the responsibility of the "**Sales**" department.

2. **Market Development** is in essence to keep the product mission the same while going after new geographic regions (globalization) or new demographic segments.

    - This became the responsibility of the "**Marketing**" department.

3. **Product Development** is the continuous improvement of unique solutions (product and services) that change the mission of the product to go after different user expectations, requirements and demands.

    - This became the responsibility of the "**Product Management**" department.

4. **Diversification** of the business is when the business is developing new products for new markets, which can be adjacent or non-existing markets. Tesla Motors which delivered the electric car as transportation with a new mission for a non-existing market, is a good example.

- This research argues that this should become the responsibility of the "**Corporate Innovation**" department to create new business units and organic growth.

- Diversification requires a company to take an ambidextrous organization structure where new capabilities (skills, knowledge, processes and resources) are being developed.

EXHIBIT I. PRODUCT-MARKET STRATEGIES FOR BUSINESS GROWTH ALTERNATIVES

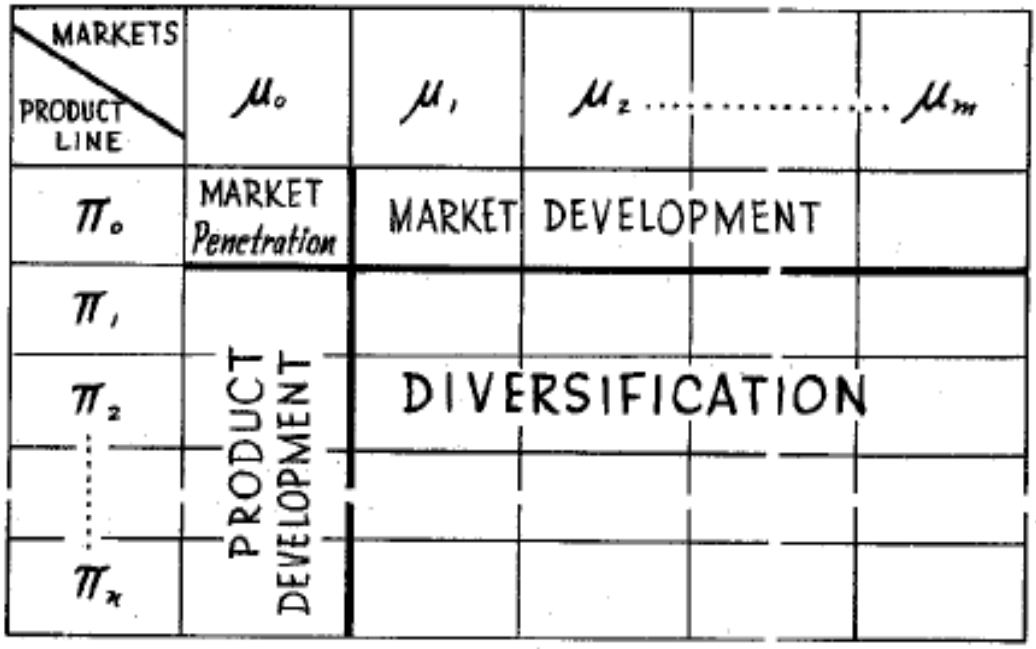


Figure 16: Ansoff Product Market Strategies for Business Growth Matrix

Source: (Ansoff, 1957)

The normalization of the **Ansoff Product-Market Strategies for Growth Matrix** was done in Figure 18 (see next page).

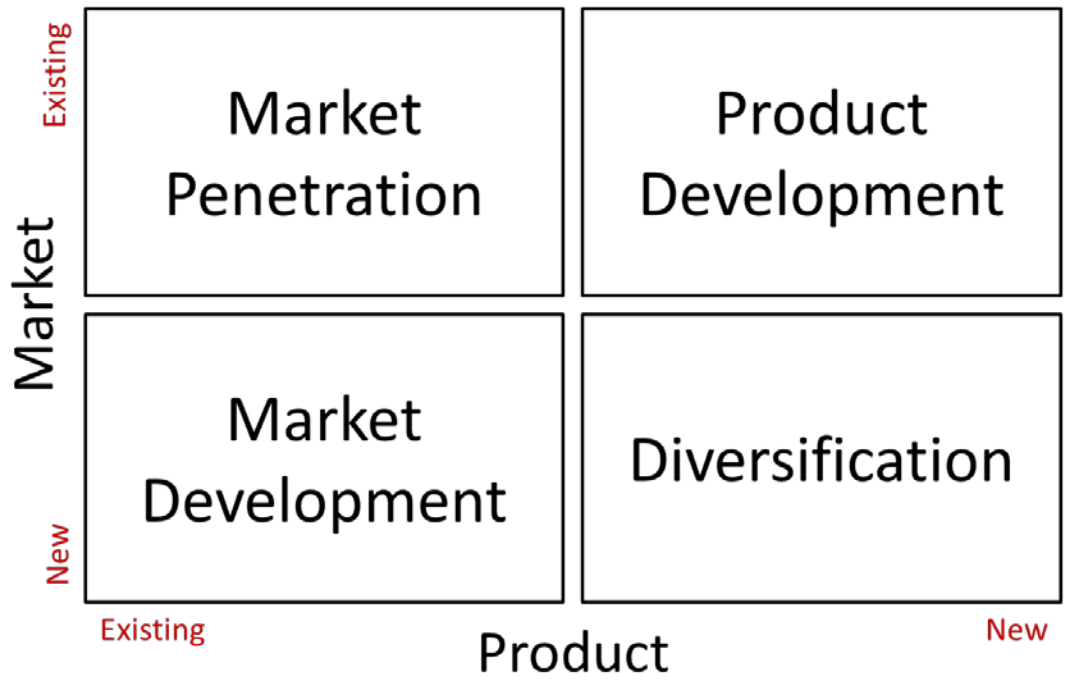


Figure 17: Original - Ansoff Product Market Strategies for Business Growth Matrix

Source: (Ansoff, 1957)

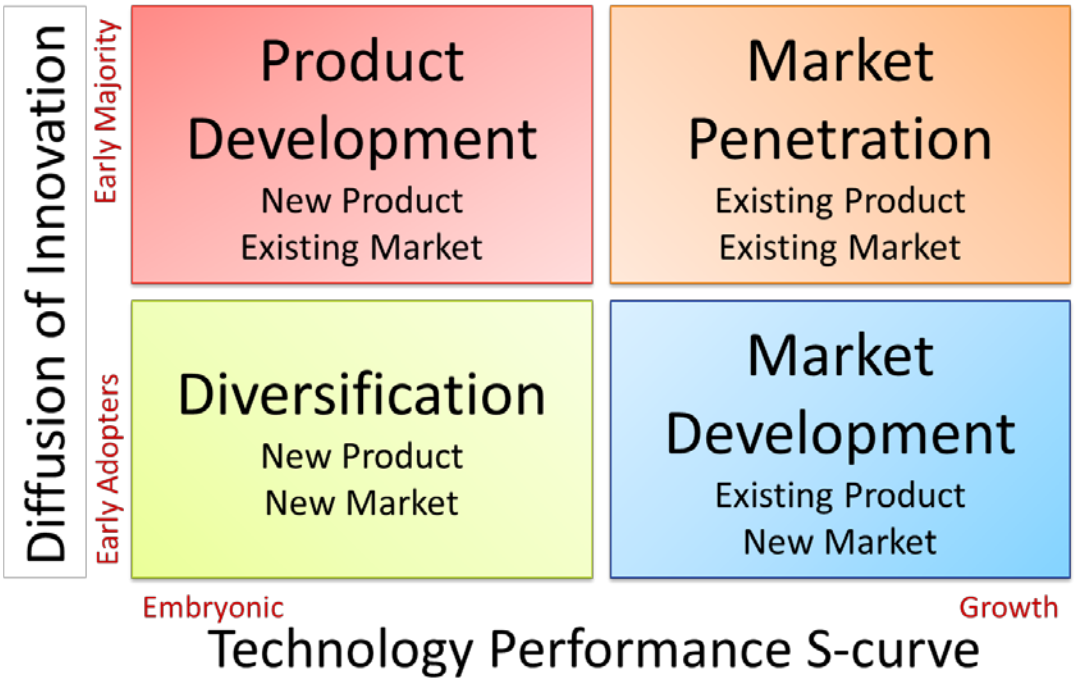


Figure 18: Normalized – Ansoff Product Market Strategies for Business Growth Matrix

4.5 BCG Henderson Growth Share Matrix (1970)

With corporations moving towards “Shareholder Capitalism” (Friedman, 1970) (Jensen and Meckling, 1976) (Martin, 2010) in the seventies, corporate management turned to making money as the single goal to increase Total Shareholder Return (TSR).

Logically then management consulting came out with the tools to support it, such as the Growth Share Matrix (Henderson, 1970) from Bruce Henderson at the Boston Consulting Group (BCG) with the focus on betting cash on profitable outcomes. This is of course in direct contrast with the Market-Product alignment from Prof Ansoff.

The Henderson Growth Share Matrix as in Figure 19 works as follows:

1. **Cash Cows (**Low Growth, High Market Share)
    - Profits and cash generation are high to pay dividends to shareholders.
    - Because of the low market growth, investment requirements are low.
    - The more the company invests in cash cows, the greater the return.
    - This research: Strives to build Cash Cows for corporations.
2. **Stars** (High Growth, High Market Share)
    - Are leaders in the market, they generate large amounts of cash.
    - Because of high market growth, it requires large amounts of cash.
    - If a Star corporate business unit can maintain its large market share, it will become a cash cow when the market growth rate declines.
    - This research: it is extremely important for corporations to “strategically innovate” new Stars that can become Cash Cows.

3. **Question Marks** (High Growth, Low Market Share)

    - As followers in the market, these businesses generate low returns.
    - Because of high market growth, it requires large amounts of cash.
    - If the market share remains unchanged, Question Marks will simply absorb great amounts of cash.
    - **This research**: will minimize the probability to develop innovative Question Mark businesses for a corporation.

4. **Dogs** (Low Growth, Low Market Share)

    - This is typical in a “commodity market” where there are many competitors all fighting for market share, each only having a small piece of the market share “pie”.
    - **This research**: considers Dogs as business units that survived the Cash Cow phase to the point where the market became a “commodity market”.

The normalized Growth Share Matrix can be reviewed in Figure 20 (see next page).

Figure 19: Original - BCG Henderson Growth Share Matrix

Source: (Henderson, 1970)

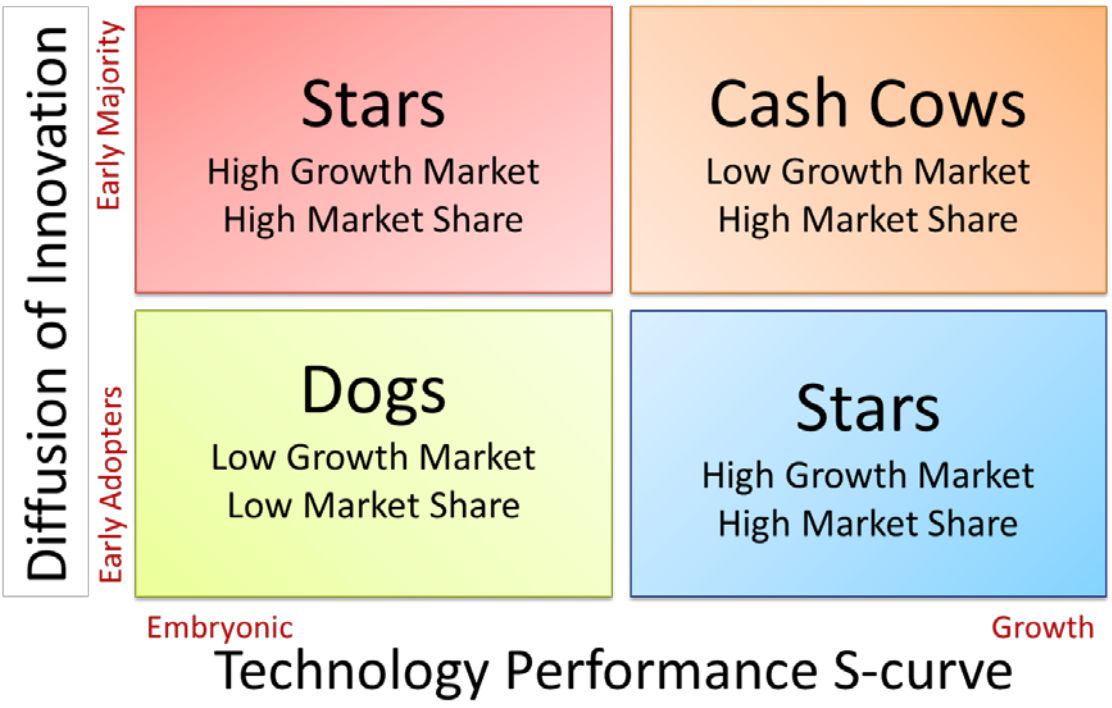


Figure 20: Normalized - BCG Henderson Growth Share Matrix

4.6 McKinsey Gluck Nine Box Industry Matrix (1978)

Following the original matrix model of Bruce Henderson at BCG, Frederick Gluck at McKinsey (consulting firm) was more interested in moving corporations towards **Strategic (Thinking) Management** (as opposed to financial annual budget planning) (Gluck et al., 1978a) (Gluck and Kaufman, 1980) (Gluck, 1983) and the strategic future investment in new businesses.

Gluck defined Strategic Management as "really a systematic, company-wide embodiment of externally oriented planning" (Gluck et al., 1978a). From this perspective on Strategic Management, this research postulated the following:

1. There exists a strong correlation between "Strategic Thinking" and "Ecosystems Thinking".
2. The introduction of Strategic Management may have influenced Prof Michael Porter's research towards "How Competitive Forces Shape Strategy" (Porter, 1979) and then his "Generic Competitive Strategies" (Porter, 1980b).

According to Gluck (Gluck et al., 1978a) **Strategic Thinking** is based on four rules:

1. It requires **fact-based intelligence**, insight and foresight.
2. **Questions** every assumption.
3. **Unwillingness** to throw more resources to solve a problem, in contrast to the common notion "work harder, not smarter".
4. The **solution** is usually not a straight-forward answer, but rather a complex detour.

This work resulted in the Gluck Nine Box Industry Matrix (Gluck et al., 1976) which was based on portfolio management, as demonstrated in Figure 21.

The fundamental difference between Bruce Henderson's and Frederick Gluck's models is that the:

- **Henderson Growth Share Matrix** is primarily finance-based planning.
- **Gluck Nine Box Industry Matrix** is primarily resource-based forecast planning.

In principle, the Nine Box Industry Matrix works as follows (Figure 21):

1. **Axial Dimensions** are similar as with the Henderson Growth Share Matrix.
    - **Attractiveness** as Growth of the relevant industry.
    - **Competitive Strength** (or Share) of the business unit within that industry.
2. Business Units **below the diagonal** should be sold, liquidated or be run purely for cash.
    - Are **Dogs** in the Henderson Growth Share Matrix.
3. Business Units **on the diagonal**: are candidates for selective investment.
    - Are **Cash Cows** or **Question Marks** in the Henderson Growth Share Matrix.
4. Business Units **above the diagonal**: are candidates for aggressive investment and growth.
    - Are **Stars** in the Henderson Growth Share Matrix.

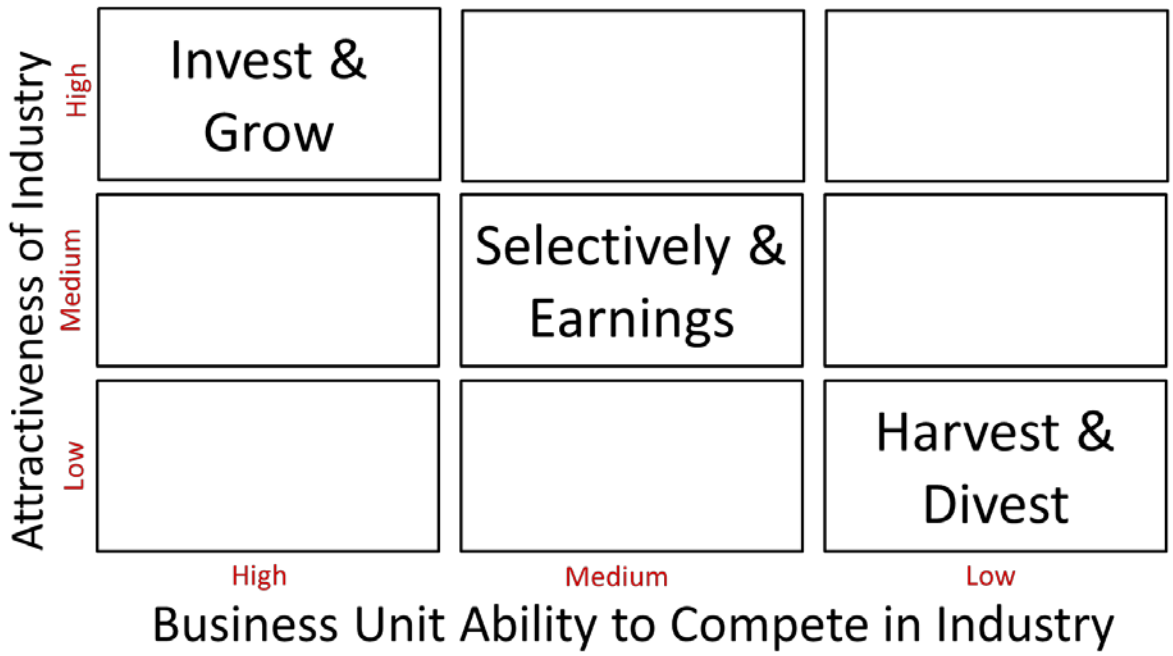


Figure 21: Original – McKinsey Gluck Nine Box Industry Matrix

Source: (Gluck et al., 1978a)

Discovery: Mapping the Henderson Growth Share Matrix onto the Gluck Nine Box Matrix (as illustrated Figure 22) provides some insight into what can happen when a corporation stop **aggressive innovation** too early when it has a Star business unit, it will lose market share before the market turns into a commodity market.

Extremely important to take note of the "Dynamics of Innovation" (Utterback and Abernathy, 1975) and "Dominant Design" (Abernathy and Utterback, 1978) models where the focus on product innovation on features to become a Star business needs to transition to process innovation to reduce cost to become a Cash Cow business.

The normalization of the Gluck Nine Box Industry Matrix is available in Figure 23 (see next page).

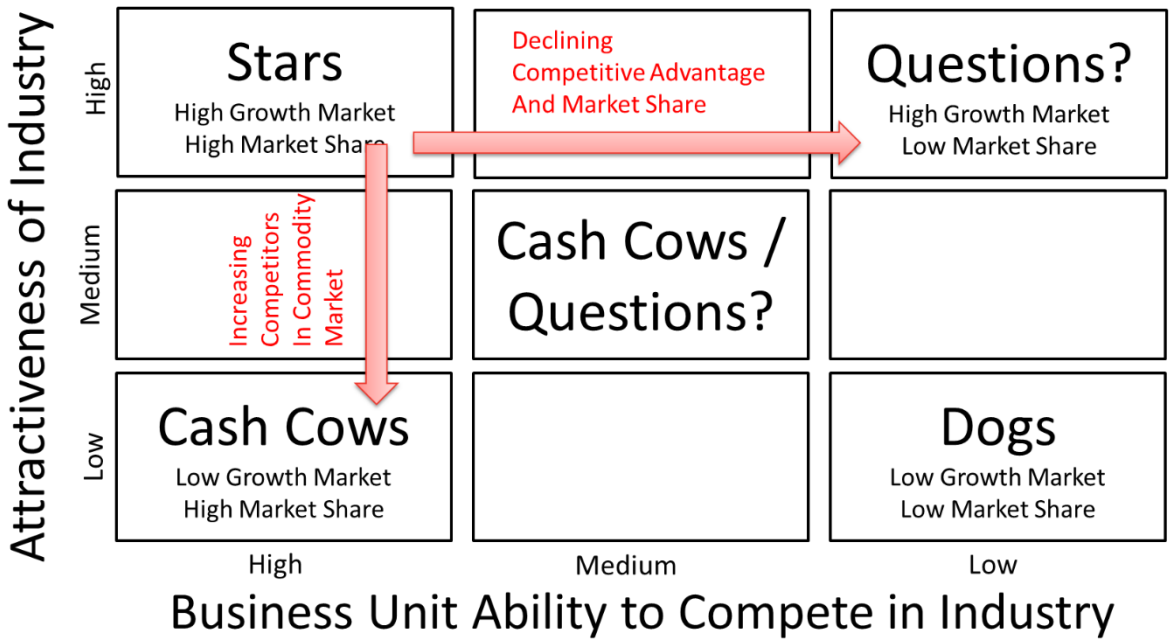


Figure 22: Henderson Growth Share Matrix Mapped onto Gluck Nine Box Industry Matrix

Source: (Gluck et al., 1978a)

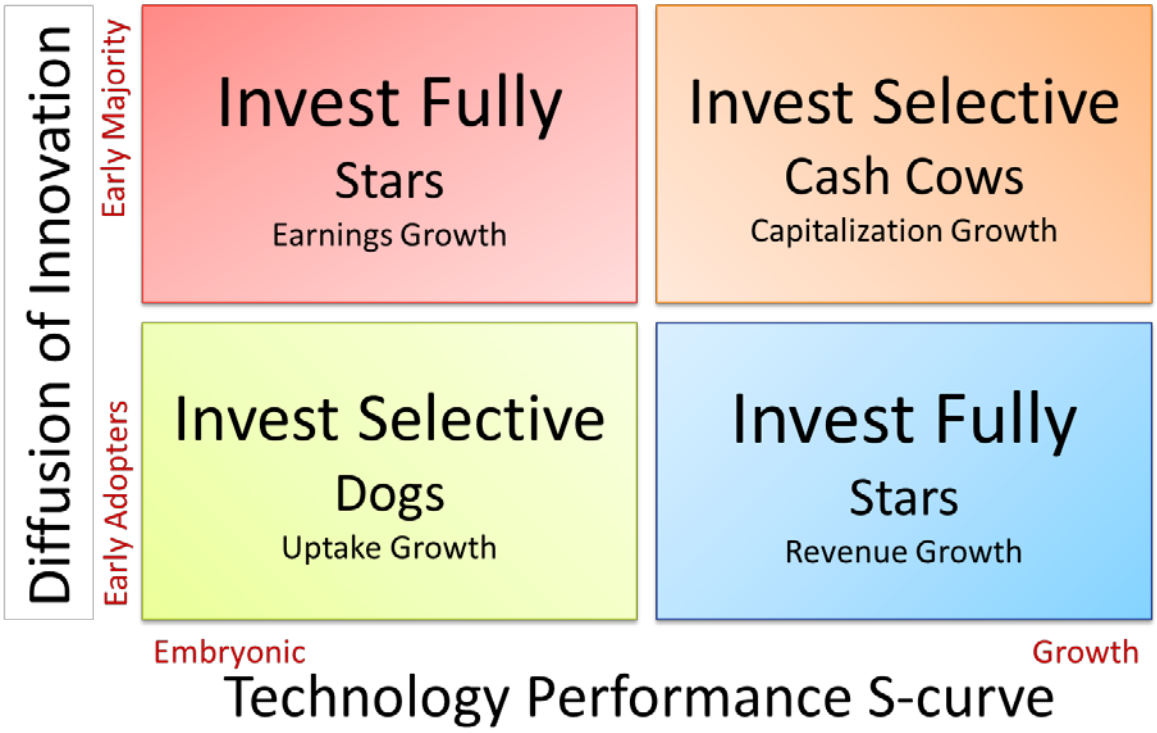


Figure 23: Normalized - McKinsey Gluck Nine Box Industry Matrix

4.7 Porter Generic Competitive Strategies Matrix (1980)

Prof Michael Porter originally published the 5 Competitive Forces that Shape Strategy (Industry Rivalry, Buyers, Suppliers, New Entrants, Substitute Solutions) (Porter, 1979) and as an answer to deal with the competitive forces he published the Three Generic Strategies (Porter, 1980a). These strategies assist corporations to be competitive within their industries.

This matrix integrates Ansoff's Business Growth Strategies that focused purely on product, with the work done on "Dynamics of Innovation" (Utterback and Abernathy, 1975) and "Dominant Design" (Abernathy and Utterback, 1978) that was published in the 1970s. The axial dimensions align this matrix also with the matrixes of Henderson and Gluck. In addition, this model also aligns well with what is known as the "Marketing Mix" (Product, Place, Price, Promotion).

In principle the Porter Generic Competitive Strategies Matrix works as follows (see Figure 24):

1. **Differentiation** (or Diversification to become a Star) Strategy: It is very important to note that if the target market is industry wide, it is extremely important to deliver a breakthrough technological product that is very different from what exists in the market.

    - According to Ansoff's matrix, this requires a new product for a new market.

2. **Cost Leadership** (to become a "Cash Cow") strategy: takes note of the "Dynamics of Innovation" and thus changing markets from being new to a "Dominant Design" commodity.

    - To stay relevant in the industry, an innovation strategy to maintain a competitive advantage is to transition from technological product leadership to cost leadership.

    - The corporation needs to focus on efficiencies and scale to reduce product costs this can include: manufacturing innovations, value chain process innovations or even business model innovations.

3. **Focus** (Continues Product and Market Development to maintain a "Cash Cow" status): This is where Selective Investments in a business unit are important.

    - Product Management plays a vital role here to focus products on specific "Jobs to be Done" (JTBD) markets to deliver a very specific Value Proposition.

4. **Stuck in the Middle** (is when a business becomes a “Question Mark” or a “Dog”): This is exactly what happens when a company terminate aggressive innovation and does not transition innovation to other types of innovation (Keeley et al., 2013).

    - This happens when a corporation does NOT have a specific or sufficient holistic “**Corporate Innovation Strategy**” in place.

    - This research argues that this is the problem “**Shareholder Value Capitalism**” created (cost management and risk aversion), which Prof Porter identified appropriately.

Hypothesis: This research postulates that “Stuck in the Middle” as a symptom of “Shareholder Value Capitalism” is exactly one of the causes why the “Corporate Innovation Performance Challenge” exists.

The normalization of the Porter Three Generic Competitive Strategies can be viewed in Figure 25 (see next page).

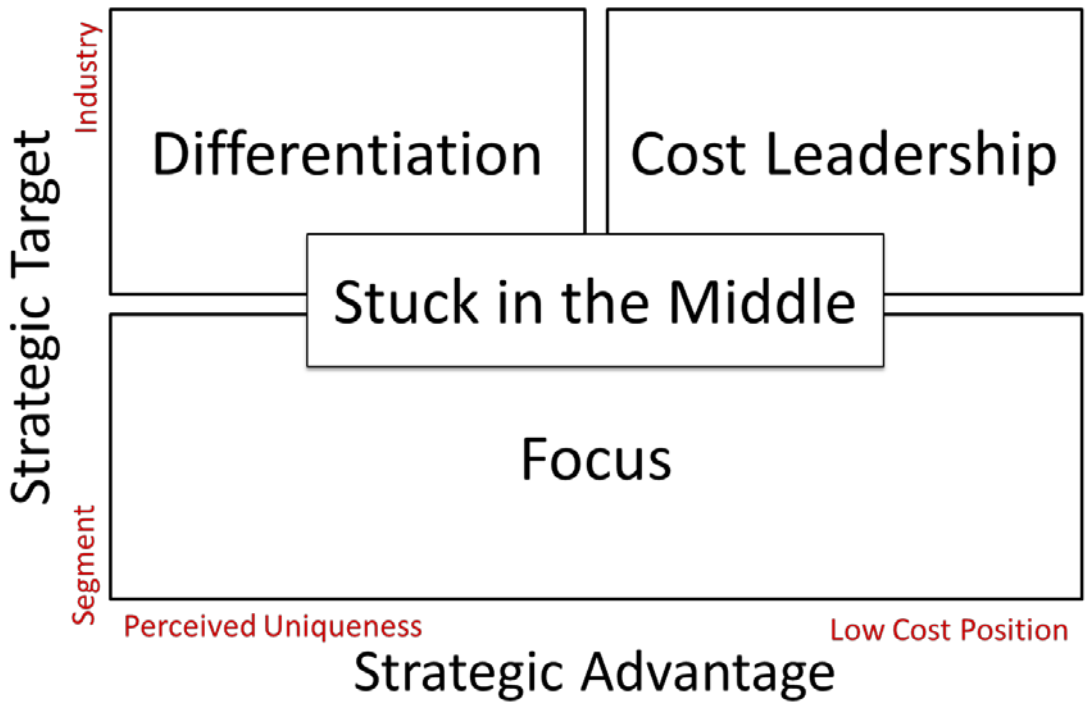


Figure 24: Original - Porter Three Generic Competitive Strategies

Source: (Porter, 1980a)

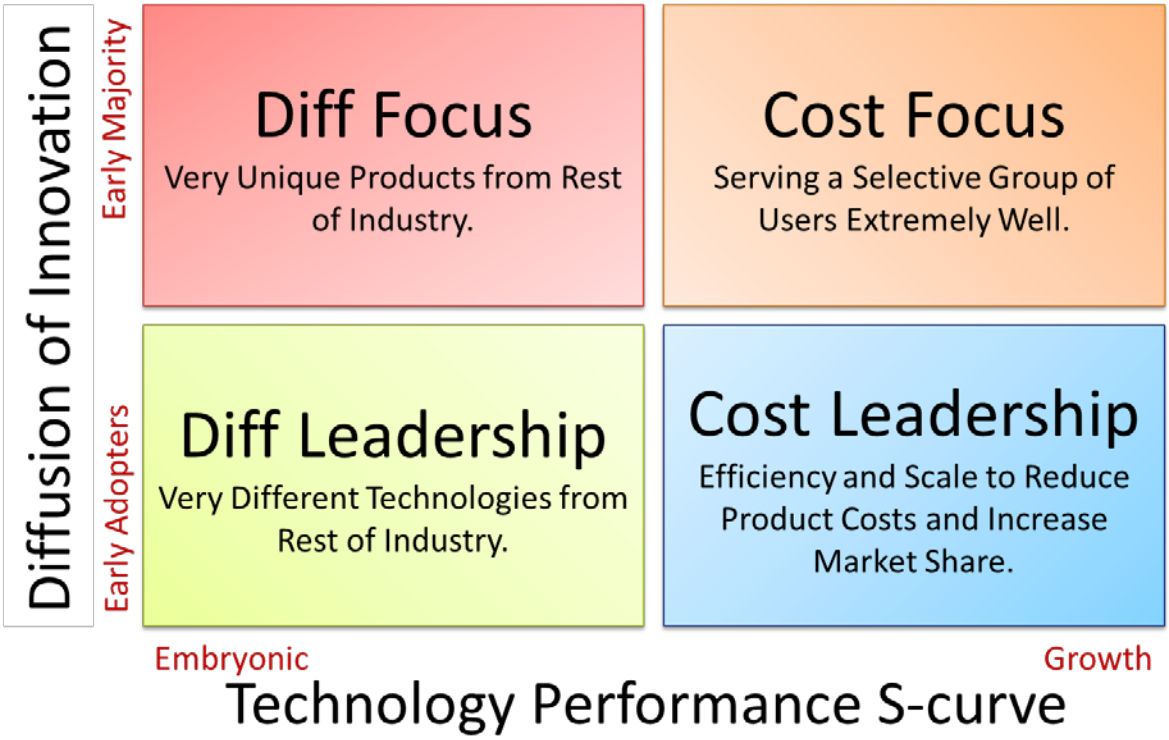


Figure 25: Normalized - Porter Three Generic Competitive Strategies

4.8 Baghai Three Horizons Model (1999)

"Growth is a noble pursuit. It creates new jobs for the community and wealth for shareholders. It can turn ordinary companies into stimulating environments where employees find a sense of purpose in their work," (Baghai et al., 1999)

The "Baghai Three Horizons Model" is probably one of the simplest and most well-known models in corporate strategy. As a project at McKinsey, Baghai et. al. (Baghai et al., 1999) investigated why and how some corporations manage to sustain growth while the majority seems to fail, as Foster indicated with his publication of the "Corporate Longevity Wave" (Foster and Kaplan, 2001b).

Baghai provided an extremely simple solution to sustain growth; it is to plan for profitable innovation across three future horizons as in Figure 26:

- **Horizon 1**: Extend and defend core business – Short term innovation strategy.
- **Horizon 2**: Build emerging businesses – Medium term innovation strategy.
- **Horizon 3**: Create viable options – long-term innovation strategy.

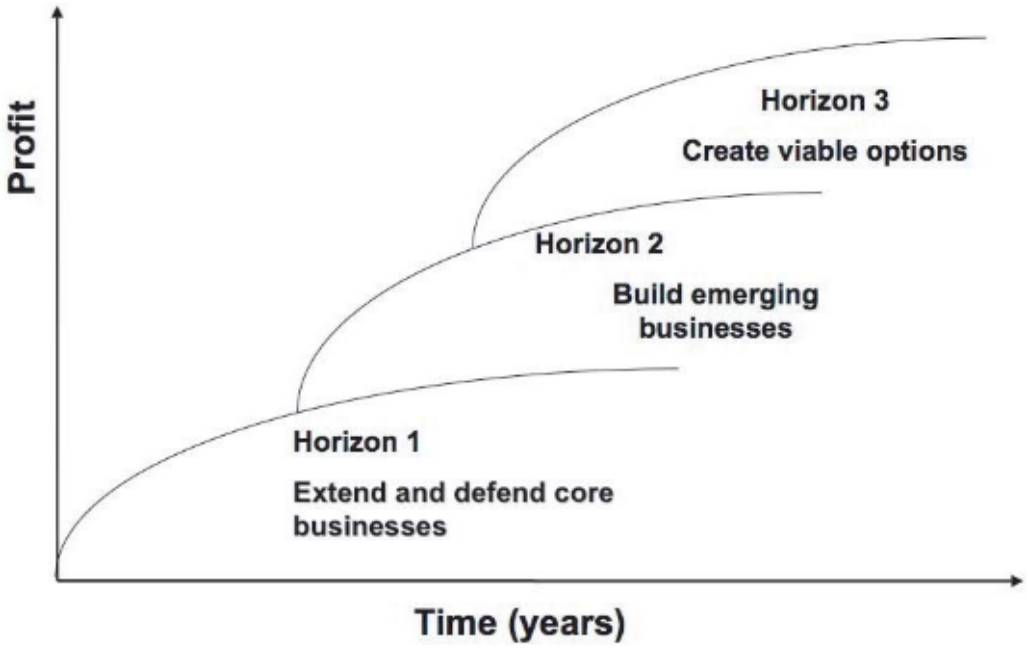


Figure 26: Baghai Three Horizons Model

Source: (Baghai et al., 1999)

Note: Extremely well aligned with this research is the concept to build new business as a medium-term (Horizon 2) corporate innovation strategy.

The Baghai Three Horizons Model was adopted to fit in a matrix structure as in Figure 27.

The normalization of the “Baghai Three Horizons” model was accomplished as in Figure 28 (see next page).

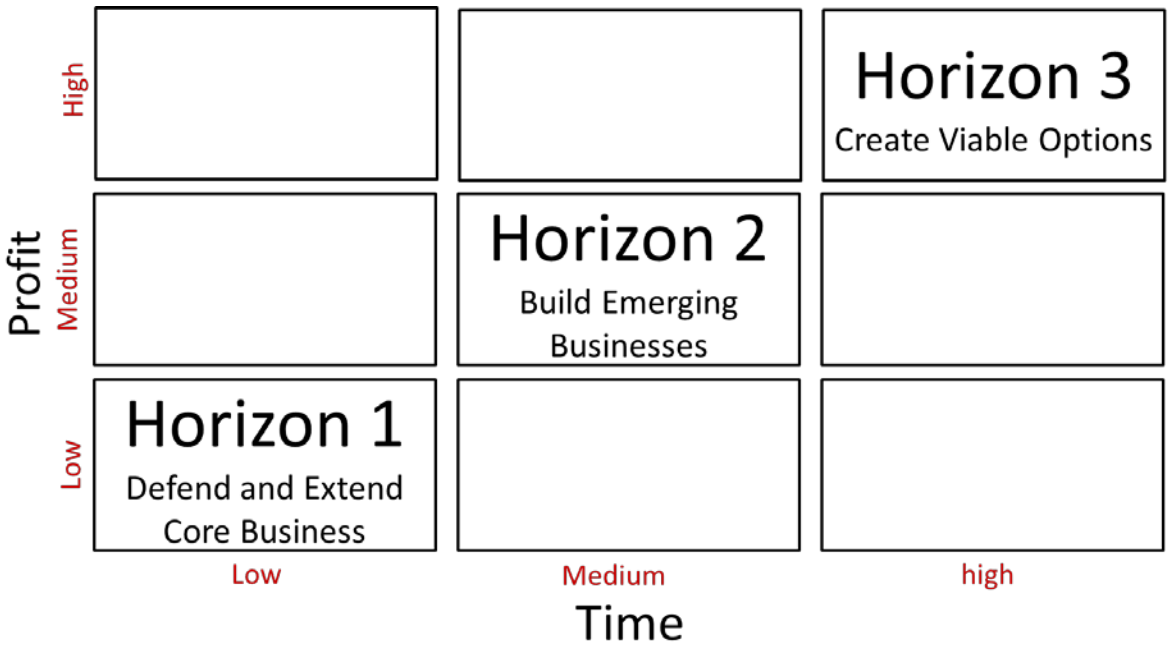


Figure 27: Original – Baghai Three Horizons Model

Source: (Baghai et al., 1999)

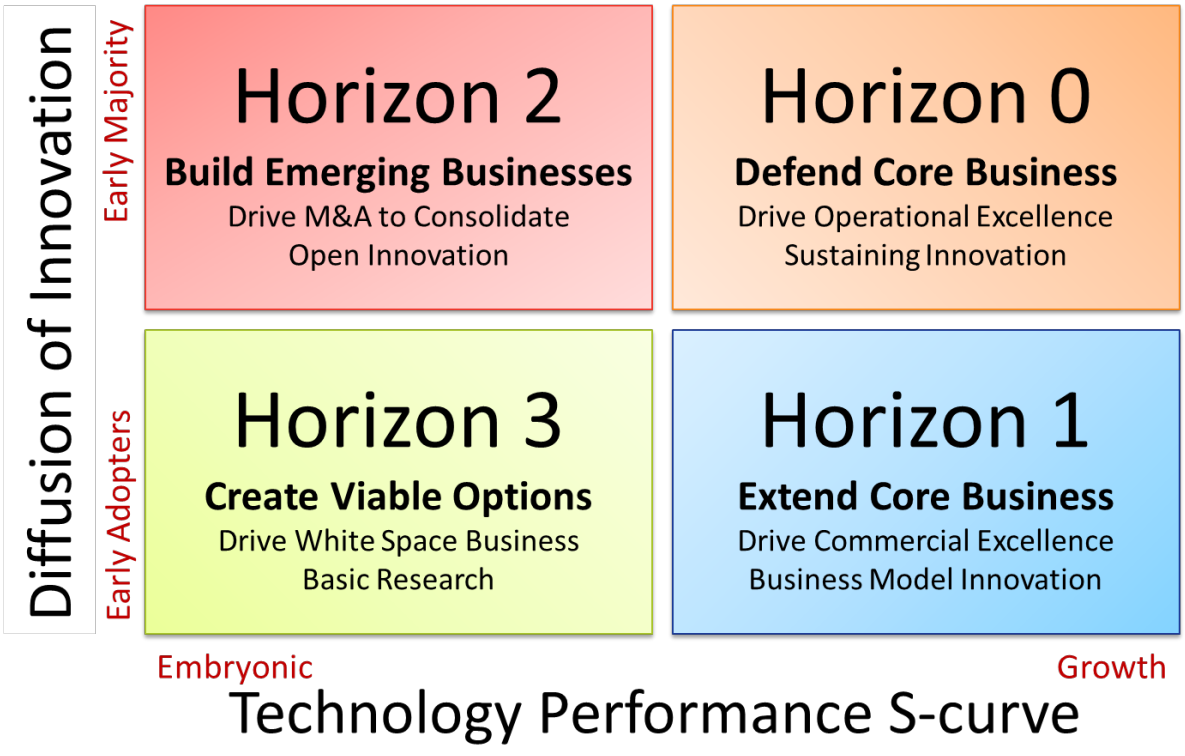


Figure 28: Normalized – Baghai Three Horizons Model

4.9 Nagji Innovation Ambition Portfolio Matrix (2012)

"A study by the Corporate Strategy Board shows that mature companies attempting to enter new businesses fail as often as 99% of the time. Rather than hoping that their future will emerge from a collection of ad hoc efforts, smart firms manage for "total innovation." (Nagji and Tuff, 2012)

The "Nagji Innovation Ambition Portfolio Matrix" is a fantastic adaptation of the "Ansoff Product Market Strategies for Business Growth", which has been integrated into the "Baghai Three Horizons Model" to create a new model for "Strategic Corporate Innovation".

Typical with corporate innovation strategy, it guides corporate executives "Where to Play?" (Market) and "How to Win?" (Product). This model is also aligned with Baghai's Three Horizons' Model, which specifies three different markets: Core, Adjacent and Transformational. More detailed information is available in Figure 29.

In principle, the "Nagji Innovation Ambition Portfolio Matrix" works as follows, see Figure 29:

1. **Core** Innovations:
    - Optimizing existing products for existing customers.
    - Incremental changes to existing products and incremental inroads into new markets.
2. **Adjacent** Innovations:
    - Expanding from existing business into "new to the company" business.
    - Leveraging something the company does well into a new space.
3. **Transformational** Innovations:
    - Developing breakthroughs and inventing things for markets that do not yet exist.
    - Create new offerings, if not whole new businesses, to serve new markets and customer needs.

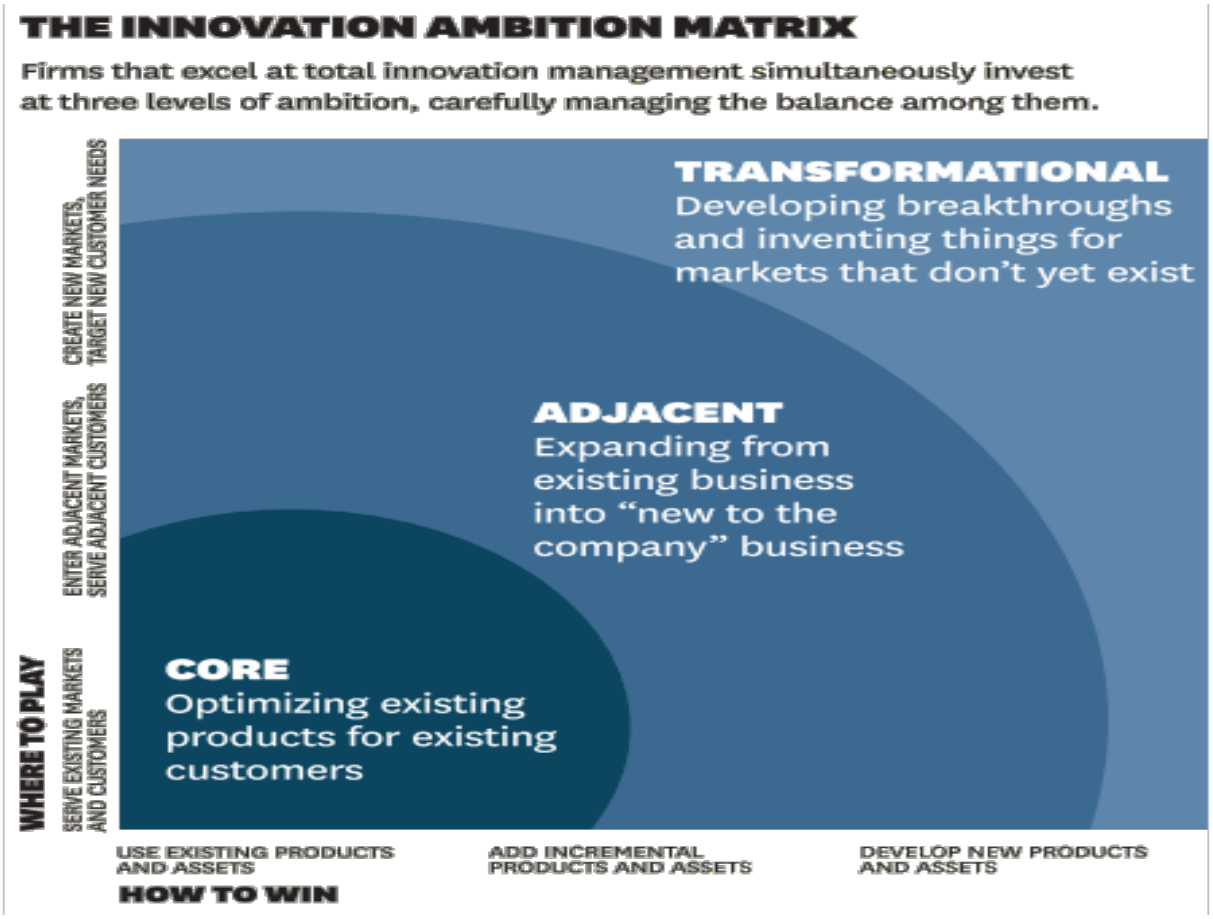


Figure 29: Nagji Innovation Ambition Portfolio Matrix

Source: (Nagji and Tuff, 2012)

Note: A strong point Nagji and Tuff made is that corporations should have different organizations configured for different innovation ambitions, which clearly suggests the need for an "**Ambidextrous Organization**" structure.

The Nagji Innovation Ambition Portfolio Matrix was adapted to fit in a matrix structure as in Figure 30.

The normalization was then performed according to Figure 31 (see next page).

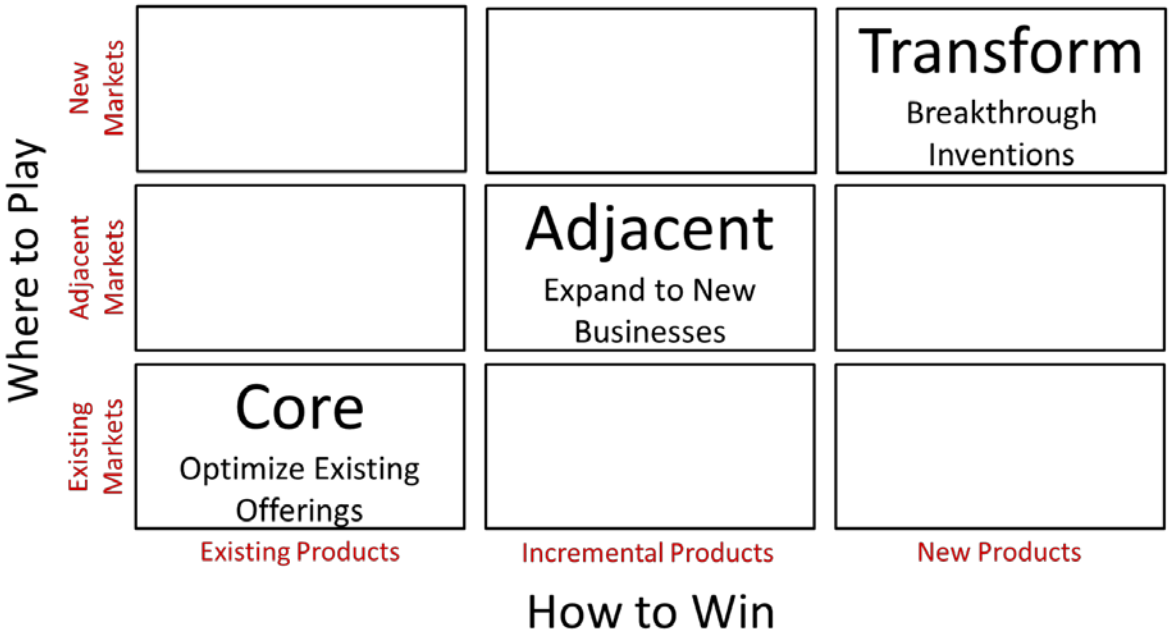


Figure 30: Original – Nagji Innovation Ambition Matrix

Source: (Nagji and Tuff, 2012)

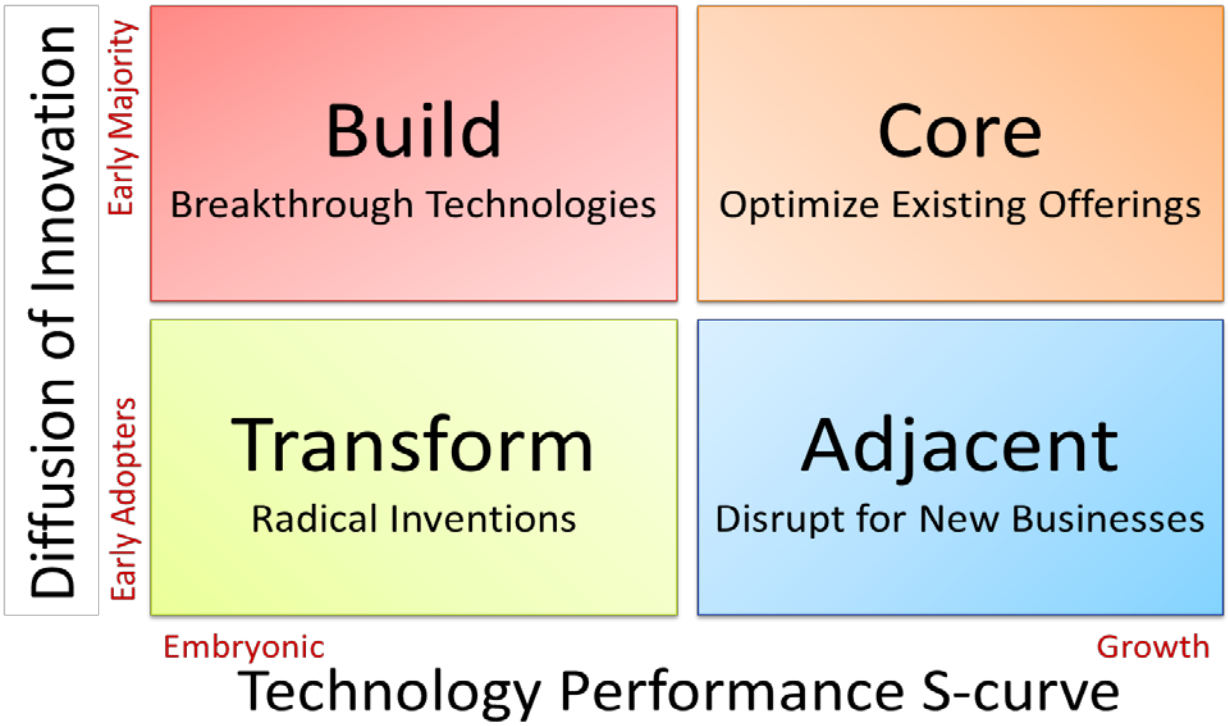


Figure 31: Normalized – Nagji Innovation Ambition Matrix

4.10 Deschamps Typology of Innovation by Strategic Focus (2005)

"Different types of leaders seem to be needed at different stages of the innovation process. For example, innovation activities, and thus leadership imperatives, are quite different at the ''fuzzy front-end'' and ''speedy back-end'' of the process." (Deschamps, 2005)

Deschamps determined that there is a significant difference in managing innovation between the "Fuzzy Front-End" and the "Speedy Back-end" that requires different processes (exploration vs exploitation) and different management styles. He also identified two very different points from where innovation originates and spread through the corporation. It is either "Top-Down" (strategically driven by executive management) or "Bottom-Up" (as driven by corporate intrapreneurs). (Deschamps, 2005)

As where Baghai (Baghai et al., 1999) and Nagji (Nagji and Tuff, 2012) look at the strategic planning horizons and markets for innovation, Deschamps wanted to determine what management leadership is required for each horizon and market.

Deschamps identified four strategic dimensions of innovation and thus created a "Typology of Innovation by Strategic Focus" (Deschamps, 2005), according to Figure 32:

- **Objective**: Must the innovation strengthen an existing business or must it create a completely new business.
- **Scope / Focus**: Should the innovation focus only on improving a product or service feature or should it deliver a completely new technological product and business model.
- **Boundaries**: Depending on the complexity of the solution that needs to be innovated, it may require co-creation with outside experts, resources, partners, etc.
- **Intensity Level**: Will the innovation then be considered incremental, disruptive, breakthrough or radical?

The normalized framework was constructed as in Figure 33 (see next page).

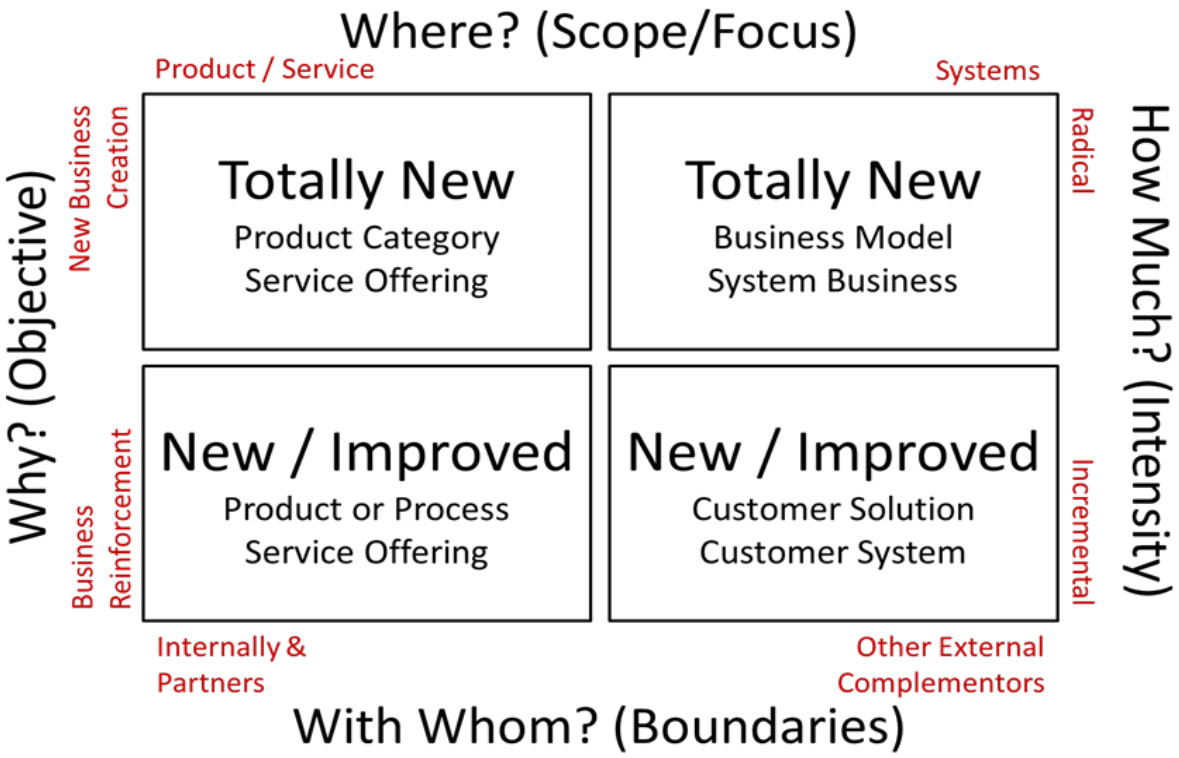


Figure 32: Original - Deschamps Typology of Innovation by Strategic Focus

Source: (Deschamps, 2005)

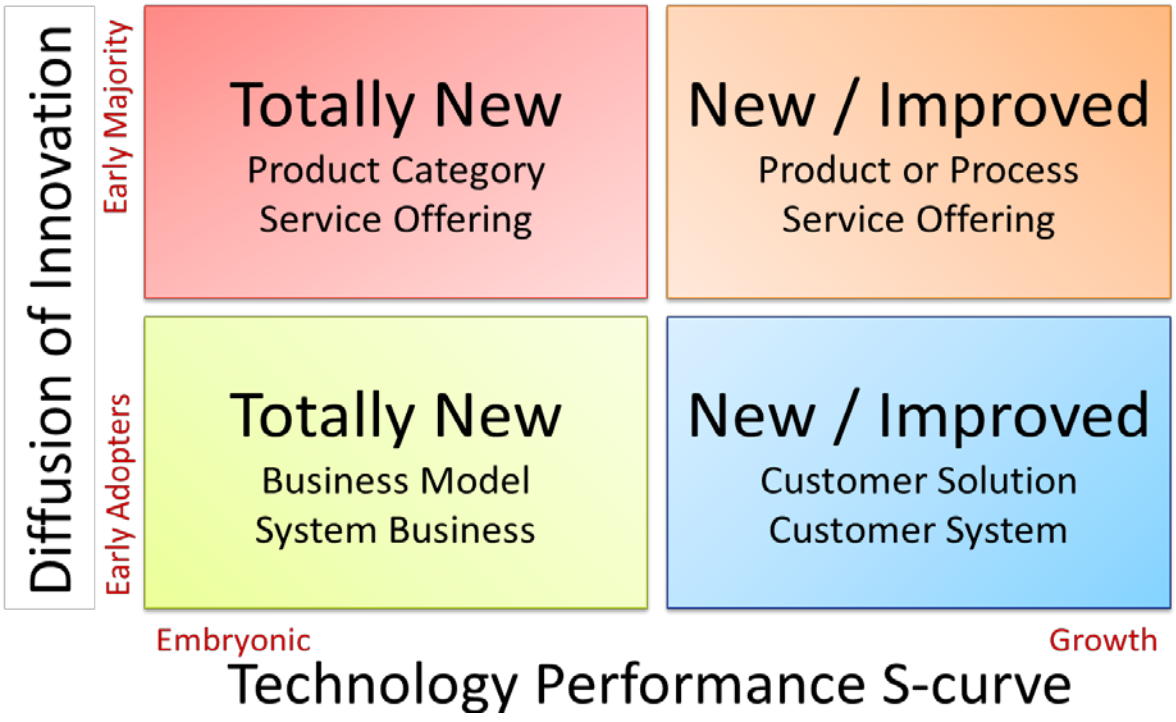


Figure 33: Normalized - Deschamps Innovation Typology by Strategic Focus

4.11 Hax Integrative Strategy Delta Model (2006)

Prof Hax (of the MIT Sloan School of Management) developed the Integrative Strategy Delta Model to link (innovation) strategy with execution.

He identified three “Adaptive Processes” to support a Business Model as shown in Figure 34:

1. **Innovation**: This process ensures the continuous delivery of new product features and service capabilities (incremental or radical improvements) to ensure the sustainability of the corporation.

2. **Operational Effectiveness**: Is focused on the delivery of the new products or services at the lowest possible cost and within the shortest possible time.

3. **Customer Targeting**: This has to identify the target market and ensure the best possible user experience with the product or service the corporation has to offer.

The normalization of the Hax Integrative Strategy Delta Model was constructed in Figure 35 (see next page).

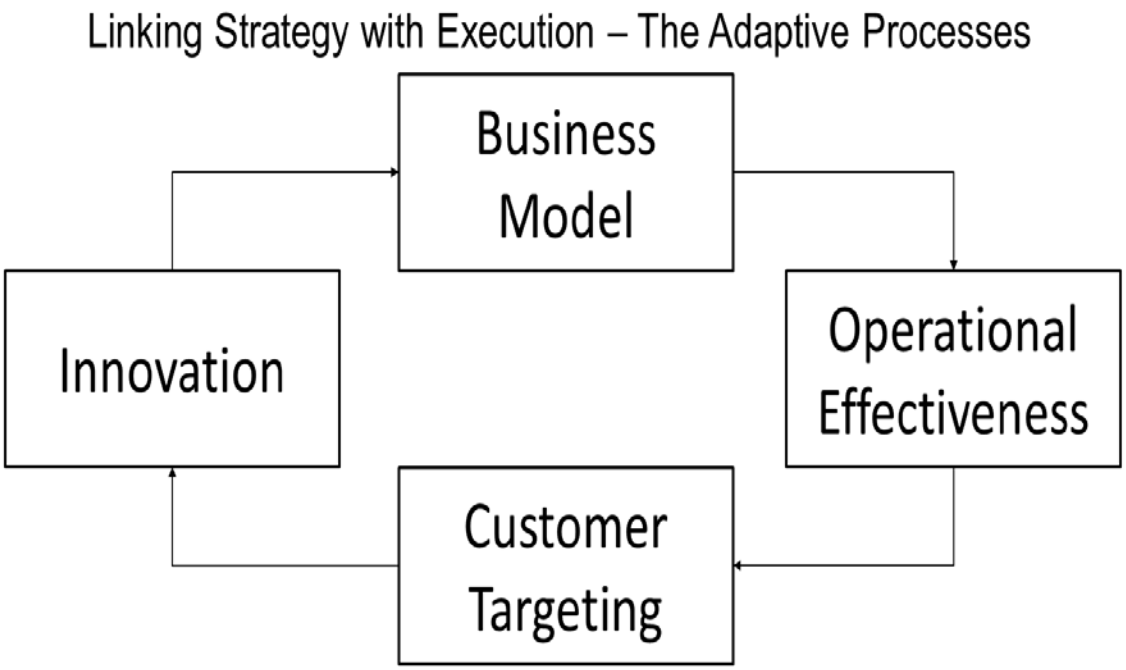


Figure 34: Original - Hax Integrative Strategy Delta Model

Source: (Hax, 2006)

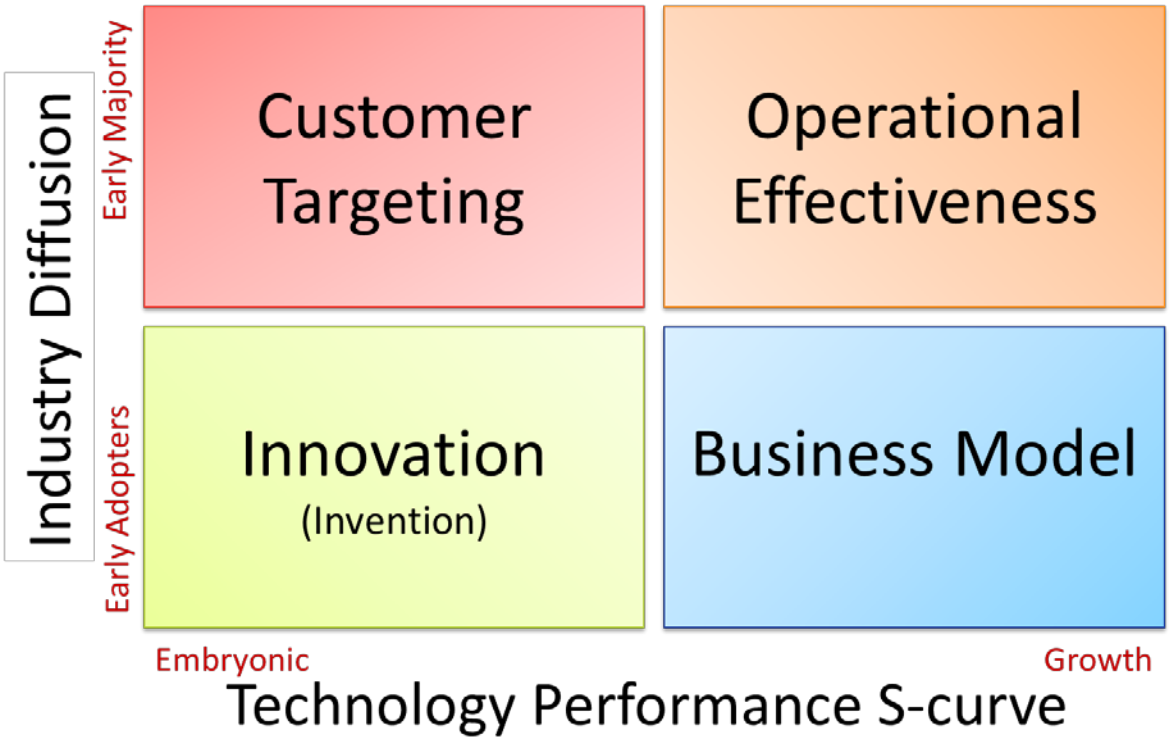


Figure 35: Normalized – Hax Integrative Strategy Delta Model

4.12 Jaruzelski Innovation Strategy Approach Profiles (2007)

Jaruzelski is responsible for the annual “Global Innovation 1000” reports in which “PwC Strategy&” (global strategy consulting firm) is following the financial results of the biggest public corporate R&D spenders globally.

For the 2007 study, they looked for the first time at the relationship between the corporate strategy and innovation strategy, and also between innovation strategy and the in-depth customer understanding.

From their research they identified three distinct innovation strategies which corporations followed (Jaruzelski and Dehoff, 2007) as in Figure 36:

1. **Need Seekers**: These companies actively engage current and potential customers to **shape** new products, services, and processes as a **resource-based approach**. This innovation strategy usually requires a **disruptive innovation** effort type.

2. **Market Readers**: These companies **watch** their markets carefully, but they maintain a more cautious approach. These companies focus on sustaining **incremental innovation**.

3. **Technology Drivers**: These companies **follow** the direction suggested by their technological capabilities, leveraging their investment in R&D as a **position-based approach** to drive **breakthrough innovation** mostly into newly self-created markets. The companies often seek to address the unarticulated needs of their customers.

The normalization of the Jaruzelski Innovation Strategy Approach Profiles was constructed in Figure 37 (see next page).

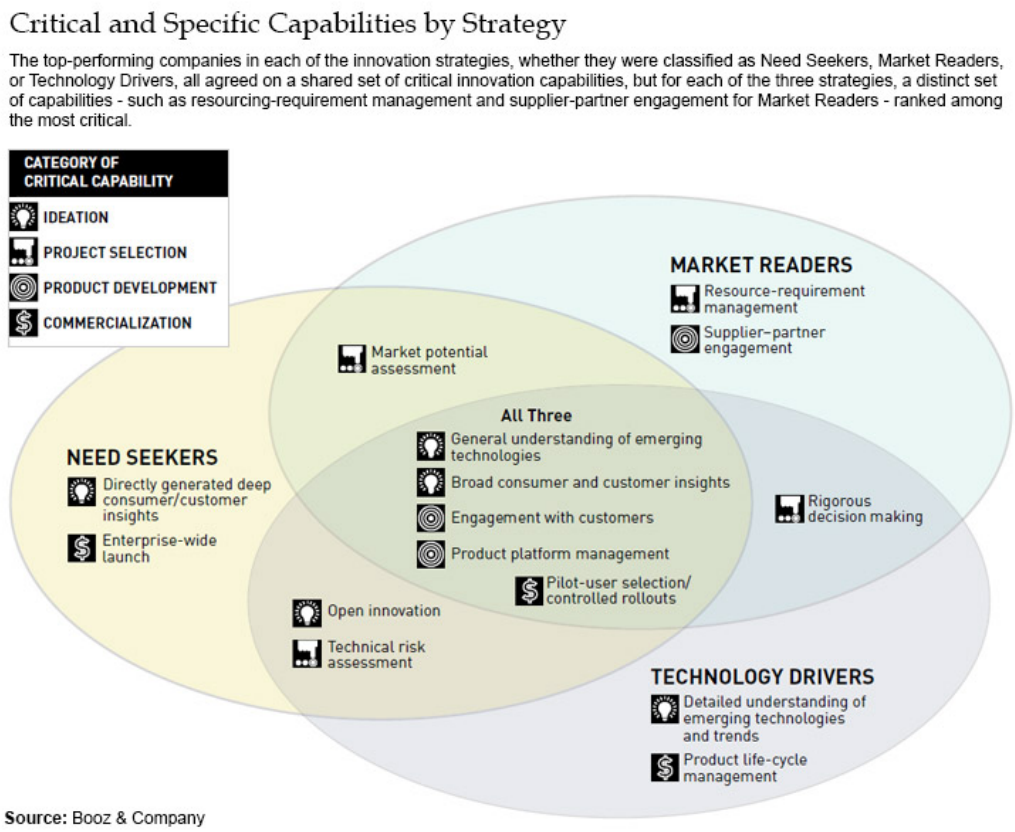


Figure 36: Original – Jaruzelski Innovation Strategy Approach Profiles

Source: (Jaruzelski and Dehoff, 2007)

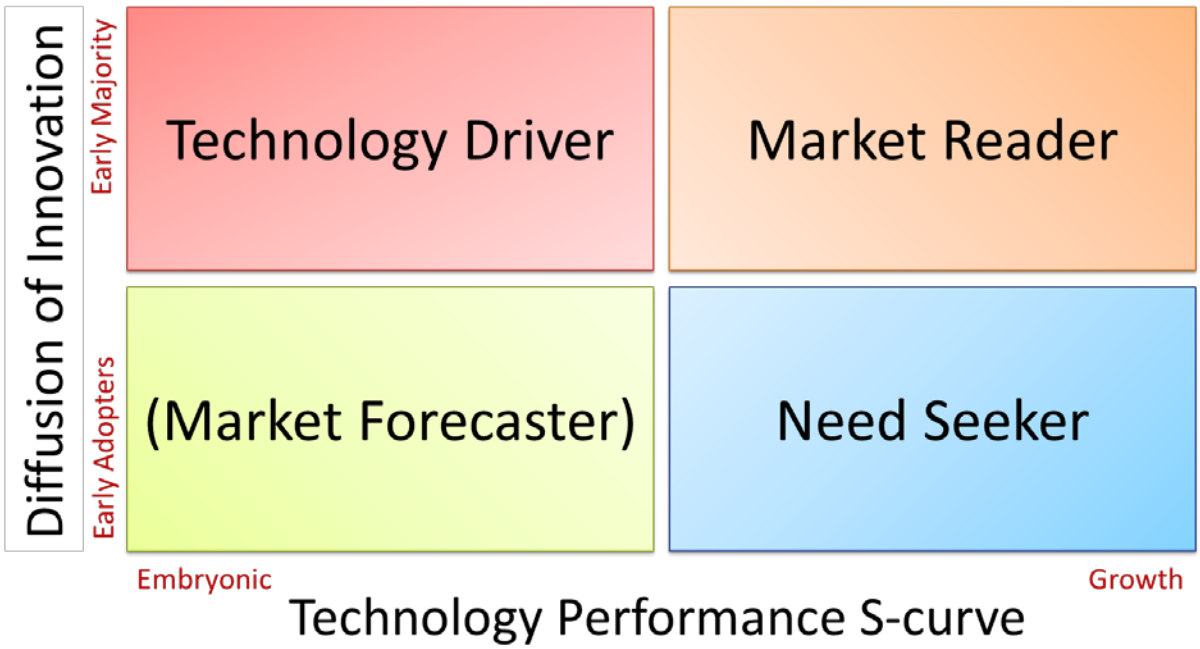


Figure 37: Normalized - Jaruzelski Innovation Strategy Approach Profiles

4.13 Mainardi Landscape of Strategy Concepts (2010)

While Jaruzelski (Jaruzelski and Dehoff, 2010) looked into innovation strategy, Mainardi and Kleiner (Mainardi and Kleiner, 2010) (also from "PwC Strategy&" consulting firm) were more focused on business strategy. Important to note is that they started to ask the question: How can corporations gain the "Right to Win" in the market? This is also well aligned with Porter's "Competitive Advantage Strategy" where a corporation has an exceptional high probability to win in the market it enters.

Mainardi and Kleiner created a matrix in which the 4 quadrants each represents a basic school of thought (or best approach) for developing business strategy to obtain the "Right to Win", as in Figure 38.

1. **Position**: these position-based strategies select favorable markets as defined by external forces (similar to **Technology Drivers**).
2. **Concentration**: these resource-based strategies make the most of current core capabilities within the corporation (similar to **Researching Inventors**).
3. **Execution**: these operational excellence strategies make the most from efficiencies and cost reduction (similar to **Need Seekers**).
4. **Adaptation**: these strategies allows for experimentation and rapid change (to be fast acting **Market Readers**).

The axial dimensions were defined as follows:

- **X-axis**: defines if the strategy is developed bottom-up (as with Execution and Adaptation) or top-down (Positioning and Concentration).
- **Y-axis**: defines if the strategy is based on current corporate capabilities (as with Execution and Concentration) that will focus on incremental innovation or future capabilities (Positioning and Adaptation) that will require more breakthrough innovation.

The normalization of Mainardi Landscape of Strategy Concepts were constructed as in Figure 39 and Figure 40 (see next page).

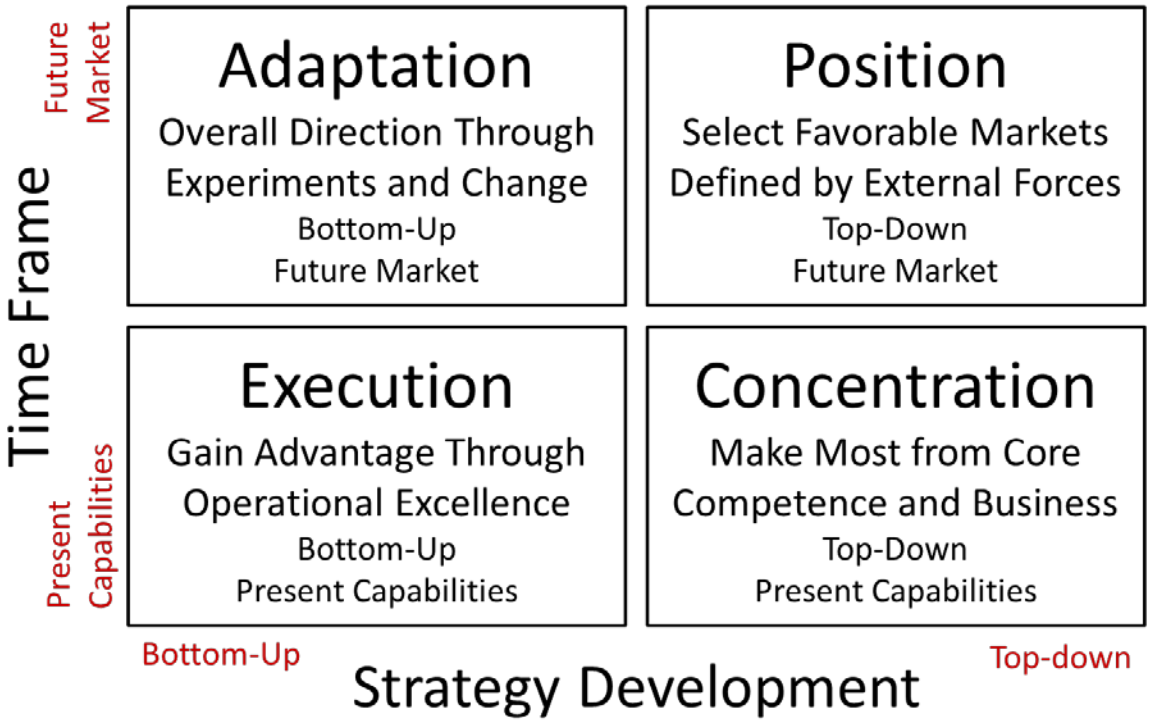


Figure 38: Original - Mainardi Landscape of Strategy Concepts

Source: (Mainardi and Kleiner, 2010)

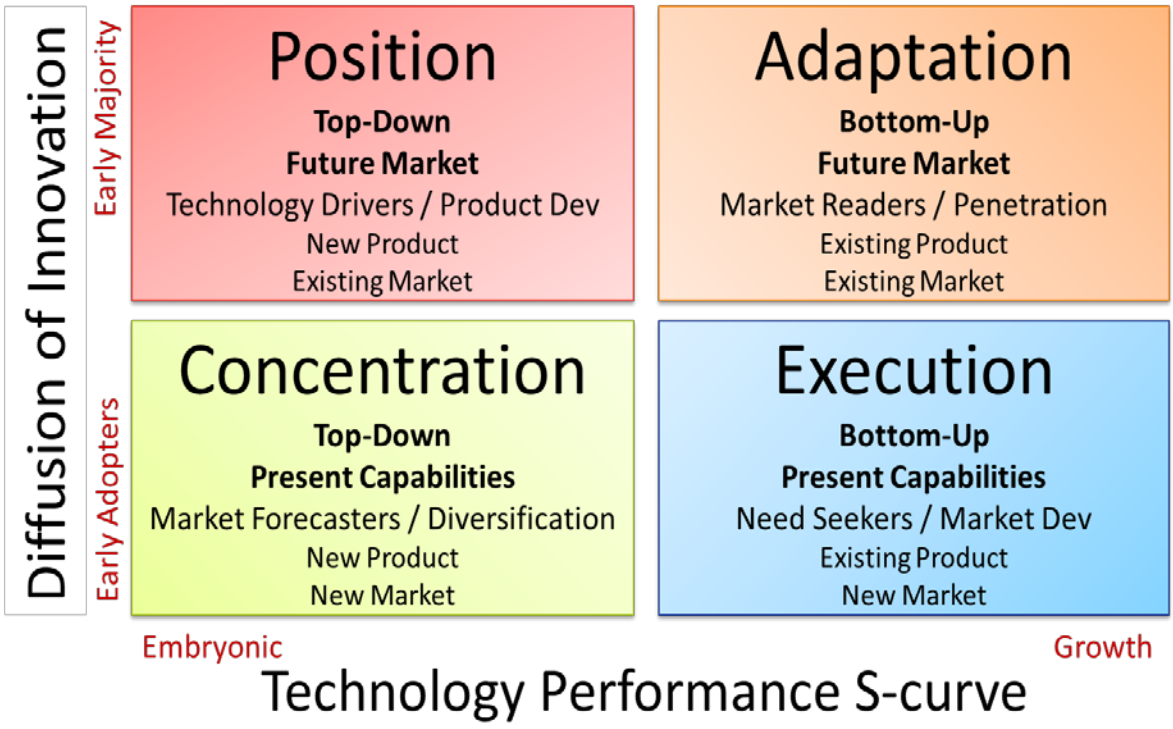


Figure 39: Normalized - Mainardi Landscape of Strategy Concepts (Axial Dimensions)

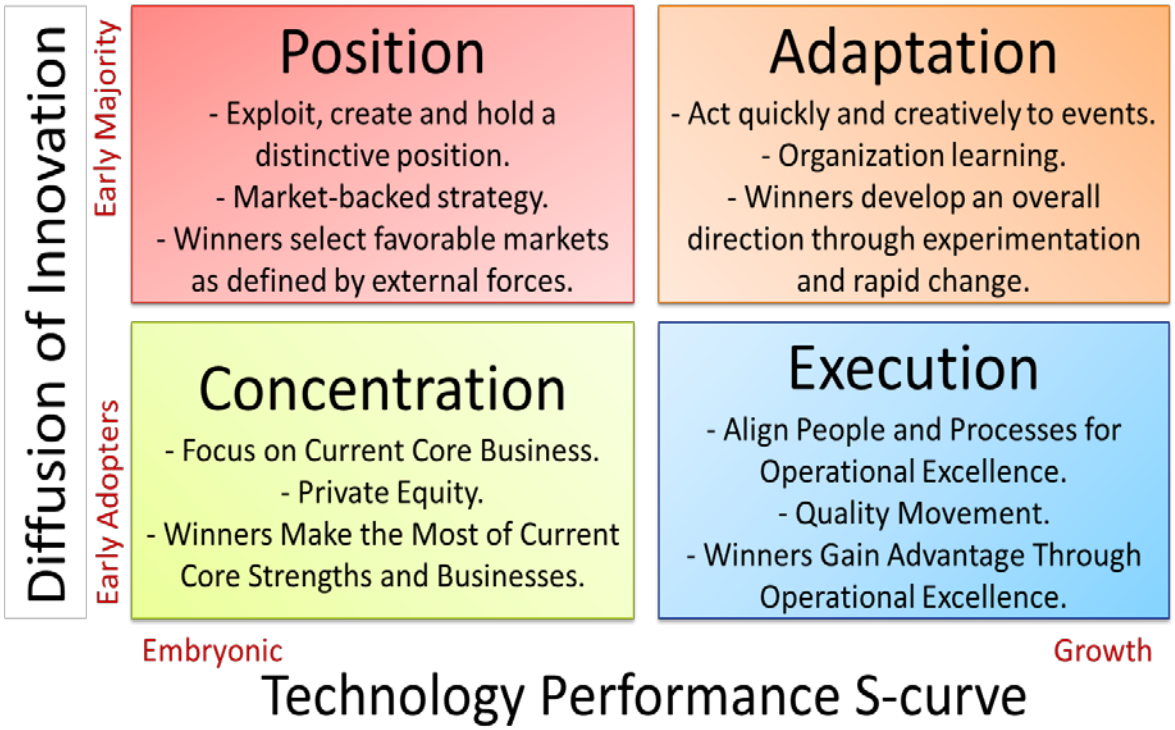


Figure 40: Normalized Focus - Mainardi Landscape of Strategy Concepts (Annotations)

4.14 Reeves Strategy Formulation Approach Palette (2012)

Extending the work as presented by Jaruzelski and Mainardi (Mainardi and Kleiner, 2010) (both at “PwC Strategy&” consulting firm), Martin Reeves (the director of the Henderson Institute) at the Boston Consulting Group (BCG) conducted a most extensive systems approach on all available business strategy methodologies (no less than 80 were identified) in an interactive web page as in Figure 41 (see next page).

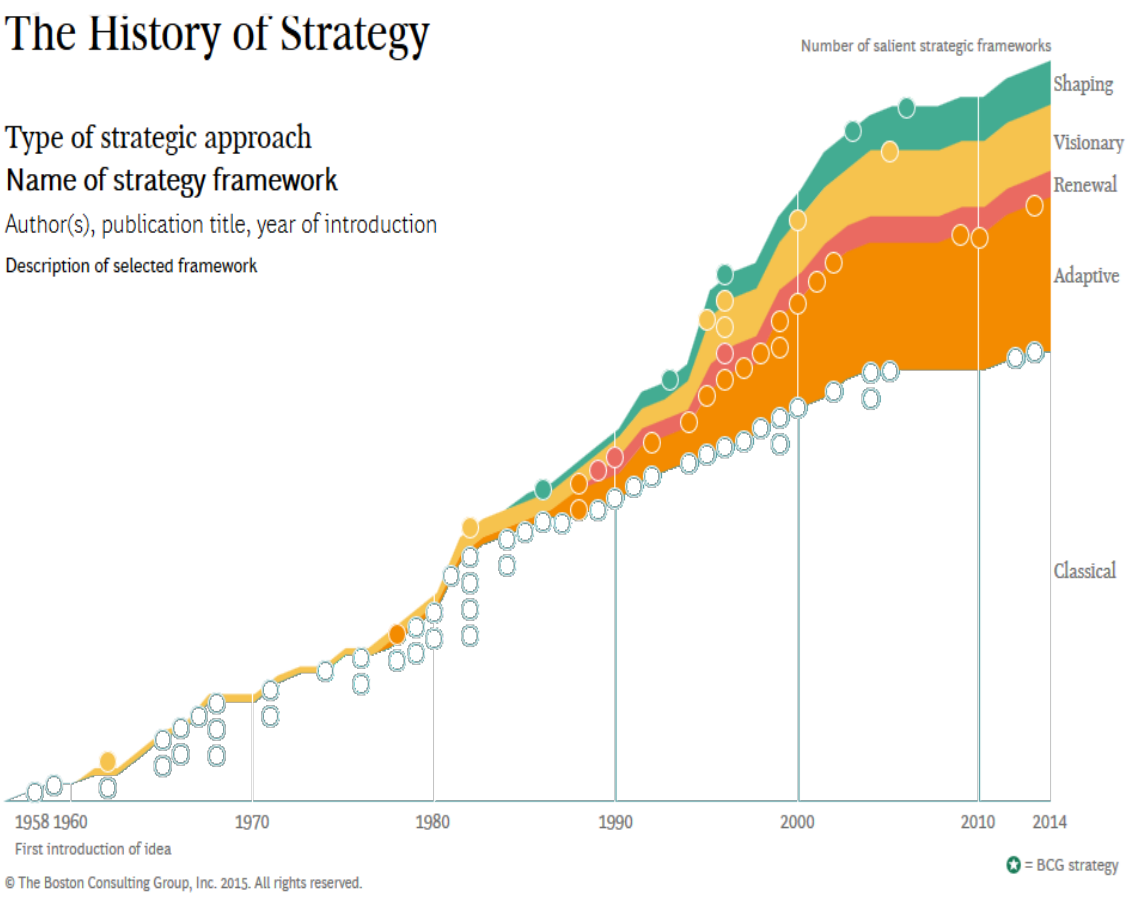


Figure 41: Evolution of Business Strategy Methodologies

Source: https://www.bcg.com/publications/collections/your-strategy-needs-strategy/intro.aspx

Similar to Mainardi (Mainardi and Kleiner, 2010), Reeves categorized business strategy methodologies into the following five categories (Reeves et al., 2012), see Figure 42:

1. **Classical Strategy**: These methodologies are the traditional strategies that work well for business units operating in immutable (little opportunity to change it) but predictable commodity market environments. (Adaptation – Customer Reader)

2. **Adaptive Strategy**: These methodologies are more flexible and experimental and work far better in immutable environments that cannot be easily changed in markets that are also unpredictable. (Adaptation – Market Reader)

3. **Shaping Strategy**: These methodologies are best in an environment where the company has the ability to change the market even though it exists with an unpredictable market. (Execution – Need Seeker)

4. **Visionary Strategy**: These methodologies are within an exceptional competitive environment where the corporation has a competitive advantage and has the power to

change the market within an industry that has predictable growth and direction. (Position – Technology Driver)

5. **Renewal Strategy**: These methodologies are used to turn a company around with limited resources or options. (Concentration – Market Forecaster)

Reeves developed a very specific "**Contextual Circumstance-Based Strategy Formulation**" matrix to categorize the business strategy methodologies (Reeves et al., 2012), according to very similar axial dimensions as the Ansoff Product Market Growth Matrix, Henderson Growth Share Matrix (also from BCG) or Gluck Nine Box Matrix, see Figure 42:

- **X-axis: Malleability** – (can you shape the market?) is your new technological product or business model service in a position to capture (existing or new) market share and change it.
- **Y-axis: Predictability** (can you forecast it?) – how easy (or difficult) is it to predict the strategic target market growth or attractiveness of the industry.
- **Z-axis: Harshness** (can you survive it?) Reeves added a third dimension (Z-axis) to this matrix to define the position the corporation is in (Reeves et al., 2015).

The normalized Reeves Strategy Formulation Approach Palette Matrix is constructed in Figure 43 and Figure 44 (see next page).

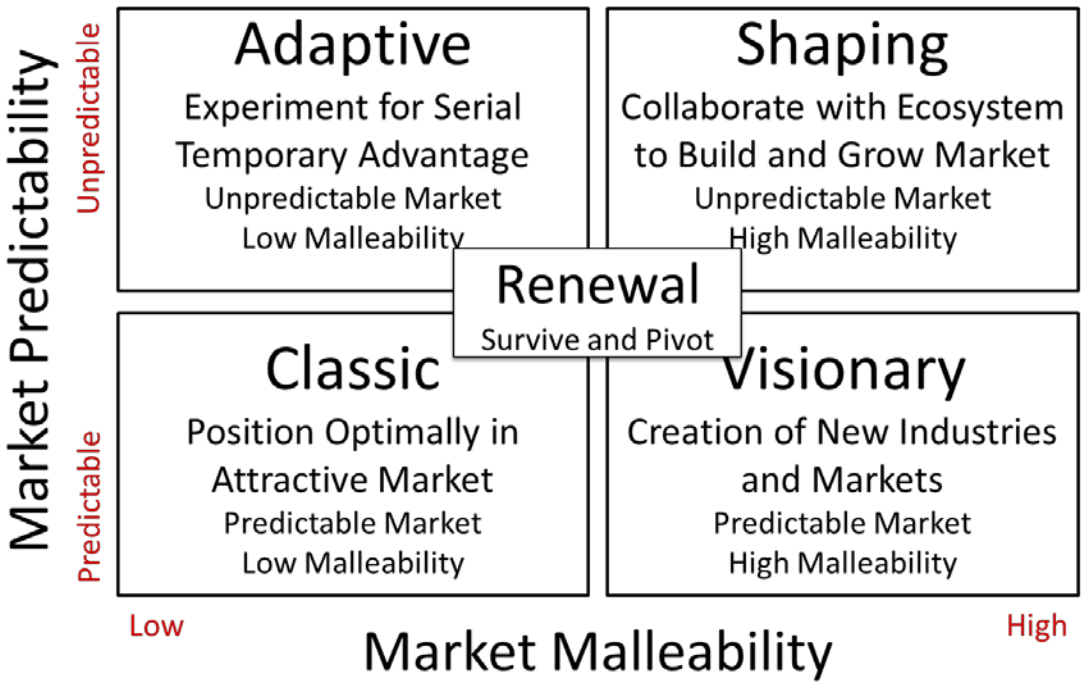


Figure 42: Original - Reeves Strategy Formulation Approach Palette

Source: (Mainardi and Kleiner, 2010)

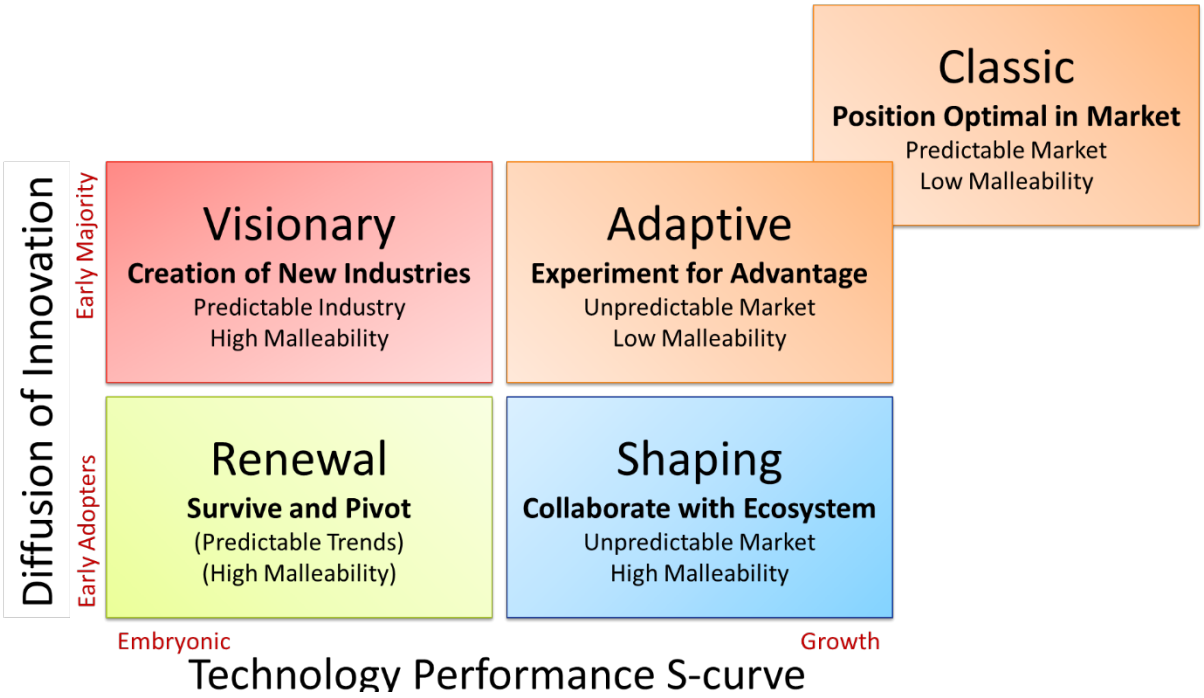


Figure 43: Normalized – Reeves Strategy Formulation Approach Palette (Axial Dimensions)

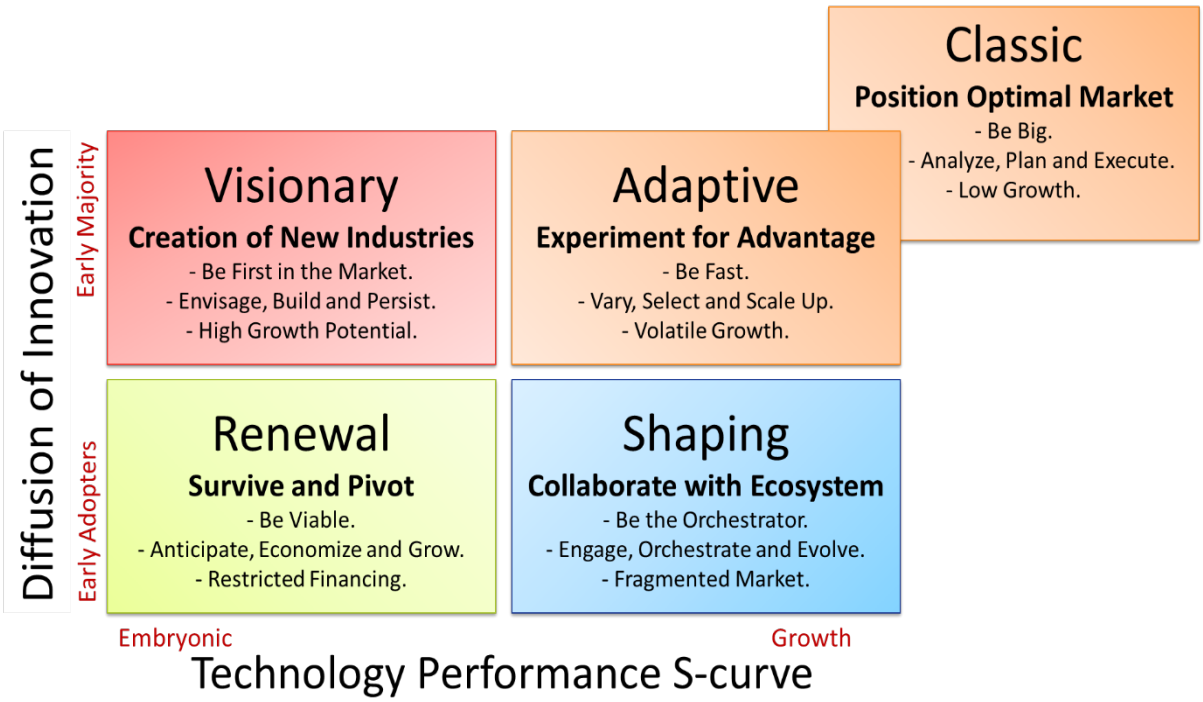


Figure 44: Normalized – Reeves Strategy Formulation Approach Palette (Annotations)

4.15 Satell Innovation Effort Strategy Matrix (2013)

"I found that every innovation strategy fails eventually, because innovation is, at its core, about solving problems — and there are as many ways to innovate as there are types of problems to solve." (Satell, 2017)

Even though Satell defined his matrix as "Innovation Types", this article will classify it as "Innovation Effort Strategies" since different innovation effort strategies are required, depending on how well the problem can be defined for the target market and how much knowledge (technologies or products) exist to solve the defined problem (Satell, 2013) (Satell, 2017).

The axial dimensions can also be conceptually mapped to that of Ansoff, Henderson, Gluck, Nagji and Reeves' matrixes with the:

- **X-axis**: defines the knowledge, technology or product's **competitive advantage**.
- **Y-axis**: defines the target market or industry's **competitive environment**.

The Satell Innovation Effort Strategies Matrix can be explained as follows (Satell, 2013) (Satell, 2017)., according to Figure 45:

1. **Basic Research**: This is the type of "innovation" done at universities and some R&D labs. While there is not a clearly defined outcome, continuous experimentation is done to learn more to adaptively generate many options for solutions. (Concentration – Renewal)
2. **Sustaining Innovation**: This is the type of innovation where there is a clearly defined problem and a reasonably good understanding of how to solve it. This is typically the domain of the Product Manager within a corporate business unit who can document very well-defined requirement specification. Popular methodologies within this domain are Outcome-Driven Innovation (ODI) or Blue Ocean Strategy. (Adaptation – Adaptive)
3. **Disruptive Innovation**: Prof Clayton Christensen introduced the concept of disruptive innovation in his book titled "The Innovator's Dilemma" (Christensen, 1997a). This is when an available or simple technology is used with a different business model (innovation) to serve low-end or non-consuming customers. (Execution – Shaping)
4. **Breakthrough Innovation**: This type of innovation is required when it appears to be an extremely difficult problem to solve or obstacle to overcome with technology (or knowledge) that does not exist yet. (Position – Visionary)

The normalized Satell Innovation Effort Strategy Matrix is constructed in Figure 46 (see next page).

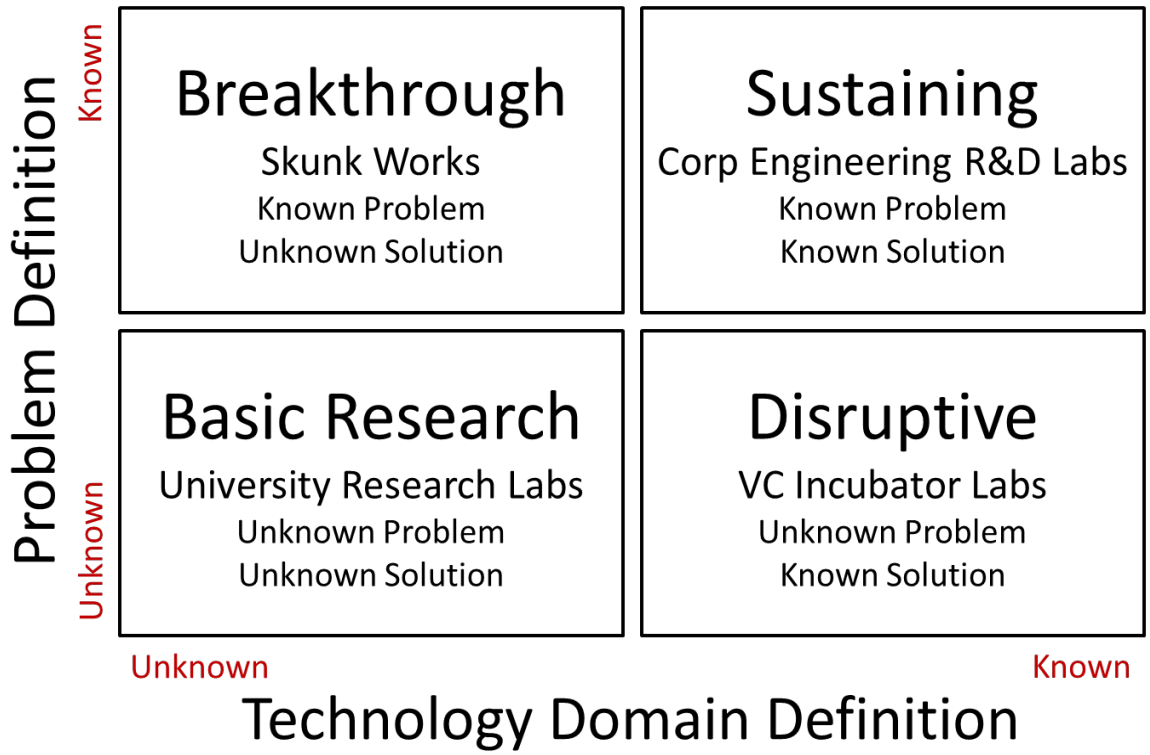


Figure 45: Original – Satell Innovation Effort Strategy Matrix

Source: (Satell, 2013) (Satell, 2017)

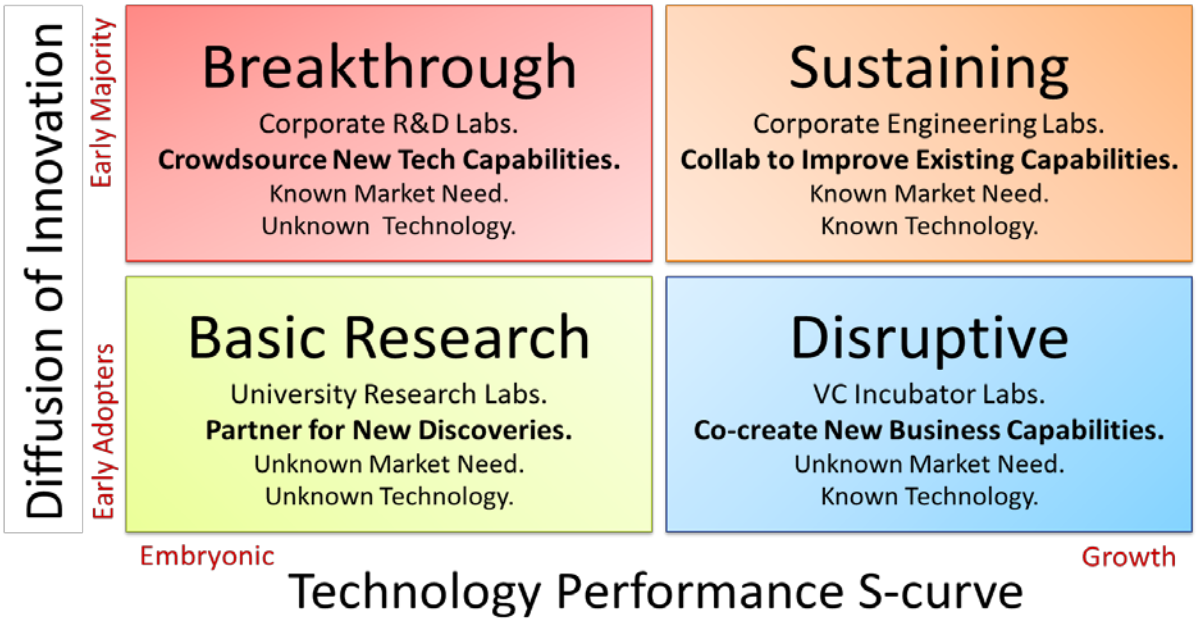


Figure 46: Normalized - Satell Innovation Effort Strategy Matrix

4.16 Pisano Innovation Strategy Landscape Matrix (2015)

"The problem with innovation improvement efforts is rooted in the lack of an innovation strategy. I have found that firms rarely articulate strategies to align their innovation efforts with their business strategies." (Pisano, 2015)

Similar to the Satell Innovation Effort Strategy Matrix, Prof Pisano also devised a matrix that demonstrates the degree of change in technology or the business model. Thus, the axial dimensions of his matrix are:

- **X-axis**: Can an existing technology be used or does the innovation require a new breakthrough technology?
- **Y-axis**: Can an existing business model be used or does the innovation require a new business model?

The Pisano Innovation Strategy Landscape Matrix has the following innovation strategies (Pisano, 2015), see Figure 47:

1. **Routine innovation**: An innovation strategy builds and incrementally improves a corporation's existing technological products and business model. (Sustaining)
2. **Disruptive innovation**: An innovation strategy (or methodology) initiated by Prof Clay Christensen, requires a new business model but not necessarily a new technological breakthrough. (Disruptive)
3. **Radical innovation**: An innovation strategy that focuses purely on the development of a new technological product with very little thought about a business model. (Breakthrough)
4. **Architectural innovation**: An innovation strategy that integrates a radical new (or breakthrough) technological product and a new business model disruption. (Basic Research)

The normalized Pisano Innovation Strategy Landscape Matrix is constructed in Figure 48 (see next page).

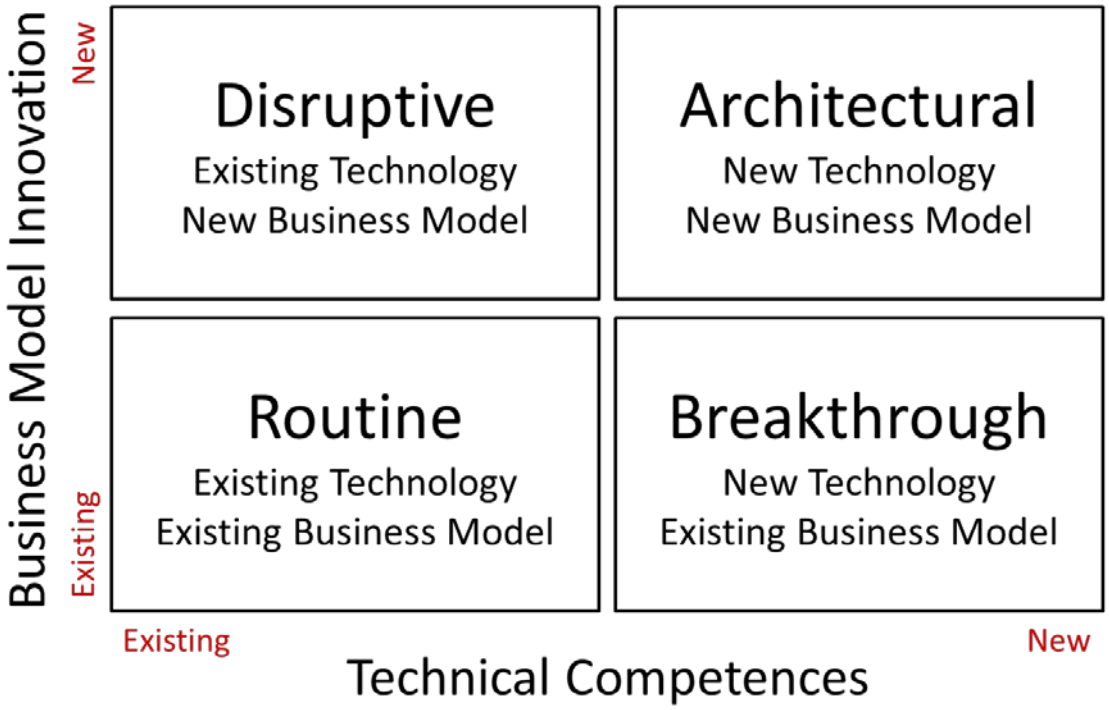


Figure 47: Original - Pisano Innovation Strategy Landscape Matrix

Source: (Pisano, 2015)

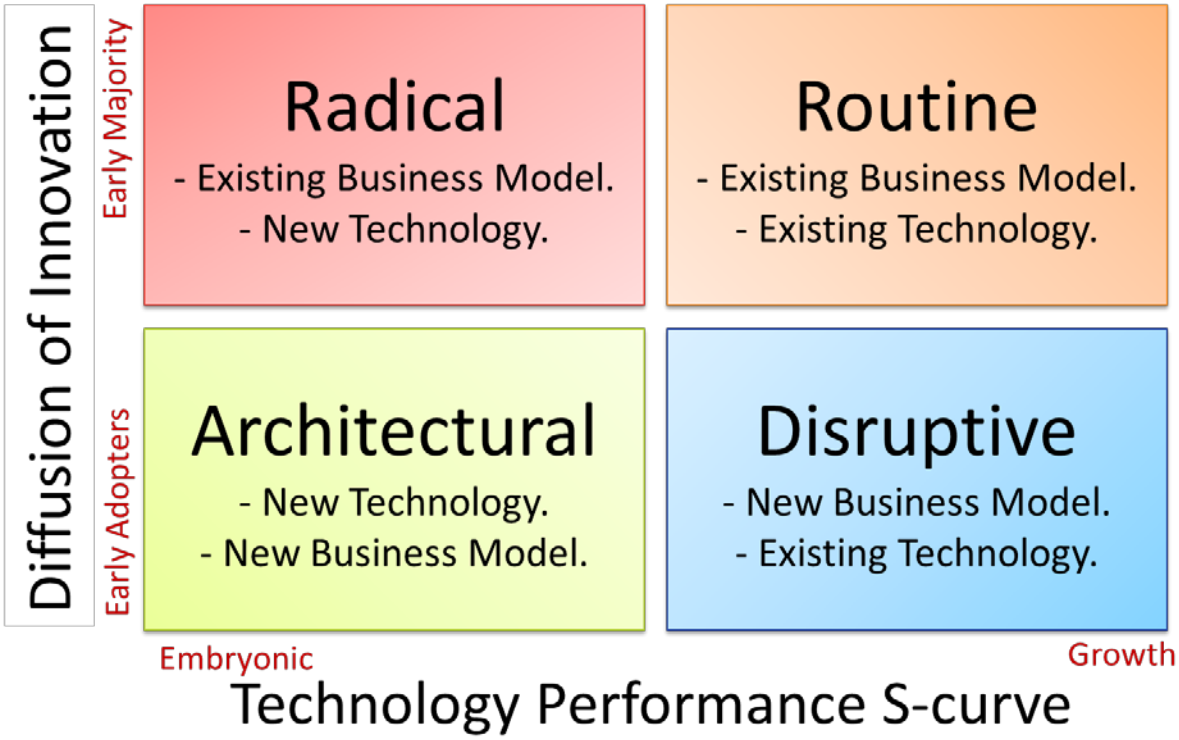


Figure 48: Normalized - Pisano Innovation Strategy Landscape Matrix

4.17 Ulwick JTBD Growth Strategy Matrix (2016)

Prof Igor Ansoff defined the "mission of a product as the description of the job the product is intended to perform, which has to be aligned with the mission a customer has to get something done." He also supported the idea to combine qualitative and quantitative methods for selecting diversification strategies to be best suited for long-term growth for a company. (Ansoff, 1957)

From a marketing perspective, **Prof Theodore Levitt** emphasized that corporations should focus on **solving the needs of customers** and not focus on the products or technologies themselves. (Levitt, 1960)

Anthony Ulwick translated this work into a "Jobs-to-be-Done" (JTBD) theory (Ulwick and Leonard, 2002) (Ulwick and Osterwalder, 2016), which was later also well supported by Prof Clayton Christensen (Christensen et al., 2005) (Christensen et al., 2016b) at Harvard Business School to support his own theory on Disruptive Innovation.

Similar to Satell's and Pisano's innovation strategy matrixes, the "JTBD Growth Strategy Matrix" (Ulwick and Hamilton, 2016) is also a "**Contextual Circumstance-Based**" innovation strategy matrix as in Figure 49, with the following axial dimensions:

- **X-axis**: Cost leadership (similar to Prof Porter's matrix).
- **Y-axis**: Market satisfaction with the new innovative solution in comparison to existing solutions on the market to "Get the Job Done".

The Ulwick JTBD Growth Strategy Matrix was defined as follows (Ulwick and Hamilton, 2016), see Figure 49:

1. **Differentiated Strategy**: This is similar to "Radical" or "Breakthrough" innovation strategies where a corporation develops and delivers new technological products to underserved customers who are not satisfied with the performance of any existing solutions on the market and are willing to pay more money for any performance gains. A good example is professional athletes (and weekend-warriors with high expectations) who require any performance advantage to beat their competition. (Breakthrough – Radical)
2. **Dominant Strategy**: This is similar to Prof Pisano's "Architecture" innovation strategy where a corporation delivers a new technologically advanced solution at a lower cost to the market (through a new business model). This is a case where a corporation wants to

develop a “sure-win” competitive advantage across the whole industry and market. (Sustaining – Routine)

3. **Disruptive Strategy**: This is as defined by Prof Clayton Christensen’s research where an inferior technological product with an improved business model reaches new low-end (or non-consumption) customers with low expectation at a low price point. (Disruptive)

4. **Discrete Strategy**: This is purely based on convenience where a corporation provides a product or a service where the customer does not have any other choice but to select the only existing solution available. A good example is Internet access, in many rural areas the only option to connect to the Internet is via a cellphone, which is an extremely expensive option. (Basic Research – Architectural)

5. **Sustaining Strategy**: This is typically in a commodity market where there is fierce competition to stay in the market and to hold on to market share. Sustaining – Routine)

The normalization of the Ulwick JTBD Growth Strategy Matrix was constructed as in Figure 50 (see next page).

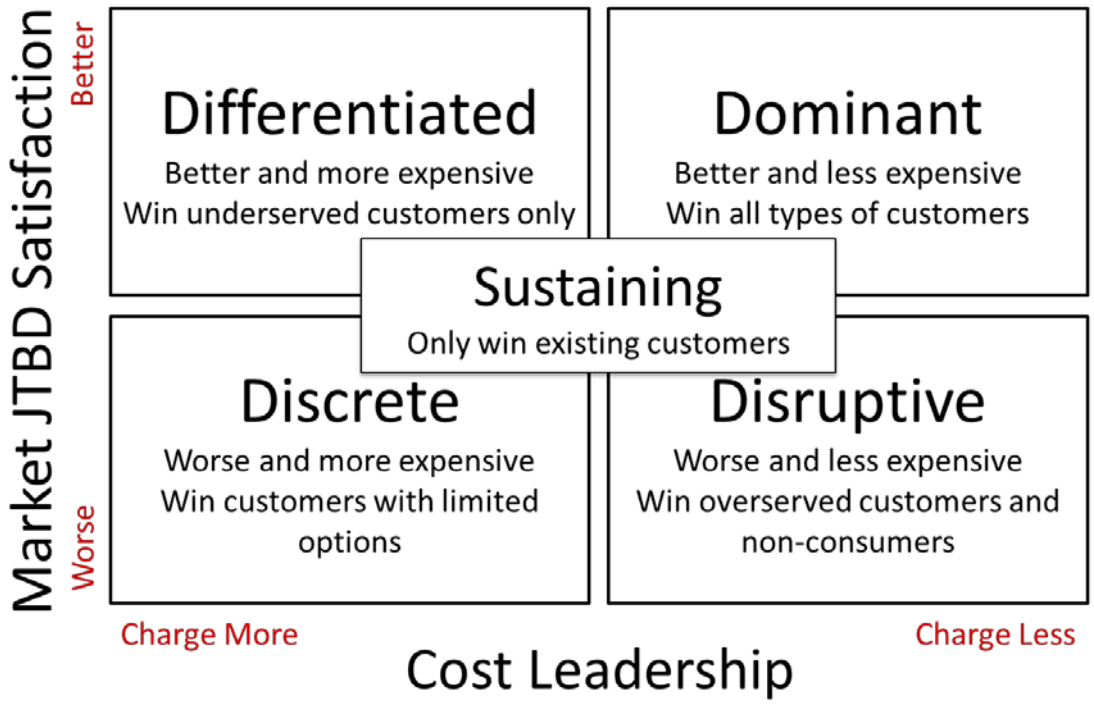


Figure 49: Original - Ulwick JTBD Growth Strategy Matrix

Source: (Ulwick and Hamilton, 2016)

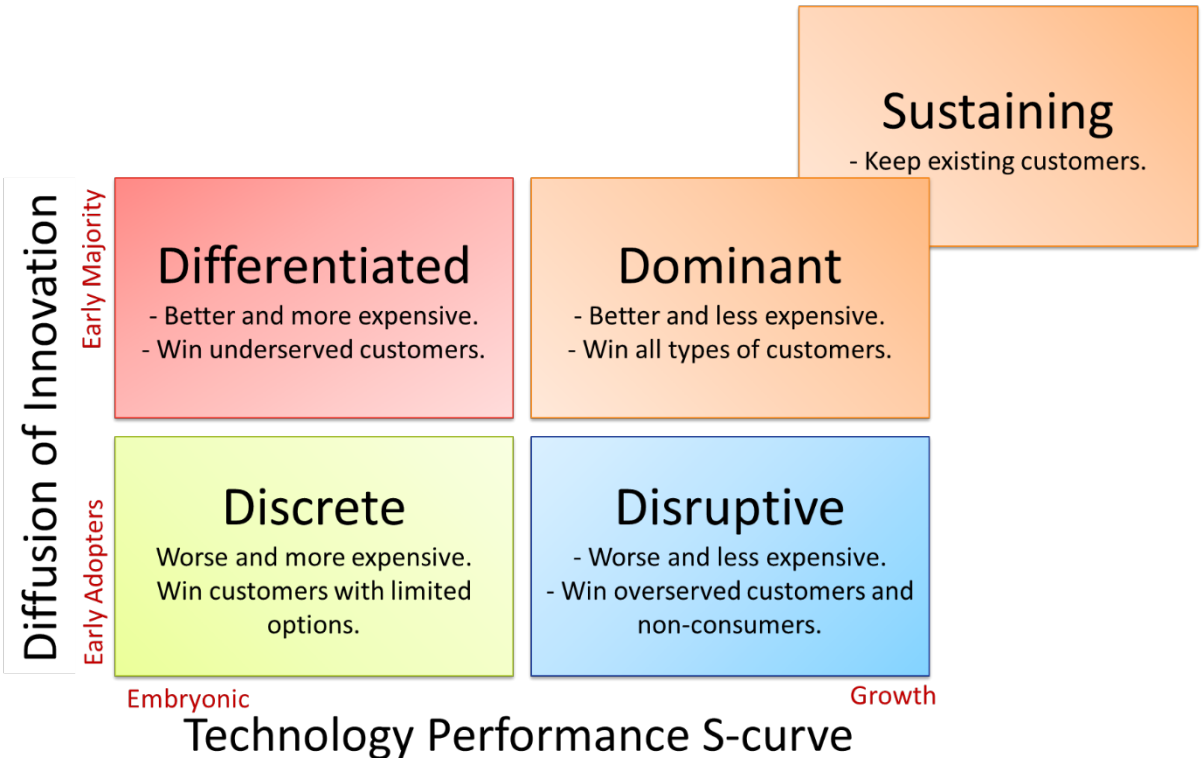


Figure 50: Normalized - Ulwick JTBD Growth Strategy Matrix

4.18 Cummings Strategic Innovation Positioning Matrix (2016)

Cummings developed the Strategic Innovation Positioning Matrix (Cummings, 1997) (Cummings and Stanford University. Engineering-Economic Systems, 1997) from his PhD research at Stanford University.

The Cummings Strategic Innovation Positioning Matrix was adapted where two axial dimensions were added to the matrix to provide better meaning to the matrix and to align it better with the other matrixes that were discussed in this chapter, as in Figure 51:

- **X-axis**: Product Focus is either unknown or very specific to solve a “Jobs to be Done” need for customers.
- **Y-axis**: Market Focus is either unknown or a very specific known target market.

The normalization of the Cummings Strategic Innovation Positioning Framework was constructed as in Figure 52 (see next page).

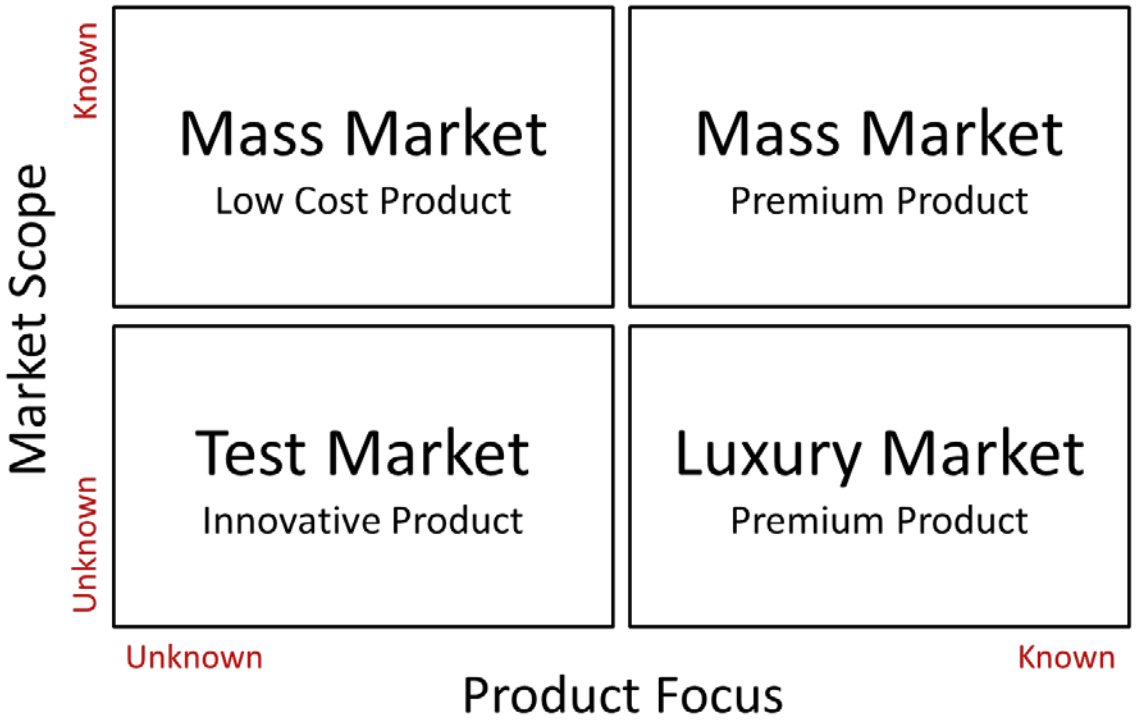


Figure 51: Original – Cummings Strategic Innovation Positioning Framework

Source: (Cummings and Stanford University. Engineering-Economic Systems, 1997)

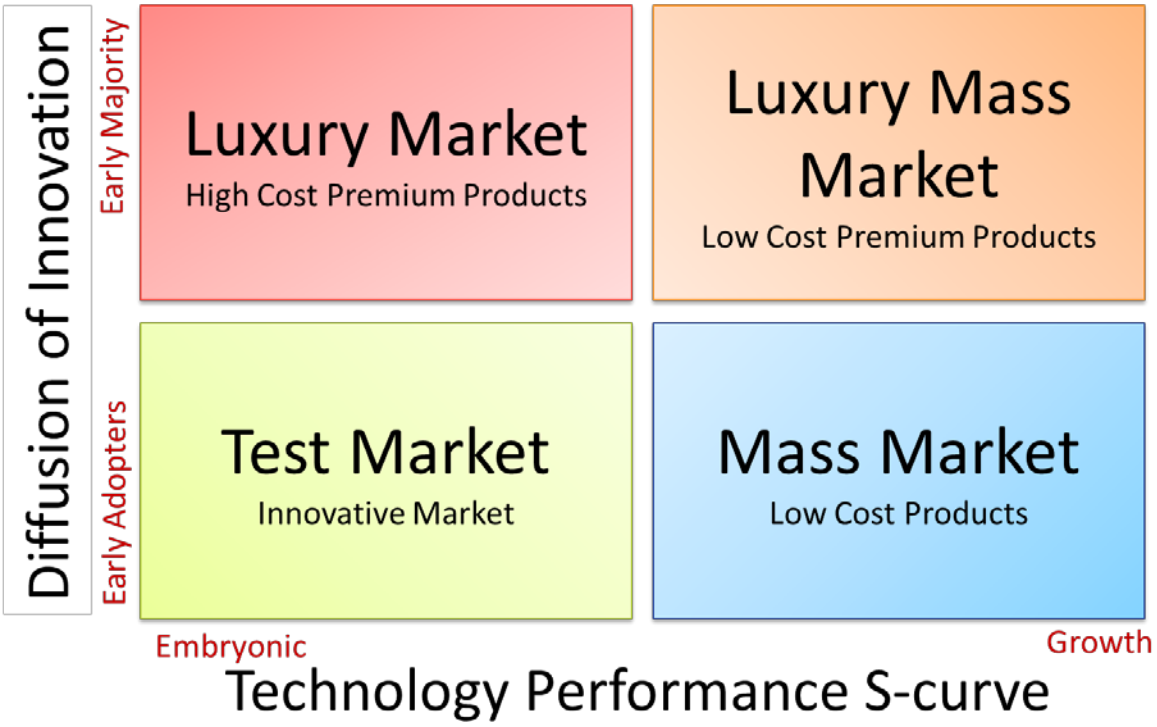


Figure 52: Normalized – Cummings Strategic Innovation Positioning Matrix

4.19 Conclusion

Through divergent literature scouting for “Strategic Corporate Innovation Frameworks, Models and Theories” from published literature, a “**Strategic Corporate Innovation Theory Evolution Map**” as a Systems Thinking Diagram was created (or modelled) with almost 80 knowledge elements that could be identified as being applicable.

From the data it was determined that **Prof Harry Igor Ansoff** was one of the founding fathers of “Corporate Strategy”. Therefore, this research started the design and development of a Systems Model with his “Market Growth Strategy Matrix” model.

Finally, 15 “Strategic Corporate Innovation Frameworks, Models and Theories” were identified as knowledge elements that could be part of the “Strategic Corporate Innovation Systems Model” to support “Corporate Innovation Formulation” with either a “Value Innovation” or a “Diffusion of Innovation” approach.

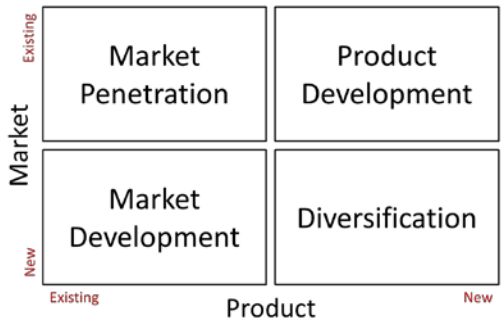
This chapter then discussed each of the important “Strategic Corporate Innovation Frameworks, Models and Theories” that serve as knowledge elements in more detail. The axial matrix dimensions were normalized (or standardized) to be mapped onto Prof Ansoff’s model as the foundational matrix.

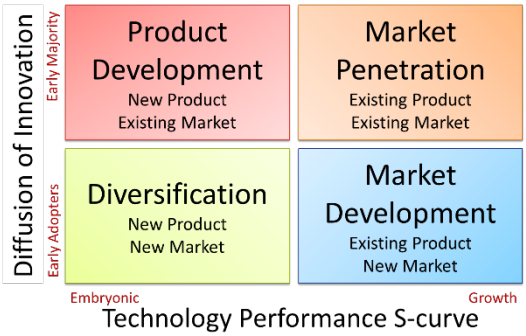
From the normalization many correlations could be identified among the various matrixes. This important knowledge can now be applied to start with the **design and development** of a “**Strategic Corporate Innovation Systems Model**” as in Chapter 5.

The following tables provide a summary of the normalization of the selected existing frameworks, models or theories that were discussed in this chapter (see next page).

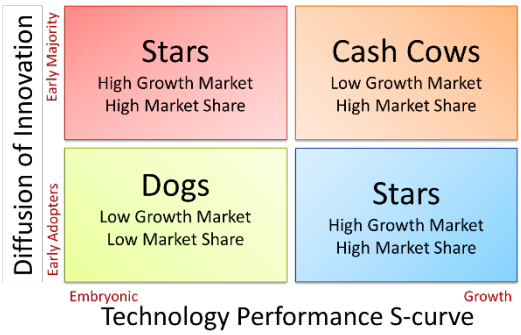
Table 12: Summary of the Normalization of Selected Frameworks, Models or Theories

1. Ansoff Product Market Strategies for Business Growth Matrix (1957)

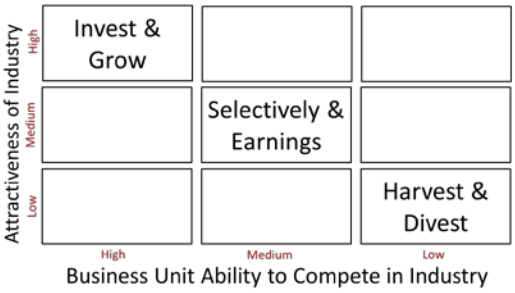


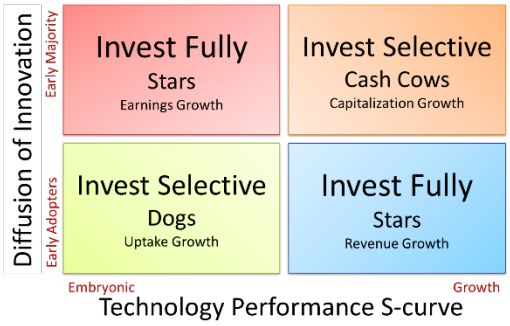


2. BCG Henderson Growth Share Matrix (1970)

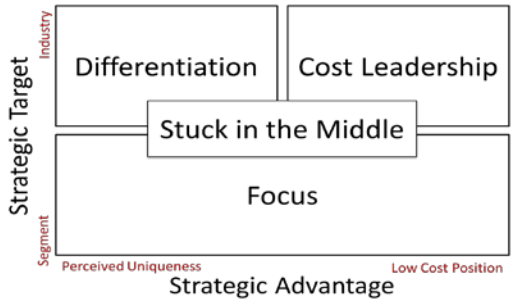


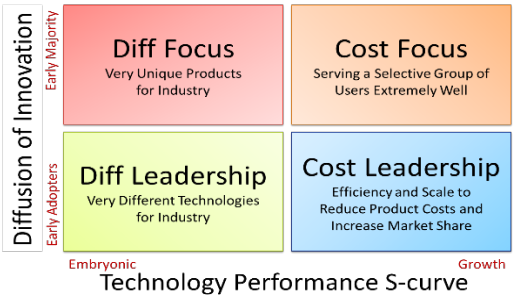
3. McKinsey Gluck Nine Box Matrix (1978)





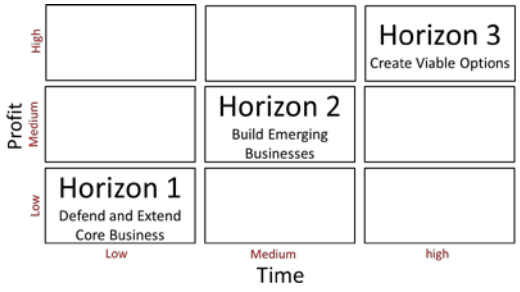
4. Porter Generic Competitive Strategies Matrix (1980)

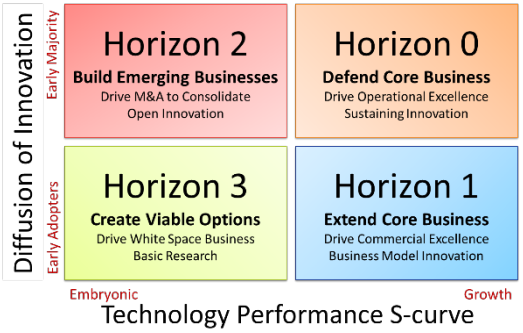




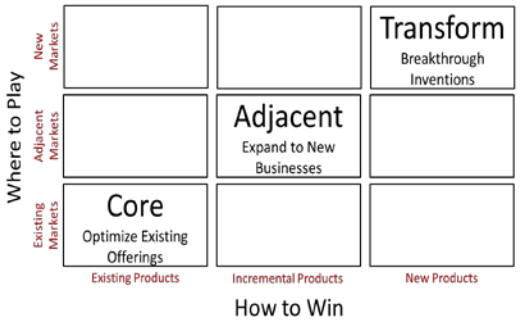
To be continued …

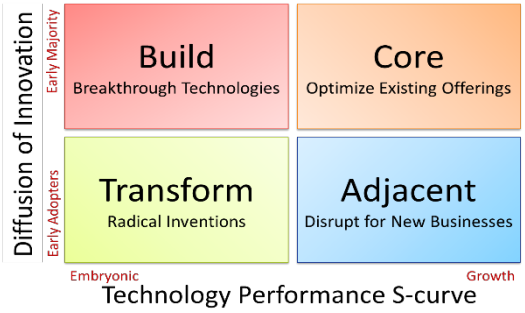
5. Baghai Three Horizons Model (1999)



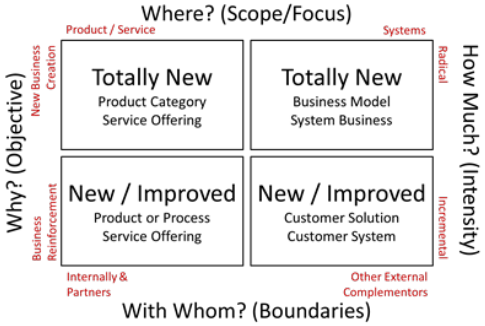


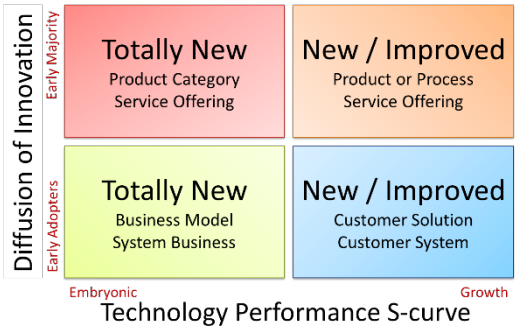
6. Nagji Innovation Ambition Portfolio Matrix (2012)



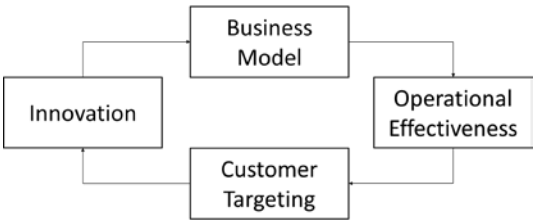


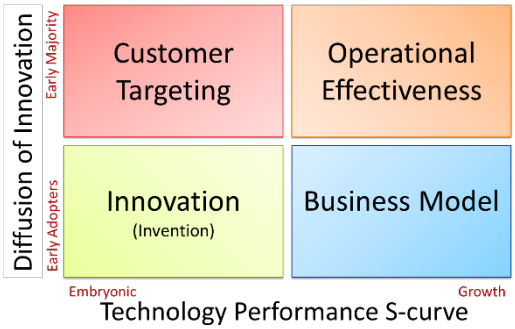
7. Deschamps Typology of Innovation by Strategic Focus (2005)





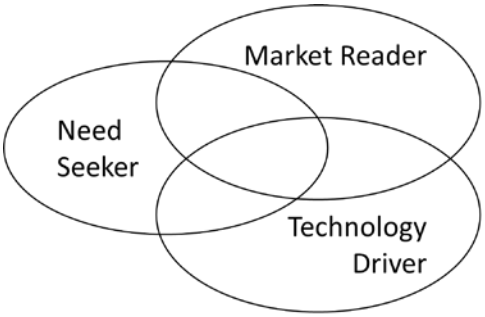
8. Hax Integrative Strategy Delta Model (2006)

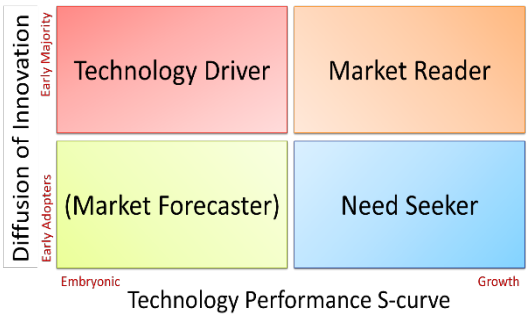




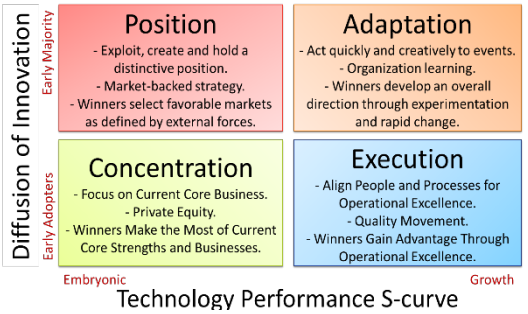
To be continued …

9. Jaruzelski Innovation Strategy Approach Profiles (2007)

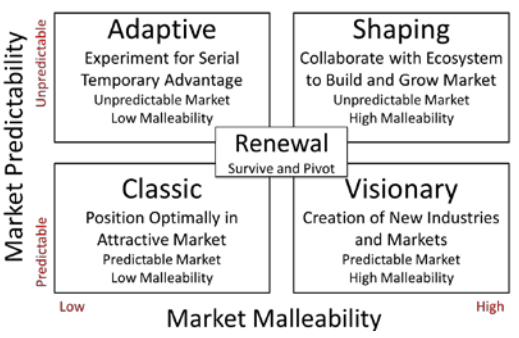


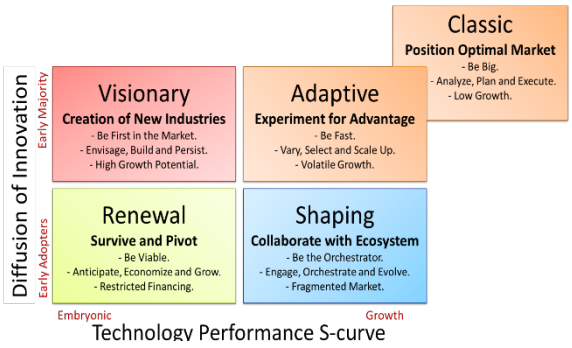


10. Mainardi Landscape of Strategy Concepts (2010)

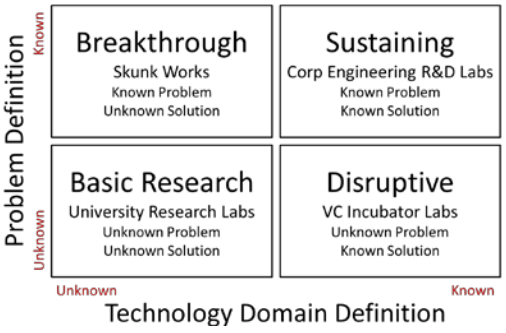


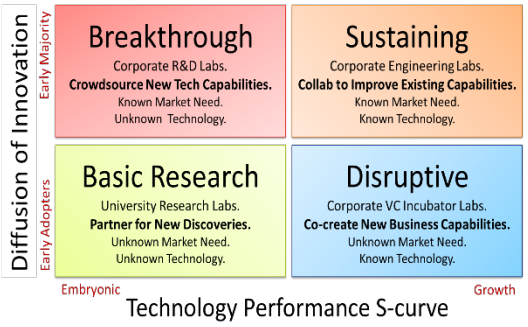
11. Reeves Strategy Formulation Approach Palette (2012)





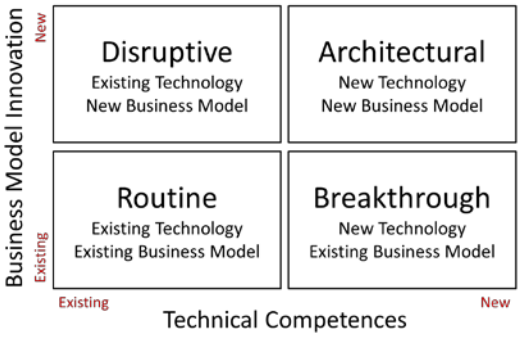
12. Satell Innovation Effort Strategy Matrix (2013)

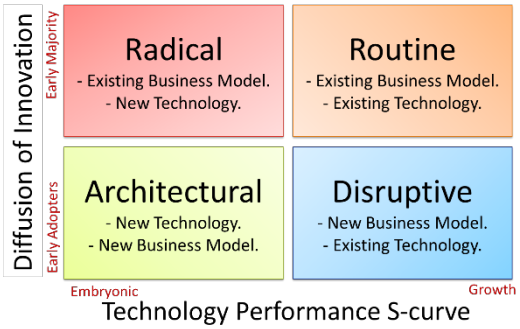




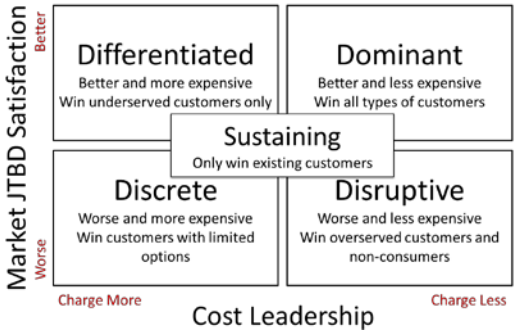
To be continued …

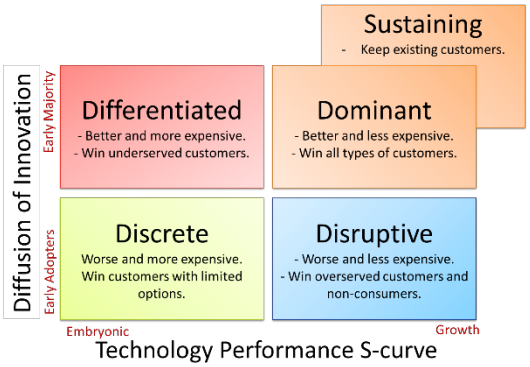
13. Pisano Innovation Strategy Landscape Matrix (2015)



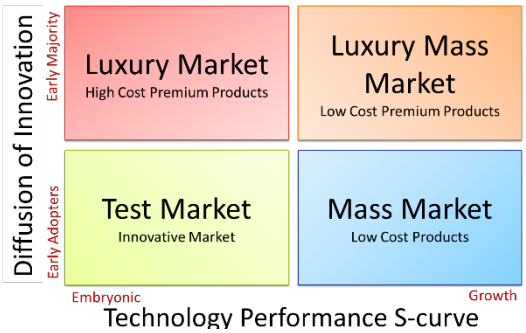


14. Ulwick JTBD Growth Strategy Matrix (2016)





15. Cummings Strategic Innovation Positioning Matrix (2016)



End.

Discovery: From this literature study, it is now very clear there is no existing standard for "Strategic Corporate Innovation Management" lexicon taxonomy. This discovery highlights the need for a standardized terminology definition reference guide (or systems model) for corporate executives.

CHAPTER 5: LITERATURE DEFINITIONS AND CONCEPTS

5.1 Introduction

During the literature study phase various important concepts that are applicable to “Strategic Corporate Innovation” were identified, which can assist to develop a deeper understanding for the “SCINav Systems Model”. Several of these concepts will be discussed in this chapter.

5.2 Ambidextrous Organizations

The traditional definition of an ambidextrous organization is where a single organization has the necessary separate organization structures in place to support both exploration (long-term) and exploitation (short-term) innovation functions.

These different innovation functions should exist within the same corporation, still under the leadership of a single corporate executive management team to ensure sustainable survival and growth (O'Reilly and Tushman, 2004) (Christensen and Overdorf, 2000) (Ohr, 2017).

O’Reilly and Tushman gave a very good summary of the differences between the two-opposing exploitative and exploratory business function (O'Reilly and Tushman, 2004) in Table 13.

This research suggests that innovation **exploration** should exist at the corporate level where new business units are being incubated, while innovation **exploitation** should exist at the business unit level where the focus is on efficient operations. This is demonstrated in Figure 53 (see next page).

Table 13: Ambidextrous Organization's Exploitative and Exploratory Business Functions

Source: (O'Reilly and Tushman, 2004)

Alignment of:	Exploitative Business	Exploratory Business
Competitive Arena	mature technologies and markets	new technologies and markets
Strategic intent	cost, profit	innovation, growth
Critical Tasks	operations, efficiency, control, incremental innovation	adaptability, new products, breakthrough innovation
Competencies	operational	Innovative
Structure	formal, mechanistic	adaptive, loose, autonomous
Metrics and Rewards	margins, productivity	milestones, growth
Culture (Focus)	efficiency, low risk, quality, customers	risk taking, speed, flexibility, experimentation
Leadership Role	authoritative, top down	visionary, involved
Management Style	mechanistic management system	organic management system

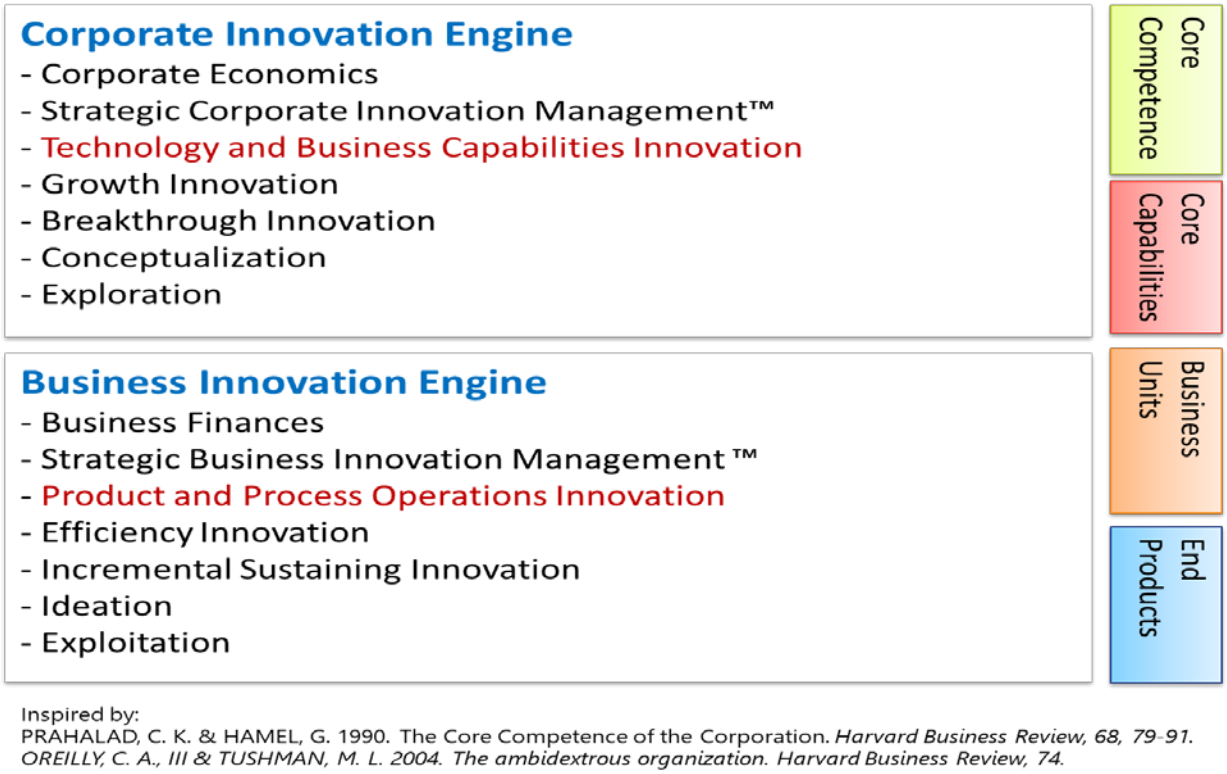


Figure 53: Strategic Corporate Innovation Management Ambidextrous Organization

5.3 Ambidextrous Innovation

With the development of the Strategic Corporate Innovation Management (SCIM) Systems Model, this research needed to initiate the concept of “Ambidextrous Innovation” where two primary main streams of innovation exist within an “Ambidextrous Organization” as “Core Capabilities”, as demonstrated in Figure 54:

- Breakthrough technological products.
- Disruptive business model services.

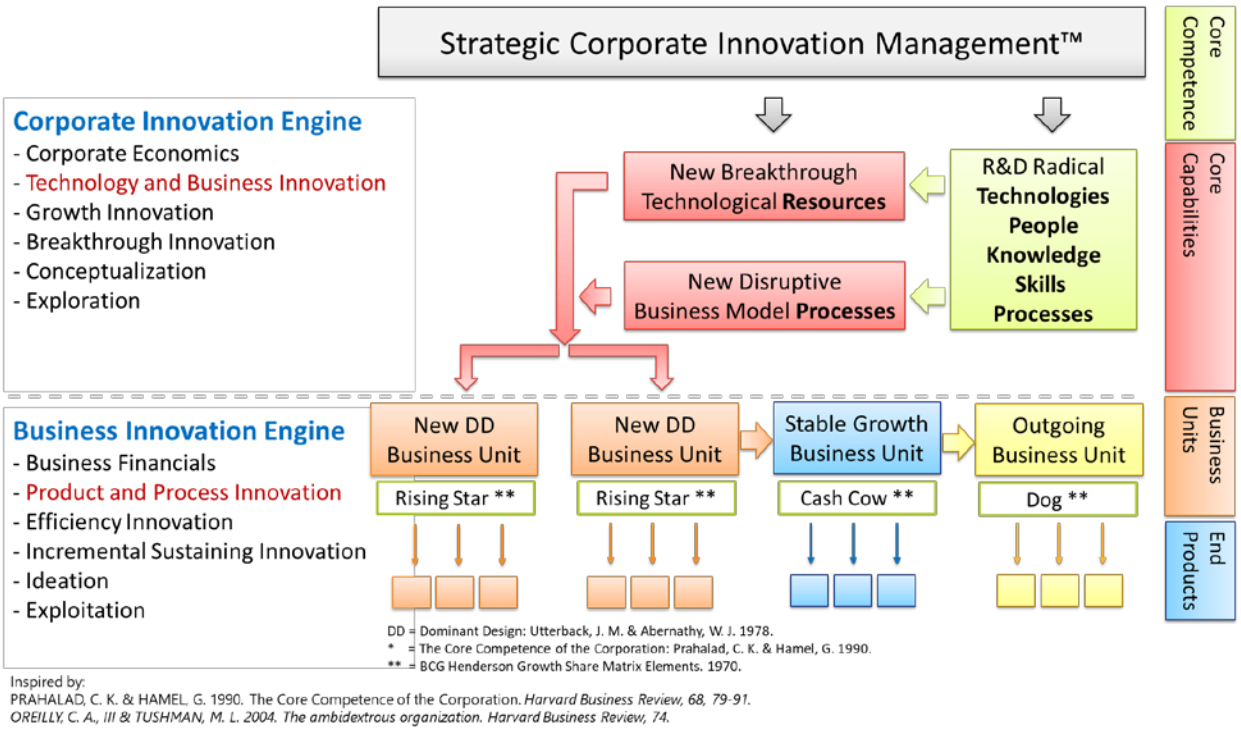


Figure 54: Ambidextrous Innovation – Knowledge Flow Diagram.

5.4 Breakthrough Innovation

As per Satell (Satell, 2017), “Breakthrough Innovation” is the innovation effort required when a target market is known but the underlying technology is not. This means a new technological product for a very specific need is required, which is then considered to be “Breakthrough Innovation”.

This research considers “Breakthrough Innovation” as the delivery of new products from existing technology (inventions), in contrast to where “Radical Innovation” focuses on the delivery of new technology as inventions.

5.5 Core Competence

“The problem is that an organization’s capacity for innovation stems from an innovation system: a coherent set of interdependent processes and structures that dictates how the company searches for novel problems and solutions, synthesizes ideas into a business concept and product designs, and selects which projects get funded.“ (Pisano, 2015)

Prahalad and Hamel initiated the concept “Core Competence of the Corporation”, where “Core competencies are the collective learning in the organization, especially how to coordinate diverse production skills and integrate multiple streams of technologies.” (Prahalad and Hamel, 1990)

From this definition, the “Core Competence” is also responsible for the:

1. **Harmonization** of technology streams, which includes the organization of work and the delivery of value to customers.
2. **Communication** across multi-functional corporate boundaries.
3. **Adhesion** of several business units together.
4. **Development** of new businesses units.

This research argues that “Strategic Corporate Innovation Management” is a “Core Competence of the Corporation” to harmonize the delivery of new insights as technological solutions of value to customers and consumers.

With an adapted visual explanation of the corporation as a tree, the “Core Competence of the Corporation” can be explained as follows (Singh, 2015) (Prahalad and Hamel, 1990) in Figure 55 (see next page):

1. **Core Competencies** (as the tree roots) which are rooted in corporate executive management functions that will harmonize, communicate and develop an adhesive corporate culture for innovation, which is completely invisible to the outside world.

2. **Core Capabilities / Technologies / Products** (as the tree trunk) are the knowledge, skills, tools, resources, technologies, etc. that are being developed at corporate level to identify and incubate new technologies and business units for the future.

3. **Business Units** are independent P&L “centers” that are responsible to grow the corporation further with new products and marketing programs.

4. **End Products** (as the leaves) are the instantiated visible products that are being delivered to customers as insightful solutions.

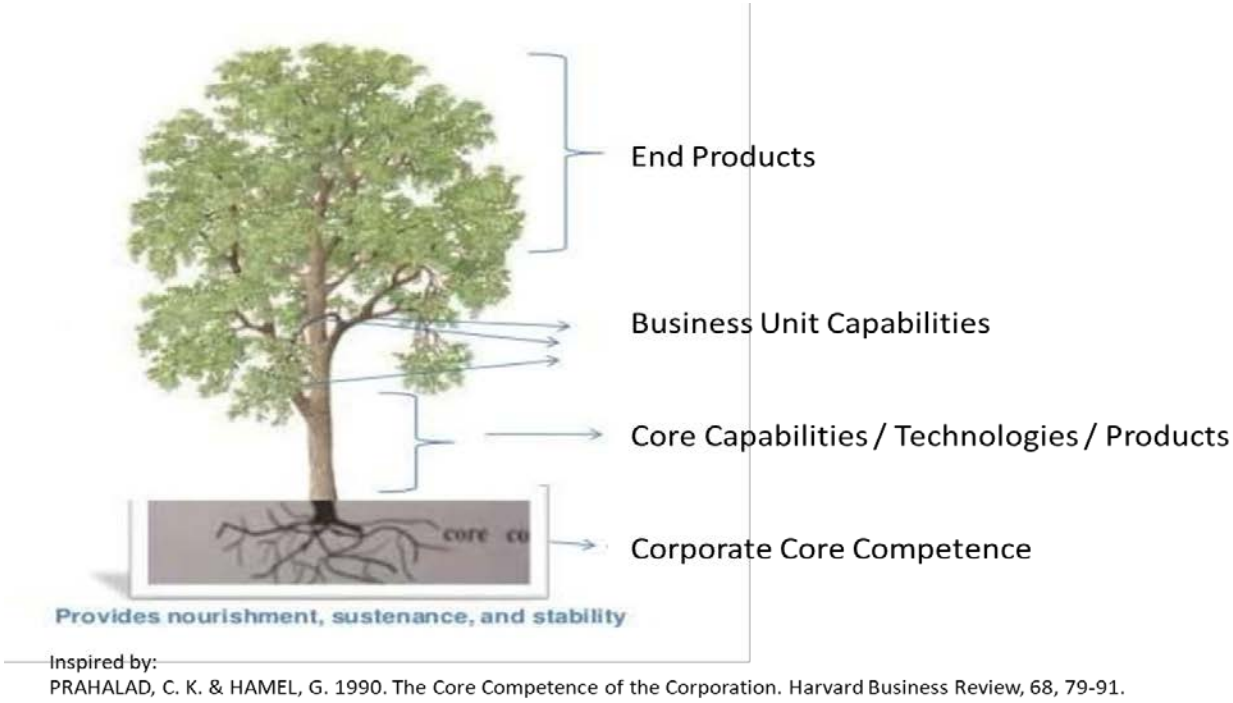


Figure 55: Core Competence of the Corporation (Adapted)

Inspired by: (Singh, 2015) (Prahalad and Hamel, 1990)

5.6 Corporate Innovation

As background, definitions from the following most prominent researchers and proponents for corporate innovation were included.

From an **economic** perspective: "… carrying out of **innovations** in the industrial and commercial **organism**. By innovations I understand such changes of the combinations of the factors of production … consist primarily in **changes** in methods of production and transportation, or in changes in industrial organization, or in the production of a new article, or in the opening up of new markets or of new sources of material". (Schumpeter, 1927)

From a business **entrepreneurial** perspective "**Innovation** is the **effort** (work) to create **purposeful** (for a need) and **focused** (with a specific solution) **change** in an enterprise's economic or social potential (value or wealth)" (Drucker, 1985a)

From a **systems** perspective: "**innovation system**: a coherent set of interdependent processes and structures that dictates how the company searches for novel problems and solutions, synthesizes ideas into a business concept and product designs, and selects which projects get funded." (Pisano, 2015)

This research defines: "**Corporate Innovation** as a system where multidisciplinary capabilities (knowledge, skills, processes and resources) are integrated to deliver new insights as unique solutions, which customers or consumers will value in such a way that the corporation will; (1) generate brand recognition in the market, (2) create wealth for employees and (3) sustain organic growth for shareholders." (Bouwer, 2015) (Bouwer, 2017)

5.7 Corporate Strategy

"**Effective Strategy** is an integrated set of **actions** designed to create a sustainable advantage over competitors." (Gluck et al., 1978a)

"**Business Strategy** was defined as a set of objectives and integrated set of **actions** aimed at securing a **sustainable competitive advantage**." (Gluck and Kaufman, 1980)

"The essence of **Strategy** is in the **activities** — choosing to perform activities differently or to perform different activities than rivals. **Competitive strategy** is about being different. It means deliberately choosing a different set of activities to deliver a unique mix of value. **Strategic Positioning** means performing different activities from rivals' or performing similar activities in different ways." (Porter, 1996)

"A diversified company has two levels of strategy: business unit (or competitive) strategy and corporate (or companywide) strategy. **Competitive strategy** concerns how to create **competitive advantage** in **each of the businesses** in which a company competes. **Corporate Strategy** concerns two different questions: **what businesses** the corporation should be in and how the corporate office should **manage the array of business units**. To survive, companies must understand what good corporate strategy is." (Porter, 1987)

Therefore, **Corporate Strategy** is a commitment (Pisano, 2015) to a set of intelligent unique decisions, actions (Gluck and Kaufman, 1980) or activities (Porter, 1996) from a repertoire of known (resource- or position-based) business options to manage a portfolio of business units (Porter, 1996) (Henderson, 1970) to establish specific competitive advantages and economic growth ambitions. It is about: "doing the right things at the right time".

This research defined three primary levels of strategies within a corporation (Gluck and Kaufman, 1980) (Gluck et al., 1978b) as in Figure 56:

1. **Corporate strategy** focuses primarily on corporate growth in the form of new business units which requires long-term planning for the development of new technologies, capabilities, innovation, etc. At a corporate level there should be a significant concern about what businesses to develop, how the parent corporation can add value via core capabilities or core technologies and how the business units can support each other (Sull et al., 2017) (Porter, 1988). Secondary to this level corporate strategy should also consider "shared concerns" and "shared resources" at this level (Gluck and Kaufman, 1980).

2. **Business strategy** focuses primarily on efficiency excellence and cost reduction to deliver existing products to the market in a reliable, consistent, profitable, competitive, etc. manner.

3. **Product Strategy** within Business Units (BUs) is responsible to keep their brands and products up-to-date with competitors and customer demands.

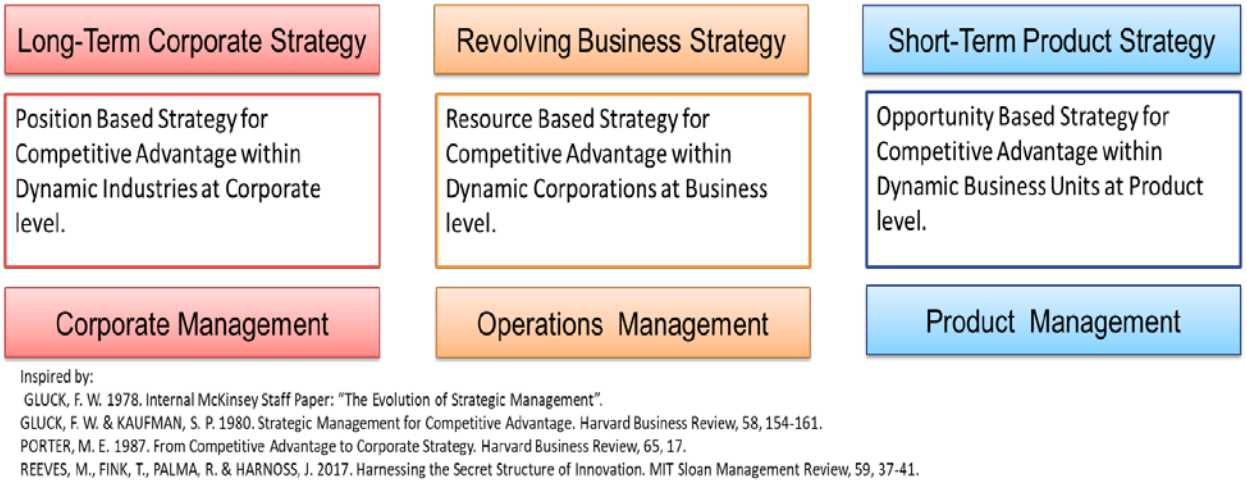


Figure 56: Three Effective Levels of Strategy Formulation within a Corporation

5.8 Corporate Innovation Strategy

"Creating an **innovation strategy** involves determining how innovation will create value for potential customers, how the company will capture that value, and which types of innovation to pursue." (Pisano, 2015)

"Avoiding competition by an indirect approach is the essence of creative and **Innovative Strategy**: a reformulation of a product's function, the development of new manufacturing methods or distribution channels, or the discovery of dimensions of competition to which traditional competitors are blind". (Gluck and Kaufman, 1980)

"**Strategic innovation** occurs when a company identifies gaps in the industry positioning map, decides to fill them, and the gaps grow to become the new mass market." (Markides, 1997)

Corporate Innovation Strategy focuses on the long-term horizon positioning of existing or new:

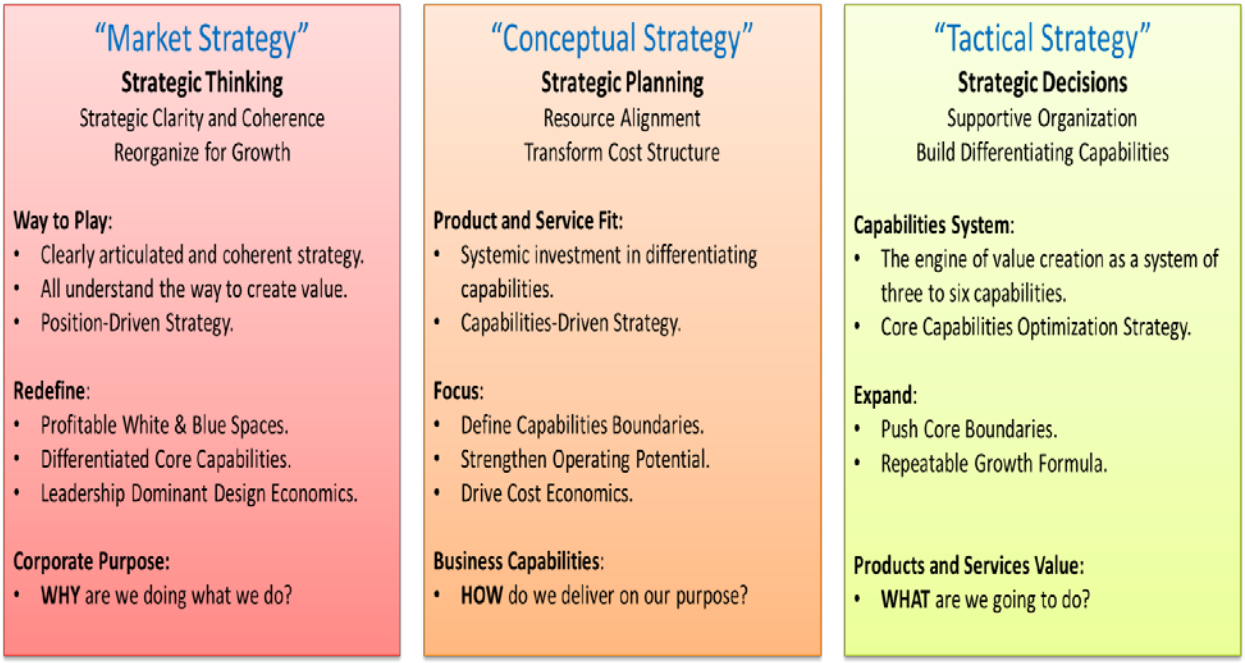
- Core Technologies, and
- Core Capabilities

that will lead to actions and activities to sustain:

- the organic growth of existing or new core business units,
- and the economic growth for corporate longevity.

To sustain corporate economic growth, corporate executives will need to go through three phases to formulate a “Corporate Innovation Strategy”, as in Figure 57, which are defined as follows:

1. **Market Strategy**: Clearly articulate what industries or markets existing or future business should be in, and secondly what market segment(s) must be targeted? Why are we doing what we do, and for whom?
2. **Conceptual Strategy**: Technology, product and business model portfolio and roadmap. How are we going to do it?
3. **Tactical Strategy**: Resource allocation plan. What exactly will we deliver to the market?



Inspired by:

DIVAKARAN, A. & COUTO, V. 2013. How Ready Are You for Growth? *PwC Strategy& strategy+business magazine. Booz & Company Inc.*

MAINARDI, C. & KLEINER, A. 2010. The Right to Win. *PwC Strategy& startegy+business, 14.*

SINEK, S. 2009. *Start with Why: How Great Leaders Inspire Everyone to Take Action, Penguin Publishing Group.*

ZOOK, C. 2007. Unstoppable: Finding Hidden Assets to Renew the Core and Fuel Profitable Growth, Boston, Mass. : Harvard Business School Press, c2007.

TEECE, D. J., PISANO, G. P. & SHUEN, A. 1997. Dynamic Capabilities and Strategic Management. Strategic Management Journal, 18, 509-533.

GLUCK, F. W., KAUFMAN, S. P. & WALLECK, A. S. 1978. The Evolution of Strategic Management. McKinsey & Company.

Figure 57: Phases for Corporate Innovation Strategy Formulation

5.9 Corporate Innovation Strategy Elements

This research developed the "Corporate Innovation Strategy Elements Framework" as a guide to assist corporate executives to include all the important elements a corporate innovation strategy should have. The "Elements of Corporate Innovation Strategy" were identified to be as follows (see Figure 58):

1. Define **Alignment** with Business Purpose and Aspiration.
2. Define Which **Customers** to Serve.
3. Define Value **Proposition** for Customer.
4. Define Value **Model** for Business.

5. Define Value **Creation** Capabilities Portfolio that will Deliver the Value.

6. Define the Value **Transformation** Roadmap.

Conceptual Elements	Tactical Elements
Define Alignment with Corporate Purpose Aspiration. - Competitive Ambition. - Is it possible for innovation strategy to realize business aspirations. - Continuously evolve innovation strategy.	**Define Value Model for Business.** - Competitive Business Model. - Right to Win (Leinwand) - Exploit capabilities system. - Business Model. - Profit Formula. - Define level of investment, risk, collaboration, resources and time.
Define Which Customers to Serve. - Competitive Space. - Innovation intelligence, insight and foresight. - Is there a profitable opportunity? - Jobs-to-be-Done (JTBD). - Where to Play? (Lafley)(Reeves) - Where will we be active?	**Define Value Creation Capabilities Portfolio.** - Competitive Capabilities Portfolio. - Capabilities System. - Ensure adequate available resources. - Integrate interdisciplinary and cross-functional networked ecosystems. - Prune what doesn't matter to invest more in what does.
Define Value Proposition for Customer. - Competitive Advantage. - How will we win? (Lafley) - Way to Play? (Leinwand) - Leverage capabilities systems. - Foresight and Insight in the Value that will be created for customers. - Products and Services Fit.	**Define the Value Transformation Roadmap.** - Competitive Decision Roadmap. - Shape your future. (Leinwand) - Are elements of innovation strategy coherent consistently aligned? - Technologies and services roadmap. - Strategy lifecycle management system. - Leverage capabilities system in new arenas.

Figure 58: Corporate Innovation Strategy Elements Framework

5.10 Creative Destruction

Creative Destruction is a concept that was originated by Prof Schumpeter in which he explained the force shaping Kondratieff Waves (named after Nikolai Kondratiev), as a result from new related clusters of technologies and industries (Schumpeter, 1942).

The crux of this theory is how new technologies, products or companies then eventually replace existing offerings that were available on the market, thus creatively replacing existing matured technologies and corporations from existing industries (Schumpeter, 1942).

5.11 Diffusion of Innovation

The “Diffusion of Innovation” phenomenon was described by Prof Everett Rogers (1962) where he defined:

- **Diffusion** as the process by which a new innovation (as a technology, product or service) is communicated through certain channels over time among members of a social system. The point of “Critical Mass” is where there are enough individuals in a system who adopted a new innovation (as a product or service) so that further adoption becomes self-sustaining as a “Network Effect”.

- **Adoption** of a new innovation not as a complete random act of chance within a system, but rather a process where some people (as customers or consumers) are more adventurous to acquire a new solution than others.

Prof Rogers identified five groups of customers or consumers when it comes to the adoption (and diffusion) of new inventive technology or products:

1. **Innovators** / Enthusiasts (2.5%): This group do not need any motivation to adopt a new technology and will contribute their knowledge to make it work. This group is willing to pay for the privilege to have a better performing technology before anybody else.

2. **Early Adopters** / Visionaries (13.5%): This group of people will wait until most “challenges and issues” are fixed for a new technology, with sufficient manuals and user guides available to make the implementation of the new technology a productive experience. This group needs to know that the new technology is at least reliable to use before they will adopt it. This group defines the opinion leaders within their respective industries.

3. **Early Majority** / Pragmatists (32%): This group is the pragmatists who needs to know that not only if a product works reliably, but also seeks reliable proof (or validation) that the new solution’s improved performance (as promised) actually do provides a measurable better outcome against existing challenge.

4. **Late Majority** / Conservatives (32%): This group for a specific new technology will only consider using it when it has been established as the new standard for a “Job to be Done” within an industry.

5. **Laggards** / Skeptics (16%): This group will resist and wait as long as they can before they will change to a new technology. There must first be a negative impact before this group will consider to change.

The conceptual graphical presentation of the "Diffusion of Innovation" phenomenon is available in Figure 59 (see next page) where it has been integrated (or overlaid) with other theories such as:

- Windermere and Associates "**Buying Hierarchy**" (also in Figure 60 and Figure 62).
- Dr Geoffrey Moore's "**Crossing the Chasm**".
- This research's lexicon taxonomy for "**Types of Innovation Effort**".

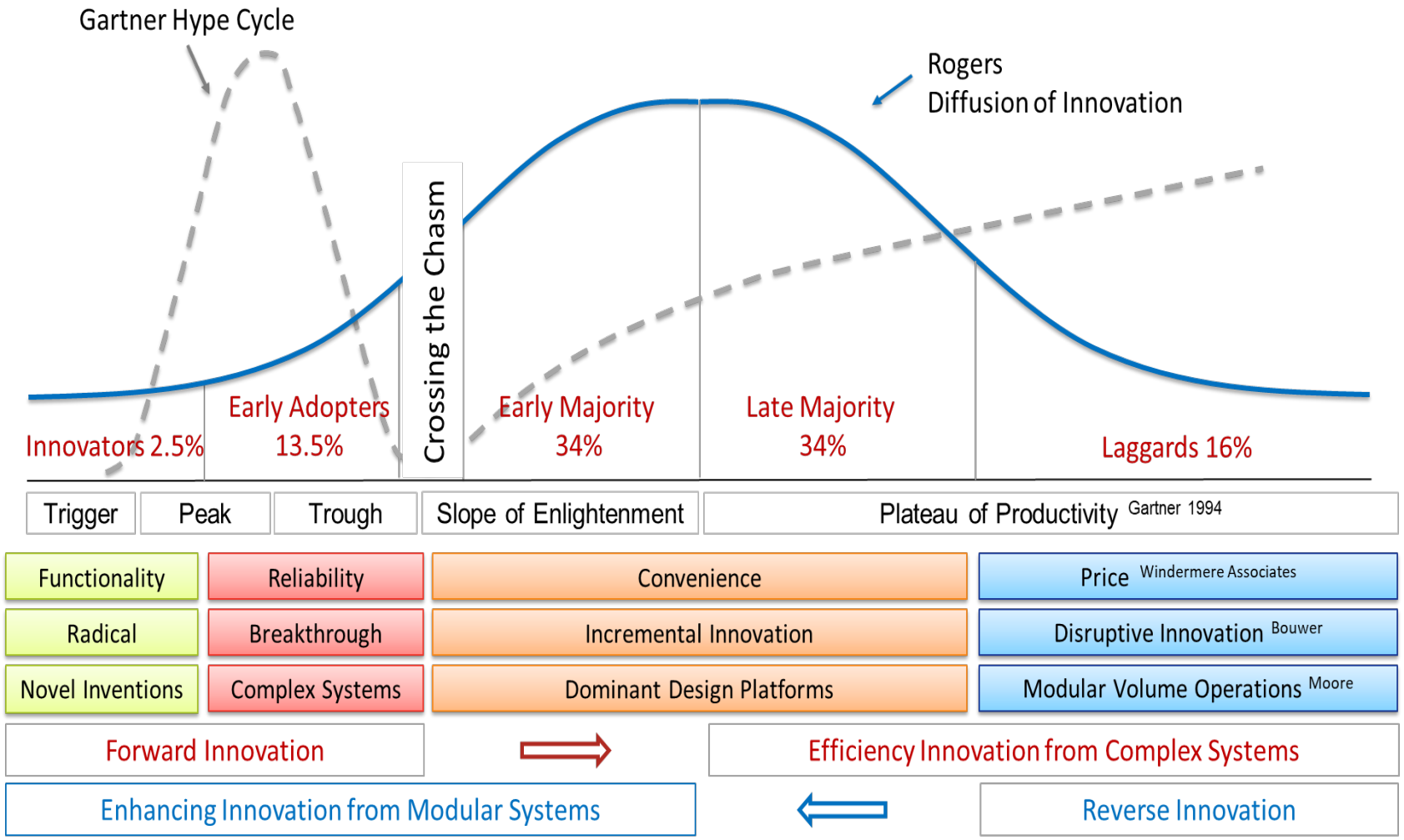


Figure 59: Diffusion of Innovation

Inspired by:

ROGERS, E. M. 1962. Diffusion of Innovations, Free Press of Glencoe.
FENN, J. & RASKINO, M. 2008. Mastering the Hype Cycle: How to Choose the Right Innovation at the Right Time, Harvard Business Review Press.
MOORE, G. A. 1991. Crossing the Chasm: Marketing and Selling Technology Products to Mainstream Customers, HarperBusiness.
GUROWITZ, E. 2012. Positioning Products and Services Accurately. Gurowitz.com [Online].
MOORE, G. A. 2005. Strategy and Your Stronger Hand. Harvard Business Review, 83, 62-72.

5.12 Disruptive Innovation

Disruptive Innovation is a theory introduced by Prof Clayton Christensen (Christensen, 1997a) as a “Creative Destruction” phenomenon he observed that could explain (as one of many reasons) why large corporations that once dominated their markets suddenly within a few years completely disappeared.

In summary, “Disruptive Innovation” is where new entrants target low-end customer market segments or non-consumption new markets, usually applying new business models that allow for the delivery of “good enough” products or services that are more **convenient** and at a significant lower **price**, while still being profitable.

These entrants then also switch to “Sustaining Innovation” to improve **performance** and **quality** to eventually target the mainstream users.

This implies that “Disruptive Innovation” follows the **Windermere Associates’ Buying Hierarchy** (Christensen, 1997b) (Gurowitz, 2012) in **reverse order** as demonstrated in Figure 60.

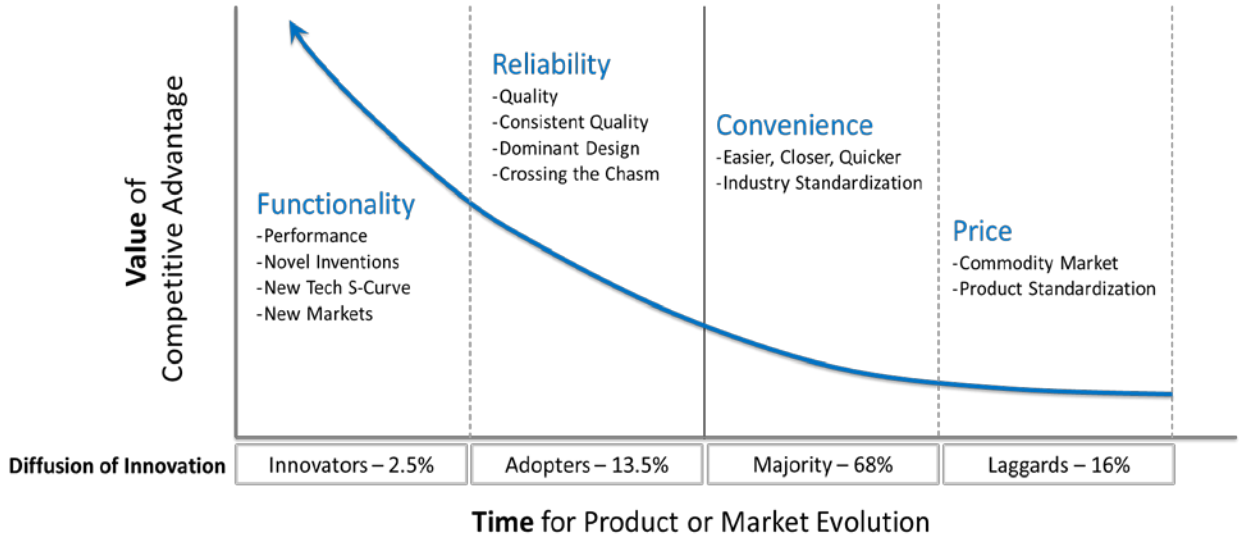


Figure 60: Windermere Associates Buying Hierarchy

Inspired by: (Christensen, 1997b) (Gurowitz, 2012)

Christensen described “Disruptive Innovation” according to the following process phases (Christensen et al., 2015). See Figure 61:

1. “**Incumbents focus on improving their products** and services for their most demanding (and usually most profitable) customers, they exceed the needs of some segments and ignore the needs of others.”

2. “**Entrants** that prove disruptive begin by successfully **targeting those overlooked segments**, gaining a foothold by delivering more-suitable functionality— frequently at a lower price.”

3. “**Entrants then move upmarket**, delivering the performance that incumbents’ mainstream customers require, while preserving the advantages that drove their early success.”

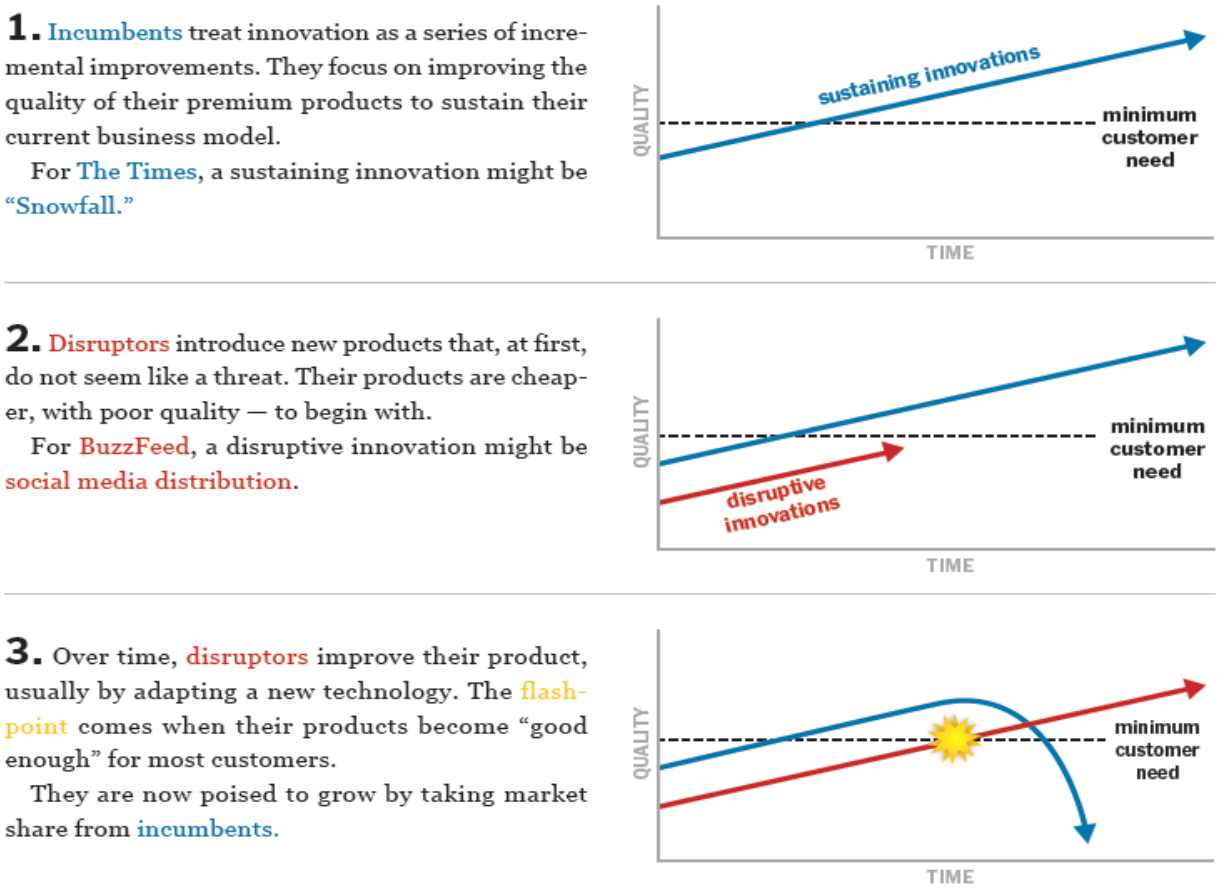


Figure 61: Disruptive Innovation – A Graphical Demonstration

5.13 Dominant Design

The concept “Dominant Design” was introduced by Prof Abernathy and Prof Utterback (Abernathy and Utterback, 1978) as a resulting phenomenon that was identified from the “Dynamics of Innovation” theory (Utterback and Abernathy, 1975) which they developed a few years earlier.

A Dominant Design (effect) occurs when various different related variations of technologies to solve the same user need (or Job to be Done) are all evolving at the same time (as a trend) and eventually converge into a single standardized technical design within the industry.

5.14 Dominant Service

This is when a certain company reinvent a business model in such a way that it became the preferred service provider (especially within the digital industry) such as: Amazon, Uber, Alibaba, Google, LinkedIn, Facebook, YouTube, etc.

"Dominant Service" in the context of "Disruptive Innovation" perspective is where an existing or known technology is used with an innovative "Business Model" to reach the market (predominantly) with a very low price point or with a high convenience for customers? According to Christensen it is usually a change in the value chain process, which is in effect a change (in the business model) that most likely will become a Disruptive Innovation.

5.15 Growth Innovation

This research initiated the term “Growth Innovation”, simply to refer to the strategic roadmap how a corporation will grow organically through a “Corporate Innovation Strategy”.

This is exactly what this research is about, namely to design and develop a “Dynamic Contextual Circumstance-Based Corporate Innovation Strategy Formulation Systems Model” that will allow corporate executives to formulate quality innovation strategies to grow the corporation organically through the innovation of new business units with high growth potential in the market.

Growth can be viewed from various perspectives:

- Market Growth.
- Revenue Growth.
- Profit Growth.
- Margin Growth.
- Earnings Growth.
- Total Shareholder Return (TSR) Growth.

5.16 Shareholder Capitalism

This research defined the term “Shareholder Capitalism” as inspired by Prof Martin (Martin, 2010) to describe the fundamental change Prof Friedman’s publication (Friedman, 1970) and other academics (Jensen and Meckling, 1976) enforced on corporations (and even governments) in the seventies. They argued that the new and only primary purpose and mission for corporations is to work for shareholders and to take care of their Total Shareholder Return (TSR) at all cost.

Within the corporation shareholders will give top executives large amounts of shares on an annual basis as a performance bonus to keep them aligned with their own (shareholder) interests, else nobody would care. In return corporate executives apply two primary accounting levers to instill confidence in the corporation’s reputation: financial growth (revenue) and profit margins (earnings). In reality it is merely perception building on what they promise the corporation will deliver in future, and sometimes it led to unethical activities (such as Enron, Volkswagen, etc.)

Unfortunately, this doctrine has many negative effects on corporations (and the surrounding economy), this research argues strongly that “Shareholder Capitalism” prevents corporations to

implement “Strategic Corporate Innovation” that can deliver new profitable businesses in the long-term to ensure a sustainable existence. This phenomenon was termed as the “Capitalist’s Dilemma” (Christensen and van Bever, 2014).

This research argues that “Shareholder Capitalism” is similar to legalized gambling as described from a:

1. Legal perspective where shareholders are not the true owner of a corporation (Bower and Paine, 2017).
2. Financial perspective (Martin, 2010).
3. Sustainable longevity perspective where the sustainable listing of corporation (measured in years) on the S&P 500 reduced dramatically. (Foster and Kaplan, 2001b) (Foster, 2012) (Reeves and Pueschel, 2015).
4. Cultural mental model perspective that fears change and is risk adverse (Foster and Kaplan, 2001a) (Sull et al., 2015).

Nobody can deny that many corporate executives and shareholder activists (alone) devised immense wealth from “Shareholder Capitalism”, arguably at the expense of many employees’ health and fair income.

Note: Some very specific research on the correlation between “Corporate Innovation Performance” and “Corporate Share Price” (or market capitalization), was recently proved to be the case (Jones, 2014) (Engel et al., 2015).

Note: The perception CEO’s have to focus primarily on short-term financial indicators such as Total Shareholder Return (TSR) to sustain share price growth (or market capitalization) as “Shareholder Capitalism” (Martin, 2010) instead of organic growth through “Strategic Corporate Innovation”, actually initiated the “Capitalist’s Dilemma” (Christensen and van Bever, 2014) (Adams, 2012) (Bower and Paine, 2017) (Wiess, 2013) This may explain the root cause for the “Corporate Innovation Performance Challenge” and the importance of “Strategic Corporate Innovation”.

5.17 Strategic Corporate Innovation

"Strategic Innovation occurs when a company identifies gaps in the industry positioning map, decides to fill them, and the gaps grow to become the new mass market.

By gaps, I mean: (1) new, emerging customer segments or existing customer segments that other competitors have neglected; (2) new, emerging customer needs or existing customer needs not served well by other competitors; and (3) new ways of producing, delivering, or distributing existing or new products or services to existing or new customer segments.

The common element in all the successful attacks is Strategic Innovation. Significant shifts in market share and fortunes occur not because companies try to play the game better than the competition but because they change the rules of the game. " (Markides, 1997)

This research defines **Strategic Corporate Innovation** as the process where an adequately well-defined Innovation Strategy is being formulated with unique decisions, and implemented to deliberately disrupt new or existing markets with unmet or overserved customer needs (Disruptive Innovation) (Christensen et al., 2015) via new business units with differentiating strategic positions in the market (Porter, 1996) that will change the rules (Business Model Innovation) (Osterwalder et al., 2010) (Chesbrough, 2007) how incumbents will compete in the market.

To be successful, it requires a **coherent alignment** of corporate capabilities with an innovation strategy (Leinwand and Mainardi, 2010) (Leinwand and Mainardi, 2016).

5.18 Strategic Corporate Innovation Management

"**Strategic Management** … is a system of corporate values, planning capabilities, or organizational responsibilities that couple strategic thinking with operational decision making at all levels and across all functional lines of authority in a corporation." (Gluck and Kaufman, 1980)

"**Strategic Thinking** is the creative, entrepreneurial insight into a company, its industry, and its environment." (Gluck et al., 1978a)

Very similar to the definition for Strategic Management (Gluck and Kaufman, 1980), Prof Pisano defined "A **strategy** is nothing more than a commitment to a set of coherent, mutually reinforcing policies or behaviors aimed at achieving a specific competitive goal. Good strategies promote alignment among diverse groups within an organization, clarify objectives and priorities, and help focus efforts around them." (Pisano, 2015)

This research defines: "**Strategic Corporate Innovation Management** as a core competence of the corporation with the responsibility to; (1) orchestrate the formulation of an insightful innovation strategy, (2) develop and align the required capabilities, (3) automate and optimize the innovation system to be fast, effective and efficient through proper coordination, collaboration and communication, to (4) deliver valuable solutions in a repeatable, predictable, profitable sustainable manner for (5) corporate longevity".

5.19 Value Innovation

This research considers "Value Innovation" as the phenomenon in which a corporation delivers unique insight as valuable solutions to customers and consumers in such a manner that it will meet and satisfy their inherent need to accomplish a Job to be Done (JTBD) with the appropriate **functionality** (highest performance), **reliability** (quality with lowest variability), **convenience** (lowest waste) and **price** (lowest cost) (Ulwick, 2017) (Gurowitz, 2012) (Christensen, 1997b).

With the assistance of the "Windermere Associates Buying Hierarchy", Value Innovation could be mapped against the "Diffusion of Innovation" user categories as shown in Figure 62.

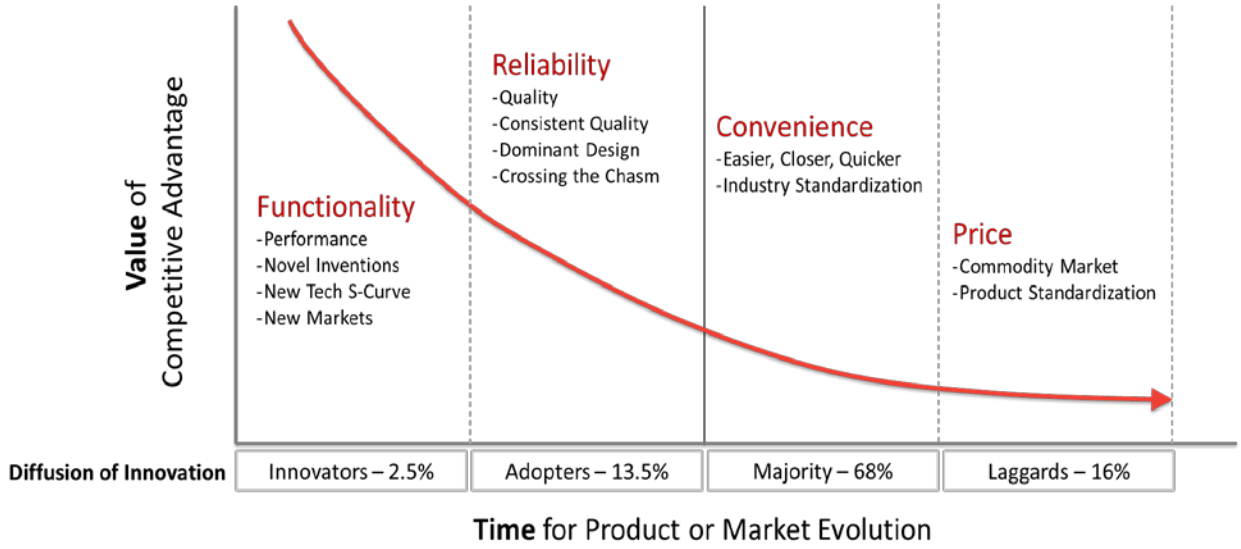


Figure 62: Windermere Associates Buying Hierarchy

Theories or methods for Value Innovation are outside the scope of this research, but worth mentioning is that the following are available:

1. **Outcome-Driven Innovation (ODI)**: This methodology was invented by Anthony Ulwick, the founder (in 1991) and CEO at Strategyn, who also initiated and advocated the Jobs-to-be-Done (JTBD) theory with Prof Christensen.

2. **New Product Blueprinting**: Dan Adams, founder and president of the Advanced Innovation and Marketing (AIM) Institute, invented this methodology.

3. **Blue Ocean Strategy**: This theory was created by Prof W. Chan Kim and Prof Renée Mauborgne, which they initially referred to as “Value Innovation” and “Value Curves” (Kim and Mauborgne, 1997) in their initial publications.

5.20 Conclusion

As stated in the introduction of this chapter, various important concepts that could assist to understand the subject matter for “Strategic Corporate Innovation” in more depth, were discussed in this chapter to provide the necessary background information that will assist to understand the System Dynamics discussions in Chapter 7.

CHAPTER 6: SYSTEM MODEL DESIGN

6.1 Introduction

This chapter will describe in great detail the Systems Modelling (or design) phase from the Systems Thinking approach as a Theory Building Methodology described in chapter 3.

From the literature study in chapter 4, fifteen (15) knowledge elements as “Frameworks, Models or Theories” within the subject matter arena of “Strategic Corporate Innovation Management” were each discussed and normalized on a 2 x 2 matrix structure with two axial dimensions and four quadrants.

The conceptual sub-elements within each of the fifteen knowledge elements were divergently dissected and isolated into independent “Contextual Innovation Lifecycle Spatial Quadrants”, but still within the context of the “Strategic Corporate Innovation Framework, Model or Theory” it belonged to. These independent “Contextual Innovation Lifecycle Spatial Quadrants” were then curated, integrated, connected and correlated.

Specific categories evolved which then later stabilized as a framework which became the “Nine Relational Dimensions” of the SCINav Systems Model. Furthermore, the “Nine Relational Dimensions” could also be organized into three groups, which exactly correlated with the “Three Phases for Strategic Corporate Innovation Formulation” as identified in Chapter 2 and developed in Figure 8.

The “Nine Relational Dimensions” were then constructed as a “Relational Multidimensional Vector of Matrixes”, which then became known as the “Strategic Corporate Innovation Navigation (SCINav) Systems Model” to function as a “Dynamic Multidimensional Contextual Circumstance-Based Corporate Innovation Strategy Formulation Systems Model”.

6.2 Design Requirements

The systems modelling (or design) of the "**Strategic Corporate Innovation Navigation (SCINav) Systems Model**" needs to conform to several requirements as defined in Chapter 1.

The systems model design and development (collectively known as systems modelling) **requirements** for this research project will be as follows:

1. Aggregate, curate, integrate, connect and correlate various frameworks, models and theories for innovation and corporate strategy into a single Systems Model.
2. Apply Systems Thinking and Systems Engineering principles.
3. Design and Develop a novel "Strategic Corporate Innovation Navigation Systems Model" that can support corporate executives with the formulation of a "Corporate Innovation Strategy".
4. Guide corporate executives to "Manage Corporate Innovation Strategically" as a solution for the "Corporate Innovation Performance Challenge".

The expected outcome for the "Strategic Corporate Innovation Navigation (SCINav) Systems Model", is to enable corporate executives to deliver unique insights as valuable solutions which customers and consumers will appreciate in such a way that the corporation will:

1. Deliver several new technological products with successful adoption in the market.
2. Generate brand recognition in the market.
3. Create wealth for employees.
4. Sustain economic growth for shareholders.

Thus, the "Strategic Corporate Innovation Navigation (SCINav) Systems Model" must be modelled in such a manner that it can serve as a guide (or map) for corporate executives who seek a practical solution based on fundamental strategic innovation management theory for their "Corporate Innovation Performance Challenge".

6.3 Relational Multidimensional Vector of Matrixes

To be scientifically correct, the physical structure of the Dynamic Multidimensional Contextual Circumstance-Based Corporate Innovation Strategy Formulation (SCINav) Systems Model is a Relational Multidimensional Vector of Matrixes.

For this thesis, the construction and configuration of the "Relational Multidimensional Vector of Matrixes" are as follows (with Figure 63 to serve as a visual illustration):

- The very first matrix will be named the "**Base Matrix**".
- The "Base Matrix" will have two indexes to define its rows and columns.
    - The rows index is termed the "Y-axis" with the "Diffusion of Innovation Adopter Categories" as the associated dimension.
    - The columns index is termed the "X-axis" with "Innovation Technology S-curve Phases" as the associated dimension.
    - These two indexes will be referred to as the "**Axial Dimensions**" as they are associated with the "X-axis and Y-axis" for the base matrix and the other eight matrixes of the SCINav Systems Model as well.
- The matrixes that are stacked along the Z-axis to create a "**Relational Multidimensional Vector of Matrixes**" structure will be referred to as the "**Relational Dimension Matrixes**", each named accordingly to the SCINav Dimension it represents.
- Each matrix consists of four quadrants, which means it is a mathematical 2 x 2 square array. For the purpose of this research, each quadrant represents a specific "**Contextual Innovation Lifecycle Spatial Quadrant**".

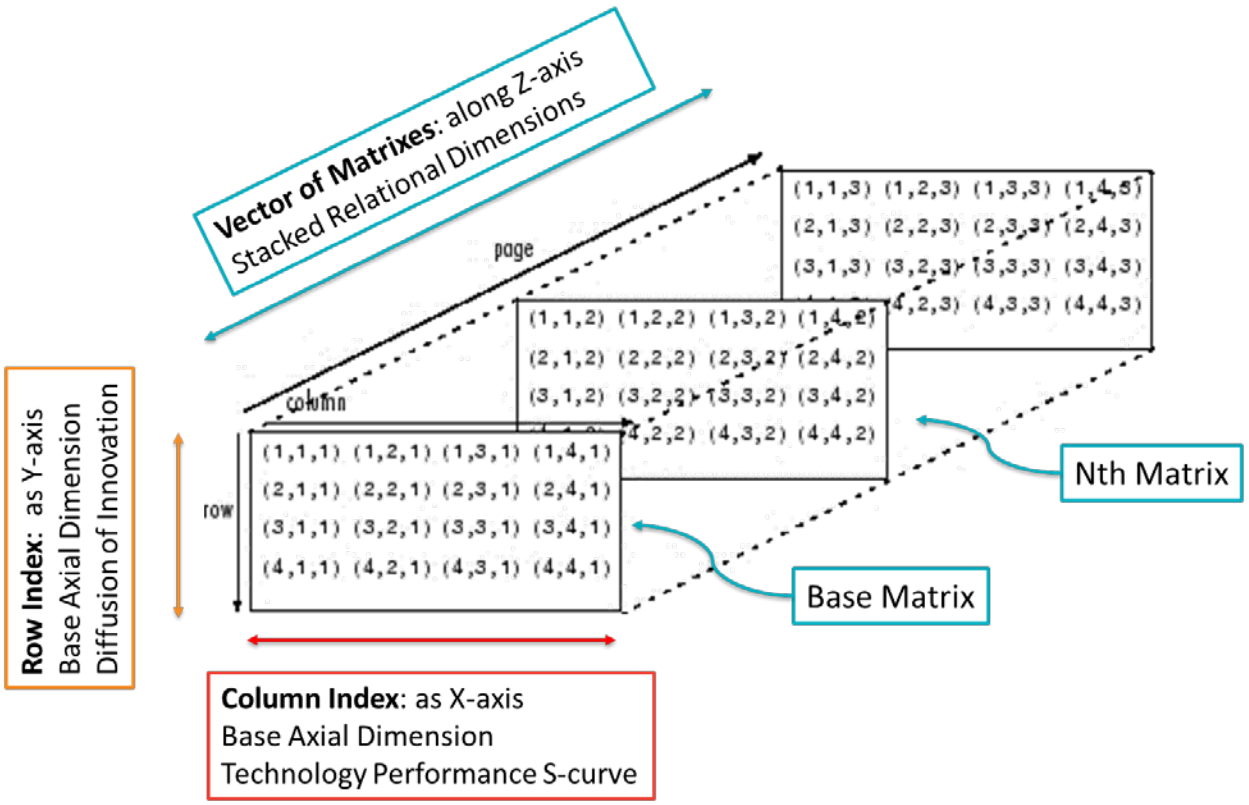


Figure 63: Theoretical Construction of the Relational Multidimensional Vector of Matrixes

Inspired by: Mathworks Documentation on Multidimensional Arrays

The quadrants on each matrix exemplifies the dynamic nature of corporate innovation strategy formulation as new novel technologies, products or services evolve and progress along a path (or route) through the “Contextual Innovation Lifecycle Spatial Quadrants” on each Dimensional Matrix of the SCINav Systems Model.

Therefore, the SCINav Systems Model represents contextual options to develop specific innovation strategies, depending in which “Contextual Innovation Lifecycle Spatial Quadrant” the new innovation finds itself.

6.4 Two Axial Dimensions

To define the Axial Dimensions along the X-axis and Y-axis for the Vector of Matrixes structure (as in Figure 63), this research went back to the foundational definition of Corporate Innovation as it was previously defined in section 5.6: "Innovation is a system where multidisciplinary capabilities (as knowledge, skills, processes and resources) are integrated to deliver unique insights as valuable solutions, which customers or consumers will appreciate in such a way that the corporation will generate brand recognition in the market, wealth for employees and economic growth for shareholders". (Bouwer, 2015).

From this definition, the core elements (or components) of the innovation system were identified as:

1. "where multidisciplinary capabilities (as knowledge, skills, processes and resources) are integrated", with the deliverable outcome as a "new technology" (or business model) that follows a "Maturity S-curve". (Foster, 1986)

2. "to deliver unique solutions which customers or consumers will value", with the outcome as the "Diffusion of Innovation". (Rogers, 1962)

To distil the two core elements from the definition of a Corporate Innovation System further, the two Axial Dimensions for each matrix were then defined as shown in Figure 64:

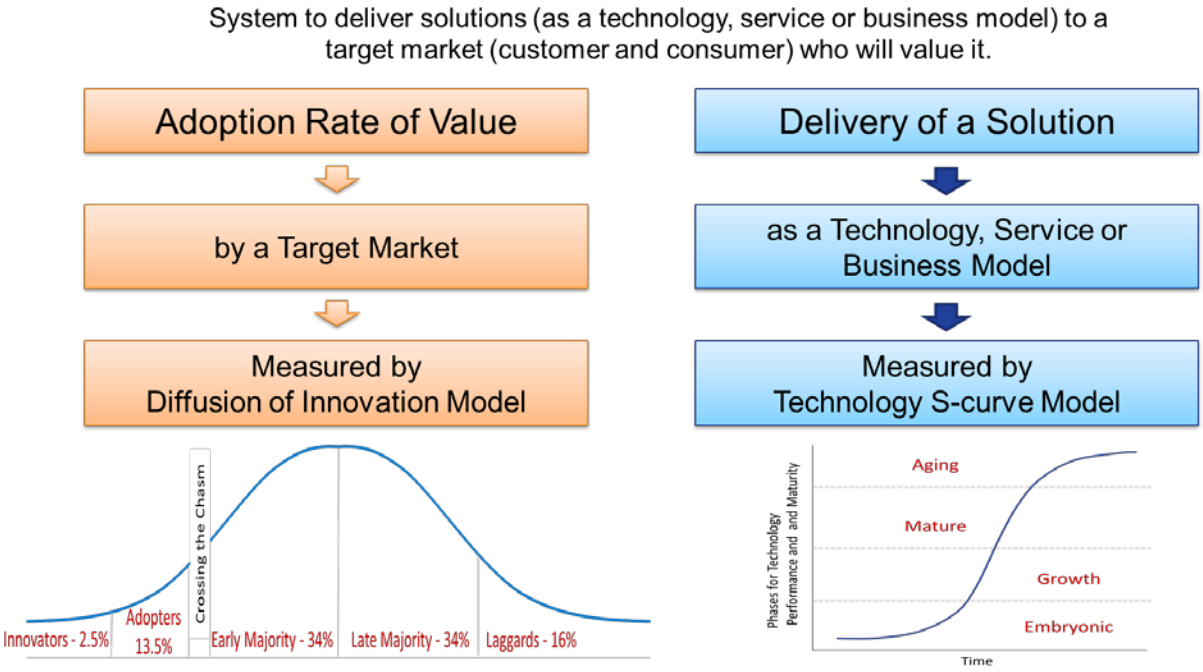


Figure 64: Two Axial Dimensions Derived for the Vector of Matrixes Structure

With the two Axial Dimensions for each Matrix identified, it was then possible to develop a two-axis schematic diagram in the form of a matrix (or a 2 x 2 array) as shown in Figure 65, with the:

- **X-axis**: as the "Technology Performance S-curve" with the first two phases:
  - Embryonic phase.
  - Growth phase.
- **Y-axis**: as the "Diffusion of Innovation" with the first three consumer communities classified as:
  - Innovators to Early Adopters (bottom two quadrants from left to right).
  - Early Adopters and Early Majority (top two quadrants from left to right).

Discovery: The "Diffusion of Innovation" and "Technology Performance S-curve" dimensions correlates extremely well with the two extrapolated components for "Strategic Corporate Innovation" (as identified in Chapter 2) as "Diffusion of Innovation" and "Value Innovation" respectively.

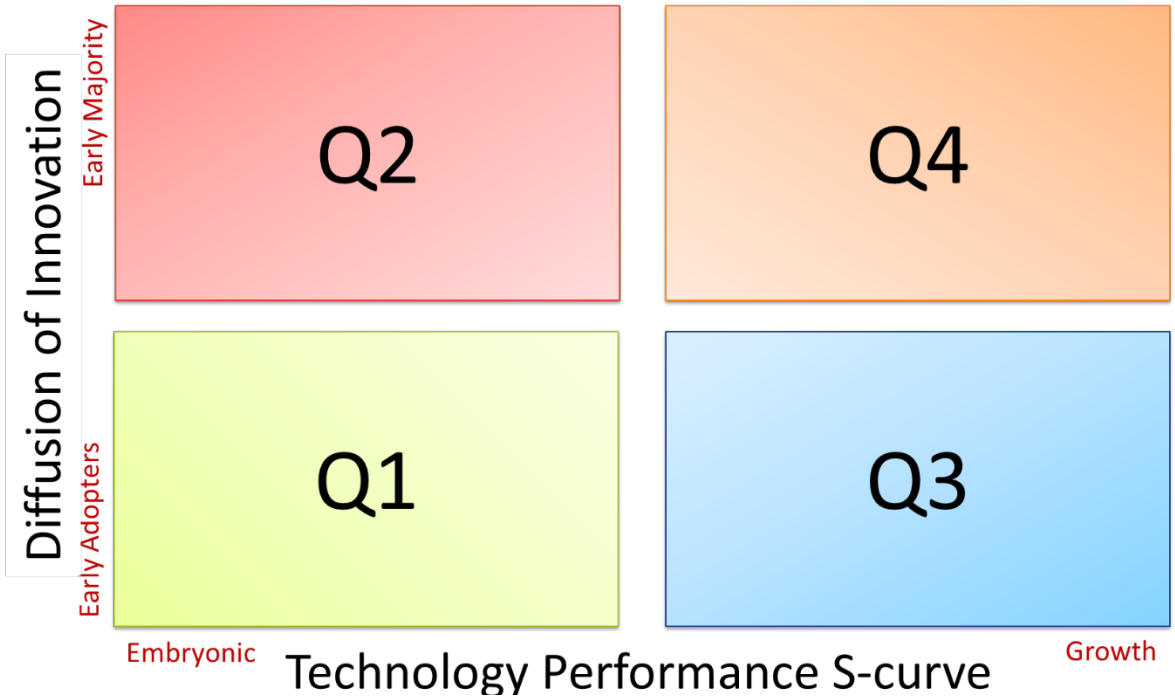


Figure 65: Schematic Diagram of a Dimensional Matrix with Two Axial Dimensions

Note: Figure 65 also includes the assigned numbers for each of the SCINav Systems Model Dimensional Matrix's "Contextual Innovation Lifecycle Spatial Quadrants", and will be used accordingly during the rest of this thesis.

6.5 Nine Relational Dimensions

This section will describe in great detail the systems modelling (design and development) process to demonstrate how the "**Nine Relational Dimensions**" (as in Table 14) evolved from the various "Contextual Innovation Lifecycle Spatial Quadrants" that were originally extracted and normalized from the "Fifteen Strategic Corporate Innovation Frameworks, Models or Theories" knowledge elements in Chapter 4.

Each one of the "Nine Relational Dimensions" is represented by at least one specific 2 x 2 square matrix, each with four "Contextual Innovation Lifecycle Spatial Quadrants" as outlined in Table 14, with the following properties:

- Each **row** in Table 14 represents a "Relational Dimension" with a descriptive name.
- Each **column** in Table 14 represents a specific "Contextual Innovation Lifecycle Spatial Quadrant", as configured and relationally color-coded according to the matrix in Figure 65.

Modelling conventions used to design the "SCINav Systems Model" from Table 14 (see next page) were the following:

- The color scheme for the columns used in Table 14 will match the color scheme used on each Dimensional Matrix as shown in Figure 65 and Figure 66.
- Each "Contextual Spatial Quadrant" from Table 14's dataset has a corresponding coordinate where it is positioned within the "Relational Multidimensional Vector of Matrixes" structure as shown in Figure 66.
- Each "Contextual Spatial Quadrant" from the "Relational Multidimensional Vector of Matrixes" systems model as shown in Figure 66 with the same color is interrelated and interconnected (as with elements within a system).

Table 14: Nine Relational Dimensions Dataset

Matrix Quadrant	Quadrant 1	Quadrant 2	Quadrant 3	Quadrant 4
Market Strategy Options	**New Tech** **New Market** Test Market Premium Inventions	**New Tech** **Known Market** Luxury Market Premium Technologies	**Known Tech** **New Market** Mass Market Lowest Cost Products	**Known Tech** **Known Market** Luxury Mass Market Valuable Products
Market Strategy Archetypes	**Innovators** (2.5%)	**Adopters** (13.5%)	**Laggards** (16%)	**Majority** (68%)
Market Strategy Buying Preferences	**Functionality** - Innovators - Novel Inventions	**Reliability** - Adopters Integrated Complex Systems	**Price** - Laggards - Modular Volume Operations	**Convenience** - Majority - Dominant Design Platforms
Conceptual Strategy Options	**Renewal** Diversification Differentiation	**Positioning** Product Development Differentiation Focus	**Shaping** Market Development Cost Leadership	**Adapting** Market Penetration Cost Focus
Conceptual Strategy Archetypes	**Market Forecasters** - as Visionaries	**Market Spotters** - as Pioneers	**Market Explorers** - as Sculptors	**Market Readers** - as Followers
Conceptual Strategy Anticipated Outcomes	**Differentiative Advantage** - Knowledge Transformation - Novel Inventions - Anticipate a S-curve	**Strategic Advantage** - Technology Transformation - Integrated Complex Systems - Crossing the Chasm	**Disruptive Advantage** - Business Model Transformation - Modular Volume Operations - Creating a Chasm	**Competitive Advantage** - Ecosystem Transformation - Dominant Design Platforms - Capture the Market
Tactical Strategy Options	**Horizon 3** - Random Strategy - Create Viable Options - Drive White Space Invention Excellence	**Horizon 2** - Patient Strategy - Build Emerging Technologies - Drive Technology Proposition Excellence	**Horizon 1** - Impatient Strategy - Expand Core to Adjacent Blue Space - Drive Operational Excellence	**Horizon 0** - Informed Strategy - Defend & Optimize Core Business - Drive Commercial Excellence
Tactical Strategy Archetypes	**Technology Drivers** **Platform Architects** **Business Explorers** - IP Inventors	**Technology Builders**	**Business Disruptors**	**Industry Followers** **Market Advocates**
Tactical Strategy Expected Outcomes	**Uptake Growth** - Invention Innovation	**Profitable Growth** - Growth Innovation	**Revenue Growth** - Growth Innovation	**Sustainable Growth** - Sustaining Innovation

Stacking each **row** from Table 14 as a matrix on top of each other with the same colors aligned, transformed the "Nine Relational Dimensions" into the "Relational Multidimensional Vector of Matrixes" structure as shown in Figure 66. The resulting structure was named as the "Strategic Corporate Innovation Navigation (SCINav) Systems Model".

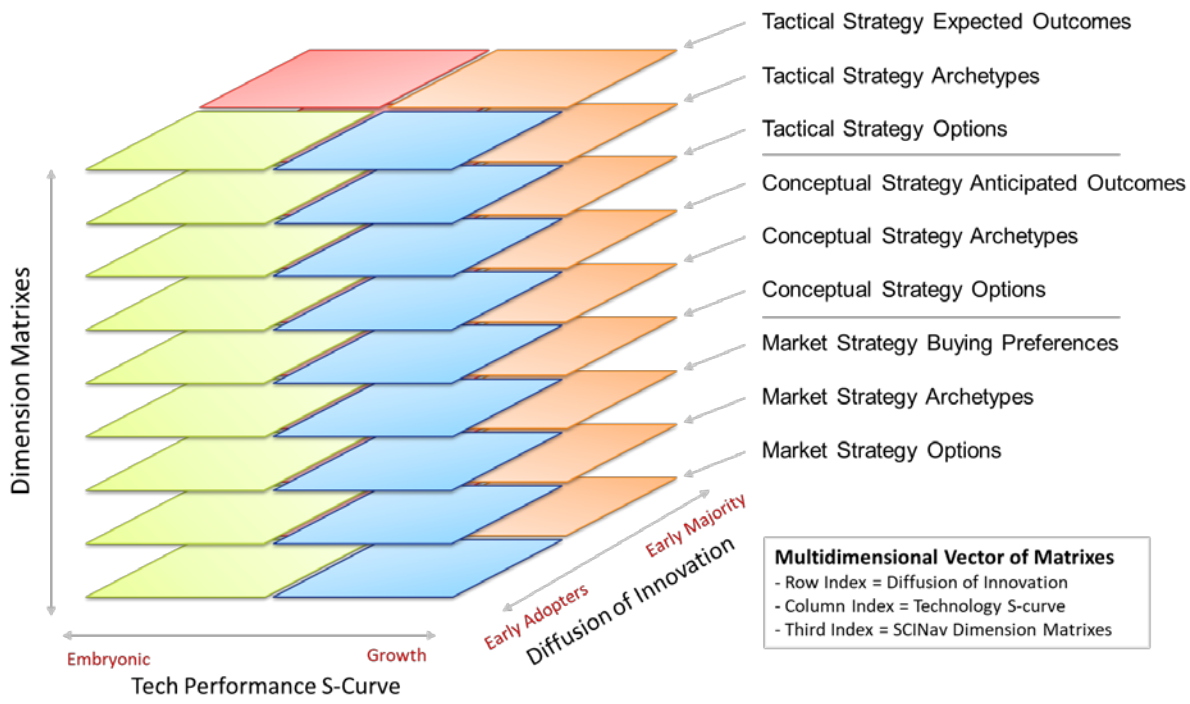


Figure 66: Relational Multidimensional Vector of Matrixes Structure

The design and construction of the SCINav Systems Model's "Relational Multidimensional Vector of Matrixes" structure as shown in Figure 66 has the following properties:

1. There are three indexes:
    - **X-axis** index: Technology Performance (Maturity) S-curve Phases.
    - **Y-axis** index: Diffusion of Innovation Consumer Adoption Categories.
    - **Z-axis** index: Stacked Nine Relational Dimension Matrixes.
2. All matrix quadrants with the same color scheme are related.
3. The 9 Relational Dimension Matrixes were "stacked" vertically along the Z-axis:
    - 3 x Guidelines defining the **Market Innovation Strategy** segments.
    - 3 x Guidelines when developing **Conceptual Innovation Strategy** elements.
    - 3 x Guidelines when developing **Tactical Innovation Strategy** elements.

The construction and modelling of each “Relational Dimension” (as a **row** from Table 14) of the “SCINav Systems Model” will be discussed in more detail in the remaining sections of this chapter.

6.6 Market Strategy Options Dimension Matrix

As previously mentioned, this research found Prof Igor Ansoff’s “Strategies for Diversification” theory (Ansoff, 1957) to be a perfect foundation for “**Strategic Innovation Management**”, who was also acknowledged as the father of “**Strategic Management**” (Gluck and Kaufman, 1980).

Note: Prof Ansoff’s “Product Market Strategies for Growth Matrix” (Ansoff, 1957) dimensions also correlated extremely well with the derived base Axial Dimensions (as discussed earlier in this chapter) of the SCINav Systems Model’s structure. Therefore, the Ansoff Matrix was adapted to become the foundational “Market Strategy Options Dimension Matrix” for the SCINav Systems Model, to be placed at the bottom of the Relational Multidimensional Vector of Matrixes structure as illustrated in Figure 65 and Figure 66.

The fully qualified name of this matrix is the “**SCINav Systems Model’s Market Innovation Strategy Formulation Options Dimension Matrix**”. as illustrated in Figure 67.

This “Market Strategy Options Dimension Matrix” is the first contextual innovation strategy decision corporate executives will need to make based on current market forces (Porter, 1979) and other market techno-economic landscape innovation intelligence, which will then dictate for which “Contextual Innovation Lifecycle Spatial Quadrant” the innovation strategy will be developed.

Additional adapted descriptors from Chapter 4 were added to this matrix (see Figure 67) to specifically define what market segments to look for (or to create), and the correlating types of products or services that are aligned with the selected Market Strategy Option.

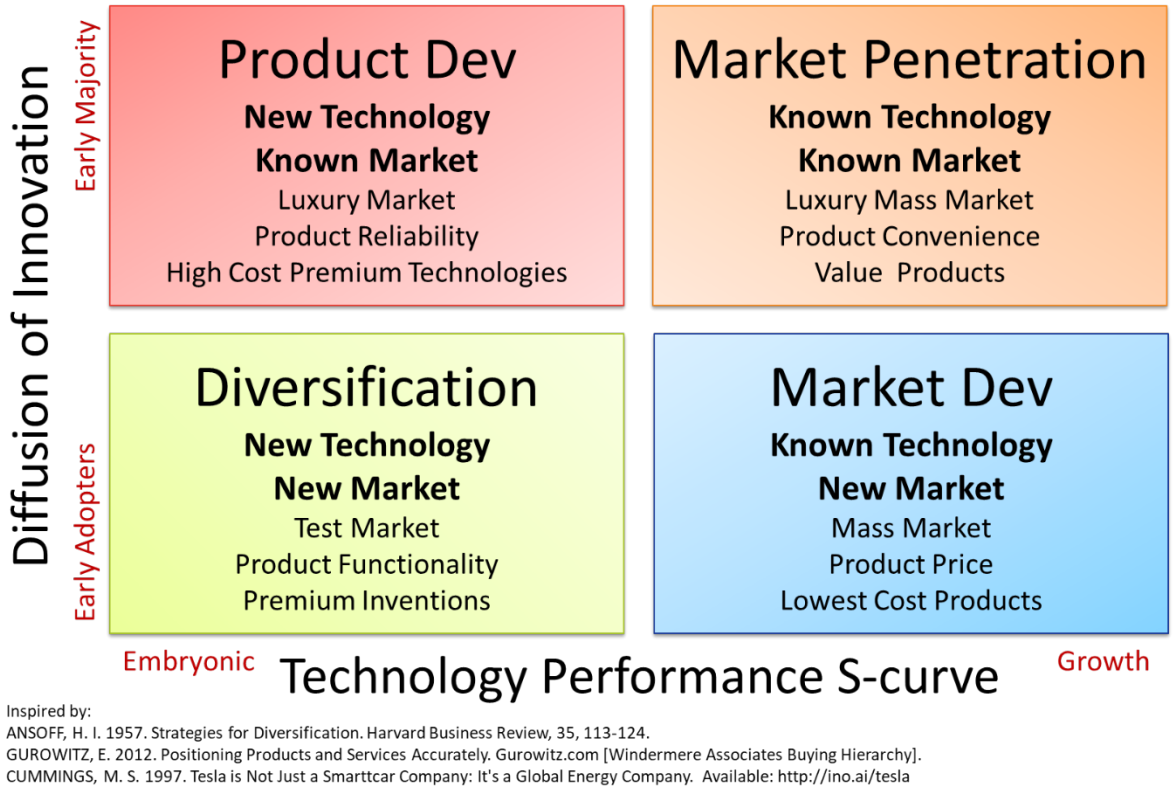


Figure 67: Market Strategy Options Dimension Matrix

6.7 Market Strategy Archetypes Dimension Matrix

Since the SCINav Systems Model applied the “Diffusion of Innovation” theory (Rogers, 1962) as an Axial Dimension for the Y-axis index (as in Figure 63 and Figure 64), it has been considered extremely important to map the “Diffusion of Innovation Model’s Communities of Consumers” as a SCINav Dimensional Matrix as well.

The fundamental concept from Prof Everett Roger's research is that he discovered that different communities of consumers will adopt new technological innovations at different phases in time, which also correlated to the rate (or size) of adoption. He defined five communities (or categories) of consumers according to the diffusion (or adoption) rate (or size) of innovation (or technology), as in Figure 68:

As discussed in section 5.11, the five categories of customers that were identified with the "Diffusion of Innovation" model from Prof Everett Rogers, were the following:

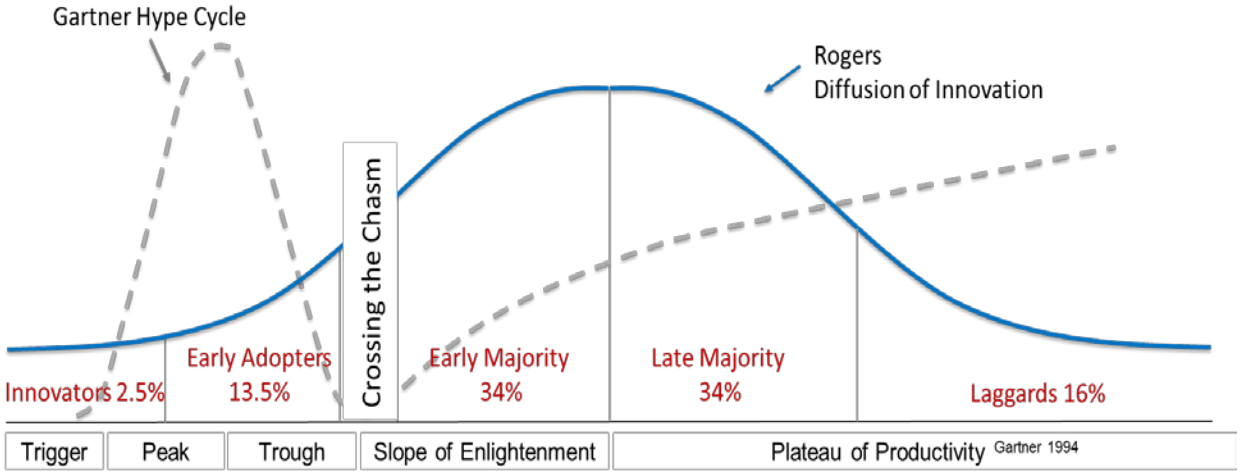
1. **Innovators** / Enthusiasts (2.5%).
2. **Early Adopters** / Visionaries (13.5%)
3. **Early Majority** / Pragmatists (32%)
4. **Late Majority** / Conservatives (32%)
5. **Laggards** / Skeptics (16%).

To provide additional insights which (or WHO?) of the "Diffusion of Innovation" customer or consumer communities will accept new technological innovations, Figure 68 mapped the "Crossing the Chasm" (Moore, 1991)and "Gartner Hype Cycle" (Fenn and Raskino, 2008) theories onto the "Diffusion of Innovation" normal distribution curve. The following can be extrapolated from the integrated theory mapping:

1. The enthusiastic "Innovators" group will "Trigger" a hype with the adoption of a new technological innovation within their small group.
2. The visionary "Early Adoptions" will catch-on and increase the adoption hype until a "Peak" of inflated expectations will be reached.
3. At the "Hype Peak", the adoption hype will soon decrease significantly and the adoption of the new technology will be heading for the "Hype Trough" between the "Early Adopters" and "Early Majority" category groups, known as the "Innovation Adoption Chasm" (or gap).
4. At this point it is extremely important for the corporation to collaborate with the "Early Adopters" (or even competitors) to reposition the new technological innovation to meet the inherent needs of the targeted market segment.

5. If a few pragmatic “Early Majority” customers can be persuaded to adopt the new repositioned technological innovation, a renewed hype of adoption will start to emerge as the “Slope of Enlightenment”.

6. Before the skeptic “Laggards” group will adopt a new technological innovation, there first needs to be a significant amount of hype in the whole industry over a long period of time before these price-and-change conscious skeptics will adopt any new technology.



Inspired by:
ROGERS, E. M. 1962. Diffusion of Innovations, Free Press of Glencoe.
FENN, J. & RASKINO, M. 2008. Mastering the Hype Cycle: How to Choose the Right Innovation at the Right Time, Harvard Business Review Press.
MOORE, G. A. 1991. Crossing the Chasm: Marketing and Selling Technology Products to Mainstream Customers, HarperBusiness.
GUROWITZ, E. 2012. Positioning Products and Services Accurately. Gurowitz.com [Online].
MOORE, G. A. 2005. Strategy and Your Stronger Hand. Harvard Business Review, 83, 62-72.

Figure 68: Diffusion of Innovation Curve Mapped onto the Gartner Hype Cycle
Inspired by: (Rogers, 1962) (Moore, 1991) (Fenn and Raskino, 2008)

The “Diffusion of Innovation Consumer Communities” were then mapped to define the “Market Strategy Archetypes” as the second SCINav Systems Model’s Dimensional Matrix as shown in Figure 69. Please note the following:

- “Early Adopters” are defined only as “Adopters”.
- “Early Majority” and “Late Majority” consumer groups were consolidated and defined as only the “Majority” “Market Strategy Archetype” group.

A good observer will notice that the “Market Strategy Archetype Quadrants” in Figure 69 are not quite in agreement with the Y-axis’ labelling as “Early Adopters” and “Early Majority”.

- The “Innovation Chasm” is actually between the “Adopters” and “Majority” archetypes, which will become more evident in the next chapter that will deal with the “Dynamics” of the SCINav Systems Model.

- The “Laggards” can also be considered as “Early Adopters” in the circumstantial event which this research termed the “Reverse Innovation Strategy Route”, which will also be discussed in more detail in the next chapter.

The second matrix’s (according to the SCINav Systems Model’s Relational Multidimensional Vector of Matrixes shown in Figure 66) fully qualified name is the “**SCINav Systems Model’s Market Innovation Strategy Formulation Archetype Roles Dimension Matrix**”.

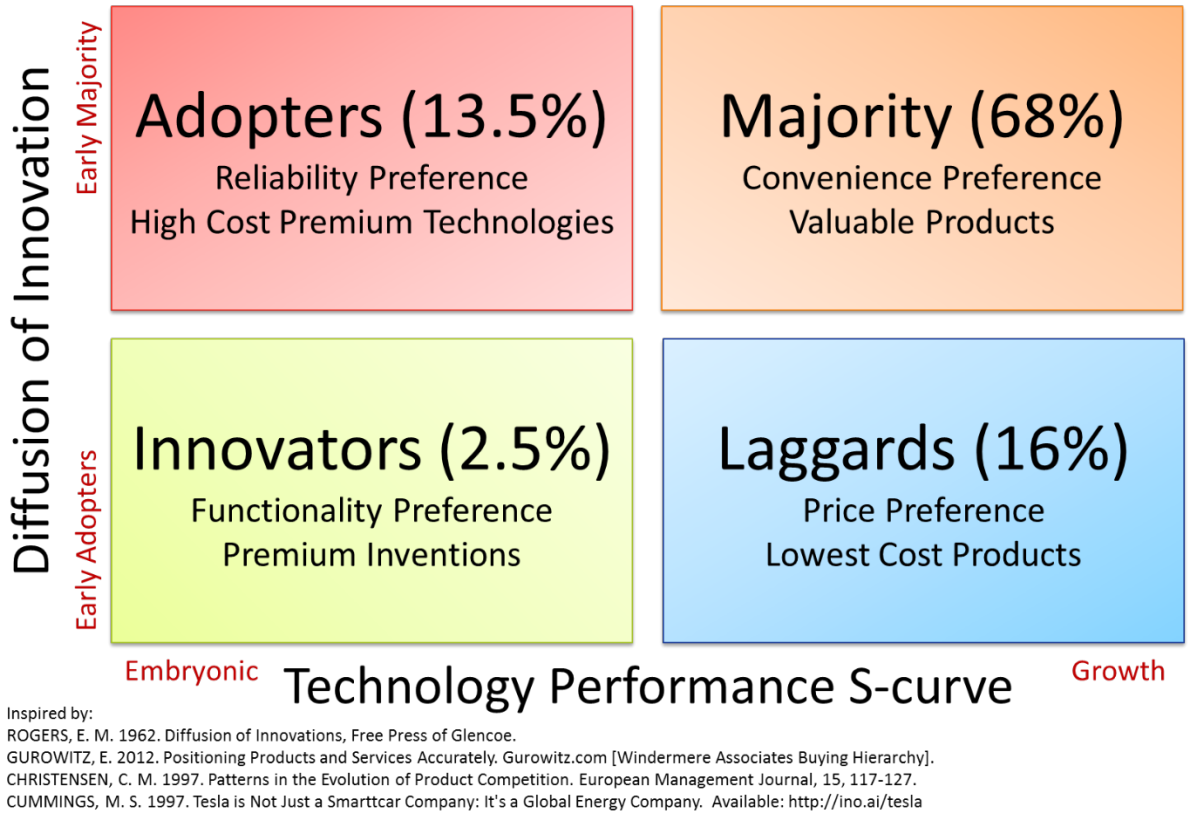


Figure 69: Market Strategy Archetypes Dimension Matrix

6.8 Market Strategy Buying Preferences Dimension Matrix

From the Diffusion of Innovation theory, Prof Rogers defined three “Types of Innovation Adoption Decisions” (Rogers, 1962) as: Optional, Collective and Authority.

Prof Christensen defined his three “Types of Innovation Adoption Decisions” (Christensen et al., 2007) as: Functional, Social and Emotional. For the SCINav Systems Model these “Types of Innovation Adoption Decisions” were too high-level to guide corporate executives as to with what motivation (as the WHY?) customers (or consumers) within the defined “SCINav Market Strategy Archetype” profiles will decide to purchase a new technological innovation.

This research strongly supports the “Jobs to be Done” (JTBD) theory that was a concept initiated by Prof Igor Ansoff (Ansoff, 1957), augmented by Prof Theodore Levitt (Levitt, 1960), with Anthony Ulwick who revisited the idea with Outcome-Driven Innovation (Ulwick and Leonard, 2002) and later promoted by both Anthony Ulwick (Ulwick and Hamilton, 2016) (Ulwick, 2017) and Prof Clayton Christensen (Christensen et al., 2007) (Christensen et al., 2016b) as “Jobs to be Done” (JTBD) theory.

Therefore, this research discovered that the “Windermere Associates Buying Hierarchy”, as mentioned by Prof Christensen (Christensen et al., 2007) and further discussed by Dr Ed Gurowitz (Gurowitz, 2012), was a much better fit for the SCINav Systems Model to define more specifically “WHY” a “Market Strategy Archetypes” profile will adopt a new technological innovation.

Figure 70 is a conceptual illustration how the “Windermere Associates Buying Hierarchy” preferences correlate with the “Diffusion of Innovation” consumer category communities. The “SCINav Tactical Strategy Archetype” roles that were added for reference purposes, will be discussed in section 6.13.

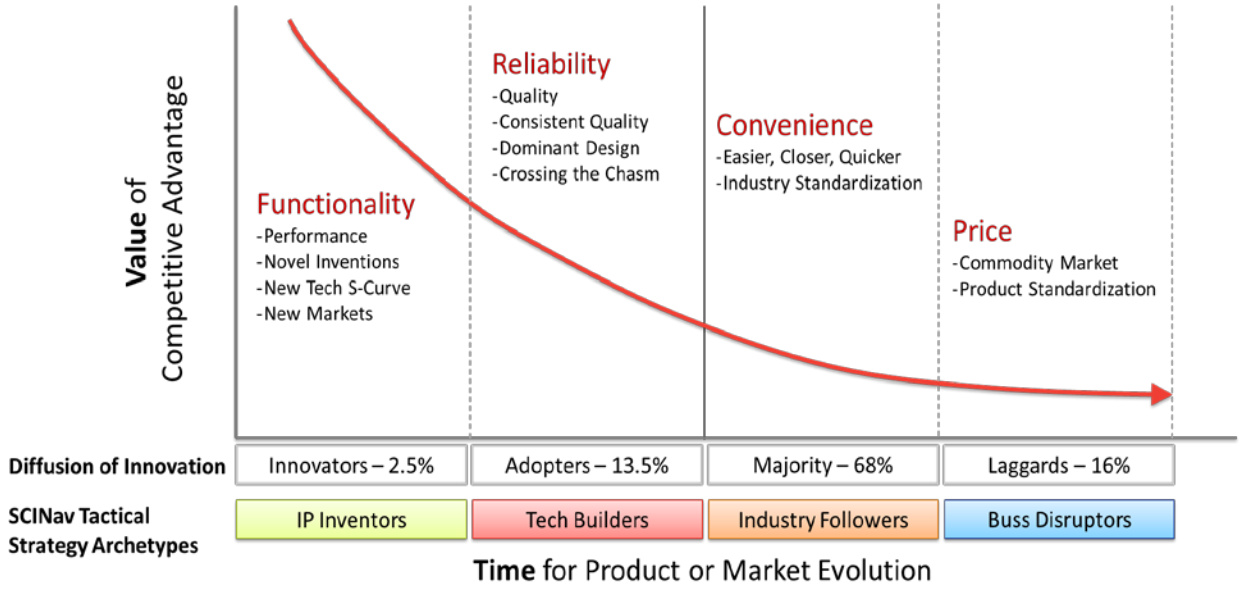


Figure 70: Conceptual Illustration of the Windermere Associates Buying Hierarchy

Inspired by: (Rogers, 1962) (Gurowitz, 2012) (Christensen, 1997b)

Note: The "Windermere Associates Buying Hierarchy" preferences are cumulative, which means that when a consumer is focused on "Reliability" it will assume that the technology or product on offer will also meet the "Functional" performance requirements.

The correlation between the five "Diffusion of Innovation" communities and the four "Windermere Associates Buying Hierarchy" preferences is outlined in Table 15.

Table 15: "Windermere Associates Buying Hierarchy" Preferences Correlated with the "Diffusion of Innovation" Consumer Communities

Windermere Buying Hierarchy	Diffusion of Innovation Communities
Functionality	Innovators and Early Adopters
Reliability	Early Majority
Convenience	Late Majority
Price	Laggards

The correlations in Table 15 are as follows:

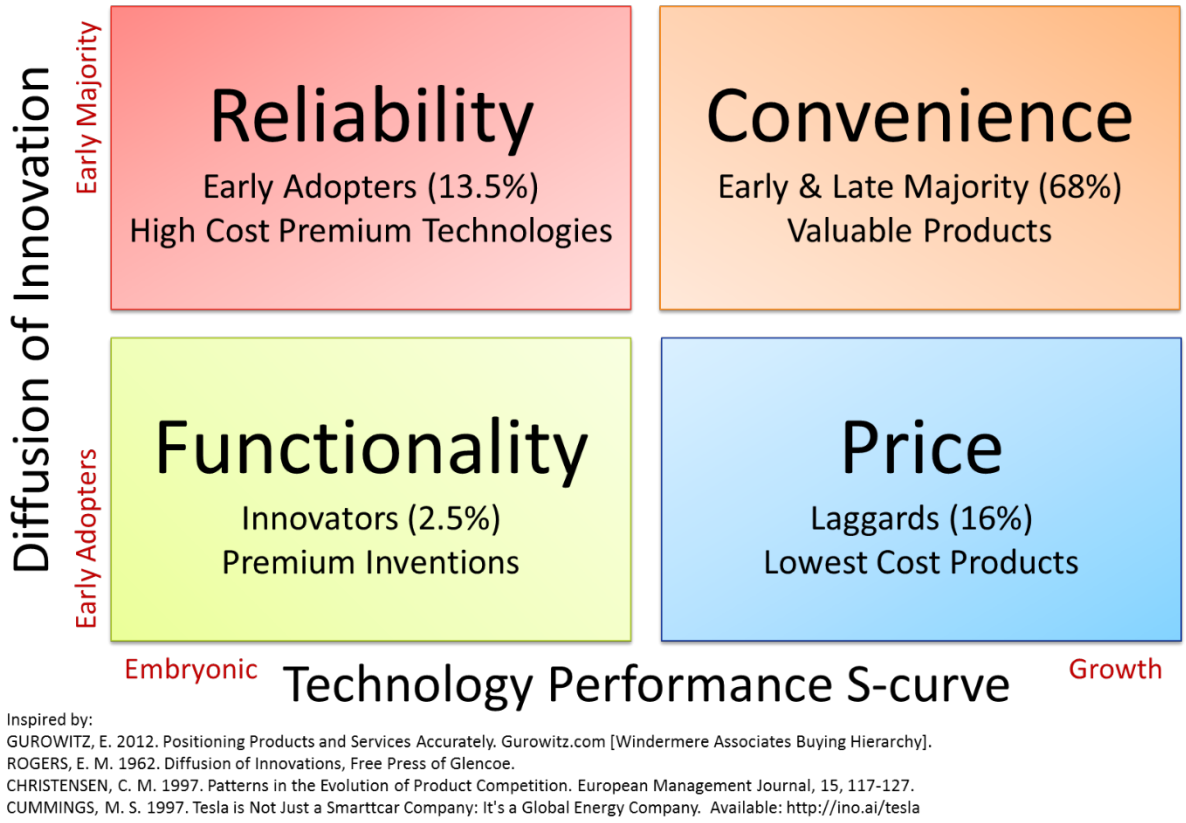
1. **Functionality** of a product is extremely important for “Innovators” and “Early Adopters”. To attract these consumer communities, new technology and product functional (or performance) improvements should be **radically** different from incumbent competitors in the industry. Therefore, corporations usually need to collaborate with research laboratories to assist them with radically different technology improvement options.

2. **Reliability** is more of a concern for the “Early Adopter” consumer community. Corporations should use their engineering development labs to increase product reliability.

3. **Convenience** is interpreted as to how easy it is for “Early and Late Majority” consumer communities to obtain the use the needed product. This usually occurs when the corporation has a solid and well-defined business model in place, which defines the value chains and distribution channels.

4. **Price** conscious consumers are the “Laggards” who expect a standardized functioning, fairly reliable and convenient to obtain product as a solution, but at the lowest possible price. This explains the success of commerce websites such as eBay and Craigslist where consumers search for used products to purchase.

The “Windermere Associates Buying Hierarchy” preferences were mapped on the third matrix as the “**SCINav Systems Model’s Market Innovation Strategy Formulation Buying Preferences Dimension Matrix**” (the fully qualified name), see Figure 71.



Inspired by:
GUROWITZ, E. 2012. Positioning Products and Services Accurately. Gurowitz.com [Windermere Associates Buying Hierarchy].
ROGERS, E. M. 1962. Diffusion of Innovations, Free Press of Glencoe.
CHRISTENSEN, C. M. 1997. Patterns in the Evolution of Product Competition. European Management Journal, 15, 117-127.
CUMMINGS, M. S. 1997. Tesla is Not Just a Smarttcar Company: It's a Global Energy Company. Available: http://ino.ai/tesla

Figure 71: Market Strategy Buying Preferences Dimension Matrix

6.9 Conceptual Strategy Options Dimension Matrix

This is the first matrix within the “Conceptual Innovation Strategy” category of Dimensional Matrixes, with the four quadrants as conceptual options how to approach the four identified “Market Innovation Strategy: Options, Archetype Profiles and Buying Preferences”.

For this, two predominant strategy models were selected from the literature study to build this specific SCINav Systems Model dimension matrix:

- The **Strategy Approach Palette** from Boston Consulting Group (BCG), (Reeves et al., 2012)
- The **Landscape of Strategy Concepts** from “PwC Strategy&” consulting firm, (Mainardi and Kleiner, 2010)

The selection, alignment and synthesis of the four “Conceptual Innovation Strategy Formulation Options” is available in Table 16. Supporting theories with correlating options from Prof Ansoff (Ansoff, 1957) and Prof Porter (Porter, 1980b) were also included in the table to provide more detail what these options represent.

The columns in Table 16 (see next page) represents the SCINav Systems Model’s “Contextual Innovation Lifecycle Spatial Quadrants”, as illustrated in Figure 72.

Table 16: Conceptual Strategy Options Dimension Matrix Dataset

Literature	Renewal	Positioning	Shaping	Adapting	Classic
Boston Consulting Group (BCG) BCG Strategy Approach Palette 5 **Strategy Archetypes to Approach Industry Segments.** 2012 Martin Reeves Knut Haanaes Janmejaya Sinha	**Renewal** - Be Viable. - Anticipate, Economize and Grow. - Restricted Financing. - Harsh Industry. - Limited Resources.	**Visionary** - Be First in the Market. - Envisage, Build and Persist. - High Growth Potential. - White Space. - Limited Regulation. - Predictable Industry. - Can Change It.	**Shaping** - Be the Orchestrator. - Engage, Orchestrate and Evolve. - Fragmented Market. - Shapeable Regulation. - Unpredictable Industry. - Can Change It.	**Adaptive** - Be Fast. - Differentiate, Select and Scale Up. - Volatile Growth. - Limited Concentration. - Young Industry. - High Technology Change. - Unpredictable Industry. - Restricted Infuence.	**Classical** - Be Big. - Analyze, Plan and Execute. - Low Growth. - High Concentration. - Mature Industries. - Stable Regulation. - Predictable Industry. - Restricted Unfluence.
PwC Strategy& PwC Landscape of Strategy Concepts **Strategy Approach Concepts.** 2010 Cesare Mainardi Art Kleiner	**Concentration** - Focus on Current Core Business. - Private Equity. - Winners Make the Most of Current Core Strengths and Businesses. - Core Market. - Resource-Based View.	**Position** - Exploit, Create and Hold a Distinctive Position. - Market-backed Strategy. - Winners Select Favorable Markets as Defined by External Forces. - New Market. - Position-Based View.	**Execution** - Align People and Processes for Operational Excellence. - Quality Movement. - Winners Gain Advantage Through Operational Excellence. - Core Market. - Resource-Based.	**Adaptation** - Act Quickly and Creatively in Response to Events. - Organization Learning. - Winners Develop an Overall Direction Through Experimentation and Rapid Change. - New Market. - Position-Based View.	
Harvard Business Review Stategies for Diversification **Ansoff Product Market Growth Strategy Matrix** 1957 Prof Igor Ansoff	**Diversification** - New Product - New Market	**Product Development** - New Product - Existing Market	**Market Development** - Same Product - New Market - Demographics - Globalization	**Market Penetration** - Same Product - Same Market - Lowest Cost	
Harvard Business Review Five Competitive Forces That Shape Strategy **Porter 3 Generic Competitive Strategies** 1980 Prof Michael Porter	**Differentiation Leadership** - Very Different Technologies from Rest of Industry. - Technology Differentiation - Highest Cost	**Differentiation Focus** Very Unique Products from Rest of Industry. - Product Differentiation - High Cost	**Cost Leadership** - Efficiency and Scale to Reduce Product Costs and Increase Market Share. - Lowest Cost	**Cost Focus** - Serving a Selective Group of Users Extremely Well. - Product Differentiation - Low Cost	**Stuck in the Middle** - Marginal Lower Cost - Incremental Product Differentiation
CycleFund Strategic Innovation and Evolution Framework **Strategic Innovation Positioning Matrix** 2016 Dr Mark Cummings	**Test Market** - Innovative Market	**Luxury Market** - High Cost Premium Products	**Mass Market** - Low Cost Products	**Luxury Mass Market** - Low Cost Premium Products	

Regarding the column titled “Classic” in Table 16 (which is not on the matrix structure in Figure 72), it is considered for Business Units that find themselves in a complete “commodity” market and where “Market Advocates” (see section 6.13) are fighting price battles the “Classic” way, which is outside the scope of this research thesis.

The fully qualified name for this SCINav Systems Model’s Dimensional Matrix is titled “**SCINav Systems Model’s Conceptual Innovation Strategy Formulation Options Dimension Matrix**”, as shown in Figure 72.

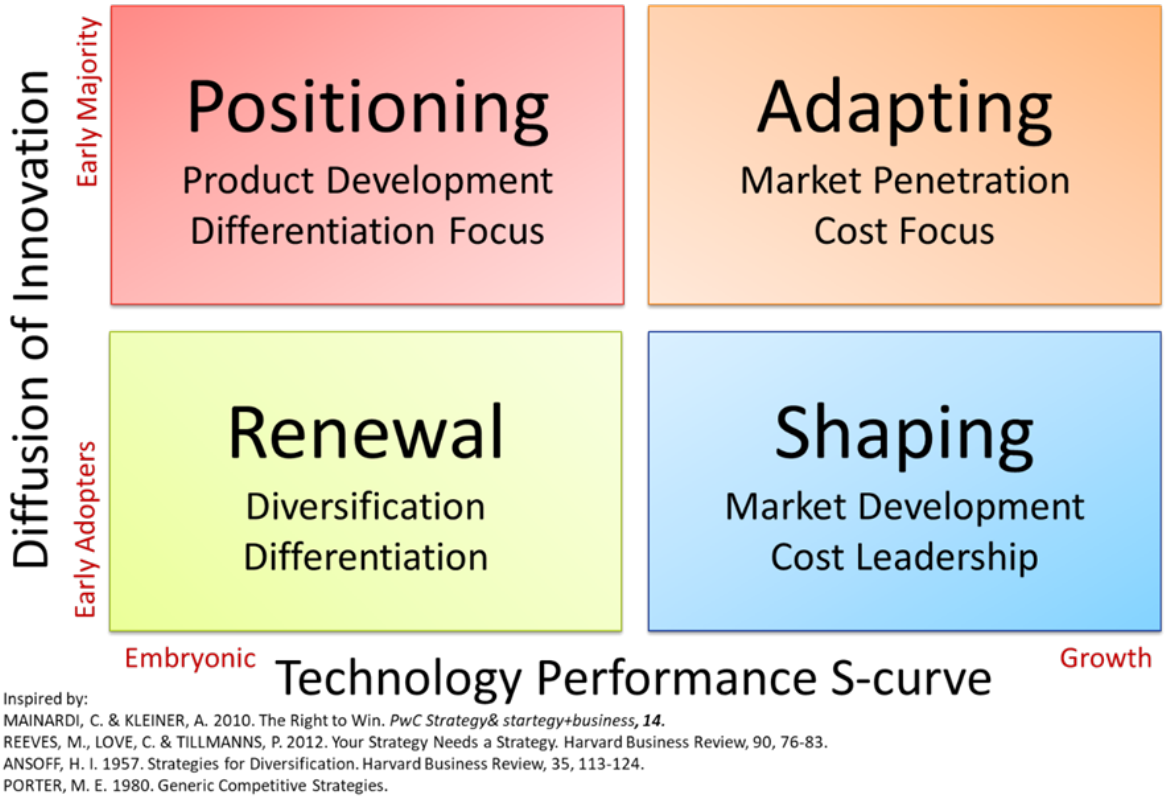


Figure 72: Conceptual Strategy Options Dimension Matrix

6.10 Conceptual Strategy Archetypes Dimension Matrix

The "**SCINav Systems Model's Conceptual Innovation Strategy Formulation Archetype Roles Dimension Matrix**" (the fully qualified name) was developed via the curation, correlation, integration and synthesis of various frameworks, models and theories that focused on the same theme, as outlined in Table 17.

(See Table 17 on the next page.)

Table 17: Conceptual Strategy Archetypes Dataset

Literature	Market Forecasters as Visionaries	Market Spotters as Pioneers	Market Explorers as Sculptors	Market Readers as Followers	Other
McKinsey & Company The Evolution of Strategic Management. **Three Ways Companies Formulate Strategy** 1978 Frederick W. Gluck Stephen P. Kaufman A. Steven Walleck		**Strategic Thinking** - Creative, entrepreneurial insight into a company, its industry, and its environment.	**Formal Strategic Planning** - Systematic & Comprehensive	**Opportunistic Strategic Decision Making** - Effective responses to unexpected opportunities and problems	
PwC Strategy& The Customer Connection **Innovation Strategy Profiles** 2007 Barry Jaruzelski Kevin Dehoff	**Technology Drivers** - These companies follow the direction suggested by their technological capabilities, leveraging their investment in R&D to drive breakthrough innovation.		**Need Seekers** - These companies actively engage current and potential customers to shape new products, services, and processes; they strive to be first to market with those products.	**Market Readers** - These companies watch their markets carefully, but they maintain a more cautious approach, focusing largely on creating value through incremental change.	
Harvard Business Review (HBR) Stategies for Diversification **Ansoff Product Market Growth Strategy Matrix** 1957 Prof Igor Ansoff	**Diversification** - New Product - New Market	**Product Development** - New Product - Existing Market	**Market Development** - Same Product - New Market - Demographics - Globalization	**Market Penetration** - Same Product - Same Market - Lowest Cost	
Bonston Consulting Group (BCG) The Product Portfolio **BCG Henderson Growth Share Matrix** 1970 Bruce Henderson	**Dogs** - Low Growth - Low Market Share	**Star** - High Growth - High Market Share	**Question** - High Growth - Low Market Share - Low Profit Margins	**Cow** - Low Growth - High Market Share - High Profit Margins	
McKinsey & Company The Evolution of Strategic Management **McKinsey Gluck Nine Box Matrix** 1978 Frederick Gluck		**Invest Selective** Drive Earnings	**Invest Selective** Drive Growth	**Invest Fully** Drive Growth	**Harvest & Divest**
Harvard Business Review (HBR) Five Competitive Forces That Shape Strategy **Porter 3 Generic Competitive Strategies** 1980 Prof Michael Porter	**Differentiation Leadership** - Very Different Technologies from Rest of Industry. - Technology Differentiation - Highest Cost	**Differentiation Focus** Very Unique Products from Rest of Industry. - Product Differentiation - High Cost	**Cost Leadership** - Efficiency and Scale to Reduce Product Costs and Increase Market Share. - Lowest Cost	**Cost Focus** - Serving a Selective Group of Users Extremely Well. - Product Differentiation - Low Cost	**Stuck in the Middle** - Marginal Lower Cost - Incremental Product Differentiation
Harvard Business Review (HBR) Managing Your Innovation Portfolio **The Innovation Ambition Matrix** 2012 Bansi Nagji Geoff Tuff	**Transform** - Breakthrough Inventions	**Build** - Breakthrough Technologies	**Adjacent** - Expand to New Businesses	**Core** - Optimize Existing Offerings	

The resulting “Conceptual Innovation Strategy Formulation Archetypes” described each role’s interactive relationship with the market, as a guide for conceptual innovation strategy development.

Each archetype role defines what approach will need to be assumed to identify specific opportunities within the market for new innovation initiatives. Thus, there is also a strong correlation with the required market intelligence, to develop the necessary insights and foresights for a conceptual innovation strategy within each of the “Contextual Innovation Lifecycle Spatial Quadrants”.

Note: The “Conceptual Innovation Strategy Formulation Archetype Roles” are about identifying opportunities, either within existing markets or to create new markets.

The mapping of the “**Conceptual Innovation Strategy Formulation Archetypes**” onto a SCINav Systems Model Dimensional Matrix is illustrated in Figure 73.

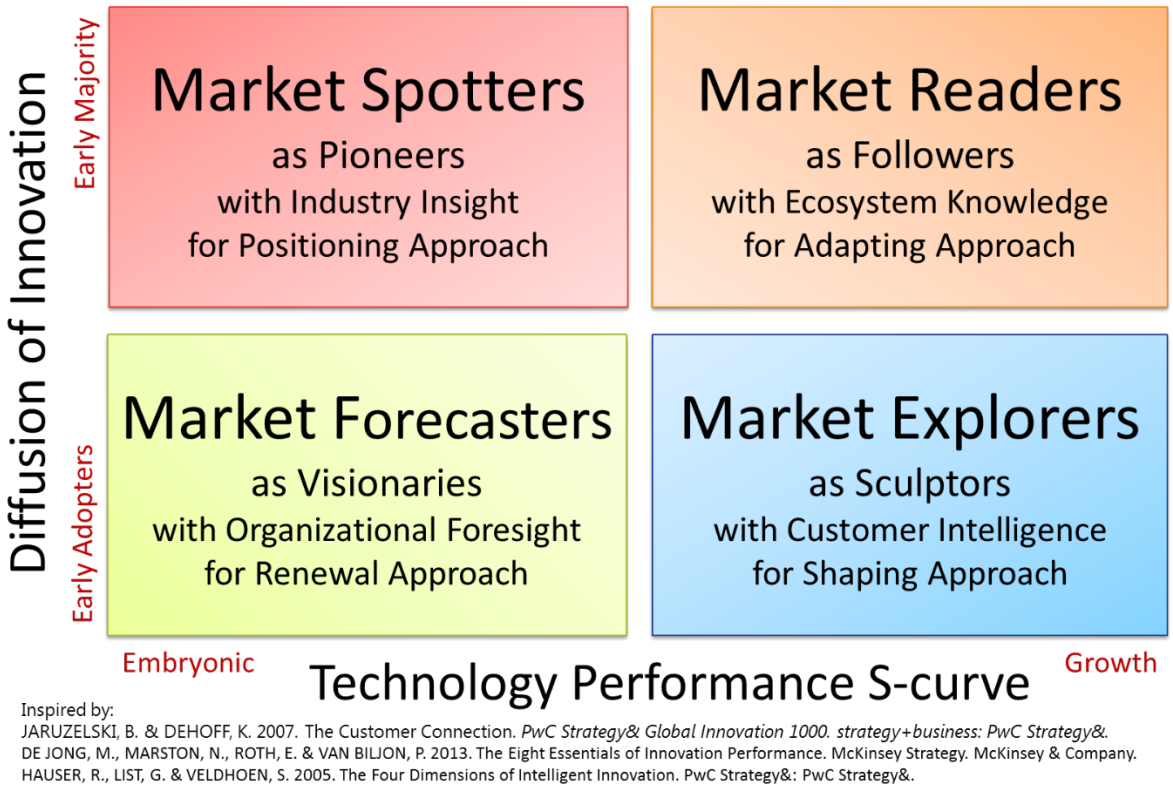


Figure 73: Conceptual Strategy Archetypes Dimension Matrix

6.11 Conceptual Strategy Anticipated Outcomes Dimension Matrix

With the development of an innovation strategy it is also very important to articulate to all corporate stakeholder (such as customers, employees and shareholders), who all have their own expectations about innovation, exactly what each innovation strategy can deliver in terms of an outcome.

The use of this specific Dimensional Matrix is two-fold:

- Assist corporate innovation strategists to set expectations for specific innovation initiatives and projects within each “Contextual Innovation Lifecycle Spatial Quadrant”.

- As a planning tool, to align shareholders and corporate executives’ perceptions to what will be required to deliver higher profit margins, revenue growth or both (these concepts will be discussed as “Tactical Innovation Strategy Expected Outcomes” in section 6.14).

This research postulates there are four conceptual outcomes as specific deliverable future "advantages" an innovation strategy, depending on the "Contextual Innovation Lifecycle Spatial Quadrant" the new innovation (as a business model, technology, product or service) is positioned at:

1. **Differentiating Advantage**: This is usually at a research laboratory where the strategic outcome should be to bring forth significant different and better technologies (or business models), which can be used to create new business units or product lines. This can be a **Corporate R&D Innovation Strategy**.

2. **Strategic Advantage**: The innovation strategy for this quadrant is usually at the corporate or startup level where a new differentiating technology needs to be integrated into a complete system as a solution to deliver value for a new target market. This can be a **Corporate Technology Innovation Strategy**.

3. **Disruptive Advantage**: This is also at the corporate or startup level, where new market opportunities and matching business models are defined. This can be a **Corporate Business Model Innovation Strategy**.

4. **Competitive Advantage**: This innovation strategy is at the business unit level where the "Innovation Chasm" has been crossed, the "Dynamics of Innovation" changed where process and efficiency innovation became more important than product innovation, and the "Early Majority" consumer community started to adopt the new technological innovations. This can be a **Business Unit Innovation Strategy**.

Discovery: The advantage with the modular 2 x 2 array design of the SCINav Systems Model's Dimensional Matrixes is that the four "Contextual Innovation Lifecycle Spatial Quadrants" allow for the development of four separate innovation strategies. This provides significant flexibility where research laboratories, corporate engineering departments, startups or business units can create their own innovation strategies. When applicable, the challenge will be to keep it aligned with an overarching corporate innovation strategy.

The mapping of these "**SCINav Systems Model's Conceptual Innovation Strategy Formulation Anticipated Outcomes Dimension Matrix**" (as the fully qualified name) is available in Figure 74.

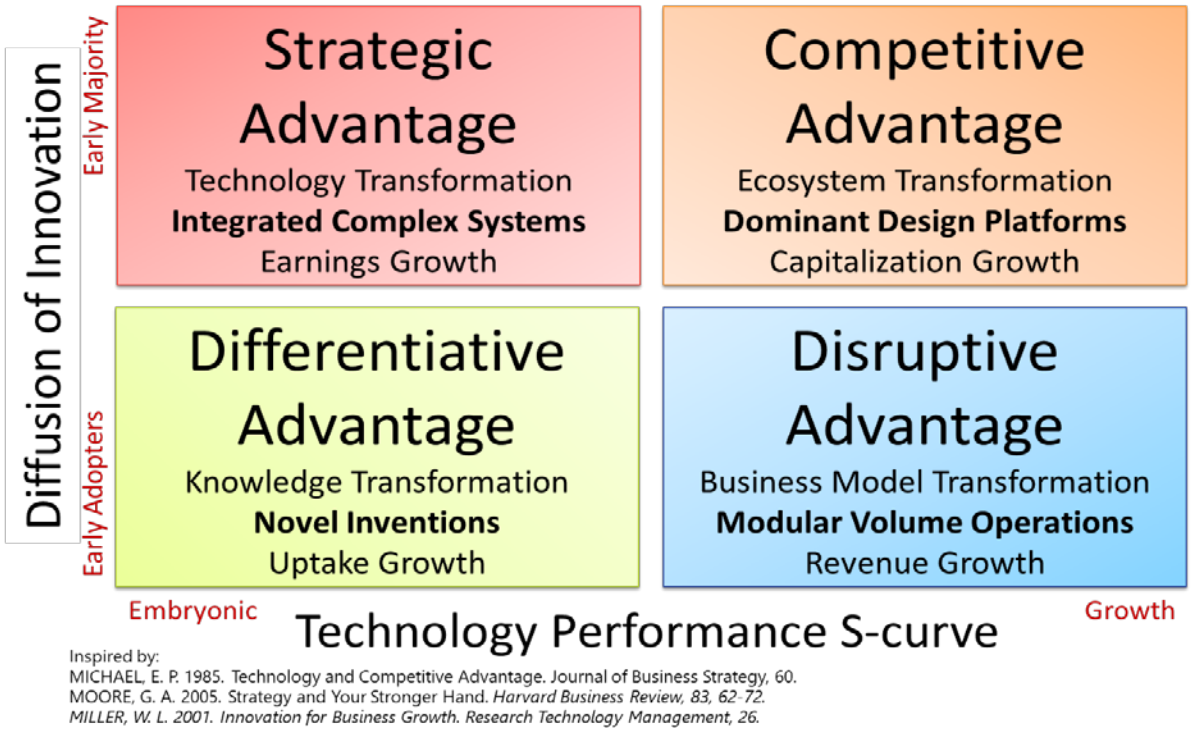


Figure 74: Conceptual Strategy Anticipated Outcomes Dimension Matrix

6.12 Tactical Strategy Options Dimension Matrix

This is the first “Dimensional Matrix” that is within the “Tactical Innovation Strategy” category of the SCINav Systems Model’s set of Dimensional Matrixes.

This research considers the extremely well known “Three Horizons Model” (Baghai et al., 1999) (as discussed in Chapter 4) as the foundation to define a tactical approach for an innovation strategy, similarly as many other researchers has done (Nagji and Tuff, 2012) (Moore, 2007) (Kastelle, 2010).

Note: In principle the “Three Horizons Model” assists innovation strategists to focus their attention to three specific time frame zones (or horizons) as: near-term, medium-term or long-term planning.

The adoption of the “Three Horizons” theory and how it correlates with other supporting theories has been curated and synthesized in Table 18.

(See Table 18 on the next page.)

Table 18: Tactical Strategy Options Dataset

Literature	Horizon 3	Horizon 2	Horizon 1	Horizon 0
Orion The Alchemy Of Growth **Three Horizons Model** 1999 Mehrdad Baghai Stephen Coley David White	**Horizon 3** - Create Viable Options. - Work in White Space to Build New Businesses. - Invest in Diversity Through Small Acquisitions. - Drive White Space Business Excellence.	**Horizon 2** - Build Emerging Businesses. - Invest in Markets Not Currently Served. - M&A to Consolidate and Diversify . - Drive Value Proposition Excellence.	**Horizon 1** - Extend Core Business. - Shift Resources to Growth Opportunities. - Pursue Fill-in Acquisitions. - Drive Operational Excellence.	**Horizon 0** - Defend Core Business. - Entrench Resources. - Divest Slow Growth Businesses. - Drive Commercial Excellence.
Harvard Business Review (HBR) Managing Your Innovation Portfolio **The Innovation Ambition Matrix** 2012 Bansi Nagji Geoff Tuff	**Transform** - Breakthrough Inventions	**Build** - Breakthrough Technologies	**Adjacent** - Expand to New Businesses	**Core** - Optimize Existing Offerings
MIT Sloan Man Review Harnessing the Secret Structure of Innovation **Information Enabled Innovation Strategies** 2017 Martin Reeves Thomas Fink, et al.	**Random Strategy**	**Patient Strategy**	**Impatient Strategy**	**Adaptive Strategy**
McKinsey & Company The Roots of Organic Growth **Growth (Approach) Profiles** 2017 Kabir Ahuja Liz Hilton Segel Jesko Perrey		**Creators** - Build value by developing new products, services, or business models.	**Investors** - Understand the sources of growth from existing products and services and squeeze funds from a variety of areas, such as low-growth initiatives or unproductive costs, to reallocate capital and double down on winners.	**Performers** -Grow by constantly optimizing core commercial capabilities in sales, pricing, and marketing.
Boston Consulting Group (BCG) Driving Growth with Business Model Innovation **Four Approaches to Business Model Innovation** 2014 Zhenya Lindgardt Margaret Ayers	**Reinventors** - Approach is deployed in light of a fundamental industry challenge, in which a business model is deteriorating slowly and growth prospects are uncertain. - Company must reinvent its customer-value proposition and realign its operations to profitably deliver on the new superior offering. - Defend external thread. - Transform the Core.	**Adventurers** - Approach aggressively expands the footprint of a business by exploring or venturing into new or adjacent territories. - Understand company's competitive advantage to bet on novel applications and succeed in new markets. - Proactively Disrupt. - Expand to Adjacent.	**Mavericks** - Approach deploys business model innovation to scale up a potentially more successful core business. - Employ core advantage to revolutionize industry and set new standards. - Continually evolve the competitive advantage of the business to drive growth. - Proactively Disrupt. - Transform the Core.	**Adapters** - Approach is used when the current core business, even if reinvented, is unlikely to combat fundamental disruption. - Explore adjacent businesses or markets, may exit their core business entirely. - Build an innovation engine to persistently drive experimentation to find a "**new core**". - Defend external thread. - Expand to Adjacent.
MIT Sloan Man Review Four Models of Corporate Entrepreneurship 2007 Robert Wolcott Michael Lippitz	**Producer** - Pursue corporate entrepreneurship by establishing and supporting formal organizations with significant dedicated funds or active influence over business-unit funding. - Designated Group. - Dedicated Funding.	**Enabler** - Dedicating resources and processes enables teams to pursue opportunities on their own insofar as they fit the organization's strategic frame. - Diffused Through Org. - Dedicated Funding.	**Advocate** - Company assigns organizational ownership for the creation of new businesses while intentionally providing only modest budgets to the core group. - Designated Group. - Ad Hoc Funding.	**Opportunists** - Without any designated organizational ownership or resources, corporate entrepreneurship proceeds. - Creating new businesses often in spite of the corporation. - Diffused Through Org. - Ad Hoc Funding.

The mapping of the “Three Horizons” model from Table 18 onto a SCINav Systems Model Dimension Matrix delivered the “**SCINav Systems Model’s Tactical Innovation Strategy Formulation Options Dimension Matrix**” (as the fully qualified name), which is available in Figure 75.

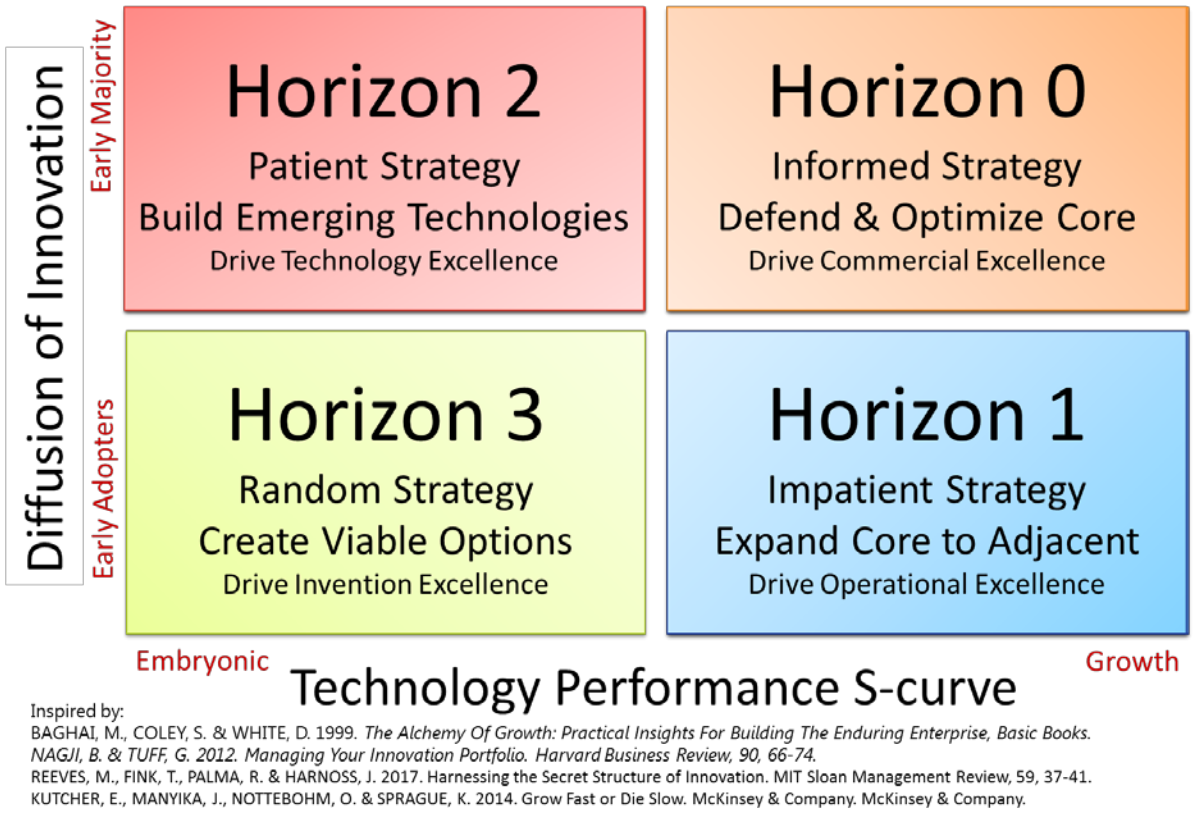


Figure 75: Tactical Strategy Options Dimension Matrix

6.13 Tactical Strategy Archetypes Dimension Matrix

The “Tactical Innovation Strategy Formulation Archetype Roles Dimension Matrix” is the primary default flagship matrix for the SCINav Systems Model since it:

1. Provides a tactical guide and naming convention to the roles corporate executives should assume during the development of a corporate innovation strategy.

2. Is the largest (expanded) matrix as a 4 x 4 indexed array of “Innovation Strategy Lifecycle Contextual Spatial Quadrants”.

The synthesis (accumulation, curation, categorization, integration and correlation) of theories related to the Tactical Strategic Diffusion of Innovation is presented in Table 19, which lead to the discovery and identification of seven archetype roles corporate executives can assume during the formulation of a corporate innovation strategy.

(See Table 19 on the next page.)

Table 19: Tactical Strategy Archetypes Dimension Matrix Dataset

Literature	IP Inventors	Technology Builders	Business Disruptors	Industry Followers	Market Advocates
PwC Strategy& The Customer Connection **Innovation Strategy Profiles** 2007 Barry Jaruzelski Kevin Dehoff	**Technology Drivers** - These companies follow the direction suggested by their technological capabilities, leveraging their investment in R&D to drive breakthrough innovation.	**Need Seekers** - These companies actively engage current and potential customers to shape new products, services, and processes; they strive to be first to market with those products.	**Need Seekers** - These companies actively engage current and potential customers to shape new products, services, and processes; they strive to be first to market with those products.	**Market Readers** - These companies watch their markets carefully, but they maintain a more cautious approach, focusing largely on creating value through incremental change.	
McKinsey & Company The Eight Essentials of Innovation Performance **Type of Innovators** 2013 Marc de Jong Nathan Marston Erik Roth Peet van Biljon	**Experimenters** - Those who are willing to explore a high number of avenues within their broad chosen areas.	**Visionaries** - Companies driven by a strong leader who sees the paradigm shift earlier than anyone else. Such organizations deliver innovation to set new rules of the game (PwC Strategy& - Supercompetitors).	**Discoverers** - Organizations capable of identifying offerings to fulfil hidden customer needs.	**Fast Followers** - Companies that master the ability to out-deliver innovation to market, even if they are not the first to come up with the idea.	**Strategists** - Companies that ensure they are optimally positioned in the right place, at the right time, with the right portfolio.
LinkedIn Pulse The Four **Roles** of the **Strategy Officer** 2018 Christian Rangen	**Scout** - The Scout is a master of seeing early trends but struggles to convert into internal action. - Responsible for early outside development of new ideas and new networks. - Attending conferences and events outside his own industry domain. - External Orientation. - Low Impact.	**Influencer** - The influencer is a master of conversations. - Cares deeply about creating shared understanding across complex issues, often simplifying the complex into easy-to-grasp key issues. - Internal Orientation. - High Impact.	**Big Systems Thinker** - The Big Systems Thinker is a master at sensing the future. - Focus far outside the home organization. - Spends time on external partnerships, alliances, mapping out M&A prospects and closing deals. - External Orientation. - High Impact.	**Analyst** - The analyst is a master of getting the current facts and numbers right. Analyst is the brainy, educated, numbers person. - Driven by getting tangible facts, allowing for conclusions and clear recommendations. - Internal Orientation. - Low Impact.	
McKinsey & Company Rethinking the **Role** of the Strategist **Five Chief Strategist Officer Archetypes** 2014 Michael Birshan Emma Gibbs Kurt Strovink	**Visionary** (14%) - Use big data to create unique perspectives on where the next growth pocket will come from and, specifically, on what will be needed to serve it. - Scanning the landscape for trends and shocks that may create opportunities or risks for the business.	**Surveyor** (14%) - Proactively shape the public debate for their industries, informing, monitoring, and responding to opportunities and risks that arise from external stakeholders. - Spotting potential disruptions and quickly advising their businesses on the impact and opportunity such shifts could produce. - Focus on the furthest horizon. - Greatest potential to change the way an industry operates.	**Architect** (40%) - Driving mergers and acquisitions, divestitures, joint ventures, and other opportunities. - Using fact-based analysis to spot industry shifts and to understand their own companies' sources of competitive advantage as a foundation for clear, differentiated strategies. - Organic growth is a core concern, and driving business performance to meet tough organic targets is a critical part of the architect's role.	**Fund Manager** (12%) - Help the company's executive committee make a series of unfamiliar and uncomfortable choices to reallocate resources away from traditional cash cows and into a disruptive technology that represents the future of the business. - Rely on robust analytics that underpin decisions to rebalance the portfolio.	**Mobilizer** (20%) - Make sure that strategy is synthesized in a concise and easy-to-communicate way that organizations can seamlessly translate into action. - Developing the strategic muscle of their companies, building capabilities, and delivering special projects. Mobilizers play critical leadership roles in company-wide efforts.

Continue on next page …

Literature	IP Inventors	Technology Builders	Business Disruptors	Industry Followers	Market Advocates
MIT Sloan Man Review Era of Open Innovation **Chesbrough 4 Innovation Generation Modes** 2003 Henry Chesbrough	**Innovation Merchants** - New IP Generation for Commercial Use.	**Inovation Explorers** - Discovery Research for Benefactors.	**Innovation Architects** - Systems of Complex Technologies.		**Innovation Missionaries** - Philantrophic Community-Based Innovation.
McKinsey & Company The Roots of Organic Growth **Growth (Approach) Profiles** 2017 Kabir Ahuja Liz Hilton Segel Jesko Perrey		**Creators** - Build value by developing new products, services, or business models.	**Investors** - Understand the sources of growth from existing products and services and squeeze funds from a variety of areas, such as low-growth initiatives or unproductive costs, to reallocate capital and double down on winners.	**Performers** -Grow by constantly optimizing core commercial capabilities in sales, pricing, and marketing.	
Boston Consulting Group Driving Growth with Business Model Innovation **Four Approaches to Business Model Innovation** 2014 Zhenya Lindgardt Margaret Ayers	**Reinventors** - Approach is deployed in light of a fundamental industry challenge, in which a business model is deteriorating slowly and growth prospects are uncertain. - Company must reinvent its customer-value proposition and realign its operations to profitably deliver on the new superior offering. - Defend external thread. - Transform the Core.	**Adventurers** - Approach aggressively expands the footprint of a business by exploring or venturing into new or adjacent territories. - Understand company's competitive advantage to bet on novel applications of that advantage succeed in new markets. - Proactively Disrupt. - Expand to Adjacent.	**Mavericks** - Approach deploys business model innovation to scale up a potentially more successful core business. - Employ core advantage to revolutionize industry and set new standards. - Continually evolve the competitive advantage of the business to drive growth. - Proactively Disrupt. - Transform the Core.	**Adapters** - Approach is used when the current core business, even if reinvented, is unlikely to combat fundamental disruption. - Explore adjacent businesses or markets, may exit their core business entirely. - Build an innovation engine to persistently drive experimentation to find a "**new core**". - Defend external thread. - Expand to Adjacent.	
MIT Sloan Man Review Four Models of Corporate Entrepreneurship 2007 Robert Wolcott Michael Lippitz	**Producer** - Pursue corporate entrepreneurship by establishing and supporting formal organizations with significant dedicated funds or active influence over business-unit funding. - Designated Group. - Dedicated Funding.	**Enabler** - Dedicating resources and processes enables teams to pursue opportunities on their own insofar as they fit the organization's strategic frame. - Diffused Through Org. - Dedicated Funding.	**Advocate** - Company assigns organizational ownership for the creation of new businesses while intentionally providing only modest budgets to the core group. - Designated Group. - Ad Hoc Funding.	**Opportunists** - Without any designated organizational ownership or resources, corporate entrepreneurship proceeds. - Creating new businesses often in spite of the corporation. - Diffused Through Org. - Ad Hoc Funding.	

Note: While the "**Conceptual** Innovation Strategy Archetype Roles" were more concerned with innovation intelligence to "**explore**" future business opportunities for new technologies or new markets, the "**Tactical** Innovation Strategy Archetype Roles" describe how to "**exploit**" the identified market opportunities.

The mapping of the data from Table 19 onto a SCINav Systems Model Dimension Matrix is available in Figure 76 and Figure 77, which then delivered the "**SCINav Systems Model's Tactical Innovation Strategy Formulation Archetype Roles Dimension Matrix**" (as the fully qualified name).

The larger SCINav Systems Model Dimensional Matrix configuration to include the extended "Tactical Innovation Strategy Formulation Archetypes" is illustrated in Figure 78, with the following "extended quadrant archetype roles":

1. Each tactical innovation strategy archetype role represents a tactical responsibility each archetype should accept within each "Innovation Lifecycle Spatial Quadrant".

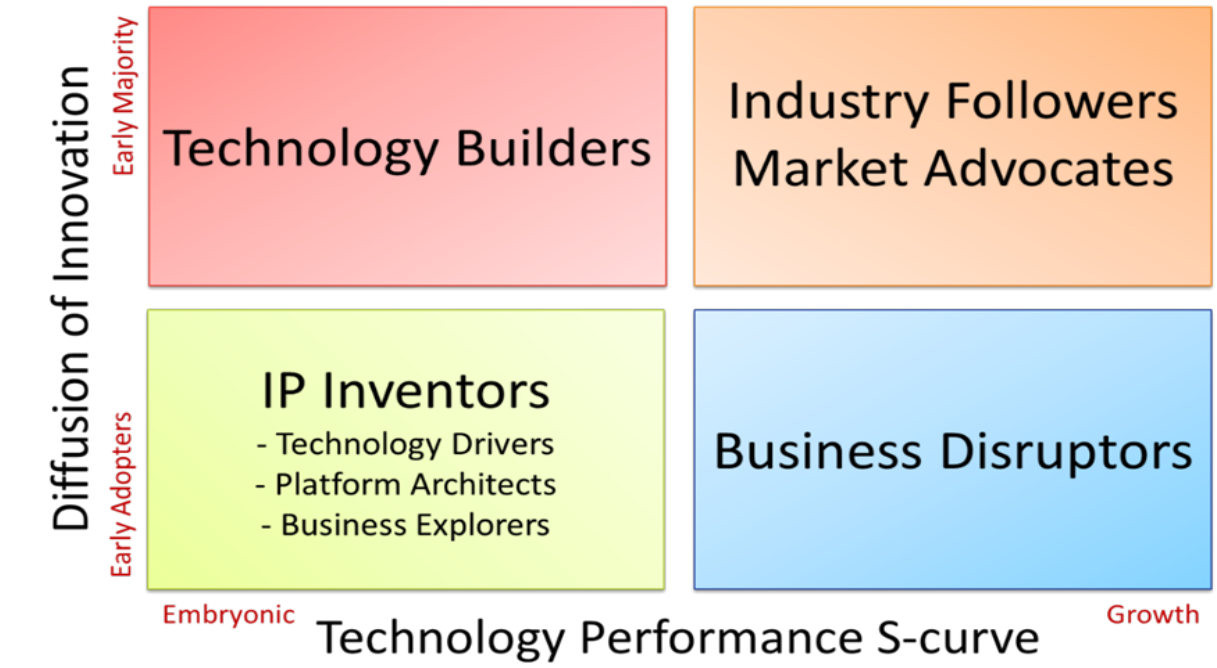
2. "**IP Inventors**" in Figure 76 represents three other innovation strategy approach archetypes:

3. "**Technology Drivers**" transfer new knowledge as technology inventions to Technology Builders.

4. "**Platform Architects**" transfer new knowledge as platform inventions directly to Industry Followers to integrate new technology transformed into products (via Technology Builders) and new business models transformed into disrupted markets (via Business Disrupters).

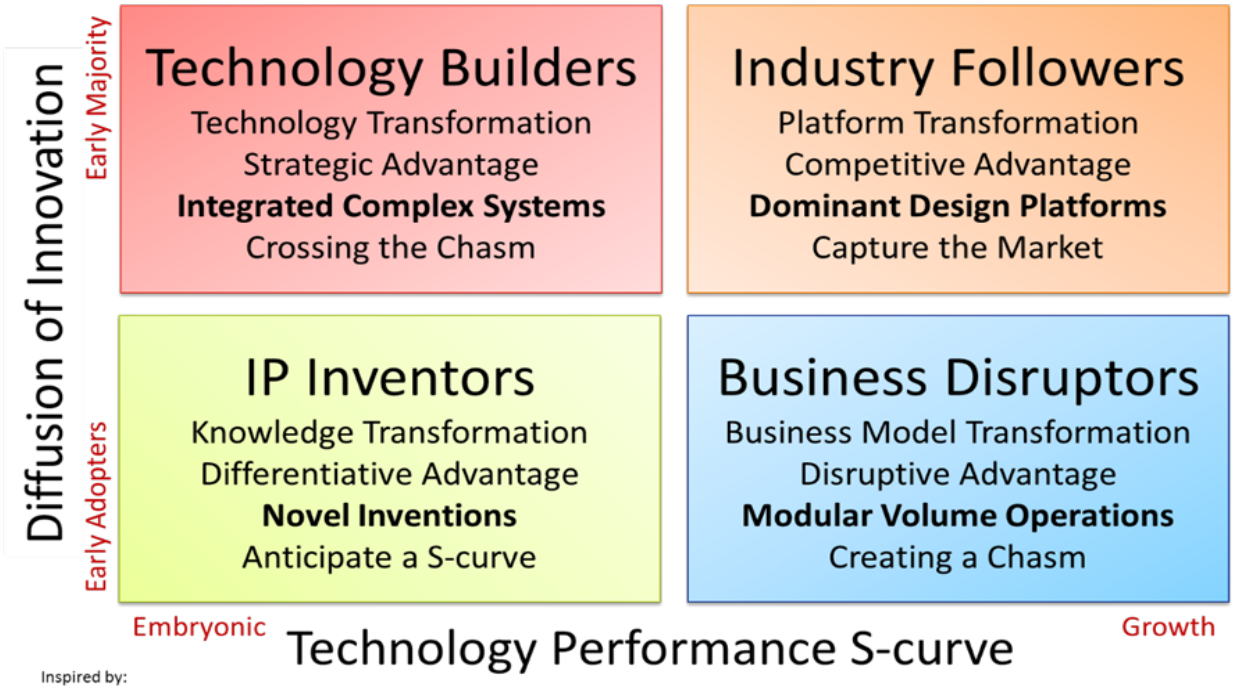
5. "**Business Explorers**" transfer new knowledge as business model inventions to Business Disruptors.

6. "**Market Advocates**" is a natural extension of Industry Followers when new "Dominant Design" business platforms become stable and products becomes commodities within their markets. In Figure 78 the SCINav Systems Model predicts that the "Market Advocate" role should be activated when the "Late Majority" ("Diffusion of Innovation Adopter Category") becomes the primary customer community.



Inspired by:
JARUZELSKI, B. & DEHOFF, K. 2007. The Customer Connection. *PwC Strategy&.*

Figure 76: Tactical Strategy Archetypes Dimension Matrix (Basic)



Inspired by:
JARUZELSKI, B. & DEHOFF, K. 2007. The Customer Connection. *PwC Strategy&.*
MOORE, G. A. 2005. Strategy and Your Stronger Hand. Harvard Business Review, 83, 62-72.
MICHAEL, E. P. 1985. Technology and Competitive Advantage. Journal of Business Strategy, 60.
MILLER, W. L. 2001. Innovation for Business Growth. Research Technology Management, 26.
CHRISTENSEN, C. M., MUSSO, C. S. & ANTHONY, S. D. 2004. Maximizing the Returns From Research. Research Technology Management, 12.
CHRISTENSEN, C. M., RAYNOR, M. & MCDONALD, R. 2015. What is Disruptive Innovation? Harvard Business Review, 44.
MICHAEL, E. P. 1985. Technology and Competitive Advantage. Journal of Business Strategy, 60.

Figure 77: Tactical Strategy Archetypes Dimension Matrix (with Annotations)

Figure 78: Tactical Strategy Archetypes Dimension Matrix (Extended)

6.14 Tactical Strategy Expected Outcomes Dimension Matrix

Finally, the "Tactical Strategic Expected Outcomes Dimensional Matrix" assists corporate executives to define expected economic or social outcomes for the corporation, according to the set of contextual innovation strategy options that have been selected from using the SCINav Systems Model, which are as follows:

1. **Research Uptake Growth**: Since this quadrant represents R&D Innovation Strategy from Research Laboratories, the economic outcome to focus on here should be the uptake (or adoption) of research in the form of trade secrets, patents or publications.

2. **Earnings Growth**: The expected strategic economic outcome from this quadrant is to increase corporate earnings (or profit margins) with the introduction of new products or services in new markets where there is very limited competition or alternatives. (Bouwer, 2019)

3. **Revenue Growth**: This expected economic outcome can best be accomplished with a disruptive business model that can attract a new market segment and scale very fast, as from a network effect with digital platforms.

4. **Market Capitalization Growth**: With this quadrant a steady growth of both revenue and earnings is most important to create a positive economic perception with shareholders and to sustain an acceptable Total Shareholder Return (TSR) percentage. (Bouwer, 2019).

The "**SCINav Systems Model's Tactical Innovation Strategy Formulation Expected Outcomes Dimension Matrix**" (as the fully qualified name) is illustrated in Figure 79.

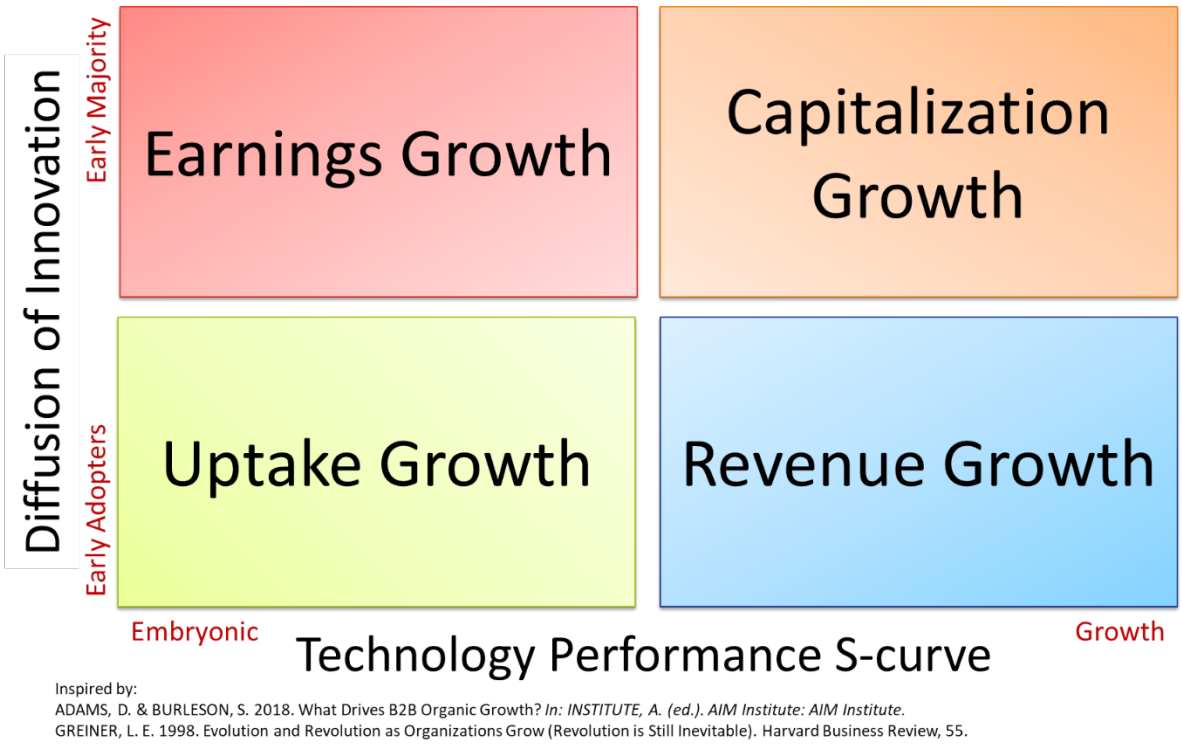


Figure 79: Tactical Strategy Expected Outcomes Dimension Matrix

6.15 Conclusion

The systems modelling (as design) of the "**SCINav Systems Model**" from a Systems Thinking approach was completed in this chapter.

The outcome was the "**Relational Multidimensional Vector of Matrixes**" structure that consists of "**Nine Dimensional Matrixes**" where each matrix has four color coded areas as "Contextual Innovation Lifecycle Spatial Quadrants" and three axial dimensions as demonstrated in the conceptual graphical representation in Figure 80..

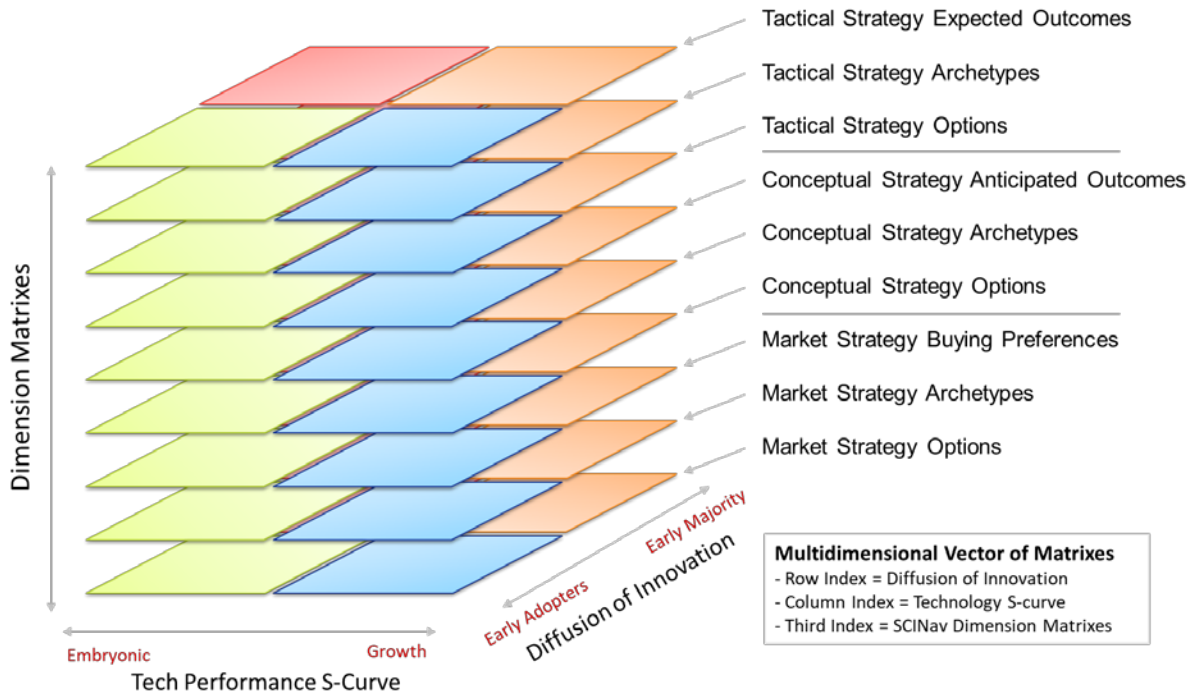


Figure 80: Relational Multidimensional Vector of Matrixes Structure

Each "Dimensional Matrix" represents a different view (or perspective) with the development of a Corporate Innovation Strategy. A summary of all "**Nine Relational Dimension Matrixes**" is available in Table 20 (see next page).

Each of the four colors (green, red, orange and blue) as a specific quadrant on each SCINav Systems Model's "Dimensional Matrix", represents a "Contextual Innovation Lifecycle Spatial Quadrant" that is associated with a set of "Innovation Formulation Strategy Theories" (which originated from the literature study) to serve as "Innovation Strategy Formulation Guidelines". The "Multidimensional Vector of Matrixes" is "Relational", because the same color on each "Dimensional Matrix" represents a correlating relationship with all the other "Dimensional Matrixes".

Figure 81 is the conceptual representation of the default "**SCINav Systems Model's Tactical Innovation Strategy Formulation Archetype Roles Dimension Matrix**" in its expanded version with the additional "Contextual Innovation Lifecycle Spatial Quadrants", only applicable to this "Dimensional Matrix".

Table 20: Summary of the Nine Relational Dimension Matrixes

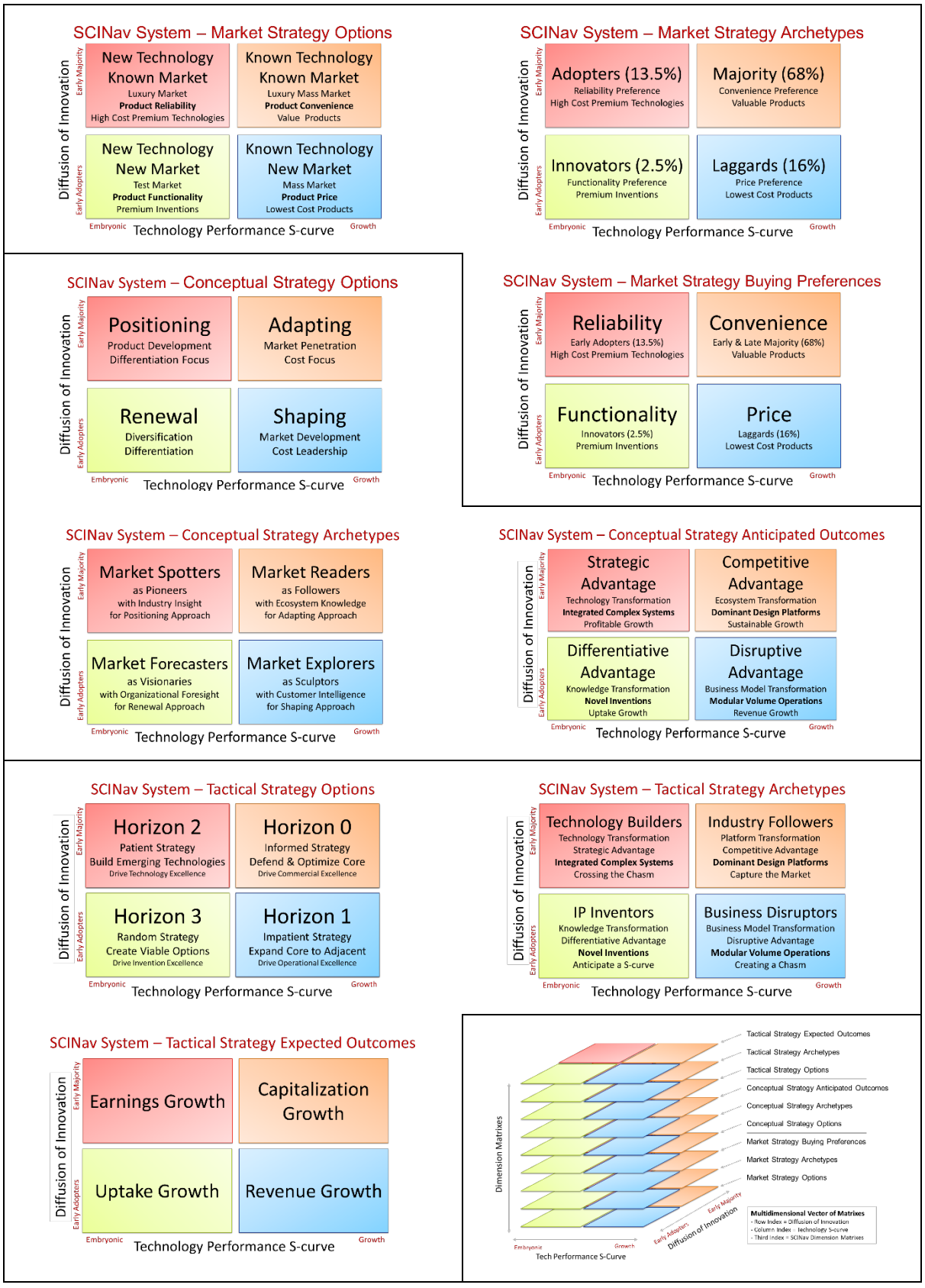


Figure 81: Tactical Innovation Strategy Archetype Roles Dimension Matrix

In this chapter the “SCINav Systems Model” was conceived as an elegant, novel, simple and pragmatic solution with the following characteristics:

1. It was designed as a “Dynamic Contextual Circumstance-Based Corporate Innovation Strategy Formulation Systems Model” to support corporate executives as a guide with their “Corporate Innovation Strategy Formulation” activities.

2. It includes the three “Components of Strategic Corporate Innovation” from Chapter 2: (1) market strategy, (2) conceptual strategy and (3) tactical strategy.

3. It was designed and developed as a Systems Model according to the principles of Systems Thinking as a Theory Building Methodology, as discussed in Chapter 3.

4. It integrates and correlates the aggregated and curated knowledge elements (as “Strategic Corporate Innovation Frameworks, Models or Theories”) that was identified in the literature study from Chapter 4, to support “Value Innovation” and the “Diffusion of Innovation” theoretical paradigms at the corporate level.

5. From the interdependent relationships among the “Nine Relational Dimension Matrixes” from the “SCINav Systems Model” structure, it is now possible to identify the causal dynamic interactions and to be able to make certain predictions to develop foresight for “Corporate Innovation Strategy Formulation”.

6. The advantage with the modular 2 x 2 array design of the SCINav Systems Model’s Dimensional Matrixes is that the four “Contextual Innovation Lifecycle Spatial Quadrants” allow for the development of four separate innovation strategies. This provides significant flexibility where research laboratories, corporate engineering departments, startups or business units can create their own innovation strategies. When applicable, the challenge will be to keep it aligned with an overarching corporate innovation strategy.

The next chapter will focus on the development of the “**System Dynamics**” among the four “Contextual Innovation Lifecycle Spatial Quadrants” of a “SCINav Systems Model Dimension Matrix”, where each quadrant represents a different state (or circumstance) of the market and technology.

CHAPTER 7: SYSTEM DYNAMICS DEVELOPMENT

7.1 Introduction

With the design of the SCINav Systems Model Chapter 6, the SCINav Systems Model's "Nine Dimensional Matrixes", their "Relational Correlations" and each matrix's "Contextual Innovation Lifecycle Spatial Quadrants" were discussed in much detail to assists corporate executive to understand the specific attributes for each "Spatial Quadrant".

It became clear that corporate innovation (of technological products or business models) is dynamic and goes through various "Contextual Innovation Lifecycle Spatial Quadrants", which were identified and separated with four different colors.

This chapter will discuss the "Causal Dynamics" of the SCINav Systems Model: (1) which direction to "travel" towards the next "Contextual Innovation Lifecycle Spatial Quadrant" and (2) the conditions when an innovation effort will cross the "Spatial Quadrant Border Crossing Point" from one "Spatial Quadrant" to another.

Note: Discussing the system dynamics of the "SCINav Systems Model", the "Contextual Innovation Lifecycle Spatial Quadrants" will be referred to as "Spatial Quadrants" in short.

7.2 Overview

With the design of the SCINav Systems Model in Chapter 6, the following axial dimensions were used for each "Dimensional Matrix":

1. "Diffusion of Innovation" to customers and consumer community groups (Rogers, 1962).
2. Innovation Technology Performance Maturity S-Curve (Foster, 1986).

With the analytical development of the dynamic SCINav Systems Model, the "Technology Performance Maturity S-Curve" dimension will have to be replaced by a more dynamic model that is more focused on the development cycles of technology. For this purpose, this research will then replace the "Technology Maturity S-Curve" axial dimension with the "Dynamics of Innovation" (Utterback and Abernathy, 1975) theory as the X-axis for the SCINav Systems Model.

The following additional theories will also be discussed to provide more information on the "causal mechanics" of how the dynamics of the SCINav Systems Model functions:

1. Dominant Design (Abernathy and Utterback, 1978)
2. Gartner Hype Cycle (Fenn and Raskino, 2008)
3. Decoupling of Integrated Complex Systems (Christensen et al., 2004)
4. Innovation Strategy Switch Point (Reeves et al., 2017)

Note: Since all the quadrants with the same color are all interrelated, only one "Dimensional Matrix" needs to be discussed to illustrate the dynamics of the SCINav Systems Model. For this purpose, the default "**Tactical Innovation Strategy Formulation Archetype Roles Dimension Matrix**" will be used in this chapter.

7.3 Dynamics of Innovation

As previously stated, this chapter will use the "Dynamics of Innovation" (Utterback and Abernathy, 1975) (Utterback, 1994) theory as a means to represent the dynamic change of technology development against the "Diffusion of Innovation" as the means to eventually "sell" the technology as a product in the market, and thus create customers.

In principle, the “Dynamics of Innovation” theory identified three phases for an Innovation Lifecycle as follows:

- **Fluid Phase**: the rate of product, service or business model innovation is the highest with a lot of experimentation within a highly evolving industry.

- **Transition Phase**: rate of product innovation declines and the product design becomes an industry standard known as a Dominant Design (Abernathy and Utterback, 1978), while the rate of process innovation increases to develop core capabilities to drive down operational time and costs.

- **Specific Phase**: This is where any intensive high rates of innovation to develop core capabilities of any kind drop significantly as some cost-effective threshold has been reached. Only sustaining incremental improvement innovations will be worked on to ever so slightly increase; (1) process efficiency to reduce the value chain’s operating expenses or (2) product value to maintain sales, revenue and margins. In many cases this is when the business unit is considered to be a “Cash Cow” (Henderson, 1970).

According to Utterback and Abernathy, these different “Innovation Lifecycle Contextual Spaces” that correlate with “Innovation Market Segments” will require different “Dominant Competitive Innovation Strategies” (Utterback and Abernathy, 1975), which may be as follows:

1. Be first to the market with a new technically advanced product (or service) with exceptional performance characteristics, as in the case of “**Technology Builders**” applying “Breakthrough Innovation” from the SCINav Systems Model.

2. Not to be the first to place a new technically advanced product on the market, but to monitor the market to react and adapt quickly. Within the SCINav Systems Model these are the “**Industry Followers**” applying “Incremental Innovation”.

3. Deliberately enter the market late with simple and much less expensive products. These corporate innovation strategists are called SCINav Systems Model “**Business Disruptors**” applying “Disruptive Innovation”.

The integrated mapping of “Diffusion of Innovation” and “Dynamics of Innovation” on the same graph to illustrate the relative relationships was done in Figure 82. Observe the specific alignment of the phases and the position of the “Dominant Design” in relation to the other curves.

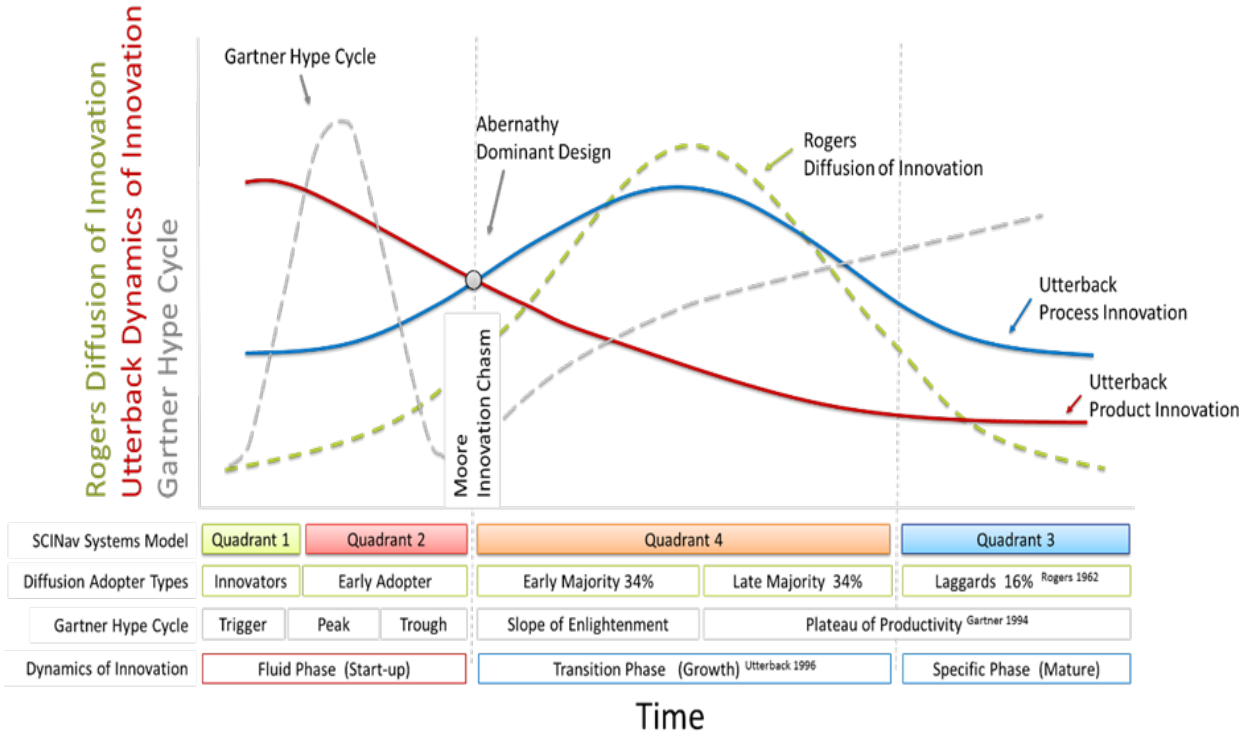


Figure 82: Conceptual Mapping of "Dynamics of Innovation" on "Diffusion of Innovation"

Inspired by: (Rogers, 1962) (Abernathy and Utterback, 1978) (Utterback, 1994) (Suárez and Utterback, 1995) (Fenn and Raskino, 2008)

Note: The integrated mapping illustrates that innovation is dynamic and propagates through different "Contextual Innovation Lifecycle Spatial Quadrants" as defined within the SCINav Systems Model's Dimensional Matrixes.

The correlation of the "Dynamics of Innovation Phases" with the "Diffusion of Innovation Communities" (or consumer communities) from Figure 82 is also presented in Table 21.

Table 21: Correlating "Dynamics of Innovation Phases" with "Diffusion of Innovation Communities"

Dynamics of Innovation Phases	Diffusion of Innovation Communities
Fluid Phase	Innovators and Early Adopters.
Transition Phase	Early Majority and Late Majority
Specific Phase	Laggards

Discovery: This is then an extremely important cornerstone rule for the SCINav Systems Model theory, as new inventions move dynamically through the "Contextual Innovation Lifecycle Spatial Quadrants", different innovation strategies will be required to ensure the successful "Diffusion of Innovation" for specific Target Markets. This correlates perfectly with the discovery of four different innovation strategies in section 6.11.

A challenge for corporate innovation strategists is to have knowledge about these "Contextual Innovation Lifecycle Spatial Quadrants" as defined within the design of the SCINav Systems Model, and to be able to identify the transition points when they need to change to another innovation strategy.

7.4 Forward and Reverse Dynamic Strategic Innovation Routes

During the research and modelling (design, analysis, integration and synthesis) of the SCINav Systems Model, it became very clear that there must exist more than one "route" to manage innovation strategically.

Prof Pisano gave some good insights on innovation strategy, which can be adapted to define the SCINav Systems Model's "Forward or Reverse Dynamic Strategic Innovation Routes" as follows (Pisano, 2015):

- **"supply-push approach** — developing technology and then finding or creating a market—can be more suitable when an identifiable market does not yet exist.".
- "**demand-pull approach** (finding customers' highly challenging problems and then figuring out how the company's cutting-edge technologies can solve them) is limited by customers' imagination and willingness to take risks".

Discovery: There exist more than one Innovation Lifecycle process within the SCINav Systems Model, which were termed as "Forward and Reverse Dynamic Strategic Innovation Routes".

7.4.1 Forward Dynamic Strategic Innovation Route

The specified chronological order of the "Dynamics of Innovation Phases" (Utterback and Abernathy, 1975) will be termed as the "Forward Dynamic Strategic Innovation Route" as shown in Figure 83, where it demonstrates when certain "Tactical Innovation Strategy Formulation Archetype Roles" will get involved with each phase of the "Dynamics of Innovation" theory. The route can be described as follows:

1. The "Technology Drivers" and "Technology Builders" (both as IP Inventors) will be responsible for product development within the Fluid Phase.
2. "Platform Architects" will then work with "Business Disruptors" to develop a value chain, business model and a market segment for the new technology. This will assist the Technology Builders to deliver new inventive technological products to the Early and Late Majority communities of the target market segment.
3. Once the rate of product, process, business model and service innovation declines and the products become commodities within their selected target markets, "Market Advocates" will take responsibility to maintain a sustainable competitive business within the market.

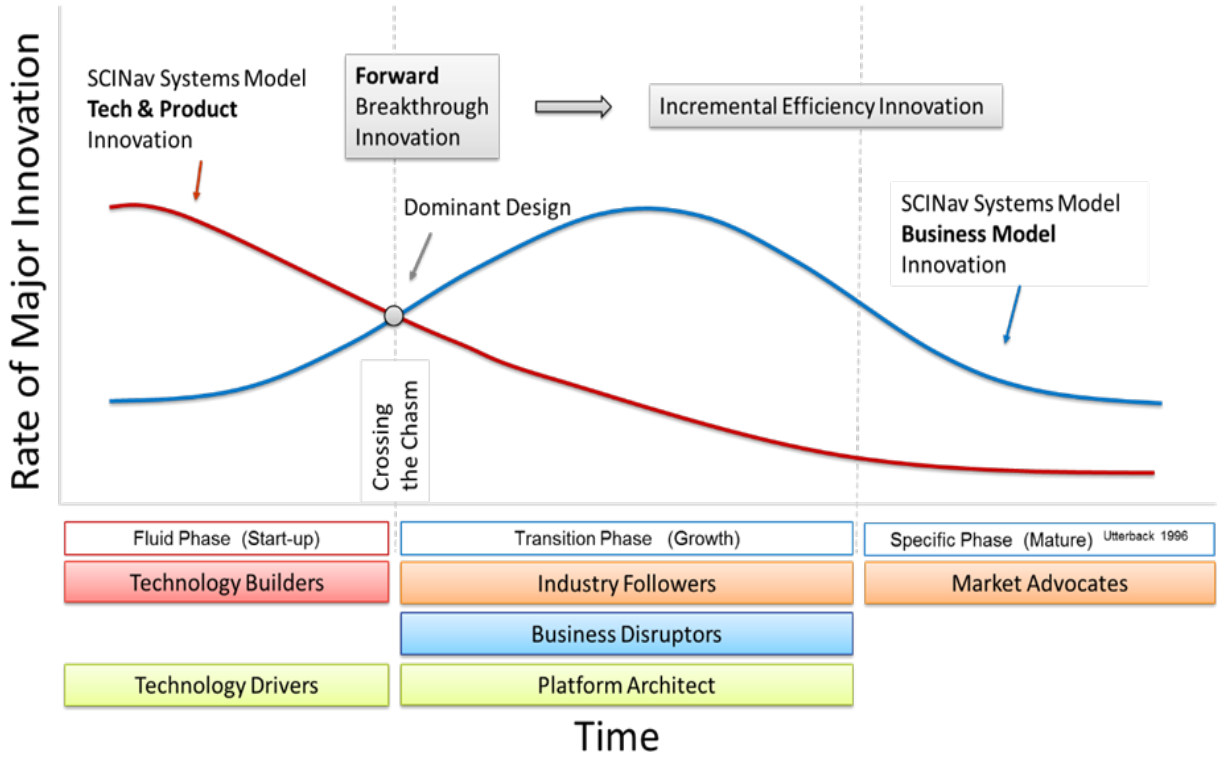


Figure 83: Forward Dynamic Strategic Innovation Route – Lifecycle Graph

To provide a better perspective of how the "Forward Dynamic Strategic Innovation Route" can be mapped onto the "SCINav Systems Model – Tactical Innovation Strategy Formulation Archetype Roles Dimension Matrix", Figure 84 was developed as a flow diagram to illustrate the route with the following associated respective numbering:

1. Technology Drivers create new Intellectual Property (IP) from novel inventions.

2. Technology Builders (primarily secret corporate R&D labs) (Satell, 2017) will acquire the knowledge of the new inventions and transform it to a product that can be launched into the market either as a B2B (Business to Business) or B2C (Business to Customer) offering.

3. Once the innovation offering is delivered to the "Early Majority" market segment community (category), the Industry Followers will keep monitoring the industry for any changes. Important to note from the diagram is that the "Dominant Design Transition Point" (and Innovation Chasm) was crossed and that the new technology (as a complete systems solution) became a platform (as an industry standard) other companies (startups, SMEs and corporations) can use to build their own new innovative technology or service

offerings. It is therefore the responsibility of the "Industry Followers" to grow the technology platform ecosystem. In this sense, the technology platform is the underlying core technological backbone for the development of future supporting products or services as new needs are being created. The "Industry Followers" must support multiple suppliers and partners to co-create collaboratively to deliver products to specific target customers at a competitive price.

4. When the innovative product offerings become a commodity within the market, it is the responsibility of "Market Advocates" to maintain a sustainable and competitive business through continuous incremental "Product and Process Innovation" at the Business Unit level.

5. (Optional) The "Industry Followers" may decide to design a new Business Model (Innovation) with the assistance from a "Business Disruptor" archetype, to dramatically disrupt itself before another new entrant will be able to deliver acceptable performing products at the lowest price as a cost leader to overserved or non-served markets.

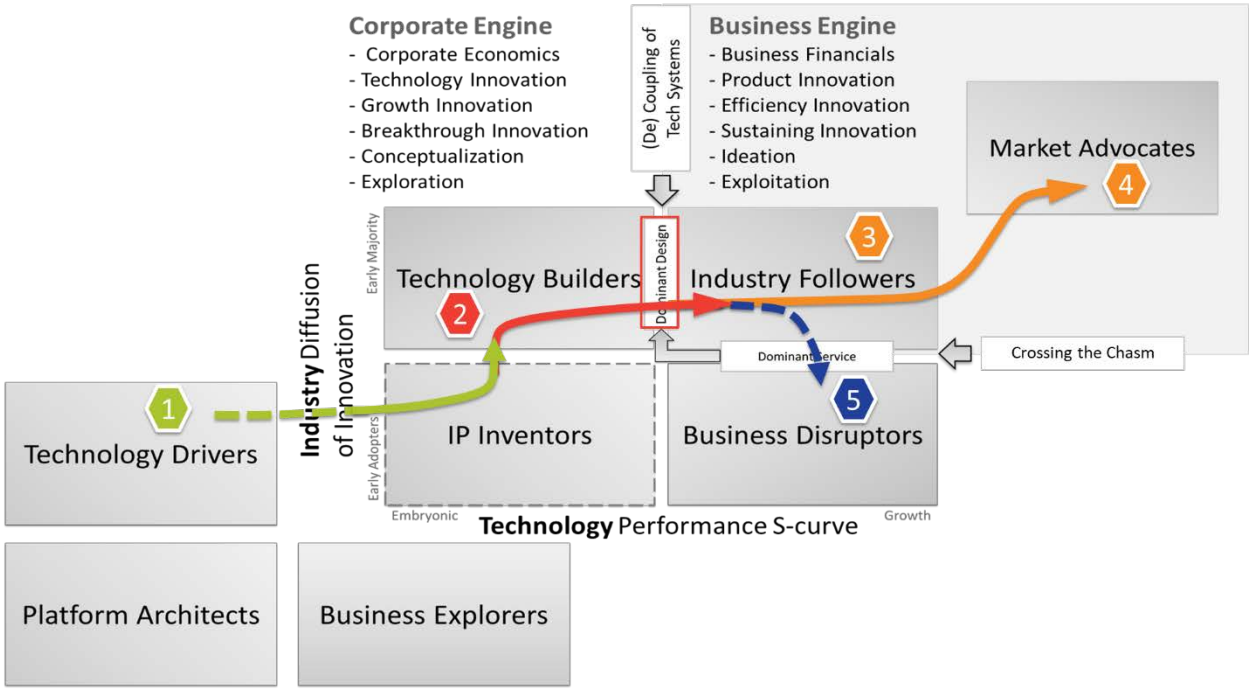


Figure 84: Forward Dynamic Strategic Innovation Route – Process Flow Diagram

7.4.2 Reverse Dynamic Strategic Innovation Route

This research will define the Innovation Lifecycle process that follows the “Dynamics of Innovation Phases” in reverse chronological order as the “Reverse Dynamic Strategic Innovation Route”.

Following the design of the SCINav Systems Model, the “Reverse Dynamic Strategic Innovation Route, can be described as an Innovation Lifecycle process where a new innovation (as a product or a service) is delivered to the market with a minimal but still acceptable set of requirement specifications with relatively low performance metrics. This is then very similar to the concept of a Minimum Viable Product (MVP) (Ries, 2011).

According to the “Windermere Associates Buying Hierarchy” theoretical model as described in section 6.8, following the SCINav Systems Model in revere as in Figure 70 the absolute top requirement for the new innovation (as a product or service) is to be at such a low price point that it will attract the attention of the skeptical “Laggards” consumer community. This is then very similar to the concept of a “Cost Leader” according to Prof Porter’s “Three Generic Strategies” model (Porter, 1980b).

Delivering a “Minimum Viable Product” as a “Cost Leader” will then make it possible to enter the market as a “Disruptive Innovation” (Christensen, 1997a).

Discovery: The “Reverse Dynamic Strategic Innovation Route” represents a different perspective to accomplish “Disruptive Innovation” in the market. With the reverse innovation route largely still as an unknown within industry, it may explain why “Disruptive Innovation” is so successful or still misunderstood.

Following the “Dynamics of Innovation” phases in reverse order in correlation with the “SCINav System Model’s Tactical Innovation Strategy Formulation Archetype Roles” has been illustrated in Figure 85, please follow the graph from right to left. Within each of the “Dynamics of Innovation” phases, the following will occur:

1. The “Business Explorers” (as Inventors) and “Business Disrupters” will be responsible for business model development within the Fluid Phase (at the right side of the diagram).

2. Platform Architects will then work with Technology Builders to select and develop technology that can assist the new business model to be adopted by the Early and Late Majority (market segment communities) of the market.

3. Once the rate of product, process, business model and service innovations all declined, and the business model became a commoditized “value network” within its selected target markets, the “Market Advocates” will take responsibility to maintain the competitiveness of the business model within targeted markets it has to deliver value.

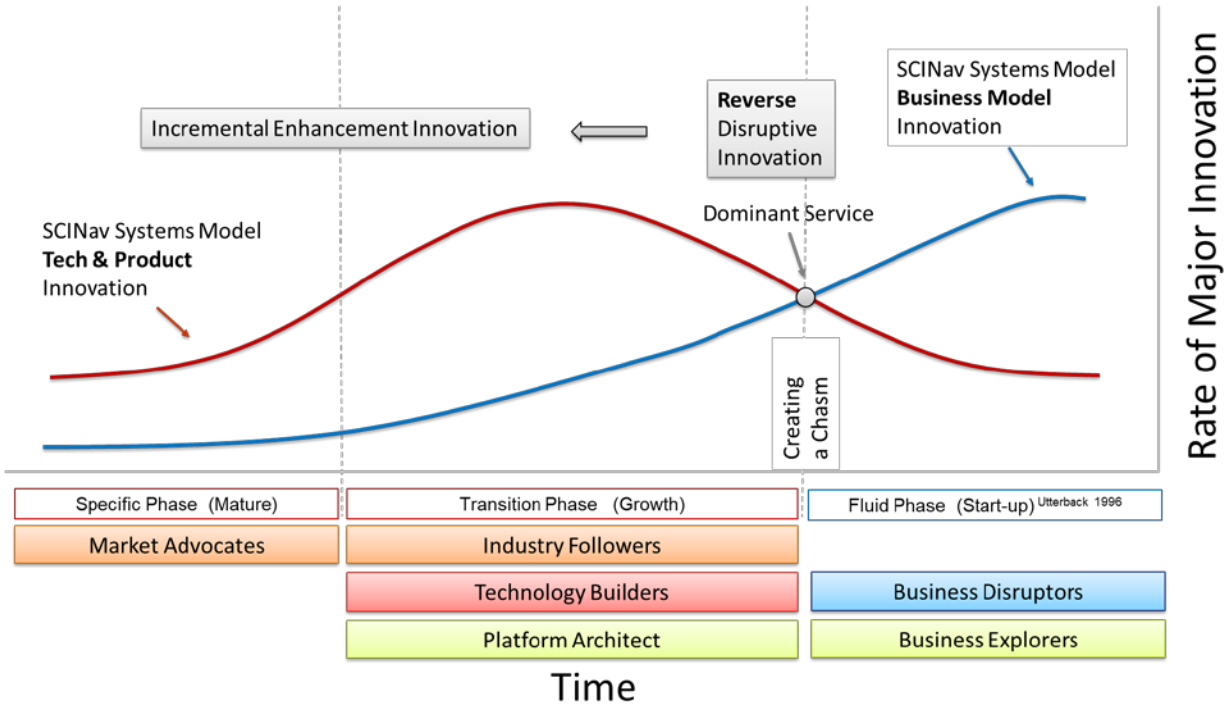


Figure 85: Reverse Dynamic Strategic Innovation Route – Lifecycle Graph

The “Reverse Dynamic Strategic Innovation Route” can also be mapped onto the “SCINav Systems Model’s Tactical Innovation Strategy Formulation Archetype Roles Dimension Matrix” as in Figure 86, with the following corresponding numbering accordingly:

1. The “Business Explorers” can develop a new type of business model.

2. The “Business Disruptors” may then be able to adapt and adopt the new business model concept to specific needs that were identified to develop a new market.

3. Similar to a “Dominant Design”, the new business model will become a “Dominant Service” (as described in section 5.14) when it has an effect on the industry and the innovative business model service offering is adopted by the “Early Majority” customer community. At this transition point the business model becomes a (digital) business platform to be used by other “Innovators” or “Early Adopters” as platform providers.

4. As competition increases from other similar business models, it becomes the responsibility of the “Market Advocates” to maintain the business model through continuous “Process Innovation” at the business unit level.

5. (Optionally) “Technology Builders” may find that the they can dramatically improve the technology that has been used in the business model and thus disrupt the business model with the addition of a superior technology.

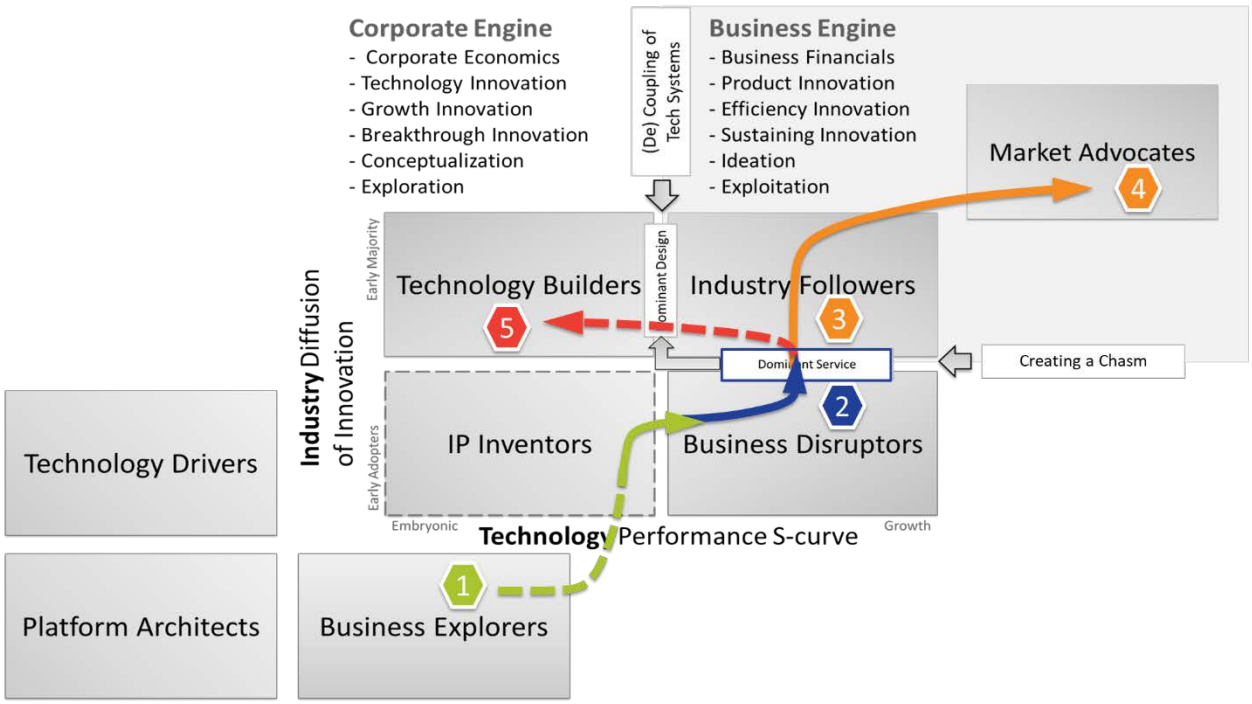


Figure 86: Reverse Dynamic Strategic Innovation Route – Process Flow Diagram

Discovery: The difference with the "Reverse Innovation Strategy Route" is that with the crossing of the "Dominant Service Crossing Point", the challenge is NOT to "Cross an Innovation Chasm" but to "Create a Disruptive Innovation Chasm". It will then become the responsibility of the "Industry Followers" to maintain the growth of the business platform ecosystem to sustain the newly created innovation chasm.

7.5 Spatial Quadrant Border Crossing Points

7.5.1 Overview

"So, an innovative idea for a particular part may be of much more value to an all-new engine that is designed around it than to an existing product to which it would bring much less value. … Our innovation stimulated our customers and competitors to change their products, and this has created value for airplane and engine manufacturers, airlines and communities around the world. It changed everything." (Epstein, 2014)

The "Strategic Advantage" for any corporation is to be able to **predict** when these "Dynamic Border Crossings" between "Spatial Quadrants" will occur, or as a worst-case scenario at least be able to monitor it as it happens in the industry.

The following list of theories was used to define the "Spatial Quadrant Border Crossing Points":

1. Dominant Design **Transition Point** (Abernathy and Utterback, 1978).
2. Decoupling of Complex Integrated Systems **Decoupling Point** (Christensen et al., 2004).
3. Information Advantaged Adaptive Innovation Strategy **Switch Point** (Reeves et al., 2017).

7.5.2 Abernathy's Dominant Design – Transition Point

Note that the "Dominant Design" theory is a consequence of extended research on the "Dynamics of Innovation" theory. The concept of a "Dominant Design" was introduced by Prof Abernathy and Prof Utterback (Abernathy and Utterback, 1978) as a phenomenon when new inventions dynamically transition through the "Innovation Lifecycle Contextual Spaces".

The fundamental definition for a "Dominant Design", is the culmination of various different related technological design variations to solve the same user need (or Jobs to be Done) that have been tested in the market and started to gravitate towards a stable standardized product design.

Additional characteristics that are specific to Dominant Designs are:

1. The Dominant Design represents a specific transition point between two “Spatial Quadrants”.

2. It is possible for first-to-market technology originating companies to influence the industry, market and governments to gravitate towards their specific Dominant Design.

3. It is not necessarily the best performing technology that becomes the:

    - Preferred design solution for customers within the target market.

    - Predominantly accepted systems design within the industry.

    - Most favorable regulatory standard for government agencies.

4. The initial name of the new technology can become the standardized term to describe the technology as well.

Examples of products that became Dominant Designs but may not have necessarily been the best product are the:

- **Microsoft Windows PC Operating System (OS)**: during the early OS “wars”, it competed against various variants such as UNIX, LUNIX, IBM OS/2 and even MacOS.

- **Optimal Energy Joule (as an affordable) Electric Vehicle (EV)**: It was developed in South Africa during the same time when Tesla Motors developed and delivered the first-generation Tesla Roadster. The Optimal Energy Joule EV (see Figure 87) may have been a better solution for the mass market, but Tesla Motors was the first to be able to deliver to the market with the Tesla 3 (even though, still quite expensive). The South African government terminated funding for the Optimal Energy Joule project (unfortunately), and thus the design never reached the market.

Figure 87: The Optimal Energy Joule Electric Vehicle Developed in South Africa

The most visible evidence when a complex integrated technologically advanced systems solution becomes a “Dominant Design”, is when:

1. Companies start to focus more on business or value chain process improvements (as efficiency innovations) to deliver more cost-orientated products to the market.
2. Product design becomes more generic where it can satisfy a larger group of users.
3. Government standardization and regulation agencies start to document product design specifications.
4. New technologies (as products) become a commodity within its market segments where competition is based on price.

Figure 88 illustrates how the “Dominant Design” is implemented within the SCINav Systems Model based on the “Tactical Innovation Archetypes Dimension Matrix”:

1. As “Technology Builders” are working to transition a radical new technology into a new innovation that can break through (therefore breakthrough innovation) from the “Early Adopters” to “Early Majority” market archetypes, the product design will stabilize within the industry and thus become a “**Dominant Design**”.

2. Similarly, “Need Seekers” will also continue to develop a new Business Model that can transition from only being used by “Early Adopters” to “Early Majority”, and thus the Business Model will then become what this research terms to be a “**Dominant Service**”.

3. A “Dominant Service” is similar to a “Dominant Design” where a new Business Model Innovation creates a new market (and industry ecosystem) and thus becomes a new dominant standard.

4. Almost every commercial service industry today was at some point a Dominant Service such as “fast-food industry”, “banking industry”, “drive-through car wash industry”, etc.

5. With the design and development of the SCINav Systems Model, the “**Crossing the Chasm**” theory (Moore, 1991) coincides perfectly with the other elements within the SCINav Systems Model as follows:

    - “Forward Dynamic Strategic Innovation Route” creates a “Dominant Design” while Crossing the Innovation Chasm.

    - “Reverse Dynamic Strategic Innovation Route” creates a “Dominant Service” while Creating an Innovation Chasm.

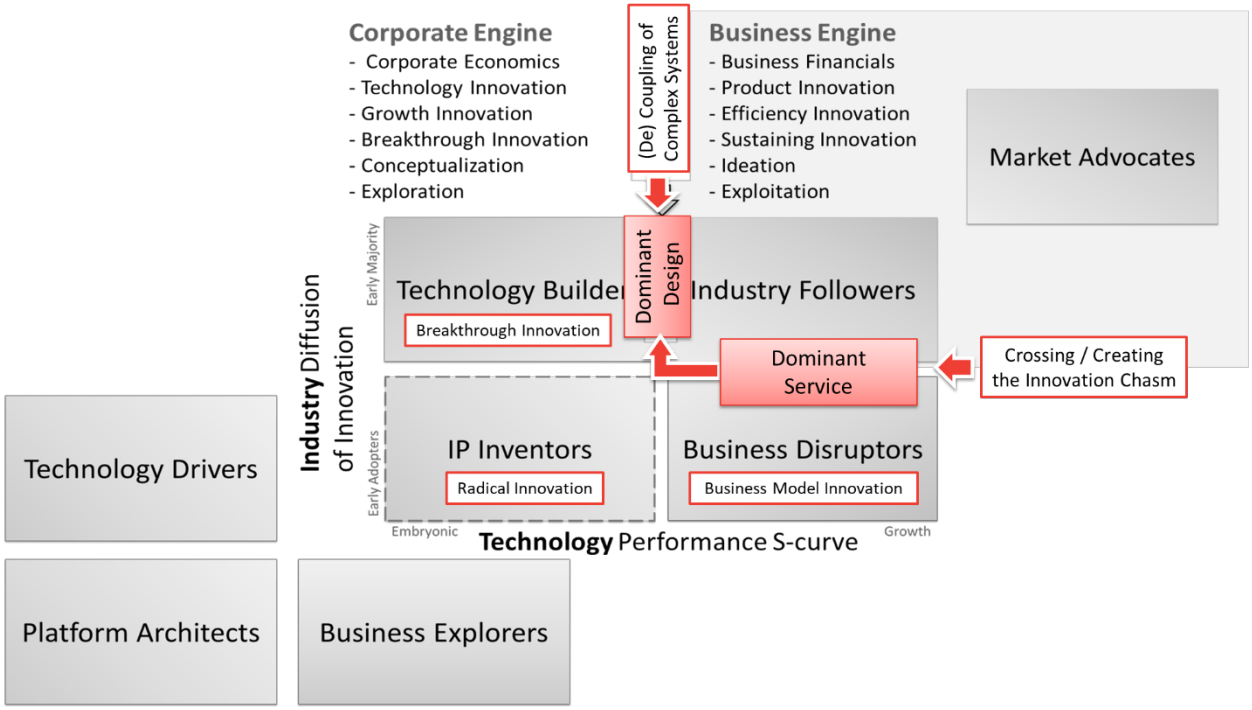


Figure 88: Dominant Design Crossing Points

With the integration of the "Dominant Design" into the SCINav Systems Model, it is important to take note of the following concepts and how it have been applied:

1. **Capabilities** are considered to be a conceptual construct that consists of assets (integrated technologies, components, platforms, products, applications, resources or services), used by skilled people with multi-disciplinary knowledge working within the constraints of multi-functional processes.

2. The **Business Model** must have four elements: a value proposition for customers, capabilities (as defined in previous point), processes and a profit formula (Christensen et al., 2016a). In this regard, Prof Christensen started to refer to **Value Networks** and defined it as "the context within which the firm identifies and responds to customers' needs, procures inputs and reacts to competitors" (Christensen and Rosenbloom, 1995).

3. **Industry Ecosystem** (Platform) **Models** (Structures) defines concatenated capabilities and business models from various corporate alliances and partners working together towards the same customer proposition and profit model. Some researchers consider this the new paradigm where businesses will operate in newly defined "Market Ecosystems" (Atluri et al., 2017) support by: (1) "Open Innovation Ecosystems" (Chesbrough, 2003a)

(Chesbrough, 2003b), (2) “Platform Ecosystems” (Parker et al., 2016) (Van Alstyne et al., 2016) (Parker et al., 2017) and (3) “Innovation Ecosystems” (Adner, 2017) (Adner and Kapoor, 2016b).

7.5.3 Christensen’s Decoupling of Complex Integrated Systems – Decoupling Point

In the previous paragraphs it was identified that a new complex integrated technologically advanced system can become a “Dominant Design” in its own industry when: (1) the design stabilizes and efficiency innovation becomes an important component of innovation efforts internally and by other companies, (2) the design specifications are documented by an industry standards organization or (3) it “Crosses the Innovation Chasm” when the “Early Majority” consumer community starts to adopt the new innovation.

The next challenge is to be able to predict (or monitor) the time when a new complex integrated technologically advanced system will transition into a simple modularize system. Fortunately, Prof Clayton Christensen defined the “Decoupling Point” for these complex integrated technologically advanced systems (Christensen et al., 2004).

The schematic diagram in Figure 89 demonstrates how the “**Decoupling of Complex Integrated Systems**” theory was adapted (according to accompanied related numbers) via a “**Forward** Dynamic Strategic Innovation Route”:

1. New technologies start as “Interdependent Architectures and Integrated Companies” where development needs to be overseen as a complete system to: (1) ensure acceptable performance functionality and quality and (2) to manage the risks involved with the commercialization of new technologies into the market.

    - This is well aligned with “Crossing the Chasm” theory, which sets the delivery of a complete system as a solution before a company can attempt to cross the innovation chasm to the pragmatic “Early Majority” consumer community group as a requirement.

- The new complex integrated technology system's performance, functionality, quality and convenience increases as technology development continues to make it more acceptable for the larger ("Early Majority") customer base of the market, which occurs along the "Trajectory of Continuous Improvement that Innovative Companies Provide".

2. When the new technological system crosses the "Trajectory of Improvement Customers can Utilize" and go beyond, this research suggests that the "Majority" of customers will not willing to pay a premium price for performance or functionality they will not be using.

3. This is when the "Decoupling Point" of the new complex integrated technology system has been reached and the innovating company then needs to change its technology innovation strategy approach from an "interdependent architecture" to a "modular architecture" where many other companies can compete to supply modules for this technology system in order to increase convenience to acquire components (or parts) and to bring the price down.

    - According to Utterback's "Dynamics of Innovation" theory, this is the transition point from the "Fluid Phase" to the "Transition Phase" (Utterback and Abernathy, 1975).

    - With Abernathy's "Dominant Design" theory, this is the point where a "Dominant Design" should establish itself in the industry (Abernathy and Utterback, 1978). When the "Dominant Design" is well document by industry standards organization, it is then possible for other companies to make components for the system.

4. Once the decoupling of the new technology system has been completed, the "Trajectory of Continuous Improvement" will follow the "Modular Architecture – Non-integrated Companies" trajectory.

5. This new technology will then follow its new path towards Utterback's "Dynamics of Innovation's Specific Phase" where continuous incremental innovation is only being used to maintain product competitiveness in the market and the business becomes the well-known "Cash Cow" according to Henderson's Growth-Share Matrix.

6. (Optional) The innovative company still has the option to keep innovating along the "Interdependent Architectures and Integrated Companies" trajectory to keep serving high demand customers and then with time trickle down the technology to the "Modular Architecture – Non-integrated Companies" trajectory.

7. (Optional) Once the innovative company managed to establish itself on the "Modular Architecture – Non-integrated Companies" trajectory, it may decide to change its business model and disrupt itself to serve another (adjacent) market at a much lower price point.

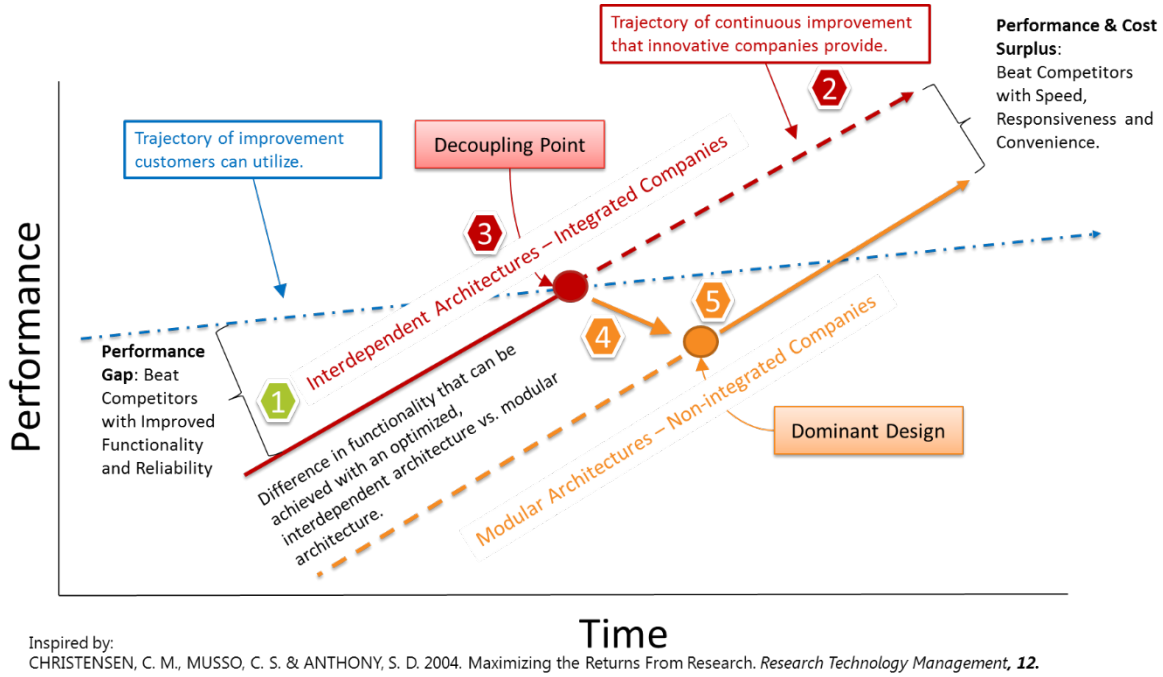


Figure 89: Decoupling of Complex Integrated Systems – Decoupling Point

Adapted from: (Christensen et al., 2004)

The importance of this theory is to predict when the "Decoupling of Complex Integrated Systems" will occur. Prof Christensen provided the following four conditions from his research (Christensen et al., 2004) to identify a "Decoupling Point":

- Engineers are able to accurately specify modular component requirement.
- Engineers are able to measure the requirement specifications with consistent results.
- Engineers documented technical specification for the communication interfaces.
- A market for the decoupled technology exists, meaning there is an interest.

With the "**Reverse** Dynamic Strategic Innovation Route", the only difference will be that innovation will start with the "Modular Architecture – Non-integrated Companies" trajectory and then find the point where an "Innovation Chasm" needs to be created with the integration of various components from various companies to create a Complex Integrated System.

1. The new Complex Integrated Systems will then be able to attract the "Early Majority Market Segment Archetype" consumer community group who is willing to pay more for a better product or service.

2. With the "Coupling Point" of the Complex Integrated System a "Dominant Design" can also be established.

3. The continuous innovation can then follow the "Interdependent Architectures and Integrated Companies" trajectory going after higher demanding customers and as such disrupt the market (or industry), which will then be considered as "Disruptive Innovation".

4. The innovative company then has the option to still continue with innovation along the "Modular Architecture – Non-integrated Companies" trajectory as well.

7.5.4 Reeves' Information Advantaged Adaptive Innovation Strategy – Switch Point

Martin Reeves at BCG identified an "Information Advantaged Adaptive Innovation Strategy" which is based on two dimensions (Reeves et al., 2017):

- Innovation Strategy Approach: An Impatient or Patient Approach.
- Innovation Technology Complexity: High or Low Product Complexity.

Note: The "Information Advantaged Adaptive Innovation Strategy" theory follows the "SCINav Systems Model's Reverse Dynamic Strategic Innovation Route" approach.

The main premise of this theory is to maximize innovation throughput and output. In principle this theory defines four types for innovation strategies:

1. **Patient** Innovation Strategy: This is where the innovation strategy looks at breakthrough type innovations that may take a long time to develop, but with the possibility to generate sustainable high returns.

2. **Impatient** Innovation Strategy: This approach is about short-term solutions with the use of existing technologies. This is usually considered to be disruptive innovations where existing technologies are used with a new business model.

3. **Adaptive** Innovation Strategy: This strategy starts with an "Impatient Innovation Strategy" and then switches to the "Patient Innovation Strategy Approach" dynamically. The challenge with this strategy is to have access to adequate innovation intelligence to predict the "Switching Point" accurately and well in advance.

4. **Random** Innovation Strategy: can be any of the strategic approaches mentioned above.

Following Figure 90, the "Switch Point" is identified when there is a transition from applying the "Impatient Innovation Strategy" to the "Patient Innovation Strategy".

Reeves et al. describes the conditions for when the "Adaptive Innovation Strategy's Switch Point" will occur as follows:

- There is an increase in licensing deals, partnerships, acquisitions or agreements. This makes the Intellectual Property (IP) analytics tools or services a valuable resource.

- Innovation Ecosystems start to incubate and grow around a specific technological platform or a new business model platform.

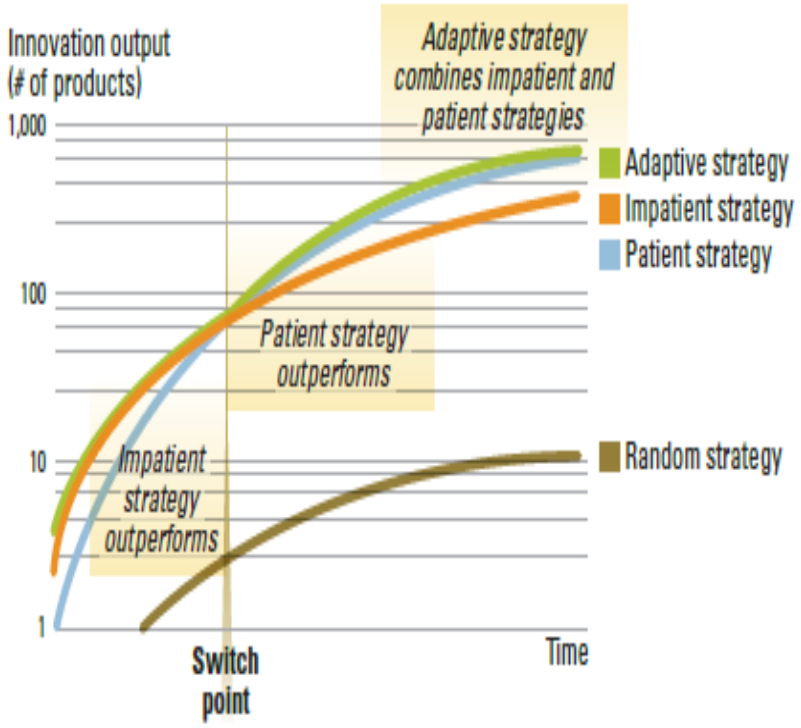


Figure 90: Reeves' Adaptive Innovation Strategy Approach – Switch Point

Source: (Reeves et al., 2017)

The requirements to use the "Adaptive Innovation Strategy Approach" are as follows (Reeves et al., 2017):

- Reframe innovation as an information-enabled search process.
- Collect information on components and innovations to characterize the space.
- Analyze the maturity of the space and adapt your strategy accordingly.
- Build an information advantage to innovate your approach to innovation itself.
- Respond to or create disruption by adapting your managerial approach.

7.6 Conclusion

Strategic Corporate Innovation is a **journey** that needs a specific strategy, depending on the contextual innovation space. Therefore, it is extremely valuable for corporate executives to have a map of how innovation strategy should dynamically unfold when it is highly depended on the circumstances of the environment.

This chapter explained how the “Dynamics of Innovation” phases can be correlated with the “Diffusion of Innovation” customer community profiles on the same graph, both mapped onto the “SCINav Systems Model’s Tactical Innovation Strategy Formulation Archetype Roles Dimension Matrix”.

The following additional three theories were discussed to identify “Contextual Innovation Lifecycle Spatial Quadrant Dynamic Border Crossing Points” on a “SCINav Systems Model Dimension Matrix”:

1. Dominant Design – **Transition Point** (Abernathy and Utterback, 1978).
2. Decoupling of Integrated Complex Systems – **Decoupling Point** (Christensen et al., 2004).
3. Information Advantaged Adaptive Innovation Strategy – **Switching Point** (Reeves et al., 2017).

This chapter then concludes the literature study (divergent and convergent Systems Thinking) and the design and development (modelling) of the SCINav Systems Model. The next chapter presents a case study that will be used to verify and validate the SCINav Systems Model.

CHAPTER 8: SYSTEM VERIFICATION, VALIDATION AND ASSESSMENT

8.1 Introduction

This chapter will **verify** and **validate** the SCINav Systems Model against the technical product and business model innovation history of Tesla Motors Inc. in the form of a case study.

Tesla Motors Inc. (which was renamed as Tesla Inc. in 2017) was selected for the empirical case study since it:

1. Was co-founded by Elon Musk who is considered to be the entrepreneurial genius of the 21st century who accumulated enormous wealth from his own doing.
2. Is ranked as the 6th "Most Innovative Company of 2018" by the well-known Boston Consulting Groups' (BCG) annual ranking report.
3. Innovated physical products and new business model services of value to new customers, which is much more difficult to accomplish than "virtual products and services" from software corporations such as Amazon, Uber or Microsoft.
4. Delivered physical products that were the results from technological radical inventions, breakthrough innovations and sustaining innovation.
5. Grew significantly at the corporate level and therefore transformed from being an automotive corporation to an energy corporation.
6. Was extremely successful to deliver new insights as unique solutions (for jobs-to-be-done needs), which customers or consumers valued in such a way that the company generated incomprehensible brand recognition in the market, wealth for employees and growth for shareholders.

As a reminder for this chapter, the "SCINav Systems Model's Relational Multidimensional Vector of Matrixes" structure is available in Figure 91.

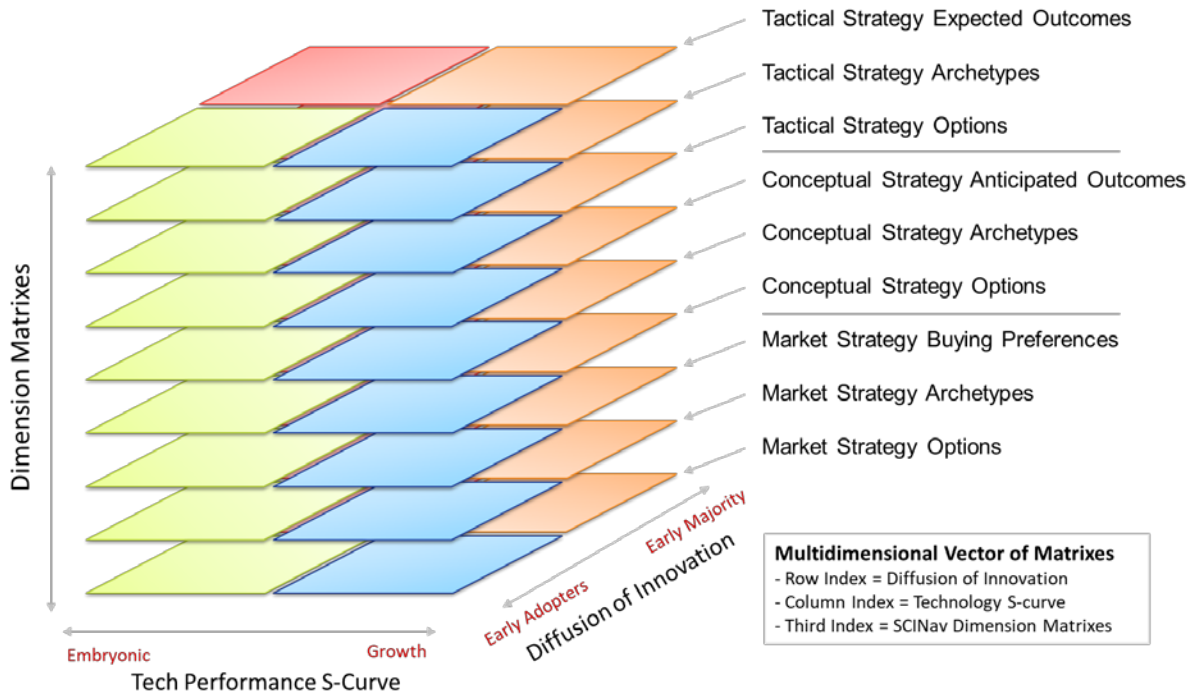


Figure 91: Relational Multidimensional Vector of Matrixes Structure

Since all the SCINav Systems Model's Dimensional Matrixes are interrelated via a color scheme and to keep this chapter within a sizeable limit of 20 pages, this chapter will discuss the case study only via the default "Tactical Strategy Archetypes Dimension Matrix" as in Figure 92. The argument is that if the default "Dimension Matrix" can be verified and validated with the case study, it will then also equally apply with the other "Dimension Matrixes". The actual verification and validation of the other "Dimension Matrixes" will be considered as work to be done at a later stage and will therefore not be included within the scope for this PhD thesis.

The rest of this chapter will discuss the historical growth of Tesla Motors Inc. in detail to demonstrated how the Tesla Roadster followed the classic (Breakthrough) "Forward Dynamic Strategic Innovation Route" while the Tesla Electric Stations followed the (Disruptive) "Reverse Dynamic Strategic Innovation Route" mapped to the "SCINav Systems Model's Tactical Innovation Strategy Formulation Archetype Roles Dimension Matrix", as in Figure 92.

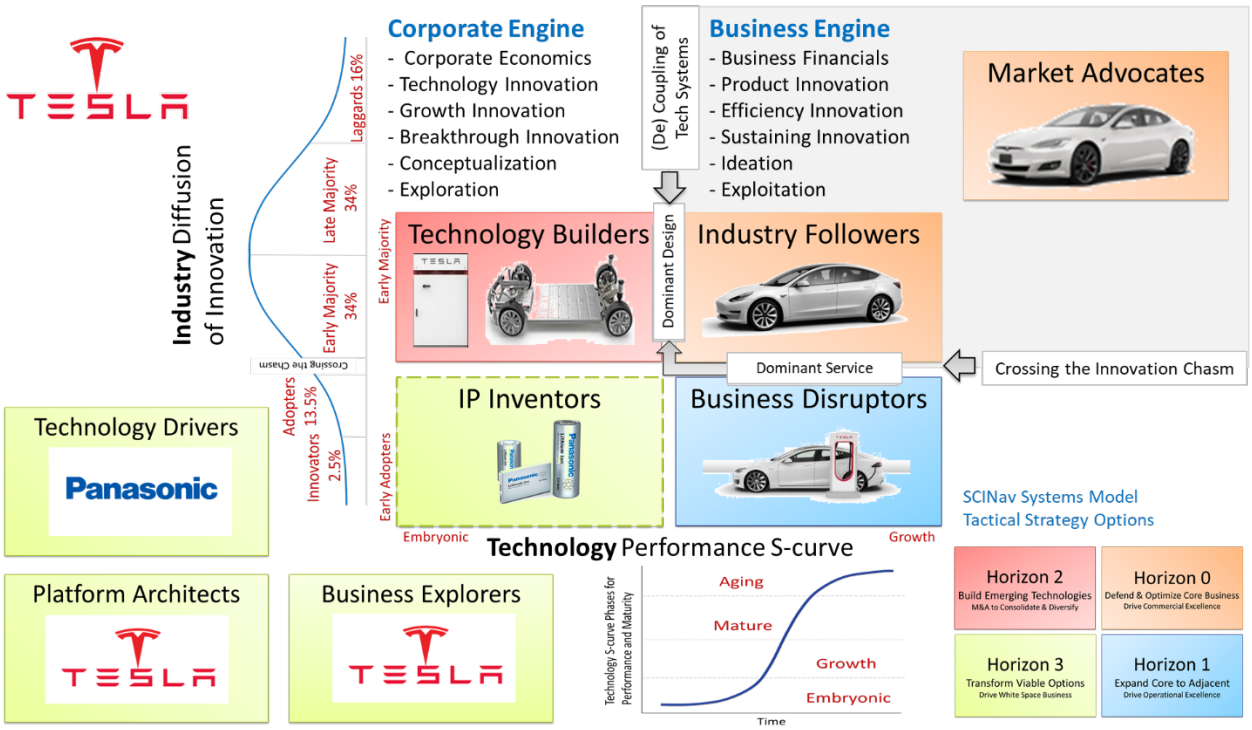


Figure 92: Tactical Innovation Strategy Formulation Archetype Roles Dimension Matrix

8.2 Overview

Tesla Motors was originally founded in 2003 by Martin Eberhard and Marc Tarpenning, with “late” (via legal settlement out of court in 2009) co-founders Ian Wright, Elon Musk and Jeffrey Straubel in Palo Alto, CA, USA. (Bensinger, 2009)

As an overview summary, the technology and business model innovations for Tesla Motors (before it became Tesla Inc. the energy corporation) can be explained with the SCINav Systems Model as follows (with Figure 92):

1. The foundational technologies for the batteries and body design came from Panasonic and Lotus Cars respectively (just to mention two companies), defined as “**Technology Drivers**”, who held the Intellectual Property (IP) and therefore are considered to be the “**IP Inventors**”.

2. Integrating and developing these basic technologies into a new “Complex Integrated Technologically Advanced System” is the work of “**Technology Builders**”, who are also considered to be “Early Adopters” of new technologies. In this case Tesla assumed this responsibility to deliver an “electrical vehicle (EV) platform” to the market, initially as a roadster sportscar. Tesla Motors then released many of their own Intellectual Property (IP) to push sales and revenue from their battery packs to become the “Dominant Design” standard for the electric vehicle (EV) industry (which explains why Tesla Motors rebranded to be a “clean energy storage” corporation as well). Up to this point the focus of New Product Development (NPD) has been on “Performance / Functionality” and “Reliability”. The first product from Tesla Motors was the “Tesla Roadster” in 2008 with a price tag of well over $100,000 (Boylan, 2016), which pushed it into the super sports car market segment where it had to compete with well-known brands and existing strong incumbent rivals such as the extremely famous Nissan GTR, BMW M4 or even the Porsche 911 Carrera.

3. Simultaneously, Tesla Motors had to think about supporting the vehicles to increase the “**Convenience**” for the consumer to purchase and service the new vehicles. This required “**Business Model Innovation**” to setup their own dealerships and charging stations which eventually also became the “**Dominant Service**” standard for the EV charging industry that wants to get involved to support and service Tesla electric vehicle customers.

4. Since then, many corporations have entered the electric vehicle industry (some in partnership with Tesla) and all became “**Industry Followers**” in the EV industry with Tesla Motors leading the charge to expand the market. During this time the “**Price**” decreased significantly with the introduction of the Tesla Model S and Model 3, as a result from continuous process efficiency innovations. This is also about the time when Elon Musk refocused Tesla Motors to become Tesla Inc. and with that action Tesla Motors became a corporate Business Unit (BU) within Tesla Inc. This is then where “Product Management” and close interaction with the market takes place more prevalently to ensure that the product undergoes continuous incremental improvements to stay aligned with the needs (priorities or preferences) of the industry and future market opportunities.

5. Eventually the companies within this new electric vehicle (EV) industry will need to grow their existing market share or move to adjacent markets. With that, Tesla Motors promised the release of a second-generation Tesla roadster sportscar in 2020 and also moved into the semi-trailer truck market respectively.

8.3 Core Competence

Before the “SCINav Systems Model’s Tactical Strategy Archetypes” can be discussed, it is important to have some background understanding how the “Core Competence” and “Core Capabilities” may possibly be structured at the corporate level for Tesla Motors Inc.

Note: The theory of “Core Competence of the Corporation” was discussed in section 5.5.

By applying “Core Competence” theory (Prahalad and Hamel, 1990) to Tesla Motors Inc., it is impossible to know what core competencies Tesla Motors instilled into the corporation, but it is at least possible to identify the following (see Figure 93):

1. “**Core Technologies and Capabilities**” as the Lithium-Ion battery packs and the Photovoltaic Solar Panel technologies:

    - This will explain why Tesla Motors opened up their Intellectual Property (IP) on the design of an electric vehicle. Tesla was developing a Core Capability to manufacture Lithium-Ion battery packs and therefore invested significant resource in this “Strategic Advantage”, which resulted in the Tesla Gigafactories.

2. “**Business Units**” are in place to further develop both the product and the market, and to deliver the end products to the market in a convenient and value sensitive manner. Tesla Inc. established the following business units the past decade (not comprehensive):

    - Tesla Motors Inc.

    - Tesla Energy Operations Inc.

3. “**End Products**” are available to the market wherein the Core Technologies and Capabilities are imbedded in, with the following products as examples:

    - Electric Vehicles: which includes Tesla Model S, Model X, Model 3, Roadster, Semi, etc.

    - Sustainable Energy: Tesla Powerwall, Solar Roof, Renewable Microgrids and Centralized Power Generation.

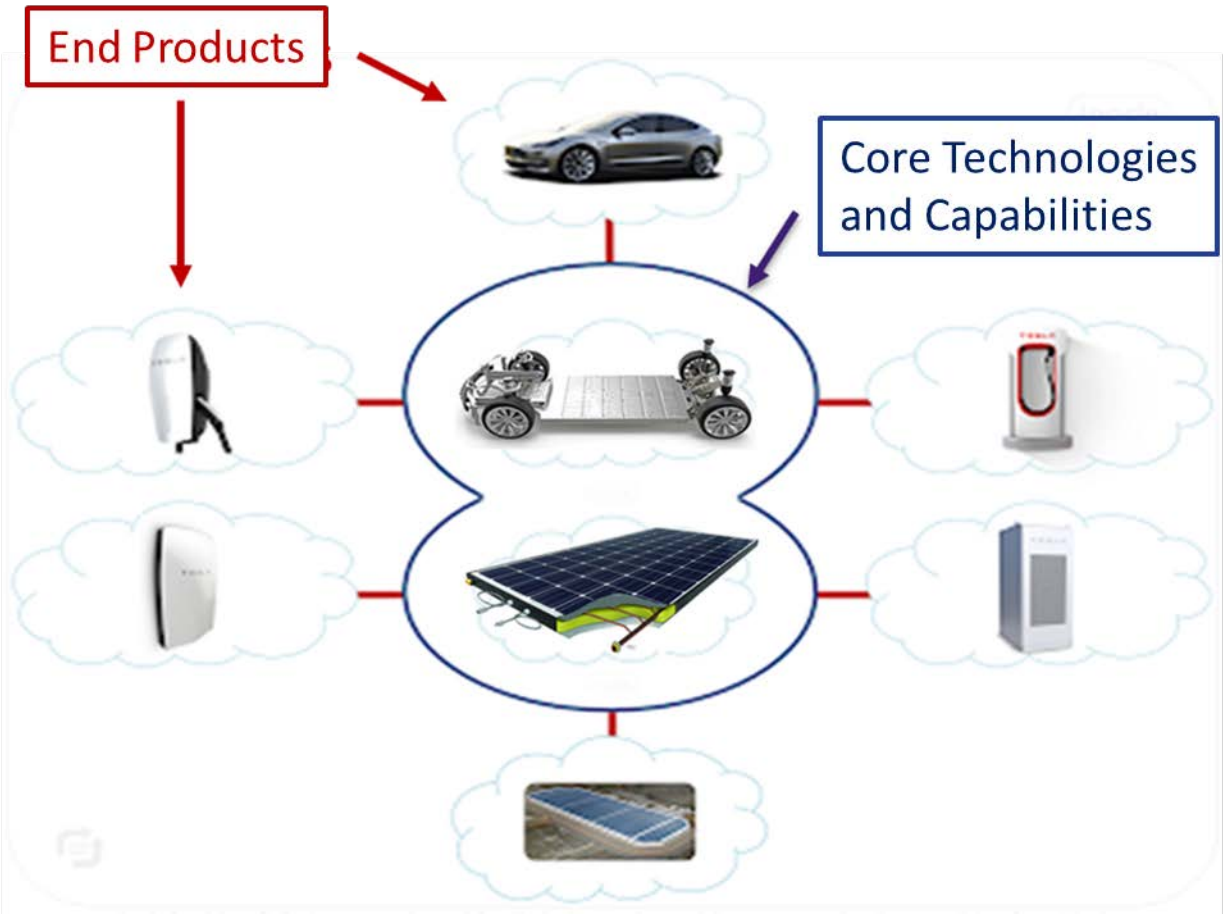


Figure 93: Core Competencies Aligned with Business Unit End Products

8.4 Verification of the SCINav Systems Model

8.4.1 Overview

To verify the SCINav Systems Model, this section has to demonstrate that an adequate “Strategic Corporate Innovation Navigation Systems Model” was designed and developed to support corporate executive with the formulation of a “Corporate Innovation Strategy” and guide them to “Manage Corporate Innovation Strategically” as a solution for the “Corporate Innovation Performance Challenge” as defined in Chapter 1.

With the continuous economic growth performance Tesla Motors displayed since it was founded in 2003, it will be postulated that Tesla Motors can be classified as a one of the very few corporations that do innovate as expected and that the “Corporate Innovation Performance Challenge” does not apply. Alternatively stated, Tesla Motors solved the “Corporate Innovation Performance Challenge”.

Thus, if the “SCINav Systems Model” can accurately follow and explain the historic strategic corporate actions of Tesla Motors, it will meet the set requirements specifications. Therefore, the following paragraphs will have to demonstrate how well the “SCINav Systems Model” could have been used by Tesla Motors’ corporate executives if they had it available for use.

In the attempt to verify if the “SCINav Systems Model” can explain Tesla Motors’ historic strategic corporate actions accurately, this section will discuss the technical product development and business model innovation history of Tesla Motors Inc. in each of the “SCINav Systems Model’s Contextual Innovation Lifecycle Spatial Quadrants”.

For this purpose, the default “SCINav Systems’ Tactical Innovation Strategy Formulation Archetype Roles Dimension Matrix” will be used (as presented in Figure 94) to represent all the other Relational Dimension Matrixes.

Figure 94: Tactical Innovation Strategy Formulation Archetype Roles Dimension Matrix

8.4.2 IP Inventors Spatial Quadrant

Following the SCINav Systems Model in Figure 94, Panasonic (as a “Technology Driver”) performed the required research and development (R&D) to provide the necessary Lithium-Ion battery cell Intellectual Property (IP) for the Tesla Electric Vehicle (EV) battery packs.

The very first Tesla Roadster was based on body gliders that were purchased from Lotus Cars (in this case another “Technology Driver”) in the UK.

According to the SCINav Systems Model, the “IP Inventors” should almost always develop B2B (Business to Business) technology solutions and therefore should rather seek startups or corporations as their customers or commercialization partners within the context of Open Innovation. This will allow for their inventions to be integrated into future products that will be launched into the market through a Corporate Business Unit.

8.4.3 Technology Builders Spatial Quadrant

8.4.3.1 Overview

Following the “Forward Dynamic Strategic Innovation Route” (see Figure 84), innovation strategy activity transitions from the “IP Inventors Spatial Quadrant” to the “Technology Builders Spatial Quadrant”. The “Technology Builders” (usually a corporate engineering division), will start to take the responsibility to “position” (or align) the technology development and systems integration for a specific target market segment they identified (or “Spotted”).

The “Technology Builders” archetype should deliver “Breakthrough Innovation” (as an innovation effort type) to achieve (or acquire) a “Strategic Advantage” (as a “Conceptual Innovation Strategy Outcome”) in the market.

This is the Spatial Quadrant where the majority of the innovation work went into the Electric Vehicle's complex integrated technological advanced powertrain which includes the: electric motors, battery packs, electrical cabling, power control systems and chassis as demonstrated in Figure 95. This is where Tesla Motors developed their Core Technological Capabilities.

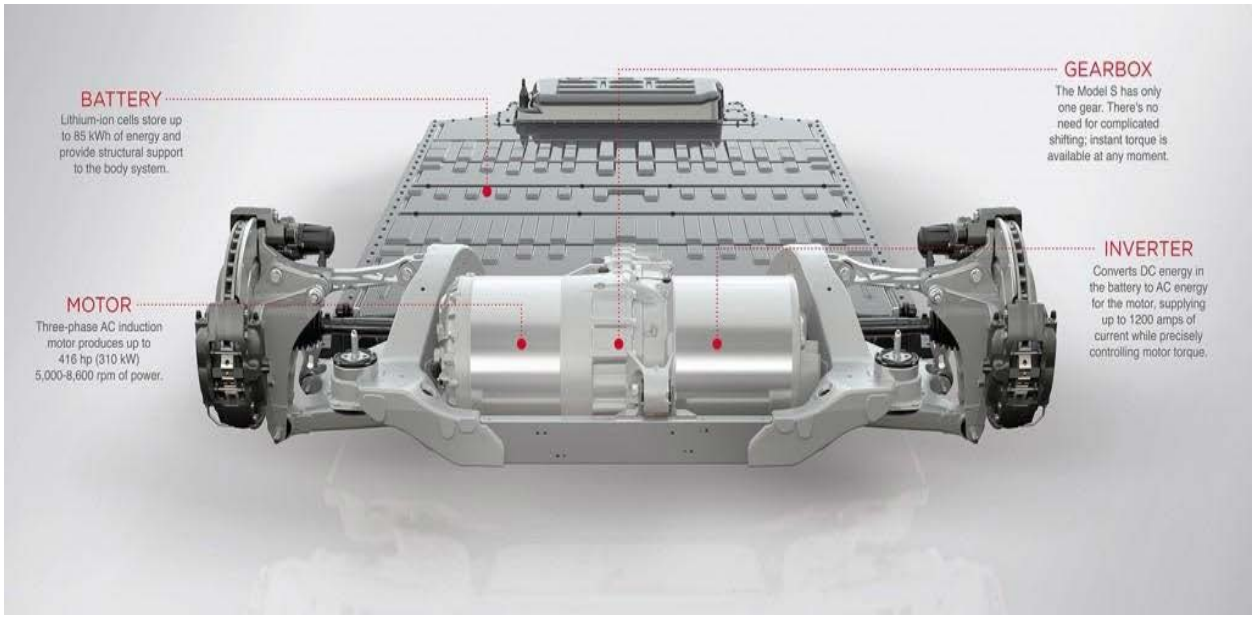


Figure 95: Tesla Model S Electric Powerplant Platform with Battery Packs

The "Technology Builder Spatial Quadrant" can also continue to design and develop different products from the same Core Technologies and Capabilities for existing Business Units to expand to new adjacent market segments. In such as a case, the expansion of a product range should be done in strong collaboration with the Product Managers or Product Planners from the Business Units.

Tesla Motors continued to develop new products based on their "Tesla Electric Vehicle Powerplant Platform" such as the Tesla Model 3 (see Figure 96), Tesla Model X, Tesla pick-up truck and the next generation Tesla Roadster (see Figure 97).

Figure 96: Tesla Model 3 Exterior Design

The new second generation Tesla Roadster will have superior increased performance over the existing Tesla Roadster with a 0 to 100 km/h acceleration in less than a ludicrously 2 seconds.

Figure 97: Tesla Roadster (2nd Generation)

Most significant events that will occur while transitioning from the “Technology Builders” to the “Industry Followers” Spatial Quadrants are the:

1. Crossing of the Innovation Chasm (Moore, 1991).
2. Establishment of the “Dominant Design” from a new Complex Integrated Technologically Advanced System (Abernathy and Utterback, 1978).
3. Decoupling of a Complex Integrated Technologically Advanced System (Christensen et al., 2004).

8.4.3.2 Crossing the Innovation Chasm (Moore, 1991)

This is where the “Diffusion of Innovation” model (Rogers, 1962) transition from “Early Adopters” (13.5%) who seek high performance products with much less regard for price, to the “Early Majority” (34%) who are much more pragmatic and “reliability” orientated (based on the “Windermere Associates Buying Hierarchy” as a “Buying Preference”) (Gurowitz, 2012).

With the success of the Tesla Roadster that sold at least 2,500 units (to “Early Adopter” within the automotive consumer space) since 2008, it then completed its role to demonstrate the technology’s practical use and reliability. It was then critical for Tesla Motors to follow it up with products that were much more suited to the “Early Majority” consumer community market segment. Therefore, the beautifully well-crafted **Model S** (see Figure 98) and **Model X** Electric Vehicles that were aesthetically much more appealing to the general public with good functional use and proven reliability (through the Tesla Speedster), were introduced (or diffused) into the market since 2012 and 2015 respectively.

Figure 98: Tesla Model S Exterior Design

8.4.3.3 Establishment of the Dominant Design (Abernathy and Utterback, 1978)

Abernathy and Utterback described the "Dominant Design" phenomenon as when a complex integrated technologically advanced system becomes so well understood that requirements specifications for the components of the system can be documented with very good certainty and accuracy by standards organization, and which the industry will also accept as an industry standard for future product development.

From a "Dominant Design" theory perspective, it appears almost as-if Tesla Motors perhaps could have predicted that the electric vehicle (such as the Tesla Model S) would soon become a "Dominant Design" with the standardization of their complex system. Almost all new Electric Vehicle design will have a very similar design. This opened up the opportunity for Tesla Motors to also supply all future Electric Vehicles with Lithium-Ion batteries.

8.4.3.4 Decoupling of a Complex Integrated Technologically Advanced System (Christensen et al., 2004)

From the establishment of a standardized "Dominant Design", it also signaled the arrival of the "Decoupling Point" of the Complex Integrated Technologically Advanced Tesla Electric Vehicle.

This means that various new (startup or corporate) Electric Vehicle OEMs and suppliers will now be able to design their own Electric Vehicles and components to compete for a share of the market. The results from this industry transformation is that Electric Vehicles will soon become a commodity market where incumbents will compete on process efficiency and price (meaning low margins), which is currently the case with fossil fuel vehicles.

Tesla Motors anticipated this upcoming event perfectly when they repositioned themselves as a Sustainable Clean Energy corporation in 2017, with the acquisition of SolarCity. At the same time Tesla Motors invested significantly to manufacture Lithium-Ion batteries with the construction and commissioning of the first Tesla Gigafactory, which became one of Tesla's Core Technology and Capability. One can imply that the strategy was to accept that the Electric Vehicle industry will soon become a commodity market, and that profitability will shift to supply of Electric Vehicle batteries to all Electric Vehicle OEMs.

Discovery: An advantage for being a first-to-market innovator to capture the "Dominant Design" for an industry, can allow the innovator's Core Technology or Capability (according to "Core Competence of the Corporation" theory) not only to supply its own future business units but also competitors as well (at a significant profit margin). Tesla Inc. applied the "Core Competence of the Corporation" theory exceptionally well with their Lithium-Ion battery manufacture capability.

With the SCINav Systems Model as a guide, the following paragraphs may be able to explain the rationale behind some of Tesla Motors' strategic decisions:

- It could be possible that Tesla Motors strategically wanted (or needed) to accelerate the transition in the market from fossil fuel to electric vehicles, which can establish the Tesla electric vehicles as a Dominant Design within the industry. This may then explain why Tesla Motors opened up its patents to be used for free as "**Open Source Intellectual Property (IP)**" (Musk, 2014). Within a few years the electric vehicle industry exploded with new electric cars from new startups (such as Rimac) and almost every existing automotive brand started to place at least one electric vehicle on the market.

- The anticipated increase in the much-needed demand for Lithium-Ion battery packs as a potential "White Space" technology within a "Blue Ocean" market (Kim and Mauborgne, 2004), could possibly allow Tesla Motors to justify the construction of its **Gigafactory** (see

Figure 99) in Nevada. The Gigafactory started production of Lithium-Ion battery packs in 2016.

- This implies that Tesla Motors could have strategized that the Electric Vehicle will soon become a commodity with highly increased competitive forces in the market after the establishment of a Dominant Design for the electric vehicle, that will reduce profit margins due to increased competition.

- Being the first corporation to cross the “Innovation Chasm” (Moore, 1991) with an electric vehicle, allowed Tesla Motors to become the “Dominant Design” (Abernathy and Utterback, 1978) for the electric vehicle industry. This then allowed Tesla Motors to have a strong influence on the standardization of sub-systems modules in the industry, which gave Tesla Motors Inc. a Strategic Advantage to become a supplier themselves.

- With the Tesla Lithium-Ion Battery Gigafactory operational, Tesla Motors then effectively also became its own supplier (and for other electric vehicle manufacturers) of Lithium-Ion battery packs (as a Core Technical Capability) for the Tesla Electric Vehicles, and many other Tesla energy end products.

Figure 99: Tesla Inc. Lithium-Ion Battery Gigafactory

8.4.4 Industry Followers Spatial Quadrant

From the SCINav Systems Model's "Forward Dynamic Strategic Innovation Route" (as in Figure 94), dynamic innovation strategy formulation and implementation will then transition from the "Technology Builders Spatial Quadrant" at the corporate level to the "Industry Followers Strategy Spatial Quadrant" at the business unit level (as in Figure 100) where continuous "**Process Efficiency Innovation**" (from the "Dynamics of Innovation" theoretical model) and "**Product Sustaining Innovation**" will become the focus for strategy to create a "**Competitive Advantage**" and "**Market Penetration**" respectively.

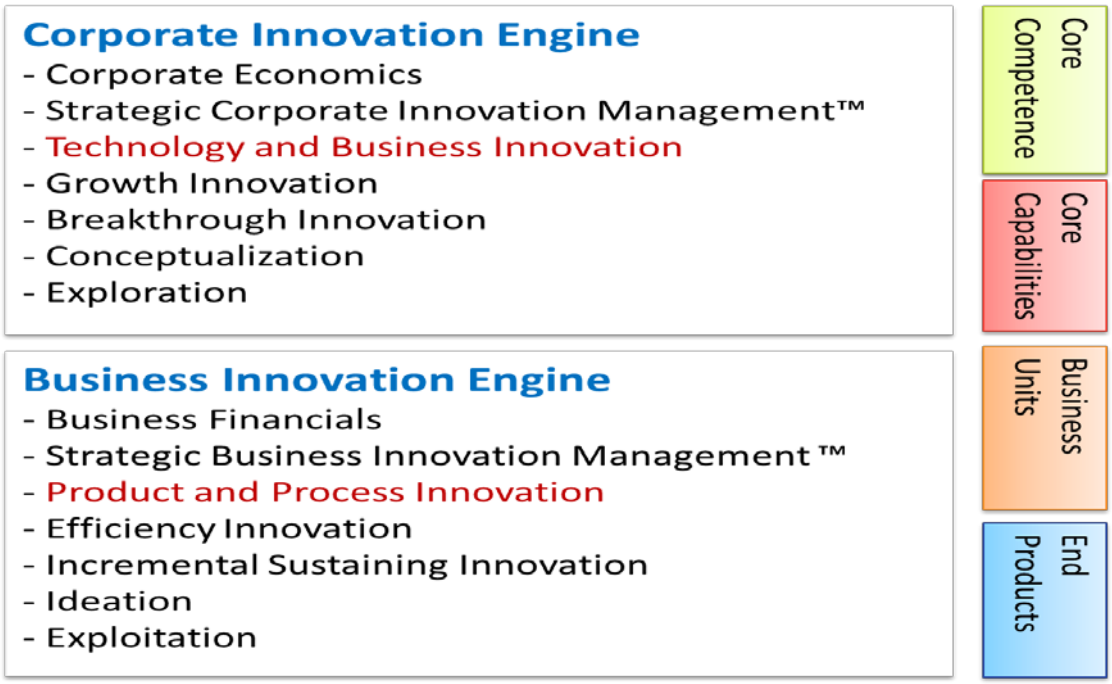


Figure 100: Corporate Innovation versus Business Unit Innovation

Ideally the efforts of "Technology Builders" and "Business Disruptors" should be coordinated to deliver new technology and business models to the "Industry Followers" in a coordinated and integrated manner. In this regard, Tesla Motors introduced the Tesla Supercharging Stations and the Tesla Direct-to-Consumer Dealership business models to increased convenience and to reduce price with the charging of Tesla Electric Vehicles and the purchase thereof respectively. These additional conveniences were extremely important to attract pragmatic "Early Majority" and

especially the conservative “Late Majority” consumer community group to purchase Tesla Electric Vehicles. The pre-order of more than 500,000 Tesla Model 3 Electric Vehicles with a non-refundable reservation fee of US$1,000 a year in advance before production would even start, was a testament to the success that Tesla could demonstrate the new technology performed reliably while being supported with the necessary “business model convenience innovations”.

8.4.5 Market Advocates Spatial Quadrant

According to the SCINav Systems Model, the “Market Advocates” works primarily with the “Late Majority” and “Laggards” consumer community market segments. For this market segment the technology already demonstrated functional performance, reliability, convenience and finally the reduced price started to play a role as well (applying the “Windermere Associates Buying Hierarchy” and “Diffusion of Innovation” theories). Since this activity is at the Business Unit level, it is out of the scope for this PhD thesis.

8.4.6 Business Disruptors Spatial Quadrant

8.4.6.1 Overview

The SCINav Systems Model’s “Business Disruptors” Spatial Quadrant (see Figure 94), is the phase where new business models are being developed. This thesis strongly suggests that it is critical to have business models ready to support new breakthrough technologies or visa-versa.

The “Business Disruptors” are responsible to deliver “Disruptive Innovation” solutions, delivering valuable products or services to non-serve or over-served market segments that are significantly more **convenient** to obtain at a significantly lower **price** than alternative options.

Convenience improvement innovations can include new or different supply chains, distribution channels, product support, product maintenance, customer support while price innovation can mean a different profit model.

Academics and Industry are studying **Business Model Innovation** (Chesbrough, 2010) (Chesbrough et al., 2013) (Osterwalder and Pigneur, 2013) and **Value Innovation** (Kim and Mauborgne, 1997) (Osterwalder and Papadakos, 2014) (Bettencourt and Ulwick, 2008) as extremely popular approaches to obtain evolutionary Disruptive Innovation.

In this quadrant, Tesla Motors had to figure out how to distribute and support the cars they sell to eliminate the "convenience" concerns from potential buyers. It is now very well known that Tesla Motors disrupted the industry strongly with two different business models:

In this regard, Tesla Motors introduced the:

- Tesla Supercharging Stations business model.
- Tesla Direct-to-Consumer Dealership business model.

8.4.6.2 Tesla Supercharging Stations

The roll-out of **Tesla Supercharging Stations** was extremely critical since it was a major convenience concern for some "Early Adopter" and especially the "Early Majority" consumer community market segments. Applying an "Ecosystem Innovation" strategy (Adner, 2006) (Adner and Kapoor, 2016a) (Adner, 2017) approach, it became very evident that electric charging stations were required in addition to the possibility to charge from home. For this reason, Tesla Motors developed a business model to deploy not-for-profit Tesla Supercharging Stations. An example of a Tesla Supercharging Station can be seen in Figure 101.

Figure 101: Tesla Supercharging Station

8.4.6.3 Tesla Direct-to-Consumer Dealerships

Aligned with the SCINav Systems Model theory that the diffusion of new technologies into the market needs to be done as a complete system (Drucker, 1985b) (Christensen et al., 2004), Tesla Motors took this concept further and integrated the automotive retail business model with the new "Digital Marketplace Platform" technology as well. An unexpected result was that it demonstrated how the current dealership model is outdated and that it adds a significant additional high cost to the price of the end-product. This inspired a new industry with new startups such as Carvana, Shift, Vroom and Joydrive while CarMax as an existing incumbent are putting the entire automotive retail business process online.

In the sense of Cross-Industry Innovation (Enkel and Gassmann, 2010), this is also a fantastic example where Tesla took some inspiration from the e-commerce (Amazon and Alibaba) industry and the sales process of fast moving electronic consumer goods (FMECG) and integrated it into a new business model for the "unexpecting" and "unprepared" automotive dealership industry.

The various Automobile Dealers Associations resisted strongly with various court cases. Legislation of various states in the USA stipulates that only third-party dealerships can sell automotive vehicles directly to potential customers. Even with these obstacles, Tesla still opened showrooms in various states, even though it could not facilitate with the sale of a vehicle.

An example of a Tesla showroom (not a dealership) where potential customers can learn more about the product can be viewed in Figure 102.

Figure 102: Tesla's Direct-to-Consumer Dealership Showroom

8.5 Validation of the SCINav Systems Model

8.5.1 Overview

To validate the SCINav Systems Model, it is important to demonstrate that it can assist corporate executive to solve the "Corporate Innovation Performance Challenge". To understand then what "Corporate Innovation Performance" should be, this thesis will revisit the definition it created for Corporate Innovation.

As per definition, this research defined "**Corporate Innovation"** (see section 5.6) to be a system in which multidisciplinary capabilities (knowledge, skills, processes and resources) are integrated to deliver unique insights as valuable solutions, which customers or consumers will appreciate in such a way that the corporation will generate brand recognition in the market, create wealth for employees and sustain growth for shareholders.

From this definition, it means Corporate Innovation must perform and deliver on the following metrics (also specified as expected system performance outcomes in section 1.4):

1. Deliver several new technological products with successful adoption in the market.
2. Generate brand recognition in the market.
3. Create wealth for employees.
4. Sustain economic growth for shareholders.

These four "**Corporate Innovation Performance Metrics**" will be discussed in the following paragraphs to validate if the SCINav Systems Model will be able to assist corporate executives overcome their "Corporate Innovation Performance Challenge".

8.5.2 Deliver New Unique Insights as Valuable Solutions

There is no doubt that Tesla Motors delivers very unique insights as valuable solutions for customers (industry, social environment and the economy) with the extremely successful diffusion (or adoption) of its new technological products in the market.

Tesla Motors Inc. managed to successfully deliver a "breakthrough" Electric Vehicle (EV) with fierce competition from existing fossil fuel vehicles the automotive consumer market and industry were accustomed to, and especially at a time when the market was extremely pessimistic after previous attempts to bring an Electric Vehicle to the market (such as the EV1 from General Motors) already failed.

The value Tesla Electric Vehicles deliver as an alternative solution for transportation can be defined as follows:

- Do not need gasoline as an energy source and thus do not have any gas emissions.
- Do not need to purchase gasoline, therefore any price increase or fluctuations became irrelevant.
- Since there is no combustion engine it is extremely quiet, therefore it does not contribute to “noise pollution”.
- Incredible performance, the Model S as a four-door family sedan will be able to accelerate from 0 to 100 km/h in only 3 seconds.
- Due to the elimination of a combustion engine, the vehicle could be designed with more passenger or baggage space.

NOTE: To measure “customers appreciation” for the value proposition a Tesla’s Electric Vehicle has as a solution for transportation; this research suggests to investigate vehicle unit sales.

Since 2008 Tesla Motors introduced 4 Electric Vehicle (EV) models: the Roadster (2008) started with a price tag of US$109,000, the Model S (2012) at above US57,400, Model X (2015) at approximately US$80,000 and the Model 3 (2017) as the ultra-mass-market model started at US$35,000 (but for the first year only the US$49,000 version was available for sale).

Even with high price tags (defined by Tesla Motors as the initial purchase price), quarterly sales numbers still increased exponentially as shown in Figure 103. With 11,603 car sales in quarter 3 of 2015, Tesla’s unit sales increased to 83,500 units three years later. This is a growth rate of 719% of unit sales only within 3 years.

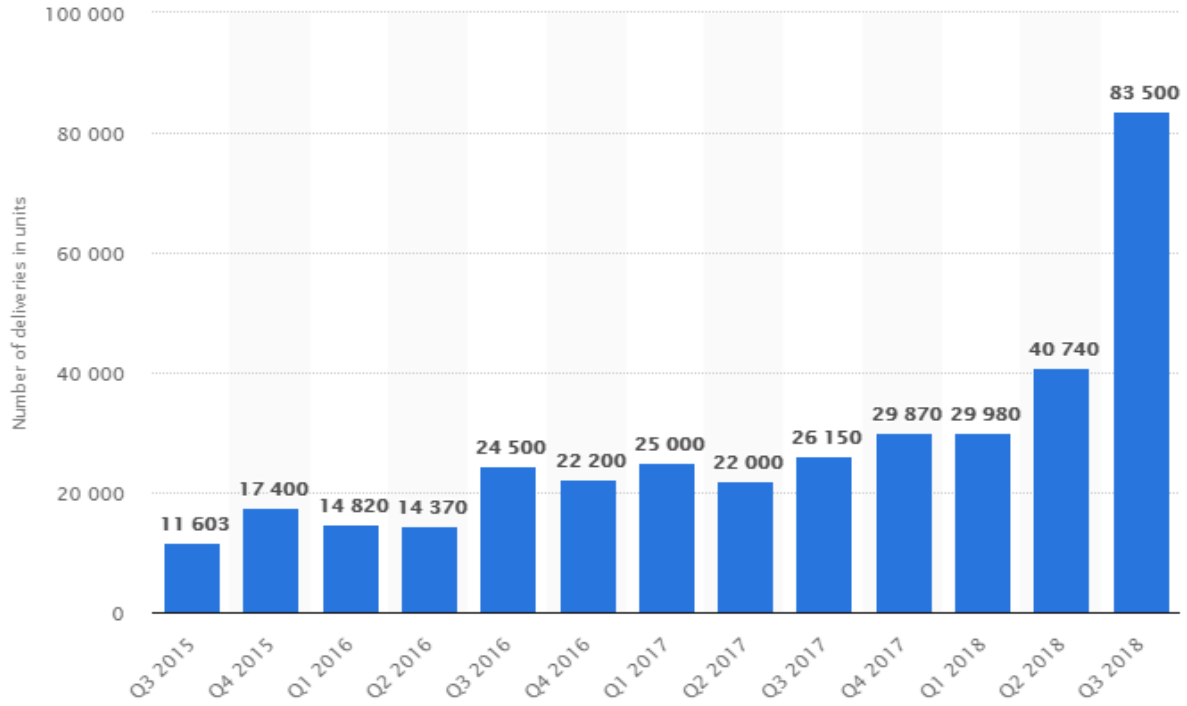


Figure 103: Number of Tesla Vehicles Delivered Worldwide.

Source: https://www.statista.com/statistics/502208/tesla-quarterly-vehicle-deliveries

The unit sales metric clearly indicates that even with: (1) a very high price point, (2) in some cases a significant long delivery time and (3) with many alternative options available on the market, many consumers still valued Tesla Electric Vehicles (EV) enough to make a decision to purchase one. It is then possible to conclude that Tesla Motors did deliver unique insights (with the Electric Vehicle) as a valuable solution for a strategically targeted market segment.

8.5.3 Generate Brand Recognition in the Market

There is no doubt that Tesla Motors Inc. as a corporation generated exceptional brand recognition in the market, it was:

- Ranked globally as the 6th Most Innovative Company in 2018 by Boston Consulting Group's (BCG).
- Ranked globally as the 4th Most Innovation Company in 2018 by Forbes Magazine.

Another quantitative metric that can be used for “brand recognition” is the number of pre-orders Tesla received for the Model 3, which is a phenomenon only known to exist within the consumer electronics industry as with the Apple iPhone. Tesla Motors received more than 500,000 pre-orders with a non-refundable down-payment of US$1,000 for a Model 3, and this was before anybody (not even industry analysts) could physically inspect or test-drive a vehicle.

The above-mentioned data indicate that Tesla Motors Inc. is a highly respected brand and that consumers will purchase a vehicle even before they could see a physical example, which is unthinkable for the automotive industry.

8.5.4 Create Wealth for Employees

It is quite difficult to measure how Tesla Motors Inc. really created wealth for employees, but at least one simple way is to ask how many jobs (as employment) it created and then what that ratio is against financial figures such as Revenue and Net Income.

8.5.4.1 Employment

The number of **employees** working at Tesla Motors dramatically increased exponentially from a workforce of 252 employees in 2008 to an estimated 46,000 employees in 2018, as demonstrated in Figure 104.

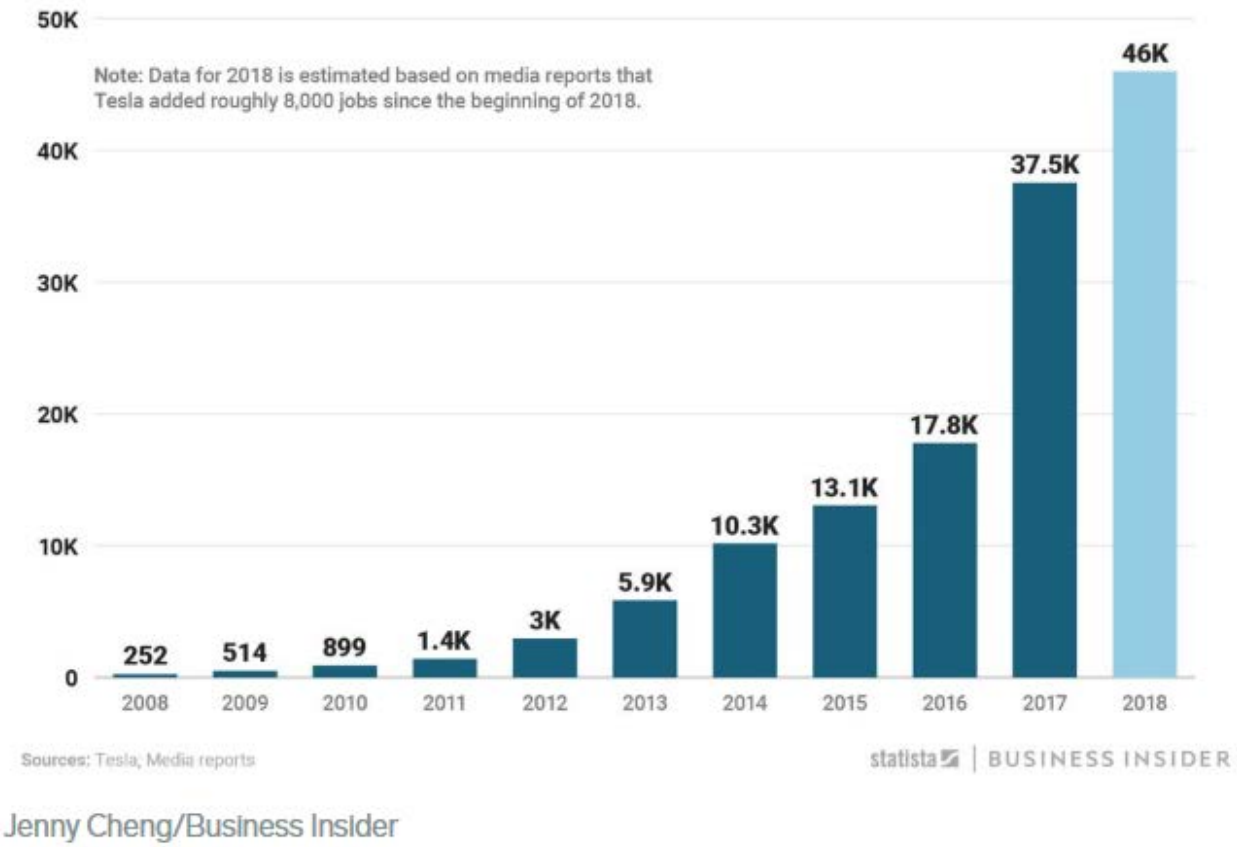


Figure 104: Number of Employees Working at Tesla Inc. (Previously Tesla Motors Inc.)

Source: https://www.businessinsider.com/tesla-grew-rapidly-now-cutting-4000-employees-charts-2018-6

8.5.4.2 Revenue and Earnings

Financial metrics to look at is Revenue and Earnings (or Net Income). The reason is that revenue represents the wealth the corporation and employees created, while earnings is considered available funds that can potentially be distributed to employees within the corporation. Financial metrics ending Q2 2018 were as follows:

- Revenue for the quarter ending June 30, 2018 was US**$ 4.002 billion** (see Figure 105)**.**
- Net Income for the quarter ending June 30, 2018 was US**$ -0.718 billion** (see Figure 106).

Figure 105: Tesla Motors Inc. Revenue since IPO (measured in US$ Billion)

Source: Mactrotrends - https://www.macrotrends.net

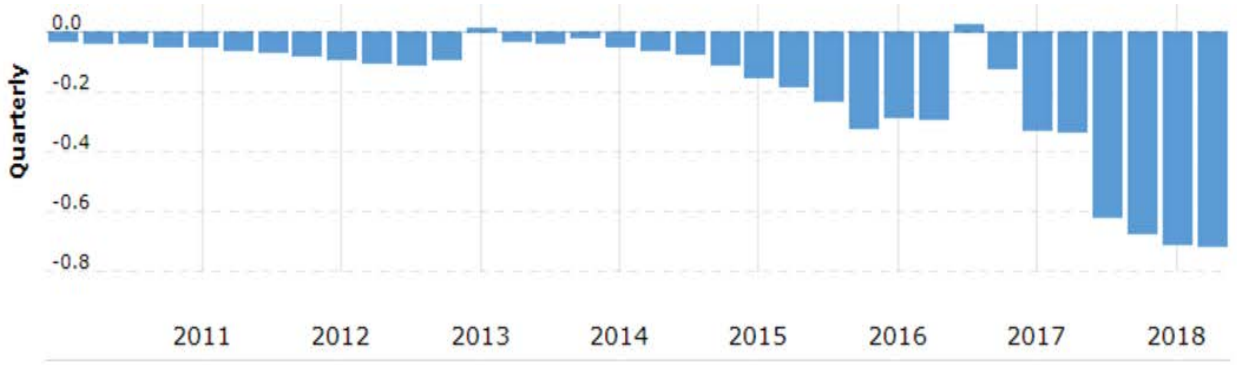


Figure 106: Tesla Motors Inc. Net Income since IPO (measured in US$ Billion)

Source: Mactrotrends - https://www.macrotrends.net

With a growing workforce and strong revenue, it is fantastic to learn how many people (as employees) can have the opportunity to generate some kind of wealth through a basic salary (with some possible benefits). It is currently not known if Tesla has a “stock options” program for employees as an additional source of wealth creation for employees.

Since Tesla Motors Inc. had a negative Net Income each year (although total assets are calculated at US$30 billion), it should be safe to assume that profit sharing bonusses is currently not an option for employee wealth creation.

8.5.5 Sustain Economic Growth for Shareholders

Even though growth (as market share, revenue, share price, market capitalization) and Total Shareholder Returns (TSR) have always been an extremely hot topic being debated on various websites and blog posts, Tesla (under the leadership of Elon Musk) appears to be more interested in finding new consumers and to make them happy rather than sustaining wealth for shareholders (a corporate philosophy similar to that of late Steve Jobs who founded Apple).

For background purposes, the best description for the current ecosystem corporations and corporate executives find themselves in was termed (by this research) as “Shareholder Capitalism”, see section 5.16 for more information. Nobody can deny that many corporate executives and shareholder activists (alone) devised immense wealth from “Shareholder Capitalism”. This legalized gambling known as “trading with corporate shares” starts where shareholder activists acquire significant amounts of shares, appoint a board of directors to “influence” top executives with large amounts of share options on an annual basis to keep them aligned with their own interests. In return corporate executives “manipulate” two primary levers to instill perceived shareholder confidence in the corporation: (1) revenue growth (revenue) and (2) profit margins (earnings). In reality it is merely perception building on financial numbers promised by the corporation and how it was met.

From Tesla’s financial history of continual financial losses, one may assume that Tesla Motors (or Elon Musk) relentlessly remained focused on long-term innovation rather than short-term shareholder returns and thus keeps investing significantly large amounts of funds into R&D and capital into modern factories to deliver new solutions customers want as “Customer Capitalism” (Martin, 2010). From history, this was very much the case with Google, Amazon and Apple who (ignored shareholders and) are currently all extremely wealthy corporations.

The bullish shareholder outlook for Tesla can be observed as how the share price increased since 2010 in Figure 107 below. According to Investopedia, with Tesla's initial public offering (IPO) priced at US$17/share and with the current share price (as of June 29, 2018) at US$342.95/share, it translated to a 1,889% increase in value.

Figure 107: Tesla Motors Inc. Share Price

Source: Mactrotrends - https://www.macrotrends.net

Discovery: From the financial graph in Figure 107, it is possible to correlate the introduction of new electric vehicle models to the market with the sharp increases in Tesla Motors share price with: 2013 (Model S), 2015 (Model X) and 2017 (Model 3). (Bouwer, 2019)

Discovery: A most significant discovery from the data presented in Figure 107 indicates that even with the large amounts of reported negative earnings (as in Figure 106), organic growth (Ahuja et al., 2017) (Kutcher et al., 2014) through the delivery of new solutions as breakthrough innovations (technology products) to new customers (or markets) are worth much more to shareholder perception and the "share price" than accounting innovations (as with mergers and acquisitions) (Birshan et al., 2017).

Regarding the expected output for sustainable growth, Tesla Motors did perform exceptionally well with the following metrics:

- Electric Vehicle Unit Sales (Figure 103): From 11,603 unit sales for Q3 2015 to 83,500 unit sales for Q3 2018.
- Revenue (Figure 105): US$4.002 billion for Q2 2018.
- Net Income (Figure 106): US$-0.718 billion for Q2 2018 (although significant fixed assets were acquired).
- Share Price (Figure 107): From US$17/share in 2009 to US$342.95/share Q2 2018.

8.6 Conclusion

The purpose of this chapter was to verify and validate the SCINav Systems Model.

To **verify** the SCINav Systems Model, this section had to demonstrate that an adequate ""Strategic Corporate Innovation Navigation Systems Model" was designed and developed (or modelled) that can support corporate executives with the formulation of a "Corporate Innovation Strategy" and guide them to "Manage Corporate Innovation Strategically" as a solution for the "Corporate Innovation Performance Challenge", as defined in Chapter 1.

Since it would have been an impossible endeavor to implement the SCINav Systems Model at several corporations over several years to obtain the necessary metrics for verification and validation, the economic history of Tesla Motor Inc. was used as a case study instead.

This chapter successfully verified that the "SCINav Systems Model" could follow and explain how Tesla Motors "Strategically Managed Innovation" via the "Forward and Reverse Dynamic Strategic Innovation Routes", from their actions and activities the past decade with the delivery of several Electric Vehicle models as new complex integrated technologically advanced system.

This chapter also successfully **validated** the SCINav Systems Model by demonstrating how corporate executives at Tesla Motors successfully overcame the “Corporate Innovation Performance Challenge” with its exceptional growth as measured by four metrics as per the definition for “Corporate Innovation” (in section 5.6):

1. Diffusion of several new technological products with successful adoption in the market.
2. Generation of brand recognition in the market.
3. Creation of wealth for employees.
4. Sustainable economic growth for shareholders.

CHAPTER 9: CONCLUSIONS AND RECOMMENDATIONS

9.1 Introduction

The purpose of this chapter is to reflect on the work that has been done for this research project. It will restate the challenge, external reviews, the contribution to academia, limitations and future research outlook.

9.2 Overview

In Chapter 1 the "**Corporate Innovation Performance Challenge**" was identified where the majority of corporate executives are not satisfied with the results their innovation efforts deliver within their corporations.

With additional empirical data the question was raised: Why is there such a big discrepancy between the percentage of corporations that have an innovation strategy (almost 80% for 2018) versus corporate executives that are satisfied with the corporate innovation performance (only 6%)? This research termed this phenomenon the "**Corporate Innovation Strategy Paradox**" as a cause for the "Corporate Innovation Performance Challenge".

With the "Corporate Innovation Strategy Paradox" identified, this research argued that the current corporate challenge is not as much to have a "Corporate Innovation Strategy" in place that is aligned with corporate growth, but the actual hidden challenge is to have a comprehensive, holistic and dynamic "**Strategic Corporate Innovation Navigation System**" in place that can support the formulation of a "**Corporate Innovation Strategy**".

The **vision** for this PhD research project was to solve the "**Corporate Innovation Performance Challenge**" with a solution that will initiate a "paradigm shift" how academics and industry think about Strategic Corporate Innovation.

The **mission** was to design and develop a system (as a guide) that will enable corporate executives (who are responsible for the "**Strategic Corporate Innovation**" function) to integrate multidisciplinary knowledge, skills and resources to deliver new unique insights as valuable solutions which customers or consumers will appreciate in such a way that the corporation will generate brand recognition in the market, create wealth for employees and sustain economic growth for shareholders.

The **goal** was to integrate all applicable theories and empirical data into a single "**Dynamic Contextual Circumstance-Based Corporate Innovation Strategy Formulation Systems Model**" as a reference guide (or map) how corporate executives can manage innovation as a system.

The primary **objective** was to apply Systems Thinking principles as a theory building research methodology.

The systems design **requirements** for this research project were then identified to be as follows:

1. Aggregate, curate, integrate, connect and correlate various frameworks, models and theories for innovation and corporate strategy into a single systems model.
2. Apply Systems Thinking and Systems Engineering principles.
3. Design and Develop a novel "Strategic Corporate Innovation Navigation Systems Model" that can support corporate executives with the formulation of a "Corporate Innovation Strategy".
4. Guide corporate executives to "Manage Corporate Innovation Strategically" as a solution for the "Corporate Innovation Performance Challenge".

The expected **performance** outcomes for the “Strategic Corporate Innovation Navigation System”, were to assist and enable corporate executives to deliver unique insights as valuable solutions which customers and consumers will appreciate in such a way that the corporation will:

1. Deliver several new technological products with successful adoption in the market.
2. Generate brand recognition in the market.
3. Create wealth for employees.
4. Sustain economic growth for shareholders.

The fundamental concept of Systems Thinking as a **research methodology** for theory building was discussed to define the design and develop process of a systems model was discussed in **chapter 3**.

The full-scale **literature research study** was completed in **chapter 4**, from which 15 frameworks, models or theories were identified to be integrated with the design, development and modelling of the “SCINav Systems Model”.

The “Strategic Corporate Innovation Navigation (SCINav) Systems Model” was **designed** as a “**Relational Multidimensional Vector of Matrixes**” structure in **chapter 6** to guide corporate executives as a “**Dynamic Contextual Circumstance-Based Strategic Corporate Innovation Formulation Systems Model**” to formulate a “**Corporate Innovation Strategy**”.

Chapter 7 discussed the following additional three theories to develop the “**Contextual Innovation Lifecycle Spatial Quadrant Dynamic Border Crossing Points**” on a “SCINav Systems Model Dimension Matrix”:

1. Dominant Design – **Transition Point** (Abernathy and Utterback, 1978).
2. Decoupling of Integrated Complex Systems – **Decoupling Point** (Christensen et al., 2004).

3. Information Advantaged Adaptive Innovation Strategy – **Switch Point** (Reeves et al., 2017).

To verify the SCINav Systems Model, this section had to demonstrate that an adequate ""Strategic Corporate Innovation Navigation Systems Model" was designed and developed (or modelled) that can support corporate executives with the formulation of a "Corporate Innovation Strategy" and guide them to "Manage Corporate Innovation Strategically" as a solution for the "Corporate Innovation Performance Challenge".

Chapter 8 successfully **verified** that the "SCINav Systems Model" could follow and explain how Tesla Motors "Strategically Managed Innovation" via the "Forward and Reverse Dynamic Strategic Innovation Routes", from their actions and activities the past decade with the delivery of several Electric Vehicle models as new complex integrated technologically advanced system.

Still in **chapter 8**, the SCINav Systems Model was also successfully **validated** against the Corporate Innovation Performance metrics where Tesla Motors: delivered new "Complex Integrated Technologically Advanced" solutions to the market, generated unprecedented brand recognition with quarterly sales of over 80,000 Electric Vehicles, created 46,000 jobs for employees and sustained economic growth of almost 2,000% in share price since 2010.

9.3 Contribution

This research designed and developed a "**Strategic Corporate Innovation Navigation (SCINav) Systems Model**" to serve as a "**Dynamic Contextual Circumstance-Based Corporate Innovation Strategy Formulation Systems Model**".

The structural configuration of the SCINav Systems Model became a "**Relational Multidimensional Vector of Matrixes**" with 9 layers of 2 x 2 matrixes supported by two Axial Dimensions as shown in Figure 108.

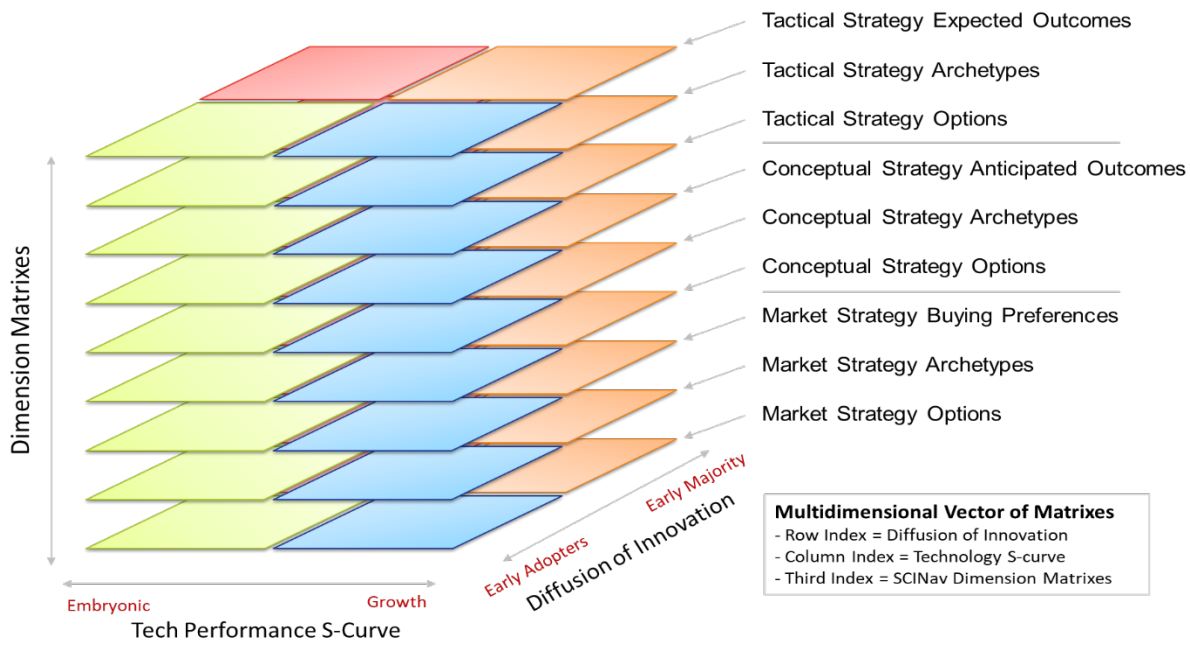


Figure 108: Strategic Corporate Innovation Navigation (SCINav) Systems Model as a Relational Multidimensional Vector of Matrixes

The systems modelling (design and development) of the "Strategic Corporate Innovation Navigation (SCINav) Systems Model" resulted as follows:

1. It was designed as a "**Dynamic Contextual Circumstance-Based Corporate Innovation Strategy Formulation Systems Model**" (from Chapter 2) to support corporate executive with their "Corporate Innovation Strategy Formulation" activity. Thus, it can guide corporate executives to choose which theoretical paradigm to use depending on the given corporate growth goals a corporation may have and, on its standing (position in the market and capabilities as a Competitive Advantage) in the industry at a given moment in time?"

2. The Systems Model was designed and developed according to the principles of **Systems Thinking** as a "Theory Building Methodology", as discussed in Chapter 3.

3. "**Nine Dimensional Matrixes**" were constructed which could be categorized into three "**Phases of Strategic Corporate Innovation Navigation**" as: Market Strategy, Conceptual Strategy and Tactical Strategy (from Chapter 2).

4. Knowledge Elements (frameworks, models and theories) were aggregated, curated, integrated and correlated (in chapter 6) as identified from the literature study (from chapter

4) to create "**Contextual Innovation Lifecycle Spatial Quadrants**" with their interdependent relationships.

5. With the knowledge that was acquired from the "Strategic Corporate Innovation Concept Definitions" (in Chapter 5), causal dynamic interactions among the "Contextual Innovation Lifecycle Spatial Quadrants" were identified and integrated into the systems model (in chapter 7) to be able to make predictions as foresight.

The end-result of the "SCINav Systems Model" was a guide that could be used by all corporate executives who wants to understand the different "Dynamic Contextual Innovation Lifecycle Spatial Quadrants" that exist and how its spatially positioned determined the innovation strategy to follow.

9.4 External Review

An application for this research was submitted to Emerald Publishing Limited (with headquarters in Bingley, United Kingdom) to be published as a book. Emerald supports the use of a peer review process for all of their books, to maintain rigorously high editorial standards.

Therefore, Emerald Publishing appointed their own international examiners (unknown to the author) to peer review this research before it can be published as a book. The feedback from the review reports were very positive, a few comments were:

- "The key contribution of this proposal is its claims to shed light on the phenomena of corporate innovation strategy. This is a very ambitious claim and the author must be complemented for identifying a genuine gap in the innovation research field".
- "The coverage will provide the reader with a solid foundation and details of the background to understand the substance of the model presented".
- "As stated, the field of 'strategic corporate innovation management' is underserved and thus the relevant literature is limited. This book could be a foundation work in the field".

9.5 Limitations

A known limitation is that the “SCINav Systems Model” was primarily designed and developed to be used as a guide by corporate executives to develop their own “Corporate Innovation Strategies”, primarily for “Organic Growth” of the corporation. It was later determined during verification that the “SCINav Systems Model” can also be used by universities, startups and Venture Capital firms.

9.6 Outlook

The future outlook for this research is to:

- Perform empirical research to measure how well the “SCINav Systems Model” can improve “Corporate Innovation Performance”.
- Keep improving the “SCINav Systems Model” through continues research.
- Identify anomalies in the use of the “SCINav Systems Model”.
- Publish a textbook that can be used to educate students at tertiary level.
- Develop a computer system that can assist with the digital transformation of “Strategic Corporate Innovation” and the development of “Corporate Innovation Strategies”.
- Research how to implement and integrate the “SCINav Systems Model” into corporate environments.

9.7 Conclusion

This chapter concludes the required documenting of this PhD research project that started in 2008.

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