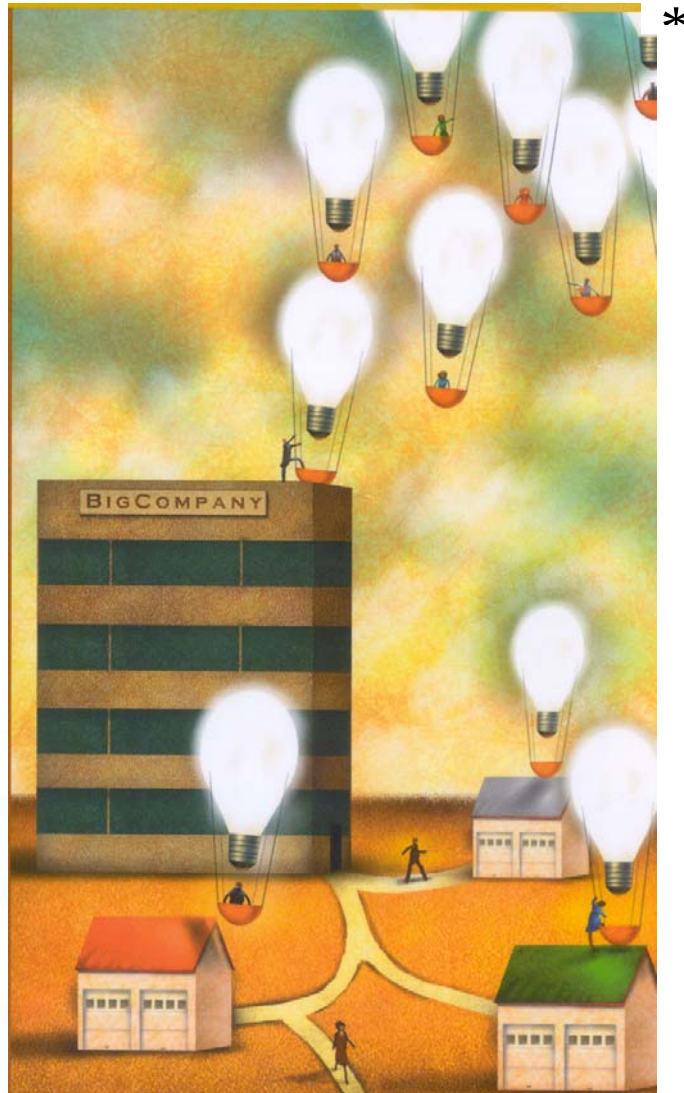


Radical Innovation capability

A managerial guide to tap radical Innovations



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*Front image - Courtesy: California management review, Feb 2006

Preface

This research is done under the patronage of the Faculty of Technology, Policy and Management of Delft University of Technology (Netherlands) and Shell International Exploration and Production. Project duration of this research was from February to September 2006.

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EXECUTIVE SUMMARY

Established firms are usually good at managing incremental innovations. However when it comes to radical innovations (RI) they often fail. Small firms are generally the ones that bring RI into the market.

There are two ways for established firms to tap radical innovations – one can buy, or one can build. Buying RI helps, but often at a price and does not bring a lasting solution to the threats of continuous innovation. Building a *capability* to recognise, develop and deploy RI projects is a way to continuously produce new growth platforms. How to establish and successfully sustain *RI capability* at a large established firm is the focus of this research.

Based on a detailed study of managing RI projects, the analyses of five academic propositions and the case study of the venturing capability of three multinational firms, this research presents a framework to systematically incubate and deploy RIs. It is followed by the practical guidelines to establish RI capability or to check the health of an already existing RI capability.

Research methodology

1. This research consists firstly of a review of relevant academic literature on radical innovations (RIs) and ways to manage RIs. Propositions from five researchers on how to tap radical innovations are then studied in greater depth.
2. The venturing capability of three large established firms – Shell, Nokia and IBM is studied and analysed. These companies are selected because of their well-established venturing program, which has a degree of recognised success.
3. A comparison is made between the academic propositions and the actual practice. Based on the insights gained from this comparison, the RI framework is presented and the practical guidelines are deduced.

Key observations

1. Skills, mindset and capabilities required to manage RIs are not only different when compared to managing regular existing business, but also contradictory. Let the managers of the core business focus on what they do best - managing and growing the existing businesses, and let the venture unit(s) take the responsibility of developing RIs and emerging businesses.
2. Each of the case study companies - Shell, Nokia and IBM has a well-defined venturing process starting from the screening of ideas through to their deployment. The venture units, however, are active only in a part of the venturing process - (early stage) incubation, (mid stage) pilot or (late stage) commercialisation.
3. In practice, companies do not usually follow any single academic proposition for venturing. They often combine a set of propositions to adapt to their setting.
4. None of the three companies has identical organisational structure for venturing. Each company has its unique structure, processes, resource allocation and decision-making system.
5. (i) 'Crossing the valley of death' - from venture unit to business unit: once matured in venture unit, RI projects become orphans if a BU is unwilling to take charge of the project,
(ii) Fluctuating interest of senior leadership in RI and venturing program, and
(iii) Short life span (on average 4-5 years) of the venture units are the most common challenges of venturing.

Conclusion

1. For RI capability - there is no one style that fits all. Design an organisational structure that serves your firm's objectives and needs. The aim of RI capability must be to gradually reduce uncertainties (organisational and resources, technical, and market) of RI projects.
2. Three phases – incubation (idea), validation (pilot) and deployment (commercialisation) are important to capture the value of a RI project. While designing the RI capability, this entire project development funnel must be considered. Capability (managerial skills from technical to commercial), resources (from 1x to 50-100x) and decision-matrix (from technical novelty to business potential) vary substantially for each phase. It is recommended that a separate (venture or business) unit take responsibility for each phase.
3. RI capability within a large established firm will survive and be successful, only if
 - i. *Venturing is aligned with the needs*
 - ii. *The objectives for venturing are clear.* Unclear or mixed objective will lead to the eventual closure of the venture unit.
 - iii. *A visionary senior executive supports venturing.* Visionary senior leader balances between the short to medium term incremental innovation and the long-term radical innovations. Interest of and the support from a senior executive is critical.
 - iv. *Resources are secured for longer term.* Resources (funds, managerial time, and organisational home) must be secured for at least 7-10 yrs. Cost cutting exercise during the financial downturn of company is one of the main reasons that venture unit is closed. The top management must ensure the resources.
 - v. *A disciplined approach is applied.* Appropriate control mechanisms (decision making, criteria, milestones) are deployed to get the expected deliverables
 - vi. *Right people are involved.* One of the crucial factors to the success of RI projects is the involvement of right kind of people – passionate, committed, entrepreneurial, t-shaped and influential – managers and team members.
 - vii. *Process of the project transfer from the venture unit to business unit is clear.* For the 'crossing the valley of death' challenge - senior leadership involvement, relationship building with the business units (BU), aligning part of the portfolio with BU's road-map, giving BU 'uncertainties resolved' RI projects, and letting the RI projects be channelled outside if they do not find a home inside are possible solutions.

Report outline

1. Chapter 1 describes the radical innovation imperative that triggered this research, and explains goals, methodology and the scope of this research.
2. Chapter 2 analyses the challenges with RI projects and the reasons why established firms often fail with RI.
3. To understand the mechanisms to tap RI projects and to facilitate the deployment of RI capability, Chapter 3 describes propositions suggested by academia on how large established firms can tap radical innovations.
4. Chapter 4 focuses on three case studies - highlighting how these companies have organised their venturing capability, what can we learn from them, and how their way of venturing compares with academic propositions.
5. Based on the observations from what the three case-study firms follow in practice, Chapter 5 presents a radical innovation framework to systematically incubate RI projects.
6. Chapter 6 reflects on issues related to radical innovation and radical innovation capability.
7. Chapter 7 concludes with seven key factors that contribute to successfully establish and sustain the RI capability within established firms.

Key words

Radical innovation (RI), venturing, venture units, RI capability, RI framework, Shell, Nokia, IBM

1. RESEARCH DESIGN

This chapter starts with an overview of what triggered this research followed by the goal, methodology, scope and relevance of this research.

1.1. *The Radical Innovation imperative*

Most researchers agree that small firms are the usual source of radical innovations, while large established firms often fail to develop and deploy such innovations (^{71, 72, 74, 19, 35, 50}). It is cautioned that firms failing to invest in radical innovations may achieve a certain degree of success, but limit their growth potential and put their long term survival at risk (^{76, 61, 32, 54}).

According to a statistics¹ related to radical innovations, 40% of the Fortune Top 500 in 1980 has disappeared, whilst of the 1970 list 60% have been acquired or gone under. Of the top 12 companies that made up the Dow Jones index in 1900 only one – GE survives today. Even apparently robust giants like IBM, GM or Kodak can suddenly display worrying signs of mortality (⁷⁹). If true, such facts carry serious implications for large established firms. The only way to respond to the threats radical innovations (RIs) is to accept it and then find ways to exploit it (²⁵). Hence, it is important that established firms develop a *capability* for tapping RIs.

Venturing is a largely accepted way of establishing RI capability. Taking their cue from the venture capital industry, firms as diverse as Nokia, Shell, British Telecom, Ericsson, Lucent, Dell and Xerox created *venture units* to promote RIs, to create a window for new technologies and to spur growth(¹⁸). However, many of them including those of British Telecom, Ericsson, Lucent and Xerox have closed down, and others are struggling to justify their continued existence(^{13, 14}). A review indicates that out of 95 independent venture units studied in 2001, only 55 were surviving in 2003(⁶). This indicates that venturing is often not effective and one of the biggest challenges that it face today is its very survival.

This raises a question that: How to establish an effective *Radical Innovation capability* (in such a way that it lasts)?

¹ Presented at the International Strategic Management Society meeting in Chicago (⁷⁹)

1.2. Research Goals

The main goal of this research is to improve the ability of large established firms to recognise, incubate and deploy Radical Innovations. This is done in three stages:

- First, by explaining the challenges to managing RI projects and how they differ from managing incremental projects (Ch. 2),
- Second, by enumerating *the essential factors* that must be considered to establish a previously non-existing RI capability or to check the health of an already existing venturing program (Ch. 5),
- And third, by explaining *the fundamental framework* that must be considered while designing a RI capability (Ch. 7).

Instead of quick-fixing the reasons for the ineffectiveness of the venture units, this research pursues a root cause analysis approach by digging the fundamental challenges to managing RIs within established firms (Ch. 2). The aim is an understanding of what is needed to successfully deploy RI capability.

1.3. Research methodology

Academic propositions

This research is conducted in two phases. First, a detailed analysis of relevant academic literature on how to tap RI is conducted. Propositions from five researchers - Henry Chesbrough, O' Reilly & Tushman, Gary Hamel, Markides & Geroski and Christensen & Raynor are studied in greater depth. These researchers were selected because of the originality of their proposition and their popularity among other researchers. Each of these propositions is distinct from other. For example, while Gary Hamel proposes to establish small venture units in every business unit to incubate radical ideas, Markides & Geroski propose that let small firms pioneer RI, and when the time is right large companies can scale it.

To keep a common framework while analysing the academic propositions, few key themes were used. A cross case method is used to identify these themes ⁽⁶⁰⁾.² The interviews taken with the companies were analysed and the key issues and concerns of the companies were considered while creating these themes. Firms were asked which areas were they particularly interested to learn from the academia. Five key themes emerged as a result of this: early warning system; organisational structure; processes; resource allocation and decision-making.

The aim of this phase is to put together the factors contributing to establishing a Radical innovation capability.

² This approach allows to understand the phenomena beyond each individual firm's context and increases the possibility of generalisation of observations ⁽³⁷⁾.

Case study

In the second phase, a multiple case study approach is used.³ The venturing function of three large established firms - Shell, Nokia and IBM are studied and analysed. This approach is used:

- To extract the common factors that are present among these diverse firms. These factors might be the essential elixir for a successful radical innovation capability.
- To explore the similarities and differences between the actual practice in firms and the academic propositions, and
- To understand the differences between the venturing practices across these three companies.

These companies were selected because - they have well-established venturing program, their venturing program has a degree of recognised success at least in the academic literatures, and they are among the leaders in their respective industries. Moreover, venture units of these companies serve a similar purpose. On a broader level, their objectives are to tap radical innovations, strategic renewal and growth.

Information on these companies was collected from three sources - first, by studying the publicly available information including the publications in scientific journals; second, from the study of confidential documents within the company; and third by conducting interviews. Three sets of questionnaires were prepared for the interviews. Each set based on the position held by the interviewee. For example, a senior manager who heads the venturing program was asked a different set of questions than the manager who actually manages RI projects. Please refer to Appendix G for more details.

Multiple interviewees were taken to reduce the risk of undue influence that any individual interviewee may have on the case study (³⁷). For Shell and IBM, interviews were conducted face-to-face, while for Nokia they were conducted by phone. On average three interviews were conducted from each company.

³ Case study research is especially appropriate for this type of exploratory research with a focus on 1) documenting the phenomenon within its organisational context, 2) exploring the boundaries of the phenomenon, and 3) integrating information from multiple sources (³⁷, ⁶⁰).

Schematics of the report

Followed by these two phases, a comparison is made between the academic propositions and the company practices. Based on the insights gained from this comparison, conclusions and recommendations are deduced and a research proposition is presented.

The following figure shows the schematics of this report.

- Chapter 2 analyses the challenges with RI projects and the reasons why established firms often fail with RI.
- Chapter 3 describes the academic propositions suggested by researchers on how large established firms can tap radical innovations.
- Chapter 4 focuses on three case studies highlighting how the multinationals have organised their RI capability, what can one learn from them, and how their way of venturing compares with academic propositions.
- Chapter 5 concludes with seven key factors that contribute to successfully build and sustain venture units. These factors are considered critical for establishing and sustaining the RI capability.
- Based on the observations from what the three case-study firms follow in practice, Chapter 7 presents a research framework for a matured RI capability.

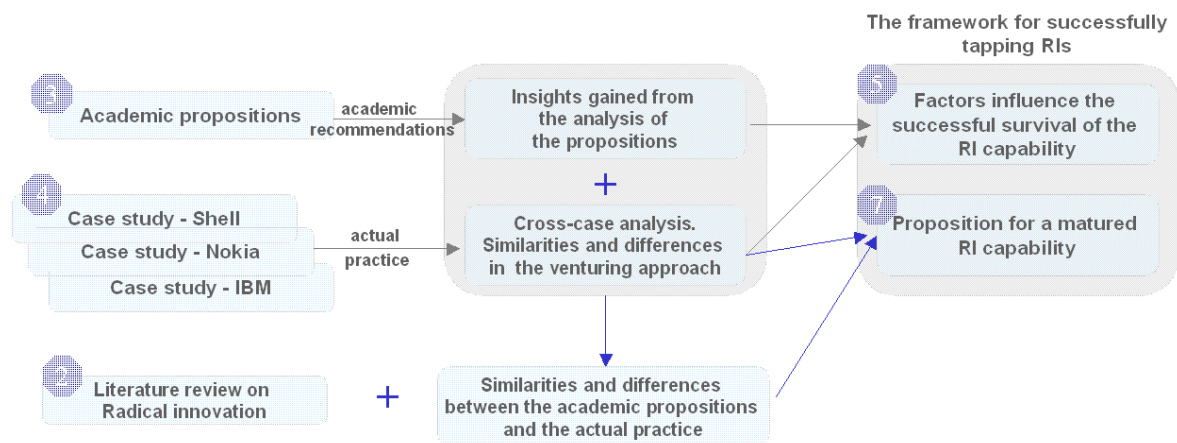


Figure 1 - Schematics of report

1.4. Scope of the research

The scope of this research is limited in three aspects.

- First, there are two ways to tap RIs - one can buy it, or one can build it. The former option, of mergers and acquisitions, is outside of the scope of this research.⁴ This research focuses on the later - how to establish a capability.

- Second, this research is about radical *technological* innovations. Although there are some similarities in managing incremental and radical innovations, it will be apparent in the following chapter that managing RI is much different when compared to incremental innovations because of the higher uncertainties and risks involved with the former. Similarly, there are several similarities in managing radical '*process*' or '*business model*' innovation with the '*technological*' innovation, but this research will mainly focus on the later. Strategies to cope with '*business model*' innovations are briefly covered in this report. It must be noted that *disruptive* innovations is considered a form of RIs and it is covered in this report.

- Third, this research is focused on large established firms. Although a small or a medium sized firm can apply the conclusions derived in this research, they might need a more customised solution based on their settings. Small and medium sized firms are often agile, they often do not have well-established global processes and standardisation, and top management is easily approachable. Large established firms on the other hand have established global processes, a yearly planning of projects and finances, and the top management is often busy in solving critical challenges such as managing stakeholders, solving a problem in a country or ensuring the planned launch of new products. While small and medium sized firms can adapt to new situation, large firms often lack such flexibility. Hence, managing RIs that require flexibility, adaptive planning and management attention, large firms need a separate set of actions.

⁴ The mechanics of buying a business have a little in common with the mechanics of building one. Nevertheless, by building capability, one may not opt out the option of M&A. M&A works complementary.

1.5. Research assumptions

Researchers agree that firms failing to invest in RIs may achieve a certain degree of success, but limit their growth potential and put their long-term survival at risk. Paradoxically, established firms are generally not good at managing RIs. In order to successfully manage and produce RIs researchers propose to create venture units however they often get closed within few years of their initiation. This leads to a conclusion that established firms' wants to create RI capability that can successfully and continuously produce RIs. Followed by this argumentation chart, an overview of the assumptions and their references is shown.

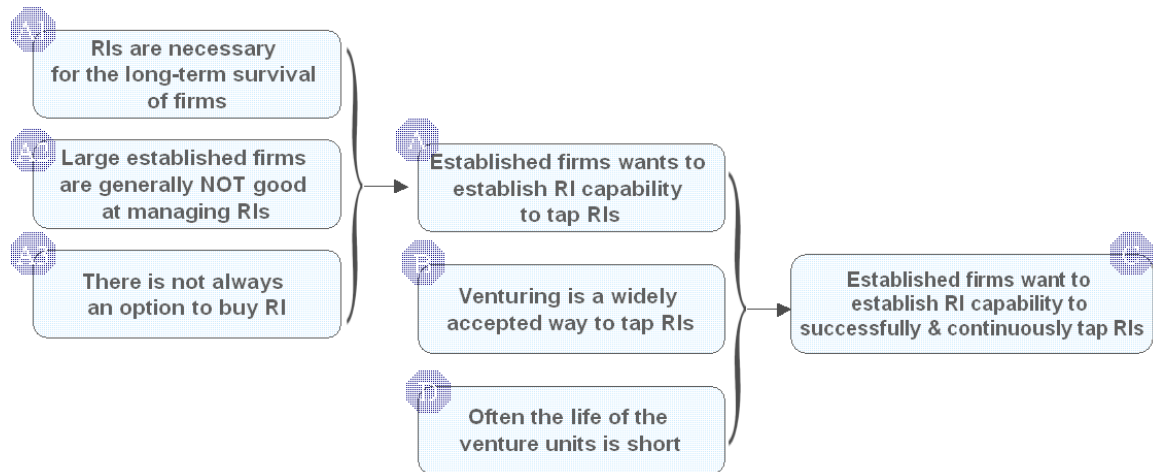


Figure 2 - Logical structure of assumptions leading to the need for this research

Table 1 - Overview of the research assumptions and their references

Assumption/ statement/ conclusion	Validation	Sources/ support
A1 RIs are necessary for the long-term survival of firms	Literature	Schumpeter (1994), Sharma A. (1999), Christensen (2003) and others
A2 Large established firms are generally not good at managing RIs	Literature	Christensen (1997), Markides and Geroski (2005)
A3 There is not always an option to buy RI	Literature, argumentation	Chesbrough (2000), Markides & Geroski (2005)
A Firms want to establish a RI capability to tap RIs	Literature, argumentation	Day (1994), Kelley et al. (2005)
B Corporate venturing is a widely accepted way to tap RI	Literature	Block (1993), Burgelman (2005),
D Often the life of corporate venture units is short	Literature	Campbell (2003), Birkinshaw (2005)
C Firms want to establish RI capability (through CV) to successfully & continuously tap RIs	argumentation	Campbell (2003), Birkinshaw (2005)

1.6. Relevance of the research

Books, for example, O' Reilly and Tushman's 'Ambidextrous organisations' and Christensen's 'The innovators solution', focus on making a firm understand the need to be involved with RIs, and explains that the radical and the incremental can co-exist. This research goes a step further in explaining what are the challenges with RI, how to build the RI capability, and explains the important factors that influence the success of RI capability.

Leifer et al. (2000) rightfully puts that management of RI projects remains more of an art than a science (⁵⁵). This research aims to understand this art and translate some of this art into science.

2. INTRODUCTION TO RADICAL INNOVATION

“You are not fit to lead an army on the march unless you are familiar with the face of the country – its mountains and forests, its pitfalls and precipices, its marshes and swamps.”
– Sun Tzu, The art of war (6th century)

Radical innovations are often associated with the new growth businesses, emerging businesses (^{8, 23, 42}), and strategic renewal (^{43, 53, 8}) of a firm. It is strategically important for the established firms to develop RIs for the future growth and for their long-term survival. To emphasize the importance of RIs and to understand the fundamentals of managing RIs, this chapter introduces:

- The differences between managing RI projects when compared to the regular incremental innovation projects,
- The importance of RIs for the established firms, and
- Why are the established firms are not good at managing RIs

2.1. Background Definitions

According to scholars, innovation is not a single act but a process which begins with an idea or an invention (^{30, 36, 78, 82, 70}) and carries through to its value creation. Classification of innovation into different types focuses attention to the outcomes of the innovation process (^{70, 30}). Innovation is classified as product, process, service, market, or management innovation among others. On a broader level, what remains the core is the *change* that it brings along. This change could be an incremental one or a breakthrough. For example, a product innovation could be an incremental functional addition or a total reengineering. From this perspective, innovation is classified into incremental and radical by several researchers. This research uses this classification. The definitions and the distinctive features of these innovations are explained in the following text.

Recently, Christensen (1997) popularised the classification of innovation into sustaining and disruptive innovation. From the text later in this section, it will be clear that disruptive innovation is a form of radical innovation.

Incremental innovation

Incremental innovations often target existing customers with better performance than previously available solutions, either as incremental year-by-year improvements or as technological advances (²⁰). Succeeding in incremental innovation depends on how well a firm performs relative to its existing competition and involves ‘doing more of the same, but better or quicker or cheaper’. There are winners and losers in this race, but the players and dynamics of the game are relatively predictable when compared to the RI.

The mechanisms that firms deploy in order to excel in incremental innovations include TQM, Kaizen, KM practices, streamlined processes, R&D, outsourcing, integrated product development and close customer interaction amongst others(⁵⁵).

Radical innovation

The paradoxical aspect of incremental innovation is radical *innovation*. RI develops new businesses or product lines and often fundamentally changes an element of business⁽⁶⁵⁾ – based on new ideas or technologies or substantial cost reductions^(55, 62).

RI frequently leverage advanced technology or combination of known technologies as a basis for advantage⁽⁵⁴⁾. RIs often result in product or value propositions which undermine the competences and complementary assets on which existing competitors have built their success⁽²⁸⁾, and disturbs prevailing consumer habits and behaviours⁽²⁸⁾ in a major way. They often result from a technology push process originating from those responsible for developing new technologies^(28, 19). However, they often need a substantial amount of time before they prove their worth.

From a practical perspective, RI results in products with an entirely new set of performance features, such as process improvements in known performance by five times or greater, or a significant (thirty percent or greater) reduction in cost⁽⁵⁵⁾. Examples of RI include - CT, MRI scanner which brought an entirely new set of performance features⁽⁵⁹⁾, PC which made mainframes affordable^(19, 59), xerography, which brought in major advances in photocopying technology⁽⁶⁹⁾ and several other technologies.

Practically the definition of RI changes with respect to the position a manager holds. For a middle manager, an innovation is radical if it brings forth an altogether a new way of doing things, while for the top management an innovation is radical if it results into a new line of business. This research incorporates both these definitions. An innovation is considered radical if it results into a *step change* to the incremental development of a technology or replaces that technology altogether as well as the one that results into an *emerging business*.

Disruptive and Strategic innovation

Two types of RI have gained popularity in recent years – first, disruptive innovation and second, strategic (business model) innovation⁽¹⁹⁾. Both these innovations result in products or services that undermine the competencies and complementary assets on which existing competitors have built their success. Examining from a broader perspective, one can observe that an innovation is a radical or disruptive is dependent on the context from which it is looked at. For example, iPod is a RI for Apple Inc., while it is a disruptive innovation from the context of Sony's Walkman and Philips CD player. With this reasoning, disruptive innovation is considered a form of RI in this research. Refer to Appendix C for the further details on differences between Disruptive and RIs.

Strategic innovations are mainly based on business models, for example: no-frills point-to-point cheap flights, online banking, online universities and more. Managing strategic innovations requires a different set of strategies when compared to that required for RI. Please refer to Appendix A and Appendix B for the definitions of disruptive and strategic innovations, and for the ways to cope with them.

The following figure shows the types of innovations based on their impact on established firms and consumers.

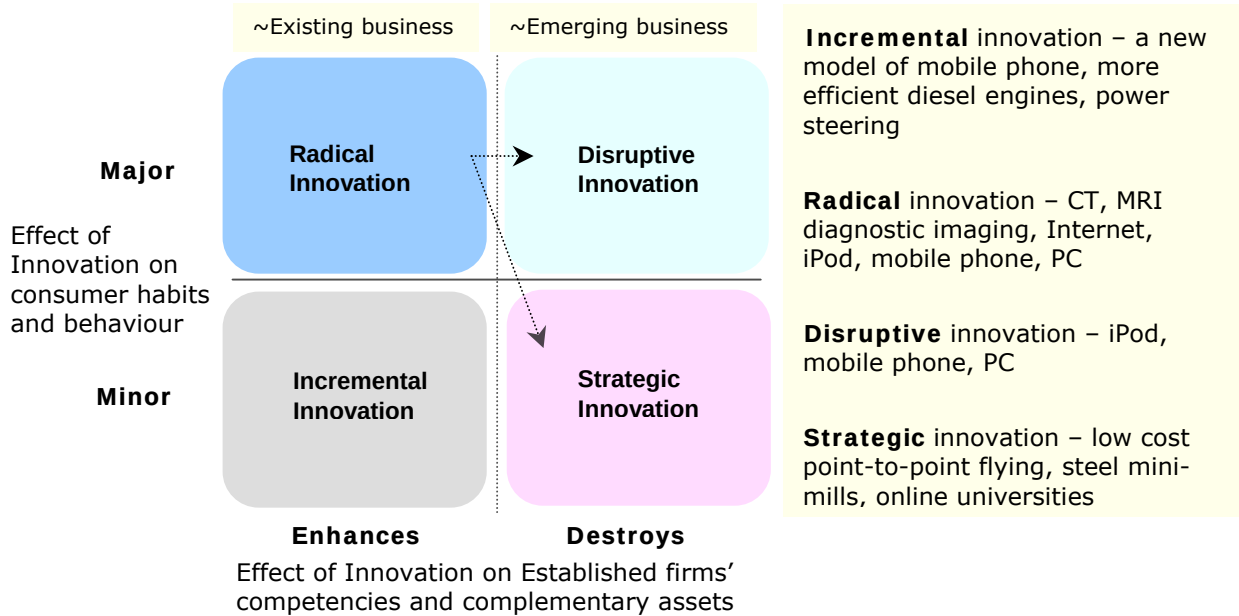


Figure 3 - Types of innovation (Adapted from Markides & Geroski, 2005) ⁽⁵⁹⁾

2.2. *Radical innovation projects*

Consultants, practitioners and researchers have compiled a phenomenal project management knowledge base ⁽²⁾. They have developed management tools and systems that enable project teams to manage large, complex projects efficiently. As a result, leading firms have become much more adept at continual improvement and incremental innovations related to existing products and processes.

Incremental innovation projects have orderly process. A potential marketable improvement to an existing product can be quickly placed within a clearly defined, time-tested process that is designed to prove or disprove its value proposition. The process, which typically encompasses six months to two years, has organisational sponsorship, funding, and targets for teams. Development and commercialisation are directed along a formal, orderly stage-gate process ⁽⁵⁵⁾. However, most of the RI projects could hardly be described in this orderly manner. Even though they include many of the same sets of activities and decision points, the management of the process is strikingly different for radical versus incremental innovations ^(4, 27, 55).

It is vital to be aware of the differences between RI projects and incremental innovation projects. It helps to clarify that a different approach is required to manage RI projects when compared to the traditional management approach of new product development or an incremental innovation. The following table shows important differences between managing RI and incremental innovation projects.

Table 2 – Characteristics - Incremental versus Radical innovation projects⁵

Themes	Incremental innovation projects	Radical innovation projects
Process	Short term - usually six months to two years	Long term - usually three years or more
	There is a linear path from concept to commercialization following designated steps	The path is marked by multiple discontinuities that must be bridged. The process is sporadic with many stops and starts, hibernations and revivals. Trajectory changes in response to unanticipated events, outcomes, and discoveries.
	Idea generation and opportunity recognition occur at the front end; critical events are largely anticipated.	Idea generation and opportunity recognition occur sporadically throughout the life cycle, often in response to discontinuities (funding, personnel, technical, market) in the project trajectory.
	A formal, approved process moves from idea generation through to their development and commercialisation	Usually there is no formal process for getting and keeping funding, which is treated by participants as a game, often with disdain. Uncertainty is too high to make the process formal.
Organisational structure	Typically, a cross-functional project team operates within a business unit.	The project often starts in R&D, migrates into some sort of incubating organization, and transitions into a goal-driven project organization.
	Each member of the project team has a clearly specified responsibility	Key players come and go during the early life of the project. Many are part of the informal network that grows up around a radical innovation project. Key players tend to be cross-functional individuals.
Resources	Business unit or corporate fund sponsors the project. It is a standard formal process.	Business unit funds the project only if they see any direct, short-term benefit. Getting a sponsor also depends upon personal network. Sponsor's change over time.
	The project is often subjected to a standard resource allocation process similar to regular projects.	Resource acquisition is a major challenge. Creativity and skills in resource acquisition from a variety of sources is critical
	The project team has all the competencies required to complete the process	Skills in competency acquisition - from a variety of internal and external sources - are critical to the survival and success of project
Decision making	A complete and detailed plan can be developed at the beginning of the process because of the relatively low level of uncertainty.	The business model evolves through discovery-based technical and market learning and likewise the business plan evolves as uncertainty reduces.

⁵ Adopted from Richard Leifer et al, Radical innovation: how mature companies can outsmart upstarts, 2000, page 19-20

2.3. Major challenges to managing radical innovation projects

A common way of defining RI focuses on the amount of technical and market uncertainties that must be resolved (³, ⁵⁵).

1. Technical uncertainties include issues related to the assumptions and correctness of underlying scientific knowledge, technical feasibility, technical specifications and so forth.
2. Market uncertainties include issues related to target customers, value proposition to customers, value chain, competitor's products and so forth.

RI projects involve high levels of both these uncertainties, while incremental innovation projects are generally low on both these dimensions. Besides technical and market uncertainties, RI project teams have to contend with organisational and resource uncertainties (³⁵, ¹⁰, ⁵², ¹⁹, ⁵⁵). Many of these stem from a fundamental conflict between the mainstream organisation and the RI team, and the difficulty of managing the relationship between them. These two additional dimensions of uncertainty create unanticipated challenges for project management.

3. Organisational uncertainties include – the project changing homes, passing through different hands of laboratory scientists, technicians, and project champions.
4. Resource uncertainties include financial support provided by a variety of internal sources which fluctuate throughout the project, changes in project champions due to the pressure from existing commitments, and so forth.

The problem of multiple dimensions of uncertainty is complicated by the fact that the uncertainties interact with one another. For example, the resolution of a technical uncertainty may produce an insight that allows the delivery of new value proposition to the market, just as the response from a customer trying out an early prototype may cause technical redirection.

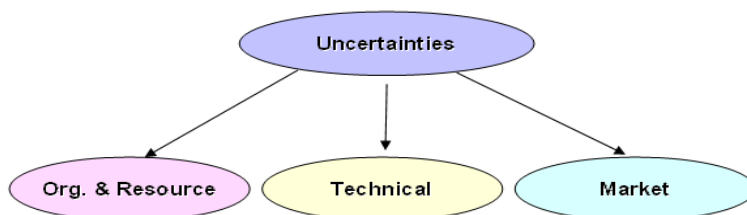


Figure 4 - Major uncertainties with RI projects

In order to manage RI projects, the aim of the RI capability should be to reduce these uncertainties. While the setup of the venturing program in itself should reduce organisational and resource uncertainties, individual unit(s) within the program must reduce technical and market uncertainties in stages.

Showstoppers: what may stop a RI project?

Each dimension of uncertainty contains one or more potential '*showstoppers*'. If they are *not* addressed appropriately, they might lead to the closure of the project. The following table describes some of these uncertainties.

Table 3 - Uncertainty dimensions and showstoppers ⁶

Uncertainty dimension	Showstoppers
Technical	- Setback in technology development, application development
Market	- Assumption about attractiveness of a particular application turns out to be false - Market test of prototype fails or has disappointing results - Failure to successfully develop a relationship with an appropriate lead user
Organisational	- Loss of champion (permanently or temporarily) - Change of attitude of business unit - Change of project manager - Transfer of oversight responsibility to a manager who didn't like this project - Failure to close alliance deal - Failure to partner in technical development or manufacturing - Loss of a key team member who is difficult to replace - Change in senior management and/ or strategic intent of the firm - Change in senior business unit's management - Transition in project phase - Transition to relevant operating unit or spin-out
Resources	- Funding reduced substantially or terminated due to a poor overall corporate performance or a change in senior management sponsor

Although it is not possible to eliminate all the showstoppers for a RI project, the deployment of the capability should be able to reduce the uncertainties and hence the showstoppers.

Please refer to Appendix D and for other challenges to managing RI projects.

⁶ Adopted from Richard Leifer et al, Radical innovation: how mature companies can outsmart upstarts, 2000, page 23

2.4. Why established firms fail to tap radical innovations

Scholars do not argue that established firms are incapable of recognising the threat posed by a radical innovation but that their recognition is slow and that any change is difficult to execute. Market demand shifts more rapidly than established firm's strategy. Some of the main reasons for the established firm's inability to embrace RIs include:

Forces of inertia and complacency within established firms

Hannan and Freeman (1984)⁽⁴⁸⁾ argue that established firms are valued for their predictability and reliability. An attempt at organisational change through RI disturbs the systems that produce predictability and reliability, hence creating a natural resistance.

According to Hill and Rothaermel (2003)⁽⁵⁰⁾, the established firms develop highly structured routines for reducing costs. Their internal resource allocation processes⁽⁹⁾ are designed to optimise the profitability of current operations. The drawback of such routines and processes is the difficulty in reallocating resources fast enough to capitalise on a new opportunity; anything that requires funds must wait until next fiscal planning. It makes a firm to focus on their short-term challenges. They do not search beyond their standard frame of reference and, thus, may fail to notice, analyse, and respond with alacrity to the competitive threat posed by RIs.

Differential economic incentives between new entrants and established firms

Based on the assumption that established firms enjoy market power and monopoly rents owing to entry barriers, Henderson (1993)⁽⁴⁹⁾ emphasises that established firms have an incentive to invest in incremental innovations that add to their established knowledge base, maintain entry barriers, and to protect and enhance their existing rent stream. Under conditions of uncertainty, established firm rationale will invest more in their current business, while less in producing RIs than new entrants. They seek to maximise the returns from known technology, rather than devote resources to pioneering new technology with an uncertain payoff. A good example is the current situation of large oil companies. They prefer to invest huge resources in going to extreme depths, gruelling land, and wild sea than alternate energy sources.

New entrants, on the other hand, do not have to battle internal forces of inertia; they do not have long-standing commitments to established value networks; and they can focus on small, out-of-the-way market niches and grow with those niches, migrating up-market as their technology matures and its performance attributes improve⁽¹⁹⁾. New entrants also have the economic incentive to make investments in unproven technologies that have a high-risk, high return profile. Often, the entire organisation can be built around a single breakthrough concept⁽⁷⁴⁾.

Embeddedness of established firms within an established industry network that does not initially value the new technology

Every firm is embedded within a value network of suppliers, customers, investors, complementary product providers, communities, and so on, to which the firm has made strategic commitments^(19, 20, 75, 50). Established firms pay attention to this network since their historic success has been based upon satisfying the demands of and cooperating with various constituents of the network. However, when faced with a disruptive event, such as the appearance of a radical technological innovation, this network produces fatal

inflexibility. For example, Nokia embedded in its value network with find it difficult to change its business model or offer radical technologies similar to those of Skype⁷.



Figure 5 – Established firm's inflexibility to embrace radical innovations ⁽²⁷⁾

Too much focus on the core

Managers at established firm are often busy with maintaining and growing the core, and solving the challenges of the mainstream business. Given the limited time and resources, they do not want to be disturbed by RI projects because their first natural priority is to put the house in order and solve current challenges, and second, it is difficult to predict the long term potential of a radical technology⁽⁷⁴⁾. Moreover, skills, mindset and capabilities of managers tuned to effectively operate existing business. Proving the potential of often a risky RI project gives them a lot of risk feeling ⁽³³⁾, because their career might be tied with the success of the project. Past success/ experience often reinforces a certain way of problem solving ⁽³³⁾, and anything radical is turned down by pointing the risks and uncertainties. For example, current priority of GM managers will be put the finances back in order, rather than invest in the next generation cars!

Inappropriate metrics of RI projects evaluation

Often established firms apply a same set of evaluation criteria to a RI as applied to regular projects, technologies or businesses. In such evaluation, a RI can hardly pass the criteria because by definitions they are more risky and have unproven market potential, their returns are only in the long term and, they do not solve any current business problems.

Managers who intuitively believe in a RI or an emerging opportunity have to prove the business potential based on hard data. This is hardly possible without putting initial efforts and resources. Now, if the managers decide to work on it, they put their career at risk. They are evaluated yearly and the potential value of RI, if any, is hardly visible within a year. Also their bonuses will be thwarted. Bonuses or rewards are based on returns, and returns from RI come often after several years.

Please refer to Appendix D for further details on inability of established firms to embrace RIs.

⁷ Skype is an internet telephony company. It has recently launched mobile phones that can make free calls through wifi network. www.skype.com, Aug 22, 2006

At the organisational level, the additional reasons for the established firm's inflexibility can be divided into vision & culture, organisational structure, and processes & resource allocation.

Table 4 - Additional organisational challenges to managing radical innovations

Challenges to managing Radical Innovations	
Vision & Culture	- Established firms cannot see the long term potential of new technology (because the very basis of competition changes) ⁽⁷⁴⁾ - Culture acts as a powerful stabilising mechanism. Exploiting and commercialising RIs destabilises an organisation⁽⁷⁴⁾ - Skills and mindsets of managers are tuned to operations of the existing business⁽²⁸⁾ - Past success reinforces certain ways of problem solving ⁽³³⁾ - Innovators tend to be high achievers, and they are attracted to working environments where they can "call the shots" and be individually responsible for results. Smaller companies, offer far more opportunity for innovators to satisfy their need for achievement, while at large corporations they are forced to complete their yearly targets first. - "Only if an idea became a passion of a senior manager did it have a shot." ⁽⁴⁰⁾
Organisational structure	- Bureaucratic structures⁽⁷⁴⁾. Like incremental innovation or regular projects, the RI project has to prove its worth at every stage. - Managers have to prove the potential of a risky RI project. This gives them a lot of risk feeling ⁽³³⁾ - "Since there was limited infrastructure and few formal processes to support new businesses, most new efforts disappeared quickly." ⁽⁴¹⁾
Processes & Resource allocation	- Firm's internal resource allocation processes ⁽⁸⁾, which are designed to optimise the profitability of the firm's current operations. - Difficult to reallocate resources fast enough to capitalise on the opportunity ⁽⁷⁴⁾ - Easy to dismiss unproven technology on the grounds of their small market ⁽³³⁾ - Lack of persistence. RI takes a relatively longer time to show its full potential. However, managers are evaluated yearly ⁽³³⁾ - Metrics of evaluation for projects (either at Business funding panel or at Research funding panel) rate RI projects as high-risk ventures having potential only after a longer period of time. This kind of rating gives higher priority to other less riskier and shorter-term regular projects. RIs projects often do not have a chance to get screened.

Beneficial sides of Established firms

Established firms, however, have certain advantages over new entrants/ smaller firms:

- √ While the average performance of established firm does decline following the arrival of a RI by new entrants, there is considerable variation in the speed and size of this decline, even within a given industry ⁽⁵⁰⁾. This implies that established firms do have some time to take action.
- √ Established firms have substantial resources to try things. A loss of few millions on a new business attempt will not even be visible on Shell's annual financial report. But for a small firm, this loss is the death of the firm. Hence, established firms do have ability to try initiatives.
- √ When compared to new entrants, established firms have strong network and commanding power. They have ability to attract and invest huge resources once they are willing.

Hence, if established firms use these strengths to embrace RIs while also learning from and leveraging with new entrants, then sustained growth and survival can be assured.

2.5. *Why do the established firms need RI capability*

The following three reasons justify the need of RI capability within the established firms.

1. For long-term survival and growth, it is imperative that a firm taps both incremental as well as radical innovations (^{55, 28, 17, 65, 4, 36, 79, 34}). Firms failing to invest in radical innovations may achieve a certain degree of success, but limit their growth potential and put their long term survival at risk (^{76, 61, 32, 54}).
2. The inherent organisational and inter-organisational reasons inhibit the capacity to take actions in the favour of RIs. Challenges with RI projects are different when compared to the regular incremental innovation projects(^{55, 35}). Ways to manage RI projects differ substantially from managing incremental innovations and existing businesses(^{54, 35}).
3. Established firms have vast resources, strong network and commanding power to incubate and deploy RIs. If they establish right structure, process and resource allocation system, a continuous generation of RIs is possible.

3. CURRENT APPROACHES TO MANAGE RADICAL INNOVATIONS

“The noblest pleasure is the joy of understanding.”
Leonardo da Vinci (1452-1519)

Having understood the impact of RIs, it is important to understand how to establish the RI capability. This chapter seeks to capture the current thinking and practices in the field of managing RI projects by drawing on management literature outlining current thinking and conceptual approaches, and a review of the approaches proposed by academia.

The chapter covers:

1. Academic propositions from five well-known researchers on how to tap RIs.
2. Strengths and weakness analysis of the suggested propositions, and
3. Learning's from the academic propositions

Academic propositions to tap radical innovations

Primary aim to establish RI capability should be to reduce the organisation and resources uncertainties.

The introduction chapter discussed three major uncertainties – market, technical and, organisational & resources. It is reasonable to say that not all uncertainties can be confronted simultaneously. Managing them sequentially can indeed reduce the burden of RI project teams. It is believed that the greatest opportunity for enhancing the probability of success of RI projects comes from spending more energy on managing *organisational and resources uncertainties* ⁽⁵⁶⁾. This uncertainty is in fact under managerial control. According to researchers⁽⁶⁴⁾, if a firm learns to reduce this uncertainty in a systematic way, the RI project teams would be better able to address the less controllable and more chaotic market and technical uncertainties. With an aim to reduce the organisational and resources uncertainties for the established firms, several researchers have proposed mechanisms.

The following section discusses propositions from - Chesbrough, O' Reilly & Tushman, Gary Hamel, Markides & Geroski and Christensen & Raynor - on how to tap RIs. Summary on the selected themes follows each proposition.

3.1. Open innovation

Chesbrough (2003) through his open innovation approach⁽¹⁷⁾ asserts that in most cases wider knowledge and greater resources are available outside the boundaries of a firm. Firms can fill-in gaps in their portfolio with external technologies by venture investing, by investing in external research projects, technology in licensing, and technology acquisition. Similarly, a firm can utilise its underutilised knowledge resources by spin-offs, technology licensing and by applying different business models to an existing technology.

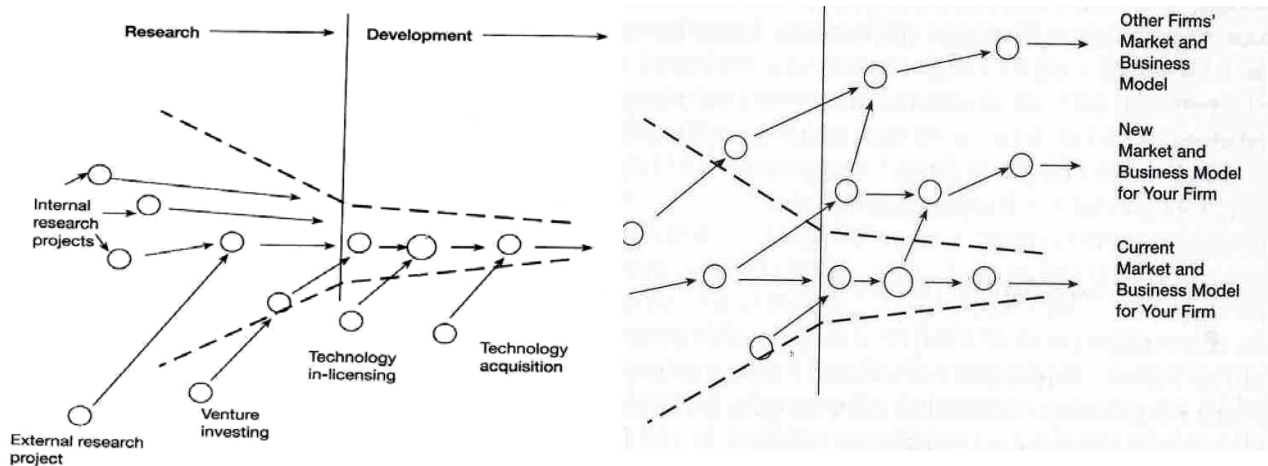


Figure 6 - Open innovation approach. Filling the gaps with external technologies; Growing new business and profiting from others' use of your technology

Chesbrough suggests that a *venturing program* in an organisation could help catalyse the above-mentioned activities. For example, through its VC arm, an established firm could finance start-ups/entrepreneurs. These VC financed firms serve as *pilot fish* for potential new market opportunities. They provide valid and useful market research because they are a real company making a real product and selling to real customers. Established companies should continuously monitor, and leverage, if and when, a pilot fish prove valuable. The development of venture occurs at arms length. This implies that the established firm could focus their efforts on managing the mainstream business while leveraging the external knowledge and resources.

A venturing program also provides an outside path for technologies that might otherwise sit on the shelf within R&D labs. It forces technology to move faster out of the lab, and provides an experimental setting to try radical technologies with different users in different markets.

The following table summarises major difference between the closed innovation and Chesbrough's open innovation approach.

Table 5 - Closed innovation vs. open innovation approach ⁽¹⁷⁾

	Closed innovation	Open innovation
Early warning system	"Ideas from outside can contaminate ours". Internal knowledge and resources are sufficient to develop what is needed.	"Best ideas can come from anywhere". Greater amount of knowledge, skills and resources is lying outside the firm. Listening to external parties is key.
Organizational structure	Vertically integrated product and service design	Core competitive differentiation and collaborative partner management
Processes	Design, develop and market in-house inventions	Optimize performance of owned assets through both in-house and external development; do enough R&D internally to recognize significant external R&D
Resource allocation	Increased margins/ revenue, reduced time-to-market, market share within existing market	Breakthrough product, technology or business model
Decision-making matrix	Own and protect	Buy, sell - the corporation acts as knowledge broker using both licensing and commercial development to monetize IP

It must be noted that although applying open innovation approach is fruitful, it requires thoughtful vision, culture and willingness. Practically speaking, a firm needs to deploy scouts, form alliances, external partnerships, collaborate with VCs, etcetera.

3.2. Ambidextrous organisation

O' Reilly and Tushman (2004) agree that the failure to recognise and develop RIs while making steady improvement to an existing business is commonplace in established firms. According to them, the large established firms simply lack the flexibility to explore new territories.

To tap emerging businesses, they suggest established firms create *new exploratory units*. These units be kept separate from the traditional exploitative (i.e. mainstream) units, and be allowed to develop different processes, structures, and cultures. A tightly integrated senior team should manage the organisational separation between new exploratory units and exploitative units. Top-level integration ensures that the fledging units have access to established resources - cash, talent, customers, and simultaneously shields them from the innovation-killing effects of the mainstream business. Meanwhile, existing units freed from the distractions of start-ups can maintain their focus on refining operations, improving products, and serving customers. Firms that follow such organisational structure are termed 'ambidextrous organisations' ^(65, 80). The following figure shows the organisational structure of this proposition.

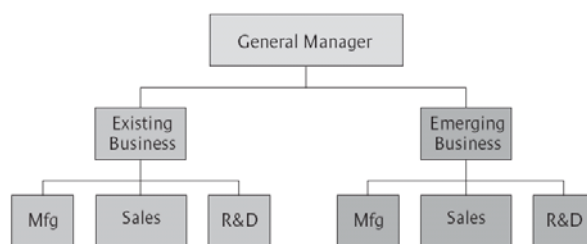


Figure 7 - Ambidextrous organisation

The following table summarises the author's proposition of ambidextrous organisation.

Table 6 - Ambidextrous organisation

	Exploitive business	Exploratory business
Early warning system	Top management deploy instruments to look out for new business opportunities. Once a potential business is identified, an exploratory business unit is formed.	
Organizational structure	Formal, mechanistic; Based on efficiency, low risk, quality	Adaptive, loose; Based on risk resolution, speed, flexibility, experimentation
Processes	Operational; Based on operations, efficiency, incremental innovation	Entrepreneurial; Based on adaptability, new products, breakthrough innovations
Resource allocation	Customers focused; Efficient allocation operation, risk cautious	Experimentation; Flexible, risk taking, speedy
Decision-making matrix	Authoritative, top down; Based on margins, productivity	Visionary, involved; Based on milestones, growth

Authors give the example of USA Today, during the 1990s when News consumers began turning to television and Internet. The President of USA Today adopted a network strategy - combining online, television, and newspaper organisations to promote cross-media content sharing. However, units were physically separated, their staffing models, cultures, and processes kept distinct, while they were integrated at the top ⁽⁶⁶⁾.

A comparison to the exploratory business unit can also be made with Shell Renewable & Hydrogen business. When compared to Shell's upstream and downstream businesses, this newly formed unit enjoys relaxed rules and evaluation criteria, and the top management supports it with the required cash, talent, knowledge base, customers and brand.

3.3. Leading the revolution

In most corporate structures, an idea must pass through cautious executives. Resources are typically allocated to projects with higher profit margins and immediate rewards. According to Gary Hamel (2003), this form of resource allocation is well suited for managing existing businesses. However, it tends to restrain RI ideas - the ones that have the potential for creating markets and businesses that didn't exist before ⁽⁴⁴⁾. With internal barriers to resources removed, an idea can compete for its worth.

Hamel proposes to breed innovative ideas via a *decentralised funding system*. Just as nature conducts many evolutionary experiments in order to give rise to a successful species, a company should fund many innovation projects and see which ones win out. By giving a large number of managers throughout the organisation the power to allocate budget for innovation, Hamel hopes to exploit the wisdom of many, over the centralised corporate decision-making process. The decentralised funding process will thus support genuinely RIs. Hamel gives Shell GameChanger as one of the examples of his proposition⁽⁴⁶⁾.

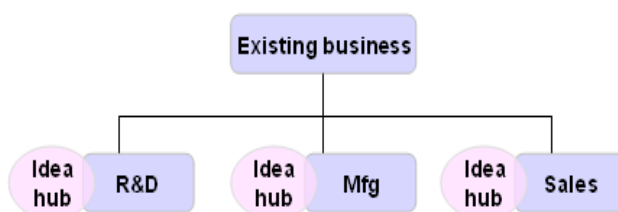


Figure 8 - Decentralised funding system

Hamel attaches three important characteristics to his proposition.

- No single person in the hierarchy can kill a great idea. Instead, power should be diffused among multiple managers, and there should be many sources of capital.
- A good idea can come from anyone - including middle or lower level employees. There should not be prejudice about who is capable of producing a new business model.
- If an idea does well in the marketplace, the innovator should be rewarded⁽⁴⁴⁾.

Table 7- Decentralised funding system

	Decentralized funding system
Early warning system	Ideas can come from anywhere – from middle and lower level managers, from outside
Organizational structure	Small venturing units in every department.
Processes	A bottom up approach. Middle managers capture ideas and fund the good ones without having to ask top management
Resource allocation	Secured fund from top for RI projects. Fund for an idea directly from middle level managers
Decision-making	Decentralized. Managers from every unit have the power to fund an idea.

Dilemma A -Top down approach Vs. Bottom up approach

DILEMMA

In contradiction to 'ambidextrous organisation' approach of developing only a few nuggets that are basically initiated by top management, Gary Hamel strongly believes in several small-scale experiments.

The former approach has benefits of top management attention, definite allocation of resources and company wide focused efforts, but has drawback that if the project fails it will incur a substantial loss.

Hamel's approach to "try and see" has benefits of not depending on one big project, risk distribution over the portfolio of ventures and a possibility of making multiple bets.

There is no empirical evidence to prove if one of the two approaches is more successful.

3.4. Fast Second

A firm can either pioneer the market with RI or scale this innovation to create a mass market - but not both.

Markides and Geroski (2005) propose a unique strategy to cope with radical and disruptive innovations. They argue with compelling examples that for such innovations a firm can either *pioneer the market* or *scale it* – but not both ⁽²⁷⁾. They demonstrate that individuals or companies that create radically new markets are not the ones that build them into mass markets. For example, Leica, Charles Stack, Apple and EMI introduced the camera, on-line bookselling, PDA and CAT scanners but Canon, Amazon, Palm and GE were the ones who captured the mass market.⁽²⁸⁾

The authors argue that the skills, mindsets and competencies needed for pioneering the market are not only different from those needed for scaling it up to mass market; they also conflict with the latter set.

Firms that are good at invention (typically, smaller entrepreneurial firms, universities, start-ups) are unlikely to be good at commercialisation (typically, established corporations) and vice versa. They suggest that instead of incorporating a new set of conflicting skills and mindsets that are alien to the established companies, established firms should focus on what they do best: *creating* mass markets. Instead of spending valuable resources and managerial talent at growing new radical businesses inside, established companies should aim to create, sustain and nurture a network of feeder firms – of young, entrepreneurial firms busy pioneering new niches.

Through its *business development function*, an established company could serve as a venture capitalist to these feeder firms. It could also develop formal strategic alliances with them or could even maintain minority equity stakes in them. Then, when it is time to consolidate the market, it could build a new mass-market business on the platform these feeder firms have provided. Since the younger firms do not have the resources, power, marketing, and distribution to scale up their creations, they should, in principle, be happy to subcontract this activity to the established firms, subject to a fair division of the spoils.⁽²⁵⁾

Such a network strategy has several advantages over the ‘grow it inside’ strategy: it allows a firm to cover more technologies and more market niches; it enables the feeder firms to compete with one another while allowing the parent company to benchmark one against another.

The following figure summarises the proposition by Markides and Geroski. Existing business focuses on their own business, while the *business development function* funds multiple start-ups. When one of them is successful, it is brought back to the existing business.

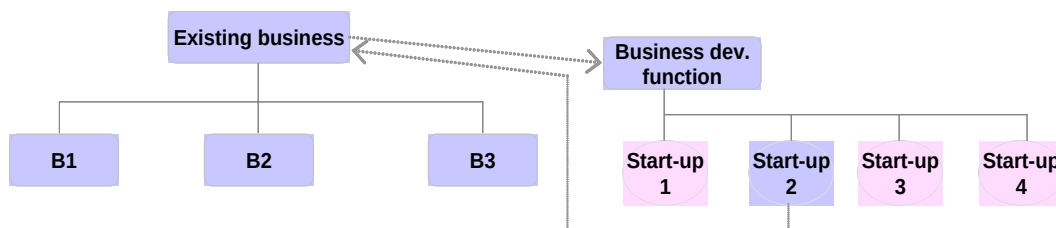


Figure 9 - Fast second strategy

The following table summarises important parameters of author's proposition.

Table 8 - Fast second – wait for the dominant design and scale it when the time is right

Fast second	
Early warning system	A separate team/ division scouts for opportunities and brings proposal to top management
Organizational structure	New business development function (NBD) provides seed funding to multiple small start-ups
Processes	Top management and the established firms focus on managing existing business. NBD monitors start-up/ entrepreneurs that are creating new market niche, waits for the dominant design to emerge and then when time is right - scale the successful one to mass market.
Resource allocation	Directly from business development function to small start-ups
Decision-making	Managers from NBD decide whom to fund and when to scale a niche market product into mass-market

A comparable example to this proposition is Toyota's New Business Enterprise division. Through this division, Toyota invests in Biotechnology and Afforestation, Marine, Aerospace, Healthcare and more.

This division invests in companies pioneering new markets. As and when a business shows potential, Toyota can scale it to global levels.⁸

There are certain similarities between this approach to that of Chesbrough's open innovation approach. It must be noted that, the open innovation approach is focused on *collaboration - leveraging* the existing business by utilising the knowledge, skills and resources available beyond the corporate boundaries, while the fast second approach of '*fund, wait and watch*' is useful to tap into emerging businesses for established firms.

DILLEMA

Dilemma B - Develop RI projects in house Vs Develop at an arm's length

Hamel and O'Reilly's proposition of developing the RI projects in-house, contradicts with Chesbrough's and Markides's approach of developing RIs at arms length.

Benefits of developing RI projects in house include opportunity of direct learning, full ownership, and benefiting from the knowledge and resources of the core business. The main drawback however is the involvement of manpower that could have been used for the mainstream business.

The 'arm's length' approach involves providing seed funds, forming alliances and partnerships. This approach is beneficial in terms of utilising skills and capabilities wherever it is available best. The approach however has limitations that the firm needs to identify appropriate partner, maintain control over these partners, stay close to the technology, ensure proprietary access to the technology, and bring in the learning's gained from the project.

Decide based on what is more
appropriate for the particular
RI project

A practical solution is to decide where to develop the RI project based on what is in the best interest of the project; the in-house skills and capabilities versus those available outside (§3.1.); and the internal conflicts of processes and values (§3.5.).

⁸ Toyota official website, www.toyota.co.jp/en/more_than_cars, information extracted on August 24, 2006

3.5. The innovator's solution

Christensen and Raynor (2003) believe that three factors affect what an organisation can and cannot do - its resources, processes and values. Resources include both tangible as well as intangible ones. Processes imply the patterns of interaction, coordination and decision making the employees use. Values are standards by which employees set priorities for projects, orders or customers.

To develop RIs, an organisation needs new processes and values because it needs new capabilities. To develop new capabilities, the authors propose that managers must create a new organisational space ⁽²²⁾, and authors suggest three possible ways to do this. Managers can:

- » Create new organisational structures within corporate boundaries in which new processes can be developed
- » Spin out an independent organisation from existing organisation and develop within it new processes and values required to solve new problems
- » Acquire a different organisation whose processes and values closely match the requirements of the new task

When developing capabilities inside, the authors suggest that the established companies should put a wall between the innovation and the existing units. Corporate leaders should create an *independent business unit*, which will provide a safe and protected environment for innovation ⁽²⁰⁾. And should deploy heavyweight teams – teams entirely dedicated to new challenge, team members physically located together, and each member charged with assuming personal responsibility – where necessary. ⁽²²⁾

The following figure explains Christensen and Raynor's proposition. When a RI idea appears in business, the project development can occur in one of three ways – at a new organisation, spinout or at an acquired organisation. Figure 11 explains which organisational home is better suited for which situation.

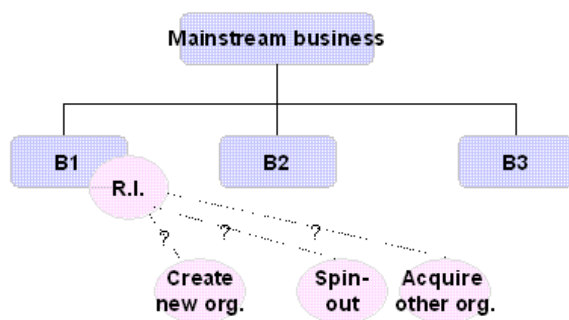


Figure 10 - Christensen and Raynor's proposition for developing RI projects

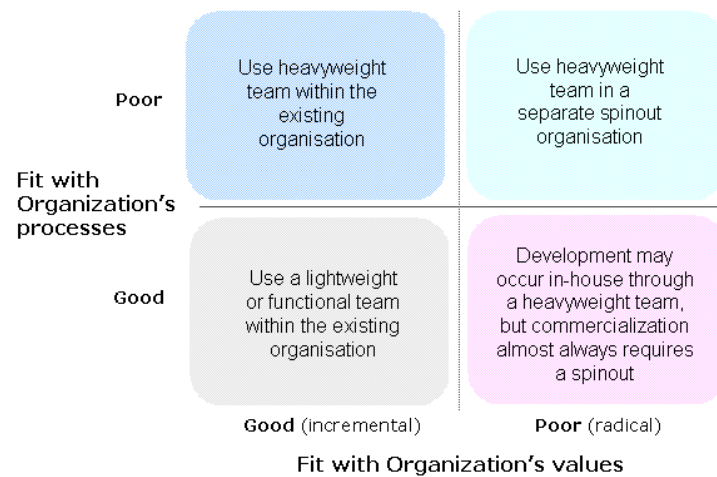


Figure 11- Framework for finding the right organisational structure and home

Table 9 - Innovator's solution – keep looking for disruption

	Innovator's solution
Early warning system	A firm must keep looking for disruptions. Disruption can start from anywhere.
Organizational structure	Based on the alignment with organisation's processes and values, a firm must decide where to develop the RI – inhouse, spinout or acquire
Processes	If it is decided to develop the RI inhouse, a wall must be placed between the existing business and this new unit.
Resource allocation	Authors do not suggest about res. allocation. However, inline with their proposition it must be allocated from the top.
Decision-making	Centralized. Senior executives decide which corporate processes do and do not apply

Dilemma C - Venture unit close to BU **Vs.** Put a wall

There is a sharp contradiction between Hamel's approach when compared to Christensen's (and to some extent O' Reilly) approach "to put a wall". Business units often have a tendency to cut corners of RI projects in such a way that they can solve their business challenges. Rather than incubating RI, they want to tune them to fit in their business needs. While doing so, the radicalness of the original proposal is often gone.

By 'putting a wall' in between the mainstream and the venture unit(s),

- The unnecessary interference of BU can be avoided,
- The venture unit can develop its own processes and culture tuned to what is best for the RI projects,
- And the RI is safeguarded from early stage killing by BU.

On the other hand, the drawbacks of this approach include (¹²):

- the venture unit does not benefit from the knowledge and skills available from the mainstream business,
- the unit might extend the RI project beyond the reasonable levels due to a lack of advice from BU.
- Even when the RI project mature, it will still remain "different". It will face substantial challenges if it potentially or directly competes with existing businesses; it requires investment (and hence cash outlay) before it becomes profitable; and/or it requires the development of new or perhaps unknown competencies and markets (⁸¹).

Hence, it is not advisable to put a wall or stay away from BU. A reasonable solution could be to let BU take the advisory role during the early stage of the venture, and as soon as the potential of RIs apparent, the business proposition becomes clear and an appropriate BU is identified, then let the BU start taking the responsibilities.

**Do NOT put a wall between
venture unit(s) and
mainstream business.**

This dilemma is related to two other dilemmas.

First, when is the right time to involve BU? If the BU is involved late then 'not invented here' syndrome strikes, while if they are involved early, then they might want to kill project that does not fit their needs.

And second, *how much autonomy should be granted to the venture unit(s)*. On one hand, too much autonomy to the venture unit(s) is associated with blowing away funds on projects that are beyond the scope of the firm and by keeping the projects alive much longer. But on the other hand, too less autonomy implies mainstream business interfering too often. The venture unit(s) is forced to solve business challenges rather than tapping RI, and 'white spaces' or beyond the core is strictly restricted.

Which part of the RI funnel do the individual propositions fit?

All the five propositions mentioned above offer unique approaches. They are distinct from the perspective of organisational structure and size, and the method of resource allocation among others. However, it is interesting to analyse where do these propositions differ fundamentally.

Seeing through the lens of RI project development, one can notice that each of the propositions target to a particular juncture of the project *development funnel*.

1. Gary Hamel is fundamentally focused on experimenting at early stage of Radical ideas. The author underestimates the challenges of later stages.
2. Markides and Geroski propose to *bet* on start-ups and *keep watching them*. They focus on the later part of the project funnel i.e. the deployment/ commercialisation phase.
3. Christensen and Raynor assume that the firm already has incubation, development and deployment capacity. Their focus is only on the decision-making action that decides - *where to develop the project*.
4. Unlike other researchers, Chesbrough does not emphasis on one particular phase of the funnel. Rather he proposes to do all the phases, but with an open mind.
5. O'Reilly and Tushman propose *parallel exploratory business units* to do all the actions that a mainstream business does – incubate, develop and deploy on a large scale.

The following figure shows which part of the RI development funnel do the propositions from the researchers fit.

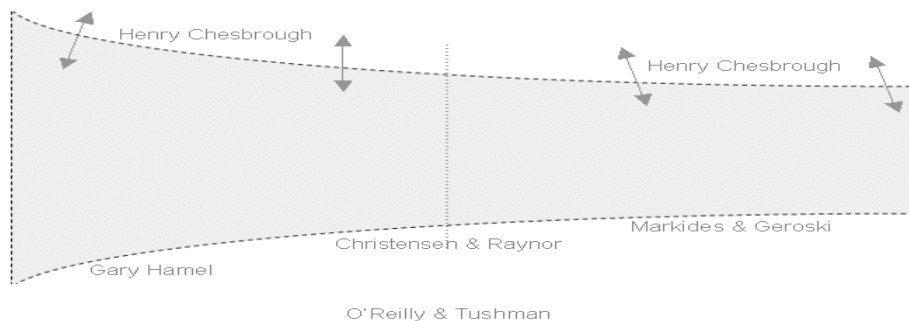


Figure 12 - Where do the propositions from researchers fit

Strengths and weakness analysis

Table 10 - Academic propositions, their strengths and weaknesses

Author(s)	Strengths and weaknesses
Chesbrough (2003) <u>Venturing program</u> Open innovation model	Open innovation approach is indeed an effective approach to tap vast knowledge and resources available outside the boundaries of the firm. It is a supplement to the steps needed to solve the problem of tapping RI, but it is not a solution in itself. The problem of RI isn't just finding good ideas from outside: it is a matter of establishing a way of running the organisation that is open to exploring new ideas and willing to back the promising ones with resources and talent.
O' Reilly and Tushman (2004) <u>New exploratory units</u> Ambidextrous organisation	Considering the inherent conflicts between established and emerging business, the authors propose firms maintain two separate entities with their unique processes, structures, and cultures, integrated only through senior management. The authors approach is thoughtful. It is one of the possible ways to drive major top-down projects. But allowing two different cultures to flourish on a large scale leads to repeated power struggles. It is also a challenge to balance resources allocation, different cultures, mindsets and values within the same organisation. With a limited size of exploratory units, this proposition becomes much more pragmatic.
Gary Hamel (2003) <u>Decentralised funding system</u>	Gary Hamel proposes allocating decision making to middle level managers at every business unit (BU). Decentralised funding is useful for bottom-up innovation; however, as the idea advances it will need more resources in terms of funds and time. This might result in conflicts for funds. Entrepreneurial managers with two sets of skills are required at every business unit. Also, a major challenge of innovation is often not generating more ideas, but establishing how to take the good ideas, develop and deploy them.
Markides and Geroski (2005) VC function through <u>Business Development function</u>	The author's proposition follows rationale that established firms are good at mass commercialisation, while start-ups are good at creating new market niches based on RIs. Their proposition, however, is not without risks. Established firms need to worry about identifying appropriate network partners, maintain control over these partners, stay close to the technology that they themselves do not discover or develop, ensure proprietary access to the technology developed in somebody else's R&D, and manage the relationship with partners whose cultures and mindsets can be fundamentally different from those of the established firms.
Christensen and Raynor (2003) <u>Independent business unit</u> Innovator's solution	The authors' approach of putting up a wall between the innovation and the existing units is appropriate for the launch of an independent business. This solution is closer to the proposition of O' Reilly and Tushman. However, Christensen's focus is more on what to do from a project-to-project basis. For example, let a project be developed in a new organisation, let it spinout or acquire a company to develop the project. This approach is suitable for a few top-down projects; however it lacks a basis to create a capability to continuously stimulate such projects. Also, there is a dilemma regarding how far a RI project is kept from the mainstream. If a project is kept too far from the core then it might not gain benefits from the established organisation.

3.6. Commonality among the academic propositions

RI capability: Creation of separate unit(s) - separated from routine structure, processes and evaluation, and semi-autonomous in decision making

Although researchers have different recommendations on how to design organisational structure, which processes to implement and how to allocate resources, all these approaches incline towards establishing a *RI capability*: the creation of a separate unit within the established firms - separated from routine structure, processes and evaluation, and semi-autonomous in decision making for RI projects.

Whether titled as an exploratory unit, an incubator, a new business development function, the venture unit or RI hub, these organisational entities share similar characteristics. For this research, we will use the term '*venture units*' for such units and the term '*venturing*' for such programs.

Terms 'RI capability' and 'venturing' have several similarities. The main difference is the specificity of its objective.

The term 'RI capability' is a concept proposed through this research. It is used interchangeably with the term '*venturing*'. There are several similarities between venturing and RI capability. These similarities are used while analysing the academic propositions and case studies. The major difference between these terms however is the specificity of its objective. Venturing is a widely used term and could have several general objectives – for example performing private equity activities and selling IP among others. By means of RI capability, this research emphasis the capability to tap radical innovations in particular.

The main aim of the RI capability is to ensure a continuous and accelerated flow of a number of RI projects from established firms.

Definition: Venturing

A venture unit uses techniques and processes which have been developed within the venture capital industry, including separation from mainstream business operations, the stimulation and processing of a number of entrepreneurial projects or investments and formalised processes to nurture, assess, develop, fund and cull projects. It is these common features that cause many authors to refer to *venturing*⁹ generically and distinguish venturing activities from the management processes used to run the mainstream businesses.

Researchers suggest that the reason for the established firms to become involve with venturing activity is to promote innovation, to create a window on new technologies, and to spawn new businesses (¹⁴, ¹⁶, ⁷³). Venturing activity is often associated with emerging businesses(⁴) and for tapping RIs(¹⁹).

Please refer to the appendix for the definitions of Venture unit, Venture program and Venture.

⁹ Some researchers title venturing program within the established firms as 'internal corporate venturing'. For the sake of simplicity, in this research the 'corporate venture program' is often termed as 'corporate venturing' or simply 'venturing'

3.7. *Why do the venture unit(s) get closed*

As mentioned in the chapter of 'research design', one of the major threats to the venturing initiative is their reduction to micro operation or complete elimination within 4-5 years of their inception. Based on the research of over 100 venture units (¹⁴, ⁶), researchers conclude that often the following reasons lead to the closure of venture units

1. Unacceptable financial results within first 3-5 years accompanied by the change in CEO or decline in company's performance.
2. Parent company managers interfering too much in the evaluation and selection of ventures. This tendency leads to cutting corners in order to fit the RI project into the mainstream. Meanwhile, they also try to pull out the funding that is allocated for venturing claiming that they have better use of those funds for the mainstream business.
3. Venture units are expected to support multiple (and changing) objectives. The venture portfolio is too diversified (³⁸, ³⁹).
4. Excessive autonomy or in other words, 'far from the core', and
5. Other reasons include a perceived need to reduce costs; competing capital investment opportunities; bad experience with venturing; shattered expectations; and the conclusion that acquisition is a preferable growth strategy (⁸).

Bessant et al (2004)(⁵) propose that venture units work best when they have CEO level support (⁶⁵, ²⁰), clear objectives(¹⁴), and their own pool of money. Research shows that employing venturing as an organisation's source of growth and renewal is preferably a strategic decision (¹¹, ⁷, ⁴⁷). Many key people in the firm, including the CEO but not just the CEO, must be convinced of the strategic necessity of venturing (⁸).

If managed systematically, venturing has several merits

Researchers argue that although the venture units get closed, the underlying concept of the specialised venture unit still has several merits. Capabilities to act quickly and to create better links to changes in the outside world are some of the additional benefits. If venturing is managed systematically¹⁰, it will lead to numerous long-term benefits for the firm.

¹⁰ Please refer to the 'Appendix F' for further details on managing innovations systematically.

3.8. Key messages from the academic propositions

Analyses of five propositions lead to the following insights. At least three out of five propositions agree with each of these insights.

1. Skills, mindset and capabilities of RI managers are different from the mainstream

Managerial skills, mindset and capabilities required for RI projects are not only different from but often contradictory to those required for managing mainstream business

Managers of the existing business understand the market and technical risks and their own skills well enough to be able to select the projects with a good chance of success⁽⁴³⁾. However, they are less skilled in differentiating good ideas from bad ones when they are screening RIs involving unfamiliar markets, technologies and business models⁽²⁸⁾. *The skills, mindset and capabilities required to manage RI projects are not only different from but often contradictory to those required for managing the mainstream businesses*^(28, 65). For example, a skilled old carpenter will have difficulty in analysing the challenges and market potential of a new machine that will replace much of his work.

It is less advisable that the task of incubating RIs or developing emerging businesses is forced on to managers who are also managing regular business. Let the managers of mainstream focus on what they do best, that is, maintain and grow the core.

It is also argued that the quality of the RI project team - sponsors, champion and team members form a crucial element that decide the success or failure of a RI project. Therefore, it is important to choose the right kind of managers to manage RI projects.

2. Apply open innovation approach

Avail the resources available outside the boundaries of the firm

Most researchers (esp. Chesbrough) propose to utilise the vast amount of knowledge, skills and resources available outside the boundaries of a firm. The firm must consider capturing value of RI projects through alternate modes such as collaboration, external partnership, alliances, idea exchange, resource acquisition from or partnering with external VCs.

This approach also implies that the venturing program must continuously look for disruption that might strike the industry⁽¹⁹⁾. Once a disruption is recognised, appropriate strategy must be deployed to cope or participate with its development. While keeping the eyes open for disruptions, the venture unit must not forget to align its focus with firm's strategy & vision⁽¹⁷⁾.

3. Give appropriate autonomy to the venture unit(s)

Venture units must have a degree of autonomy in their decision making, screening and funding of projects^(45, 65). As they aim to adapt/ decide on new opportunities quickly rather than going through a streamlined global processes and protocols, these units must be given leeway to develop their own methods and processes, budgeting and planning, evaluation and rewards that are different from those of current BU's^(65, 19).

4. Supportive role of senior leadership role

The leadership role in terms of time & resources and as a protector & motivator is emphasised by most of the researchers. It is argued that venturing is a learning process and a firm will incur a learning cost. A new business based on an RI project needs on average at least 7 years before it starts generating profits (¹⁴, ⁶). Hence, patience of senior executives with the emphasis on learning is necessary.

5. Resource allocation system

Equally important is a separate pool of committed resources for a longer period of time. The funding sponsored from the top and partially funded from the receiving BU avoids organisational conflicts for resources (⁶⁵, ⁴⁵).

Convincing a BU to fund at an early stage is very difficult and exhausting. With secured resources, the venture unit(s) can focus their efforts where they are needed the most.

6. Relaxed evaluation criteria

During the early stage, apply relatively less strict criteria for RI projects and venture unit(s)

All the five researchers agree that RI projects as well as the venture unit(s) must not be evaluated by the budgeting and planning processes applied for regular incremental projects and existing business units (¹²). Different set of, 'less stricter', criteria of evaluation are required for both RI projects and venture unit(s). RI projects require more frequent reviews and milestone based reporting. Milestones based review implies decisions to change the direction of RI project during the review, rather than the regular go/ no go decisions.

Apply a milestones based review rather than go/ no go. Adapt milestones based on new findings

The relaxed criteria however do not imply softness to evaluation. The venture unit must bolster the will to terminate projects (¹²). RI projects (esp. the bottom-up initiatives) must be considered as experiments that should be terminated if they are not making progress. Senior managers need to define an explicit termination process.

7. Organisational home for RI projects

All researchers propose that ideas need a place to go. An organisational structure is required, which can become a home for RI projects. Organisational structure means structured units, processes and people (⁴⁵, ⁶⁵, ²⁰). It is important that innovators and entrepreneurs, both internal and external, are able to locate the units.

Researchers however propose different models of organisational structure. O'Reilly propose a large exploratory unit, Hamel propose small venture unit in each BU, Chesbrough and Markides propose NBD unit and Christensen propose to decide on the structure based on the fit of RI with the firm.

4. HOW ESTABLISHED FIRMS MANAGE RADICAL INNOVATIONS

"Not everything that can be counted counts, and not everything that counts can be counted." Albert Einstein [1879-1955]

This chapter covers:

1. The case study on how venturing is organised at three companies- Shell, Nokia and IBM.
Diverse industries, successful venturing program and the different approaches used for venturing makes these case studies appealing. While Shell applies a bottom up approach¹¹ for venturing and IBM applies a holistic¹² top down¹³ approach, Nokia applies a holistic bottom up and a partly top down approach to venturing.
2. A comparison between the academic propositions and the actual practice to observe whether they match
3. Common themes that emerge from the comparison of venturing activities at the three companies

¹¹ In the 'bottom-up' approach, the employees look for resources and support from the higher up in the organisation. For example, an employee wants to develop his idea on making a next generation drilling tool, he needs to get funds and other resources from the top.

¹² A holistic approach to venturing for this research implies that the venturing program takes care of the entire chain of events starting from idea scouting through to its commercialisation

¹³ In the 'top-down' approach, resources are allocated down through the hierarchy. For example, if Shell senior executive wants to develop Hydrogen based business, and then they will initiate Hydrogen related projects.

4.1. A bottom up approach to incubate RI: venturing at Shell

Royal Dutch/ Shell PLC (“Shell”) is one of the three largest global integrated oil and gas companies of the world. Shell is involved with venturing mainly through two units – GameChanger and Shell Technology Ventures.

GameChanger (GC) is a team of managers with a seed stage incubation funds to sponsor radical ideas to turn them into a technically working proof-of-concept. Ideas come from both – internal as well as external sources. GC also organises workshops on particular themes such as ‘Greening the dessert’ and ‘Stranded Gas’ to get ideas. Evaluation of projects is tollgate based, wherein progress is evaluated with respect to the predefined milestones. As the idea advances, the funding increases from an average of \$25,000 to \$250,000. Most of the projects are handed over at the proof-of-concept phase. 10% of R&D budget goes into GC activities. It is believed that 30% of the R&D projects have their origin in GC. GC was initiated in 1996 at one of the line of businesses (EP), and by 1999 other four businesses adopted GC model.

To manage several GCs under one umbrella and to sponsor ideas that falls in between the line of businesses (for example, water, CO₂, wave energy), Shell has corporate Group GameChanger. Group GC has also organised an ‘early warning system’ to keep looking for disruption that might be of potential interest for Shell.

By being open to ideas that have never been thought before - GC applies bottom-up approach, while by organising workshop on strategic themes - GC supports top-down needs.

Shell Technology Ventures (STV) is a venture capital arm of Shell’s upstream (EP) business. EP Technology Strategy department tells STV about the technologies that Shell needs. If R&D does not have a solution, then STV goes out and looks for it – funds and commercialises them. STV serves as a route for commercialising technologies that do not find home within Shell. STV also invests in start-up firms. STV’s share in a start-up ranges from 25 to 100%. Its investment board (for major investments) consists of senior executives from strategy, finance, and research. Most of the STV’s portfolio is upstream related, while STV is growing towards downstream and chemicals. Please refer to the “supplement”¹⁴ for more details on venturing at Shell.



Figure 13 – Structure of venturing at Shell

¹⁴ Enclosed with this report. Restricted to the participating companies.

Insights from the analysis of venturing at Shell

- ✓ GameChanger and Shell Technology Ventures serves as a tool to incubate and commercialise radical technologies that otherwise would not have been taken up by the business units.
- ✓ Venturing at Shell applies an open innovation approach. GC sponsors ideas from both internal and external source. By inviting other companies, scientists and academia in the workshops, GC taps ideas from them. Similarly, over 50% of STV's portfolio consists of technologies developed outside.
- ✓ Senior executives secure the funds for both these units, while the units are autonomous in their decision-making. BU is involved as and when considered appropriate.

Although the senior management support is not as strong as it was earlier, they are approachable. A communication through the 'early warning system' and 'future energy forum' forms a vigilant system for future disruption.

- ✎ Unlike conventional venture units, GC is not responsible for commercialising ideas. An idea leaves GC as a proof-of-concept. Unless R&D or a BU takes it, the concept must wait. Leo Roodhart¹⁵ uses the analogy of 'crossing the valley of death' to explain this challenge.

- ✎ Deployment of new technology is believed to be difficult and slow at Shell. Asset managers who have the power to accept or decline a technology are inclined to use what is available in market rather than try a technology that still has high risks involved. Also, most of the assets are in partnership with other companies or countries, which makes the decision to apply a new technology much more complex.

¹⁵ Global Innovation manager at Shell, and Head of Group GameChanger

Comparison of Shell venturing with the academic propositions

It is interesting to note that while Shell does not completely adopt any one of the propositions offered by researchers, it combines several such propositions. For example, trends and disruptions are studied in a way proposed by Christensen & Raynor, while the processes and resource allocation system is similar to that proposed by Gary Hamel and Henry Chesbrough. The following table summarises Shell's venturing approach when compared to the academic propositions.

Table 11 - Venturing at Shell, a comparison with the academic propositions

	Venturing at Shell	Match with the academic propositions
Early warning system	- Trends and disruption are studied by a special 'Early warning system' team	Christensen & Raynor
Organisational structure	- Autonomous venture units separated from mainstream business operations - Existing business focuses on their business, while the task of radical innovations is assigned to GC	Gary Hamel, Markides & Geroski
Processes	- Venturing entities are not bound to the processes, values, and culture and business model developed by existing businesses. - Units have developed their own process that fits their objectives - Ideas come from both – internal as well as external sources	O' Reilly & Tushman, Henry Chesbrough
Resource allocation	- Funding to the venture units is secured from the top.	O' Reilly & Tushman, Gary Hamel
Decision-making matrix	- Managers of the venture units have autonomy to decide on the amount of funds allocated to individual ventures.	Gary Hamel

4.2. A holistic bottom up and top down approach: Venturing at Nokia

Venturing was triggered in the late 1990s as Nokia wanted to find new avenues of growth. The mission of venturing activities at Nokia is *renewal of core business through innovation*. The strategic intent is to develop new businesses. Nokia Venture Organisation (NVO) and other venturing teams throughout Nokia aim to identify and develop new business opportunities that falls outside Nokia's current focus but fall within the scope of Nokia's strategic agenda. Several units are active within Nokia under a broad umbrella of *venturing*. Each team has a unique objective - either of opportunity recognition, incubation or venture capital activity.

Two teams – Insight & Foresight team (I&F) and Innovation Acceleration Team pursue the task of 'opportunity recognition'. I&F is a Nokia version of scenario analysis. It looks at trends and disruptions happening outside the boundary of the company. I&F translate these insights into potential projects/ opportunities in which Nokia requires a deep dive. The Innovation acceleration team organises workshops and idea challenges in order to capture ideas. Internally, it uses tools such as the annual Venture Challenge idea campaign ⁽¹⁾. Ideas from employees are collected during this challenge. Externally, this team networks with other VCs, corporate VCs (e.g. the IBM VC) to acquire ideas.

Two units are active in incubating and validating ventures – the Nokia Venture Organisation (NVO) and Innovent. NVO incubates ventures internally. This unit screens ideas, develops proof-of-concept, does pilot tests, and design business plans. The project is later transferred to a BU for commercialisation. Innovent is an early stage VC fund for entrepreneurs based in the US.

To capitalise on mid and late stage external ventures, Nokia engages with a range of venture capital funds. Nokia has two VC arms for this – BlueRun Ventures (often cited as 'Nokia Venture Partners' within Nokia) and New Growth Business. BlueRun provides mid-to-late stage VC funding. Nokia is only a limited partner in this fund, other partners includes Goldman Sachs and BMC Software. Nokia expects a venture rate of return from BlueRun. New Growth Business (NGB) offers late stage VC funds and is fully owned by Nokia. NGB focuses on investments in mobile technology companies that are already experiencing an industry adoption by large companies such as Nokia.

All the venturing activities are directly reported to and managed by the Chief Strategy Officer (CSO). Funds for venturing come directly from the CSO. Approximately 1% of total sales income goes into venturing activities at Nokia. Please refer to the supplement for more details on venturing at Nokia.

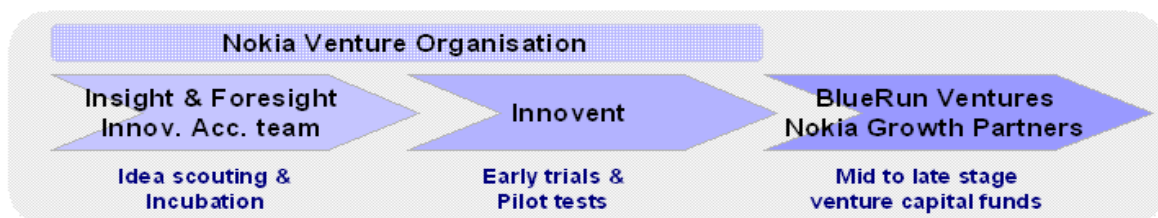


Figure 14 – Structure of venturing at Nokia

Insights from the analysis of venturing at Nokia

- ✓ Each of the venture units within Nokia plays a specific role in the innovation funnel of RI projects. For example, I&F focus on capturing trends and disruption, Innovent on early stage external seed funding, NVO on internal incubation, while Nokia Venture Partners focuses on mid-to-late stage VC.
- ✓ Although venturing is a single entity, individual units have decision-making autonomy. Their specific role and independence helps them in leveraging a RI project from any particular phase. In addition, a project can be brought in from outside or be sent outside at any phase of development without going through Nokia's product funnel.
- ✓ All the venturing activities are managed directly under the CSO. Being a senior leader, the CSO can align (or not align) the venturing activities with that of the BUs. Funds come directly from the CSO. Hence, none of the venture units has to go looking for funds from a business unit.
- ✓ Nokia implements both – a top-down approach and a bottom-up approach to innovation. By incubating ideas at NVO, Nokia captures bottom-up innovations; while through trends and disruption knowledge from the Insight & Foresight team, the CSO initiates top-down innovation projects.
- ✓ NVO and R&D both being at the same premises have the advantage of an informal network. This helps in frequent exchanges of insights about trends and disruptions, in mitigating the technical problems of RI projects and in project transfer.

Comparison of Nokia venturing with the academic propositions

As with Shell, Nokia does not completely adopt any one of the propositions offered by researchers, it combines several such propositions. The following table summarises Nokia's venturing framework when compared to the academic propositions.

Table 12- Venturing at Nokia, a comparison with the academic propositions

	Venturing at Nokia	Match with the academic propositions
Early warning system	- Trends and disruption are studied by two entities – Insight & Foresight team and Nokia R&D.	Christensen & Raynor, Henry Chesbrough
Organisational structure	- Autonomous venture units separated from mainstream business operation - Existing business focuses on their business, while the task of emerging business and renewal is assigned to venturing entities.	O' Reilly & Tushman, Markides & Geroski
Processes	- Venturing entities are not bound by the processes, values, culture and the business model developed by existing businesses - They have developed their own process that fits their objectives	O' Reilly & Tushman
Resource allocation	- Funding to the venture units is secured by the CSO	O' Reilly & Tushman
Decision-making matrix	- Managers of venture units have autonomy to decide on the amount of funds allocated to individual ventures. - Venturing entities are free to decide on individual ventures within their set boundaries e.g. NVO can decide up to pilot stage of a venture without having to ask a BU to fund or provide resources. While BU's are free to decide whether they wish to adopt a venture in their own business.	O' Reilly & Tushman, Gary Hamel

4.3. A holistic top down approach to deploy RI: Venturing at IBM

With almost 330,000 employees worldwide and revenues of US\$91 billion¹⁶ annually (2005), IBM is the largest IT firm in the world. IBM's strategy is based on the creating new platforms, ecosystem development and acquisition. Support from the ecosystem¹⁷ is necessary to promote the platforms created by IBM, while the acquisitions strengthen them. It is not surprising that one of its venture arms (EBO) is aimed at creating new platforms, while the other arm (VCG) is aimed at ecosystem and acquisitions.

Venturing at IBM mainly takes place through its Emerging Business Opportunity (EBOs) program, while its VC arm - IBM Venture Capital Group (VCG) plays a unique role. The EBO program is in place to identify, incubate and deploy radical innovations (titled as 'EBO') in the form of new growth businesses; the VCG complements EBO management by helping to identify and refine EBO ideas, to identify external partners and to build ecosystem that is necessary for the success of an EBO.

An opportunity is considered an EBO if it has a potential to generate over € 1 billion revenue within 3 to 5 years (⁵¹). EBOs are created around a disruptive technology, a new market or a new business model. The Corporate Strategy group initially manages EBOs. The Corporate strategy helps to identify and solve the cross-business issues.

EBOs are never fully funded through corporate funds. The funding comes from the business units who are the beneficiaries of the investment over time. Corporate funds are made available to EBOs to supplement the BU's funding. Financial mechanisms are put in place to protect an EBO from the vulnerability of expense cuts in an effort to manage short-term unit profitability. Once the EBO has a proven business design and a clear ownership, the EBO is considered as 'graduated' and is transferred to the sponsoring BU.

IBM Venture Capital Group (VCG) was established mainly to influence the VC community. VCG serves as a focal point for IBM interactions with the VC community. It is noticeable that VCG does not make a single VC investment; in other words, unlike other corporate VCs it does not invest a single euro in a start-up company. VCG's overall mission is to increase acceptance of IBM's vision, strategies, standards, and platforms in the VC community. It also aims to gain leading solution partners, leverage ecosystem, and source M&A targets.

VCG acts as a link between the EBO program and the VC community. The VC community can serve as partners with the complementary solutions because a number of the VC's 'hot investment areas' overlap with the EBO.

Apart from these programs, IBM has deployed disparate instruments such as TAP (Technology adoption program), IBM ThinkPlace, and Crow's Nest team.¹⁸

¹⁶ IBM Stock Report. Morningstar, Inc.. Retrieved on 27-06-2006

¹⁷ An ecosystem for an IT company is similar to the gas station infrastructure for an oil company, or the tower antenna infrastructure for a mobile phone company.

¹⁸ www.ibm.com, Aug 21, 2006. Please refer to the detailed case study for more details

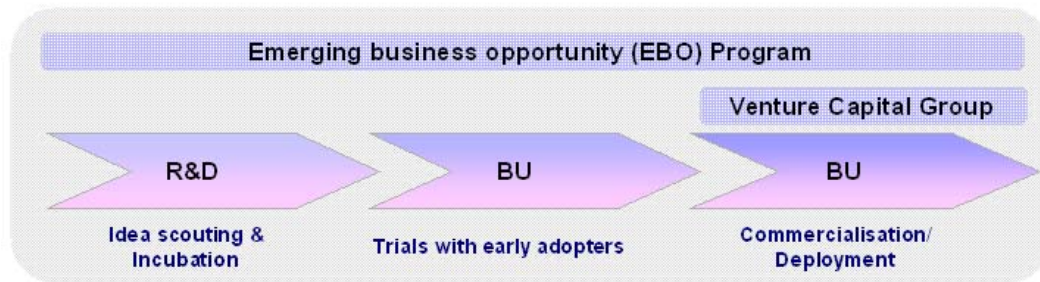


Figure 15 – Structure of venturing at Nokia

Insights from the analysis of venturing at IBM

- ✓ *A platform for tapping emerging businesses.* Through the EBO program, IBM has created structured processes and resources allocation system in order to identify, incubate, test and deploy emerging businesses based on new technologies.
- ✓ *Venture instruments complement each other.* While the EBO program creates new growth platforms, the VCG supports these platforms by identifying external partners and helping to build ecosystem that is necessary for the success of an EBO.
- ✓ *Role of senior leadership as an initiator and catalyst.* Senior leadership role is critical to the success of the EBO program. The Corporate Strategy group acts as the initiator of new EBO. An early stage of EBO has much higher risks and uncertainties. The Corporate strategy takes the responsibility and works closely with the senior leadership of the business units during this stage.
- ✓ *Ownership from the business units.* Two factors stimulate the participation of the business units. First, they are obliged to fund the EBO if the results from the EBO will be relevant to them. Secondly, they are not at risk if the EBO did not turn out to be a success. The senior leadership understands that the uncertainties are much higher with EBOs and hence a different set of evaluation criteria (based on milestones) is used.
- ✓ *Evaluation criteria and financial mechanisms.* A unique set of evaluation criteria for different business horizons. The H3 business horizon (EBO) has much relaxed criteria when compared to the H1. The financial mechanisms are also in place to averse a sudden cut of the funds.
- ✎ *Transfer of EBOs to the mainstream is not well defined.*
- ✎ *High revenue requirements for new EBOs.* The primary criterion for the EBO selection is its ability to generate over € 1 billion in revenue within 3 to 5 years. This implies that the potential innovation that could not generate € 1 billion or could start generating only after 5 years cannot pass the EBO screening.

Comparison of IBM venturing with the academic propositions

IBM's approach to venturing is close to the proposition of ambidextrous organisation, the major difference being that IBM has not created new organisational units for creating emerging businesses. The EBO program gets greater attention from the senior executives, but execution responsibility of developing EBOs belongs to the mainstream business units.

Table 13- Venturing at IBM, a comparison with the academic propositions

	Venturing at IBM	Match with the academic propositions
Early warning system	- The ideas for EBOs are captured from BUs and VCG team among others. - Trends and disruption are studied by CEO's Crow Nest team	Christensen & Raynor, Henry Chesbrough
Organizational structure	- No separate units are created for managing and developing EBOs. The relevant mainstream units are responsible for developing EBOs - Commitment from the BUs is ensured by the senior management	O' Reilly & Tushman, Unique
Processes	- The evaluation criteria and the financial mechanisms are distinct when compared to those of mainstream businesses. - Although EBOs are developed by the mainstream units, the EBO managers are evaluated with different (more relaxed) criteria	O' Reilly & Tushman
Resource allocation	- EBOs are never fully funded from the centre. Funds from the centre are combined with funds from the relevant BUs. - Senior management ensures that BUs do not deviate from their commitment of funds. - For EBOs that do not have a natural owner or if it is too early to identify owners, the funding comes from the centre.	O' Reilly & Tushman
Decision-making matrix	- SVP Corporate Strategy together with relevant senior executives from BUs is responsible for selecting new EBOs. - SVP Strategy and senior executives take early stage decisions on development of EBOs. Later this responsibility is transferred to the senior executives of the relevant BUs.	O' Reilly & Tushman

4.4. A comparison between Shell, Nokia and IBM

The following tables summarises the similarities and the differences in the approach of venturing at Shell, Nokia and IBM.

Table 14 - Similarities and differences between venturing activities

Themes	Shell	Nokia	IBM
1. Triggered because of a need Venture activities started because of the call of a senior executive	The Research Director of E&P initiated the GC program to foster breakthrough innovation in EP business	Venturing was triggered by CEO with an aim to find new avenues for growth	CEO initiated the EBO program as he observed that IBM was consistently missing the emergence of new industries
2. Clarity of objectives Each of the venture units has clear objectives	Objective of GC is to incubate breakthrough <i>technological</i> ideas. Any technology that a BU (i.e. operating unit) is unable to sponsor, but is in the interest of Shell to have the technology, GC sponsors it. STV supports this objective through its VC capability.	NVO aims to find new avenue of growth through venturing. Technologies/ platforms that do not have a specific owner are incubated at NVO. Once business potential is identified, the venture is transferred to appropriate BU/ Platforms.	The main aim of the EBO program is to create new emerging businesses. Each EBO in itself is a new business.
3. A more focused approach Venture units have become more focused and limit the number of projects in their funnel when compared to the time they started	GC was created in 1996. Initially it was open for any sort of ideas including a breakthrough sandwich packing, but now they focus on ideas that fits Shell strategically	NVO was initiated in late 1990s. NVO gained momentum by initiating several projects. But now NVO is limiting to approx. 10 projects at early stage and around 10 at the mid-to-late stage	EBO program started in 2000 with 7 projects and geared to 18 within a span of 2 years. However, after CEO review the number of EBOs were limited to 7 in 2005
4. Senior leadership A senior executive is directly involved with overseeing and evaluation venture unit(s)	GC reports to and is evaluated by the VP of the related business unit. Group GC reports to CTO. STV reports to the board of E&P business.	Venture units report to one of the two heads – NVO Head or VC Head, who in turn reports directly to CSO.	All the EBO's report to and are managed by CSO. Day to day responsibility of managing EBO does belong to the BU that owns the EBO. VCG reports to the Board.

A managerial guide to tap radical innovations

5. Resource allocation Resources are either partly or fully funded by the senior management	For GC, one quarter of funds come from corporate office, while three quarters come from the BU. Group GC is totally funded by CTO. Funds for STV comes from Executive VP of BU.	Funds for NVO and other venture units come from the centre. Funds for the two VC arms partly come from Nokia and partly from external parties.	EBO's are funded through BUs. The BU that has highest to gain from an EBO is responsible to fund. When such arrangement is not clear, starting funds come from CEO.
6. Decision making autonomy Although decision-making is autonomous, relevant BUs are involved as the project advances.	Within its limit (idea to proof-of-concept), GC is autonomous to make decisions. That is, it does not have to ask permission from a BU to fund projects. STV makes decision on its own, however when a deal requires larger funds, permission of board is sorted.	With a clear objective for each of the venture units, a venture unit is free to make its decision without asking for permissions or looking for funds.	As the projects are mostly company wide and large amount of funds in 100 millions is involved, the decision-making is largely controlled by senior executives (esp. CSO).
7. Early ownership Despite the risks involved, all the three companies have identified a need of early "ownership" of projects. That is, involving the relevant BU early in the process as advisory.	Shell GC involves BU at the second stage in the screening process. As individual businesses do not fund projects it is less likely that they want to kill the project, rather their logical approach is to wait and see what comes out.	NVO's approach is to deliver an already field validated project to BU. NVO involves a BU after proof-of-concept or after the field validation. NVO believes that if a BU is involved early in the process then the risk of the venture becoming orphan can be reduced.	Once an EBO is identified, IBM's senior executives force a BU to fund the project. By this way, BU(s) take early ownership. During this entire process, CSO and his team acts as advisory. This structure is different when compared to time this program started. In the past, CSO took ownership, while BU(s) just supported.
8. Early warning system Early warning system is in place, but the instruments differ	Through Group GC, Shell has deployed a number of scouts in each of the BU. Several scout teams are formed and each team works on a particular theme. Besides this, the Future Energy Forum serves as an instrument for senior executives to get awareness about trends and disruptions.	Nokia Insight & Foresight team takes the charge of scouting for radical innovations. They also draft scenarios and convert these scenarios in technology impact	CEO's 'CROW' team scouts for trends and disruptions and reports to senior executives.

9. Approach Overall approach to manage venturing differs	For Shell, GC and STV are more of a bottom up instrument. They do support top down motives, for example, by organising workshops on strategic themes, but are mainly focused on ideas coming from bottom	Venturing at Nokia is a combination of a holistic bottom up approach and partly a top down approach. Venture structure allows a project to be brought in at any stage of its development – idea, proof-of-concept, mid or late stage.	EBO is mainly a top down program. Most often senior executives initiate EBO's.
10. Organisational structure Venturing program is organised in accordance to the approach	GC serves as an instrument to scan and incubate ideas until it reaches a proof-of-concept stage. Later, the responsibility is transferred to Exploratory R&D. STV scans and funds technologies/ start-ups or to spin-out technologies which Shell does not have a particular interest in developing	NVO incubates ideas to a proof-of-concept and then validates them through field trials. However, it is the line of business that can accept/ reject its commercialisation. On the other hand, VC entities serve the top down needs and invest in project in which Nokia has strategic interest.	EBOs are top down projects and are managed in parallel with IBM's current line of businesses. Business units have the responsibility starting from development, validation and commercialisation of EBOs. VCG serves as a propagator of motives of senior executives.
11. Technology Companies emphasised that <i>technology</i> played a critical role for future. However, the impact of technology on the business differ	For Shell, a new technology is often not a new business; it serves as a tool to assist the current operations. A group of technology may lead to a new line of business	A radical technology might lead to a new business, but not necessarily. For example, camera in mobile phone helped to sell more mobile phones, while enterprise solutions initiate led to a new BU.	A radical technology leads to a new line of business. Each EBO is considered a new line of business. For example, pervasive technology brings along a new set of applications and services
12. Milestone based evaluation	Whether the project is incubated at Shell GC, Nokia NVO, or IBM EBO; at the early stage, the RI projects are evaluated based on milestones rather than standard financial returns, time or cost savings. Next milestones are adjusted based on the progress and new learnings.		

13. Open innovation approach	All the three companies have imbibed the open innovation approach. There is a continuous shift from an internally focused to externally embedded idea development. For example, when the Shell GameChanger started, it focused on ideas from internal sources. Idea generation exercises were also limited to internal boundaries. Currently, GC readily accepts ideas from external sources. As a next stage, GC also sponsors projects at universities and external enterprises. The venture capital programs of the three companies differ substantially mostly because of the level of their open innovation approach. Shell Technology Venture (STV), which is a fully owned VC arm of Shell, invests in start-up companies to reap financial as well as strategic benefits. Nokia is only a limited partner of Nokia's BlueRun Ventures. By partnering with private VCs, Nokia limits its risks, while enabling BlueRun to act more professionally. IBM's Venture Capital Group (VCG) is a broker between IBM and VC community. It does not invest a single dollar; rather it connects VC communities and promotes IBM's platforms.
14. Human aspect	When compared to the quality of ideas, market potential and resources availability, all the companies emphasised on the importance of quality of managers, champion and scientists that manage RI projects

4.5. Key challenges to venturing

All the three companies face the following two major challenges.

1. 'Crossing the valley of death', that is, transferring the RI project from the venture unit to the business unit is found to be a key challenge. In such cases, the project must wait until someone takes the ownership of further development.

A misfit between what BU expectations and what a venture unit offers, between the mainstream business model and business model required by the RI to be successful and the "not invented here" syndrome are some of the common reasons.

2. Fluctuating interest of senior leadership in RI and in the venturing initiative is observed in all the three companies. The venture unit(s) must prove its worth yearly to ensure its existence. This observation supports with empirical evidence that the life span of the venture units is often short (on average 4-5 years).

Lack of the expected outcomes, negative financial results, outcomes only after several years, questions regarding rationale of funding the unit(s) when the mainstream is forced to cut costs are some of the common reasons.

4.6. Key findings from the analyses of case-studies

A comparison of venturing at Shell, Nokia and IBM shows that:

1. In practice, companies do not follow any single academic proposition suggested by researchers. They often combine a set of propositions and adapt to their setting.

For example, at Nokia, the early warning system is similar to the approach of Christensen, organisational structure is similar to the approach of Markides & Geroski/ O'Reilly & Tushman, while processes are similar to that proposed by Henry Chesbrough and O'Reilly & Tushman.

2. Each of the companies has a well-defined venture process plan – starting from the screening of ideas through to their deployment.

However, none of the three companies have a similar model for venturing. Shell, Nokia and IBM – each have their unique organisational structure, processes and decision-making system.

3. Venturing takes place at separately managed semi-autonomous venture units. Each of the venture units studied is only active in part of the venturing process, that is, either (early stage) incubation, (mid stage) validation or (late stage) commercialisation.

For example, Shell GameChanger focuses on early incubation and seed investments, while Shell Technology ventures focuses on mid-to-late stage VC funds.

These three observations forms a basis of the RI framework proposed in the following chapter.

5. FRAMEWORK TO BUILD A ROBUST RADICAL INNOVATION CAPABILITY

“The art is to see distant things as if they were close and to take a distanced view of close things” – Miyamoto Musashi, The book of five rings (1645) (⁶³)

This chapter presents a framework that forms the foundation for generating RIs from established firms.

The framework is based on the following observations:

- From the cases studied in this research, it is observed that the firms often need three distinct sets of capabilities to manage a radical innovation - starting from idea recognition through to its commercialisation. (Figure 13, Figure 14, Figure 15)
- Each of the venture units studied was active in idea incubation, project validation or commercialisation (§ 4.6.).
- Weakness in the ability to manage one of the three phases or a lack of a capability makes it difficult to successfully generate RIs.

This framework offers a platform to systematically reduce the technical and market uncertainties associated with RIs. The firm that follows this framework can enhance the success rate of generating RIs.

5.1. RI framework

The RI project must pass through three phases - incubation, validation and deployment

Any successful innovation project starts with an idea. The project goes through incubation to deliver a working proof-of-concept. Later, the proof-of-concept must be validated through pilot tests and eventually commercialised. Similarly, in order to capture value of a radical innovation, the RI project must pass through these phases. In general these phases can be termed as the *incubation*, *validation* and the *deployment* phase.

Firm must deploy the capabilities required by these phases.

Each of these phases is distinct in terms of the challenges and the managerial skills required to overcome the challenges. Resources, processes and the evaluation criteria differ significantly for different phases. It is not surprising that each of the venture units studied is only active in a part of the venturing process – that is either (early stage) incubation, (mid stage) validation or (late stage) commercialisation. These fundamentals are presented in this framework. This framework emphasises that the firm must deploy the capability required by these phases to effectively generate RIs.

It is not necessary that a firm itself attend all these phases. A firm can organise these phases in various ways. For example, Shell has deployed venture units for first and third phase, while the role of second phase is carried by the mainstream exploratory research. The RI project may take several paths from the venture unit to internal R&D, NBD, BU or external VC or an external company. How to organise the phase depends on various factors including the objective of venturing, the type of industry, top management vision and needs. However, the underlying emphasis is that the firm must deploy the capability necessary for the phases.

These three phases are shown in the following figure, and are explained in the sections below. Table 15 gives a summary of the key elements (resources, deliverables, challenges, targets) of each of these phases.

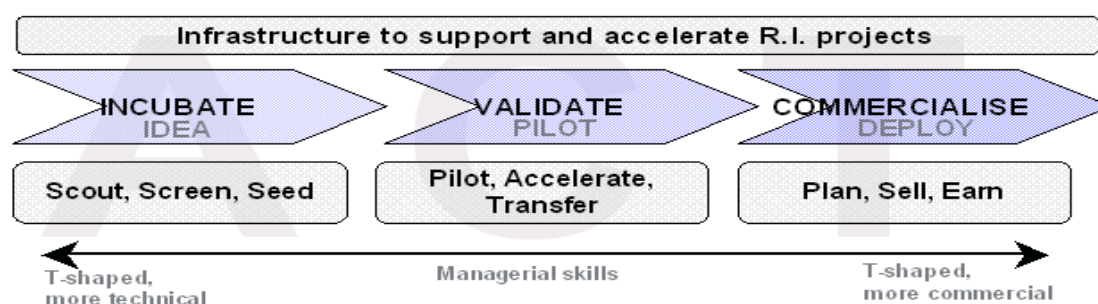


Figure 16 –The Radical innovation framework

This framework overcomes two major limitations of the academic propositions. First, researchers propose structures and processes that help to reduce organisational uncertainties, however they do not offer a platform to systematically resolve technical and market uncertainties. And second, in contradiction to the academic propositions, the practice shows that there is no one right organisational structure that fits all. Established firms organise their RI capability in varied organisational structure and processes. What remains common though is the process from idea incubation to commercialisation.

5.2. Incubation phases

The *incubation* phase includes scouting for opportunities, screening of ideas, and sponsoring the ideas with seed funds. Focus during this phase must be to reduce the technical uncertainties.

Scouting

Systematically look for ideas, trends and disruption

Scouting means continuously looking for opportunities and disruptions. It also includes systematically looking for ideas. Ideas must be collected from employees and external sources on a regular basis as well as by organising workshops on strategic themes important to firm.

Establishing an 'early warning system' (EWS) forms a part of the scouting efforts. EWS is especially needed for established firms who are leading the industry, because they are the ones who will loose the most when a disruption strikes. EWS can be organised through a fulltime team (like IBM CROW team, Nokia Insight & Foresight) or a part-time committed team (like Shell GameChanger 'early warning' scouts). Continuous reporting to the senior management and the relevant line of businesses is crucial.

Screening

It is the quality of ideas that matters not the quantity

Screening of good ideas out of many is important. It is often not the quantity but the quality that matters. Firms often start venturing on several ideas with a mindset that most of the ideas will fail, but only later they realise the limitation of resources and reduce the number of projects with a focus on quality (Refer to Table 14). The issue

with 'false positive' (bad ideas which get selected) and 'false negative' (good ideas which get rejected) is often cited as a challenge. The unit must attempt to avoid this, for example, by setting appropriate evaluation criteria, through experienced evaluators and adaptive evaluation: setting evaluation meetings based on milestones/ tollgates so that further funding can be terminated if above issues are detected (§ 4.1. , Table 14).

Although a venture unit might be open to any sort of ideas, setting the appropriate criteria for screening is critical. These criteria must be based on the objective of the venturing unit. Having a vision for how and who will develop, whether it fits with firm's strategic context (for example, an idea of drilling in dessert is not for IBM), and where the idea will eventually go are important parameters.

Seeding

A distributed funding spread over a period of time based on milestones is advisable.

Seeding means providing seed investment to the selected ideas. It must be kept in mind that at this early stage, ideas can not be evaluated like a regular product development idea because the uncertainties involved with the former are much higher while the potential market and business case are not so clear. (Refer to page 13 and 14). Defining and evaluating the development of idea based on the predefined *milestones* is advisable (§ Table 14).

A distributed funding spread over a period of time rather than a bulk funding at a time is better. A good example for this is Shell's GameChanger. Here funding is divided into three stages (§ 4.1.); the funding continuous only if idea reaches the predefined milestones, as well as if the idea is still interesting for the Shell (because in many cases, the base on which idea was approved changes. For example, a competitive alternate is available and hence idea might not be interesting any more).

5.3. *Validation phase*

Pursue field trials with the focus on early feedback to reduce carried risks and confirm the business value

Validation phase is necessary to confirm the potential of RI project. How a firm validates a RI project might differ – for example, Shell validates through full-scale lab trials as well as field trials, Nokia validates through friendly customers and/ or early adopters, while IBM validates its products and services through customer trials and early adopters. In any case, the emphasis here must be to reduce the technical and market uncertainties, and to gain early feedback. As seen from the Figure 17, after this phase the potential value of RI outweighs uncertainties.

Assistance from the mainstream business units must be utilised for validation. Forming alliances and partnership at this stage might be a good strategy for certain projects. Now in the end, if the project does not have potential, then managers must be willing to take the hard decision to refocus the efforts or dissolve the project.

5.4. *Commercialisation phase*

The commercialisation phase implies deploying the RI project in the market to generate revenues. During this phase, the focus must be on commercial aspects such as return on investment, growth potential, discounted cash flow, among others. There are two major homes for this phase – the mainstream business units and the venture capital arm. Which home is more appropriate for the RI project depends on various factors. Please refer to Christensen's “§ The innovator's solution” for more details.

Apart from the inhouse capability to commercialise the RI projects, three out of five academic propositions suggest deploying external funds for start-ups. By this, the established firms can invest in the potential external projects.

Uncertainties reduction versus Business value creation during different phases

The following figure represents the variation in the uncertainties and the business value of RI project during different phases.

1. During the *incubation* phase, the uncertainties – technical, market and resources are high, while the business value is difficult to predict. Securing resources is most difficult in this phase.
2. The *validation* phase is the most crucial phase. During this phase, the ‘business value’ increase and the “uncertainties’ reduction curve cross each other. After this phase, the market potential of RI project often becomes apparent. This phase is called ‘crossing the valley of death’ because before this phase it is difficult to acquire resources (“nobody wants to own the project” as the market potential is unclear) while after this phase most of the risk is removed and the technology becomes ready for deployment. The valley, here, indicates the challenges of acquisition of resources and of early ownership. Without this phase, the proof-of-concept must wait or sometimes die.
3. The *commercialisation* phase still has some uncertainties, but they are much lower when compared to the former phases. Most business value is captured during this phase. It is not surprising that the venture capitalist often invests in the projects that are in this phase.

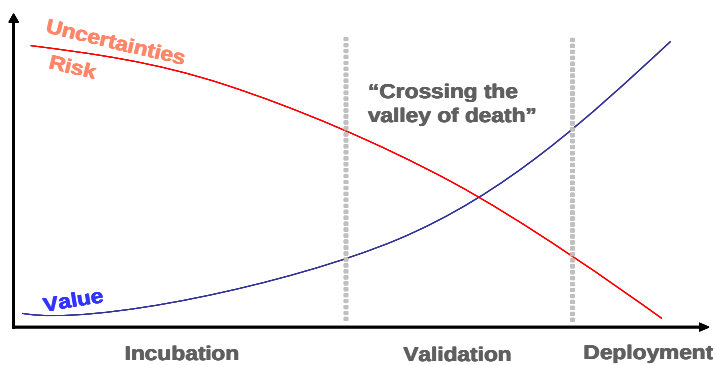


Figure 17 – Figurative representation of uncertainties reduction vs. business value generation during the different phases

The following table summarises the key challenges, targets and responsibilities of each of these phases.

Table 15 - Key elements of each phase of RI framework

Phase	Incubation	Validation	Deployment/ Commercialisation
Input	Idea	Proof-of-concept	Technology/ Working product
Resources ¹⁹	1x	~10x	~100x
Key Deliverables	Technologically proven proof-of-concept	Validated product - proven through field trials	Commercially deployable product
Key Challenges	- Technical uncertainties - Resource acquisition - Protect RI ideas from early killing	- Market uncertainty - Convincing early-adopters	- Spotting target application - User acceptance
Key Targets	- Reduce technical uncertainties - Secure and guard resources - fund, researchers, project champion - Select target applications - Prepare transfer plan - Market the technology to potential takers (e.g. VCs, R&D)	- Reduce market uncertainties - Facilitate and commence pilot trials - Secure resources for pilot tests - Find key applications - Build project legitimacy esp. with middle-level management - Prepare business proposition - Market the application to potential takers (VCs, BU, corporate board, etc.) - Find the right home for project (considering spin-out as an alternate).	- Bridge gap between technical innovation and business success - Define business model - Identify firm's position in value chain - Do preliminary market tests. Adapt approach from market learning - Prepare to fight if RI project cannibalises an existing business - Access missing competencies for a successful commercialisation - If project doesn't fit values and processes within organisation, consider spin-out option - Select partners strategically
Other responsibilities	- Idea generation, and scouting for trends and disruption - Idea screening - Provide internal and external seed investment - Map uncertainties of projects - Convince/ recruit champions - Build bridges with business unit which could be the potential home for project	- Establish and manage internal and external relations (esp. with early adopters and VCs) - Develop a learning plan - Assess transition readiness of projects - Identify transition senior management champions - Deal with BU's expectations during transition	- Establish and manage internal and external partnership (esp. with VCs) - Adapt business model based on new learning - Learn quickly as applications and markets unfold - Decide what should be outsourced and what new competencies should be developed - Manage interfaces between the team, mainstream organisation and external partners
Responsible unit/ team	RI incubator (together with the scouting team)	Technology deployment unit (with Pilot and Transition team)	Venture capital arm, Emerging business unit, New business development unit

¹⁹ Amount of funds needed increases in each phase. For Exploration and Production business, the 10x multiple rule is applied. (Ref: Leo Roodhart, Shell GC)

5.5. Skills, processes and metrics during these phases

Managerial skills, evaluation criteria, amount of funds and key targets differ substantially with different phases

One of the views for managing the process from incubation through to its deployment is to have a single venture unit^(65, 28, 17). It is possible to do so, however, the following points must be kept in mind.

Based on the life cycle of RI projects, it is observed that different phases of RI project require different set of skills, processes and metrics^(64, 56).

» From the skills perspective, it is recommended that the manager in charge of the RI project must be capable of understanding the technological and commercial aspects, in other words, be t-shaped⁽¹²⁾. Now seeing through the lenses of individual phases, managers of the incubation phase need greater technical than commercial insight, while managers of the commercialisation phase need more commercial than technical capability.

» As mentioned in Table 15, from the process perspective the amount of resources, key responsibilities and milestones vary for each phase. For example, Shell GameChanger applies 10x rule. If a project takes 1x for idea incubation, its validation will need 10x, while its commercialisation will need 100x. This multiple will of course change for other businesses and industries. Similar to resources, the responsibilities and criteria of milestones are different.

» From the case study analyses, it is observed that the evaluation of RI projects and RI managers vary for each phase. For the incubation phase, evaluation is based on how far technical uncertainties are solved, while the validation phase evaluation focus on getting clarity of market, target applications, and on reducing market uncertainties. The commercialisation phase is evaluated based on ROI and strategic benefits. Also, the ways by which managers of each phase are evaluated vary.

5.6. Open innovation approach

It is not necessary that a firm itself attend all these phases.

Figure 18 explains the open innovation approach to venturing. It shows that a RI project can be sourced from and deployed through several channels. Each of the venture units must look beyond the regular flow of projects. They must consider sourcing and transferring the RI project from/to various entities.

The main aim should be to capture value of the RI project to the benefit of the firm. Especially when the project goes outside the boundaries of a firm, commercial value must be captured. For example, IP rights can be sold after the incubation phase; a field-tested technology can be sold to VCs or can be developed further in alliance with external partners.

An incubator can collect idea from various internal and external sources. Once it develops a proof-of-concept, the project can go to the validation unit, R&D, BU, a VC or form an alliance for further development. Similarly, the validation unit can transfer the field-tested technology to various units. It can also collect the proof-of-concepts from various sources like external incubator, R&D, external entrepreneur or company. Same concept applies for the commercialising unit (e.g. Corporate VC arm like Shell Technology Ventures).

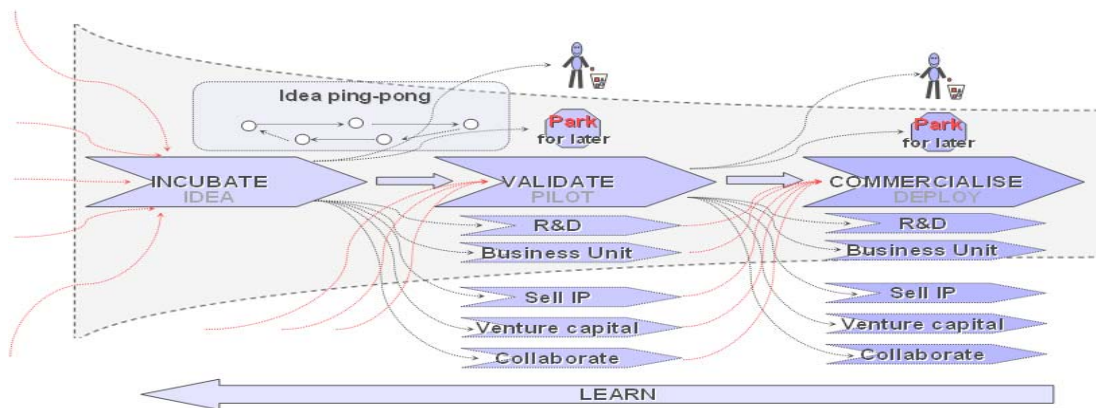


Figure 18 – An open innovation approach to managing RI projects

The 'idea ping-pong' concept²⁰ means that the RI project may go back and forth between the incubation and validation phase. This is usually because of the feedback from the field, which may require minor or major changes in the technology or other parts of the idea (business case, etc.). These aspects must be kept in mind while designing the RI capability.

²⁰ Concept adopted from Sari Kola - Nystrom (2005). In search of corporate renewal: How to benefit from corporate venturing? (⁷⁰)

5.7. Venturing in an organisational context

Mainstream businesses and RI capability can leverage each other if managed appropriately

The following figure shows how the RI capability fits within an organisation. Track 'B' shows the regular functioning of the established firm. Together with track 'Op', the firm applies the open innovation approach through alliances, acquisition, partnership and other modes. A firm spends over 80-99% of its resources in the organic growth with a focused approach.

Track 'A' indicates the RI capability. Together with the open innovation approach 'Op', it gives an ability to spin-in⁽¹⁷⁾. Based on the observations from case studies, the established firms often invest 1 – 20% of its total budget in this initiative. Shell invests approximately 10% of its R&D budget in venturing initiatives (approx. 10% of R&D budget goes to GC and approx. 2/3rd of EP R&D budget goes into STV); Nokia invests approximately 10% of its sales in venturing activities.

The crux here is to balance the mainstream business and RI capability together. Although they have different deliverables, they must support and leverage each other. Generally, the senior management must manage this balance.

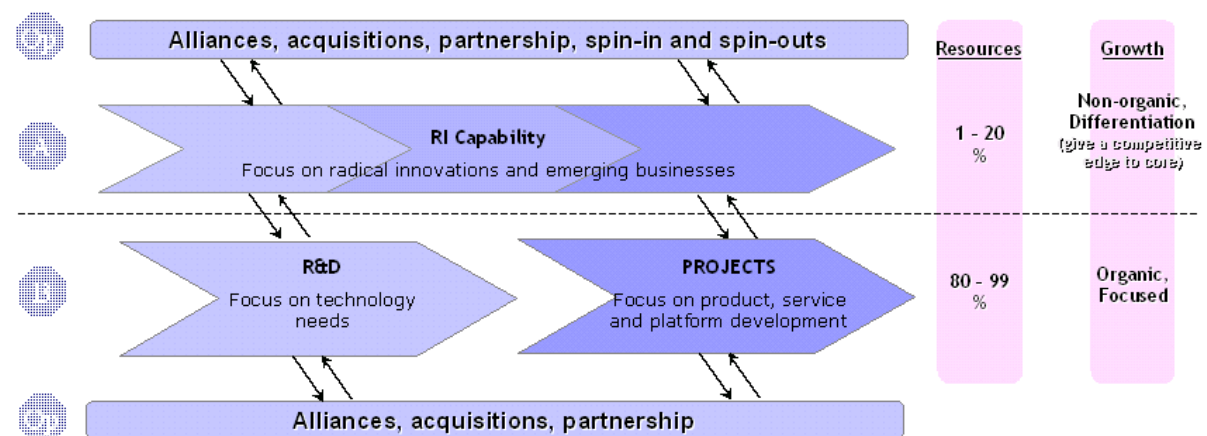


Figure 19 - Venturing in an organisational context

Recommendation for deploying more than one venture unit

Consider deploying more than one venture unit

It is essential to have the capability required by the three phases. This capability might come from the mainstream business units' and/ or through the venture unit(s).

From the above observations, this research proposes that the established firm must consider deploying more than one venture unit, perhaps a venture unit for each phase. Two arguments support this: First, the required skills and capabilities of the managers, the milestones, evaluation and deliverables differ for each phase, and second, the tendency of continuing projects to the next phase due to the emotional reasons can be limited. All the three case study companies have more than one venture unit (each venture unit aligned to one the phases.)

Table 16 – A vision for a matured Radical innovation capability²¹

	Early RI Capability	Mature RI Capability
Early warning	» Executives have to act as patron to compensate for the lack of supportive culture/ system	» Firm's leadership sets expectations, develops RI imperative, establishes facilitating organisational mechanisms, and develops goals and reward systems
Organisational structure	» Mavericks try to catch attention of patrons. There is a lack of infrastructure and systematic approach	» Idea scouts search for opportunities » Venture units help establish a screening board that use appropriate criteria » Non-traditional marketing and business development personnel work with radical innovation technical teams to develop business model
Processes	» Acquisition of resources is ad hoc » Project teams often expect a budget allocation to fund their work	» Multiple sources of capital for radical innovation. Individual managers with authority provide seed funding and venture capital fund. » Firm adopts a portfolio approach to fund RI projects
Resource allocation	» Completing radical innovation tasks, staffing the project team, and engaging champions relies on individual initiative	» Venture unit work with HR to develop strategy to identify, select, reward and retain champions, experts and team members
Decision making	» Relationship with internal and external partners are developed on ad-hoc, project-by-project basis by each project team	» Relationships between radical innovation activity and external partners are developed at a strategic level- relying on the collaboration of the project team, the venture unit, and the oversight board
Managing Transition	» Communication is poor between the RI project and the business unit. » Project often transits too early and then flounders. » Project relies on intervention of senior management for transition	» Transition team is established to continue application and market development until uncertainty is reduced sufficiently to ensure a successful transition to the operating unit.

²¹ Adopted from Richard Leifer et al, Radical innovation: how mature companies can outsmart upstarts, 2000, page 194 - 195

6. REFLECTION ON ESTABLISHING RI CAPABILITY

“There is no more delicate matter to take in hand, nor more dangerous to conduct, nor more doubtful in its success, than to be a leader in the introduction of changes. For he who innovates will have for enemies all those who are well off under the old order of things, and only lukewarm supporters in those who might be better off under the new” - Niccolo Machiavelli ⁽⁵⁸⁾

Before reaching the concluding chapter, it is important to reflect on certain issues.

1. Should the established firms put all their innovation efforts in establishing RI capability?
2. With major threats to the survival of the venturing capability, is it still advisable to establish this capability? If so, what has changed with time, and what will evolve in the future?
3. Why companies do not follow the academic propositions? Why each company has its unique approach to venturing?

6.1. *A fine balance between incremental and radical*

Senior executive must ensure company's short term and long-term growth through a balance of incremental and radical

This research has constantly emphasised the importance of radical innovation, but it must be kept in mind that it is a fine balance of incremental and radical innovations that can ensure short and long term success of a firm (§2.1.).

Most researchers agree that an established firm need both incremental as well as RIs. While incremental innovations are necessary to maintain existing businesses, for organic growth and to extend the mainstream businesses, RIs are imperative to tap emerging businesses, for non-organic growth and to renew and challenge the established beliefs of core business. A fine balance between these two innovations makes a firm survive. The following figure explains this basic observation.

Senior management play a critical role to balance this. That is enabling radical innovations (emerging businesses) to grow and develop while maintaining a necessary balance with the organisation's mainstream (existing) businesses. The challenge for the organisation is to achieve an appropriate allocation of the scarce funds and even scarce talented manager resource.

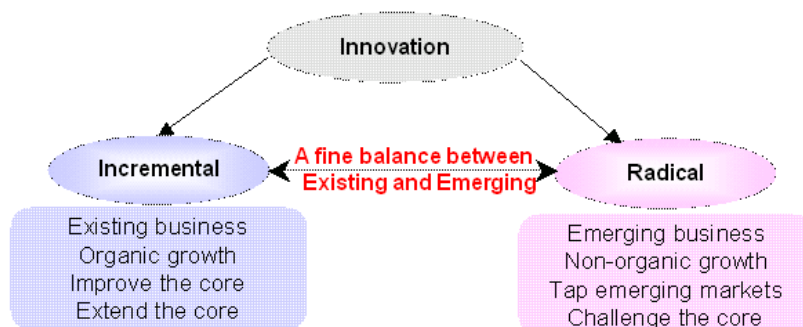


Figure 20 - Incremental vs. Radical innovation

The following gives a figurative representation of the balance between the existing and the emerging business. It shows that the incremental innovation can improve the existing business, while radical innovations can bring new growth. As an analogy, while existing business is necessary to ensure that a firm is capable of paying the salaries of employees every month, incubating RIs is necessary to make sure that a firm will be capable of continuing to pay salaries even after 20 years and more.

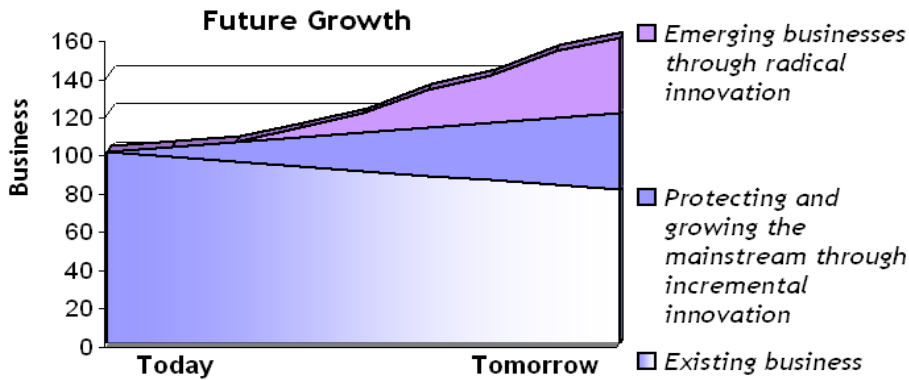


Figure 21 – Figurative representation of the future growth of the company

Analogy with a family

Another analogy to the above mentioned phenomenon could be found in a family consisting of father, mother and one son. The mother is the Chief Executive Officer (CEO) of the family with a duty to maintain the family, encourage both father and son, and to solve conflicts between father and son. The father has to make sure that he earns enough to feed the family. The family will starve if he does not earn. The son, on the other hand, is allowed to try new things. He eventually has to find something that will feed the family in future.

Here, the father is analogous to incremental innovation, and the son to RI. The father has to keep improving his skills to earn more and to maintain his job. However due to uncertainties in the job market he might loose his job. Similarly, a firm deploys incremental innovation to improve existing business, but due to market uncertainties its business might die. A son can try, fail and learn but eventually he will find a new way of business. Similarly, a firm deploys RIs to tap emerging businesses. During this process it might fail, but it has to try and learn to eventually succeed. Like a mother, during this period the CEO has to maintain a balance of resources between incremental innovations and RIs.

6.2. Merits of venturing

If managed properly, venturing still remains a widely accepted way of generating radical innovations from established firms.²² (§3.7. , § 3.8. , Appendix F - Systematic innovation management)

Act based on what the radical idea needs to be successful. Allow the RI managers to take decisive actions

Established firms design global standards and procedures for an efficient management of the incremental innovations. The business units (BUs) have their own set of criteria, often based on the short-term business needs. These criteria are good for prioritising regular projects, however are not suitable for managing RI opportunities.

The basis of establishing capability, separated from the routine structures and processes, is to enable decisive actions. RI managers must be allowed to act based on what the radical idea needs to be successful rather than what standard processes suggest to follow. If it needs partnership, then let there be partnership; if it needs external development, then let there be external development. This sort of flexibility that is usually missing in established firms necessarily calls for venture units.

Evolution of venturing

All the three case study companies have over a decade of experience with venturing. The venturing capability meanwhile has evolved with time. Two aspects asks for a greater attention - first, the open innovation approach, and second, the mindset while dealing with small firms.

As observed in Table 14, the venture units have adopted more and more open innovation approach. Starting from internally focused idea generation, they have moved to collecting and sponsoring ideas that come from outside. Firms are starting to adopt spin-ins, spinouts and collaborations options. With this trend, it is possible that the venture program becomes embedded outside the firms.

For example, Shell GameChanger currently sponsors projects at universities like TU Delft, MIT, and Harvard among others. In the future, GameChanger might move towards initiating embedded GC units at these universities. Similarly, the venture capital arms will evolve in the future. For example, as a next stage of evolution, Shell's STV might adopt Nokia model (of partnering with private VCs) and Nokia might adopt IBM model (acting as a broker, rather than as an investor).

Mutual trust and willingness to share benefits must be at the heart of open innovation policy when sponsoring RI projects at small firms

Second observation comes from the traditional approach of large companies when sponsoring projects to small firms. Traditionally large companies often want to own the most promising radical innovations they sponsor. This ownership mentality must change. It leads them to focus on the formal, contractual, and legal aspects of the relationship, paying less attention to those aspects that cannot be codified. Unfortunately, legal ownership of a new idea is only part of its potential value. Established firms must beware of this attitude. Mutual trust and willingness to share benefits with the entrepreneur must be at the heart of their open innovation policy.

²² Various researchers support this finding, including Bessant et al (2004), Leifer et al (2000) and Hamel (2000).

6.3. Design of the venturing approach

Two observations are remarkable from Chapter 3 and Chapter 4. First, the firms often do not follow any single academic proposition and second, each firm design its own unique approach which is distinct from the approaches of other firms. The following factors seem to be driving the differences in the design of the venturing capability.

Industrial drive

- Industries vary and so do the expectations from the venturing activities.

The most important challenge for leading IT companies is developing new platforms and gaining ecosystem support. It is not surprising that venturing at IBM supports this drive. Advanced technology gives an edge to the competitive position of Mobile companies. Venturing at Nokia is focused to provide this competitive edge through venturing in new technologies. Energy companies are more interested in developing breakthrough technology to find solutions for next generation energy sources. GameChanger at Shell is optimally positioned for this.

- Rapidity of change in the industry. Speed with which the response is expected is different. Comparing to the industries of Nokia and IBM, Shell can afford to wait and respond. The massive infrastructure of the energy industry cannot overturn within a month or a year. IBM, on the other hand needs relatively rapid response. A year late response might turn out to be a bad decision. Nokia stands in the middle. The communication infrastructure is present, but the industry is dynamic and is changing rapidly. *This rapidity of response demands the deployment of unique set of instruments for each industry.*
- Technology drive. While IBM and Nokia directly benefits from the technology they develop, for Shell it is not necessarily so. Shell gets its new business based on its reputation (trustable, green) and project management skills (ability to manage large projects). Technology is only tertiary for Shell. This affects the approach.

Internal motives

- Challenges are unique. Each firm has its unique challenges. These challenges differ significantly even for the firms in the same industry. For example, the needs will change drastically if the mainstream business is strong (Toyota), or it is in the mode of transition (BMW, Volkswagen) or is facing a threat (GM, Ford).
- Overall strategy and business needs are different. The strategy and business needs are found to be strongly influencing the objectives of venturing. For example, Shell's overall strategy is organic growth. To support this strategy, the objective of GC and STV is to provide advance technologies.
- Drive for venturing differs. For IBM, venturing is for delivering new growth businesses underpinned by breakthrough technological innovations. For Shell, it is an instrument to try out new things and if something interesting comes then involve the senior executives. For Nokia, if the company wants to be involved with certain technologies but it is not inline with one of the BU's then venturing is considered the way to do it.

Limited scope of the academic propositions

- Focussed on offering a particular organisational structure and processes rather than on an approach to solve the underlying challenges of RI projects within individual firms context. It is noticeable that researchers offer an approach and generalise that it is applicable to all the firms. The approach is often an organisational structure and a set of processes. However, the case study firms as well as other contradictory academic approaches prove that there can be more than one organisational structure to tap RIs. (§ Table 10, Table 14)
- Solution often limited to a particular challenge, a holistic view is missing. Most of the academic propositions are based on the assumption that established firms face a particular challenge, and they accordingly offer the solution. But often this assumption is not applicable to many firms. For example, 'ambidextrous organisation' approach is based on assumption that firms want to develop new emerging businesses. But often this case is limited to certain firms and therefore cannot be generalised.
- A one size fits all approach. A single approach to venturing for all the firms is like saying 'one size fits all'. Firms design their unique RI capability based on their context and settings. It is often wise to provide firms with the essential elements for a successful RI capability rather than providing a recipe of a structure and processes that was successful in some firms.

A firm must design its own approach (structure, processes and resource allocation system) to venturing

To conclude, a managers must keep in mind that - understanding and learning from the various approaches offered by the academia as well as what is followed in practice helps. But in the end, each firm is unique and so are its challenges. Hence, a firm must design its unique approach.

While designing this approach the above mentioned factors must be considered. Besides this, the firm must ensure that it establishes the capability required by the three phases of RI (Chapter 5) and secondly, it follows the elements that are highlighted in the concluding chapter.

7. A MANAGERIAL GUIDE TO RADICAL INNOVATION CAPABILITY

“Perceive that which cannot be seen with the eyes”
Miyamoto Musashi, The book of five rings (1645)

This chapter is divided in two sections. The first section reiterates key observations of this research, and the second section describes seven elements that are necessary for a successful and strong RI capability.

The firms following these elements can ensure successful survival of their venture unit(s) and a continuous generation of quality radical innovations. It can be reasonably argued that if the companies like British Telecom, Ericsson, Lucent and Xerox would have followed the RI framework and the seven elements, they could have avoided the closure of their venture units.

7.1. Key observations

Before describing the key elements in detail, let's reiterate some essential observations.

✓ Organisational home for RIs (§3.8.)

Ideas, prototypes and business propositions need a place to go. The organisational home includes the structure, processes and people to incubate, develop and deploy radical innovations.

✓ Early warning capability (§3.8. , Table 14)

The early warning capability can substantially improve the RI awareness and the ability to take informed decisions. Firms can deploy scouts, create a special team and/ or create discussion forums of senior management among others in order to establish this capability.

✓ RI capability for all the three phases (§ 3.6. , §4.4. , §5.5.)

While designing the RI capability, the entire RI project development funnel (from idea incubation through to its commercialisation) must be considered. The RI framework can help to gradually reduce the uncertainties of RI projects. Ensure that the capability necessary for all the three phases (§5.5.) is present or, plan to develop it.

✓ Design your own resource allocation system, processes, and decision matrix

All the academic propositions are unique - distinct in their approach and offering. Each of the case study firms designed their own approach. The venturing approach is often inline with the overall strategy of the firm (§ 6.3. , Table 14). Each firm is unique and so are its strategy and its business needs. It therefore necessitates designing RI capability based on your firm's needs rather than copying the venturing approach of other firms.

✓ Apply open innovation approach (§3.8. , §5.6.)

Encourage the venture unit(s) to access the vast amount of resources (knowledge, skills and funds) available outside the boundaries of the firm. Encourage partnerships, alliances, collaboration, spin-ins and spinouts.

7.2. Seven key elements

1. The need for RI capability (§ 6.3. , Table 14)
2. Clarity of objectives for venturing (§ 3.7. , Table 14)
3. A visionary senior executive involvement (§ 3.7. , § 3.8. , Table 14)
4. Committed resources (§ 3.7. , § 3.8. , Table 14)
5. Appropriate governing mechanisms (§2.4. , § 3.7. , § 3.8.)
6. Agreed process of project transfer (§ 3.8. , Table 14)
7. Human aspect (§ 3.8. , Table 14)

1. Need for RI capability

Not necessarily all the established firms need RI capability.

“Need” here implies the necessity and the timing. (Table 14, theme 1).

The firm must analyse:

- Whether it is necessary to develop a separate RI capability,
- Whether it is the right time to develop it, and
- Whether it is capable to develop it

Necessity. A small agile firm, for example, where the executives are available for direct communication, RI capability is often not required. In such cases, the project will be supported if the senior executives term it appropriate. The decisions are quick and responsive. This situation is unlike the established firms.

On the other hand, a few established firms might not need RI capability. If a right culture where radical ideas are accepted and are given a chance (for example, in companies like Virgin, Goggle, Apple), a separate RI capability is mostly not needed. Hence, decide whether your firm needs a separate RI capability.

Establish the RI capability when the time is right and the firm is still capable.

Timing. Even if the RI capability is termed as necessary, if the timing is not right then the life of such a capability will be short. Timing implies the presence of *cash flow* to support RIs and the *current growth prospects* of the mainstream business. If the mainstream growth is low or negative, and if the cash flow is high, it is the most appropriate time to establish the RI capability.

For example, consider the automotive industry. Establishing RI capability depends on whether the firm is General Motors, Toyota or BMW. Current situation demands GM to focus on the mainstream business and put the house in order. The time for investing in RI capability was appropriate a few years ago. Toyota, on other hand, is capable and it is the right time for the firm to invest in RIs. Based on the cash flow and growth analysis, when a firm could establish RI capability is represented by the following figure.

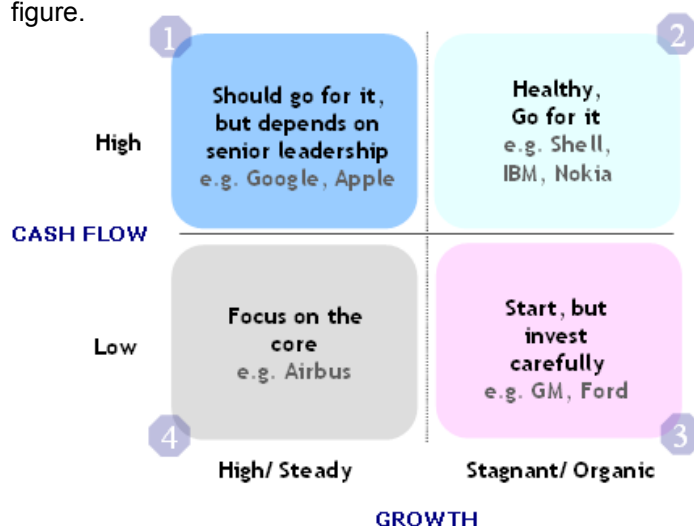


Figure 22 - Need for radical innovation capability

The above figure proposes to start venturing activities when the *timing* is right and when the firm is *capable* to do so. The figure is self-explanatory.

2. Clarity of objective

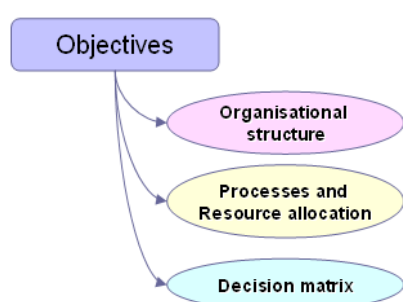
Although it sounds obvious that the objectives will be clear when a new unit is setup, it is often not the case. One of the major reasons for the failure or closure of the venturing initiative is the lack of clear objectives (§3.7.). Actions of the venturing unit(s) will not be focused unless the firm is unambiguous about the *objectives* and the *expected deliverables*.

Be explicit about the objectives and the expected deliverables.

The objectives must be explicit. It could be to incubate radical ideas (Shell GameChanger, Nokia NVO), to invest in start-ups (Shell STV, Nokia BlueRun) or to generate altogether new emerging business (IBM EBO) among others. If there are no clear objectives, the direction, focus, and the evaluation criteria applied to each project will vary.

If there is more than one objective (e.g. technological innovation as well as venture capital funding), then it might be better to establish more than one venture unit.

The deliverables are tied to the objectives. The deliverables could be financial returns, strategic and/ or to serve as a feeder to an existing business unit. For example, if the objective is to incubate radical ideas then the expected deliverables often aim at strategic benefits and/or to serve as a feeder to R&D/ BU. If it is about funding start-ups or generating new businesses, then deliverables are often financial returns as well as strategic benefits²³. The deliverables of the venturing capability must be clarified beforehand.



Defining objectives is critical. As observed from the case study firms, various parameters of the venturing capability are based on the objectives for venturing. Hence, first define the objectives. And based on the objectives, define the organisational structure, resource allocation system and the processes. Also, develop and disseminate a limited number of key criteria that will serve to clarify the objectives and can be used for the initial screening of RI projects.

Figure 23 – Effect of RI capability objectives on other parameters

²³ It must be cautioned though that the venturing programs with purely financial aim are hardly successful. They cannot compete with established firm's revenue or profit margin, resulting in their closure.

3. A visionary senior executive involvement

It is imperative to have a senior executive responsible for the success of the RI capability

For the success and survival of the RI capability, it is imperative that a visionary senior executive (either be it CEO, CTO, CSO, a board member or SVP among others) is responsible for it. This senior executive must not only be able to understand the challenges with radical innovation projects, but also be committed and openly interested in seeing the RIs deployed. In the absence of such individual, when the firm wants to cut costs or if the senior leadership changes, there will be no one to defend the existence of the venturing capability.

Often the senior executives do not want to be associated with programs that have higher risks and uncertainties. Hence convincing the right kind of (entrepreneurial, authoritative and visionary) senior executive to take the charge is difficult, but nevertheless important.

The presence of such an executive can help in creating a RI culture, acquiring resources, defining objectives, managing interfaces and disappointments.

Two challenges associated with the senior management must be managed appropriately. First, ensure the access to the top management and second, manage the expectations when the senior leadership changes (for example, arrival of a new CEO).

Once the venturing initiative is established, there is often a tendency to delegate its sponsorship outside of senior management filtered by middle managers. "The danger," cautions Roodhart, "is that the further away from top management we get, the more taking the corporate temperature becomes a game of

Present the past success stories and show the potential of RI projects currently in the funnel

Chinese whispers. Access to top management is not only needed as a shield against rock throwers, but as an accurate barometer for the current business needs." Hence, the senior management must be kept interested.

It can be done by several means, including the following:

1. Portray the past success stories and show the potential of projects in the funnel.
2. Clarify the high uncertainties high returns game of RIs
3. Use the informal talks with the senior management to promote RIs
4. When the senior management change, adapt the objectives based on their needs and vision – however be explicit on what the venturing stands for, and what commitment is expected from them.
5. Increase the involvement of the senior management as the RI project advances. Their approval is critical to gain access to the increasing amount of the resources that will be needed for project development.

...

4. Committed resources

Commitment of resources (funds, managerial time and organisational home) over a period of time (at least 7-10 yrs) can considerably reduce the unnecessary closure of RI projects or the venture unit(s).

Resource acquisition is one of the major challenges associated with RI projects (§ 2.3.). RI projects need time (over 3 to 10 years) to prove their potential.²⁴ Meanwhile, if the funding is thwarted due to other mainstream priorities, the efforts in the RI project will go in vain.

Convincing a BU to fund a RI project at its early stage is often difficult and time consuming. With the resources secured, the RI managers can focus their efforts on where they are needed the most.

A variety of mechanisms could be deployed to ensure the security of resources.

1. Let the venture unit(s) have their own pot of money (secured by the centre)²⁵.

It is advisable that both – the centre as well as the relevant BU shares the sponsorship.

The sponsor of the venture unit(s) could be the centre or the relevant BU or both. It is advisable that both – the centre as well as the relevant BU shares the sponsorship. In general, the amount shared by the sponsors may vary over a period of the RI project. *At the early stage,*

let the centre sponsor the project and as the project advances, let the relevant BUs take the responsibility of sponsoring. The senior management must ensure that although the funds might come from various sources, the progress of the RI project does not thwart because of the lack of funding.

2. Let the most relevant BU sponsor the projects

It will be paradoxical that the management that asks the BUs for higher margins and more profits, while will also command them to fund the projects that have low returns on investments over short-to-medium term. This option can work only if unique instruments and evaluation criteria are designed when a BU sponsors RI projects (refer to IBM's approach).

3. Stimulate collaboration, and acquisition of funds from external sources

While ensuring the security of funds, the venture unit(s) must be stimulated to acquire resources from external agents (e.g. government grants, VCs, corporate VCs, external partnership, joint ventures). This strategy can keep the venture unit agile and improve its ability to sponsor more projects.

The commitment of resources however does not imply a lack of control. Although the funds are secured, they must be released based on the pre-selected criteria (e.g. milestones).

²⁴ This time varies based on the type of the RI project and the industry.

²⁵ The amount of funds allocated to a venture unit will vary based on which particular phase (incubation, development, commercialisation) the venture unit is involved with (§ 0, Table 15). This amount also varies with the objectives for venturing and the vision of the top management.

5. *Appropriate governing mechanisms*

A disciplined approach to venturing can ensure an effective functioning of the RI capability. The foundation of good governing mechanism is its ability to encourage the venture unit(s) to achieve its objectives, rather than creating policies and procedures for the bureaucratic reasons (e.g. applying the standard project management tools). Ensure the flexibility, and give the autonomy to RI managers to take decisive actions.

The following mechanisms can help to achieve the objectives of the RI capability.

1. Allow the venture unit(s) to develop their own set of processes and values

The aim must be to design the processes that the RI projects need to be successful. With clear objectives and unambiguous expectations, the venture unit(s) must be given leeway.

2. Develop distinct evaluation criteria for the venture unit(s)

Standard evaluation criteria of the mainstream business units or R&D are often not appropriate for the venture unit(s). They need time and support to prove their worth.

3. Agree on annual/ biannual meetings to discuss key issues, successes and challenges

Such dialogues can help establish trust, clarify the goals and remove misconceptions.

4. Develop key criteria for the primary screening

By jointly deciding the key criteria for screening of RI projects, senior executives can ensure that the deliverables will be inline with the objectives of the RI capability. Remember that key criteria can vary substantially. For example, IBM's key criterion is € 1 billion revenue within 3 to 5 years, while Shell's criterion is the technological breakthrough that an idea can bring.

5. Encourage milestones based evaluation of RI projects

RI projects have greater uncertainties and also larger number of options in terms of directions. New insights often come while the project is under development. Milestone based evaluation can steer the project to the right direction.

6. Encourage quality and not the quantity of RI projects

It is better to have less number of quality projects than having several projects of okay quality. This issue becomes significantly important, when the RI projects will demand greater amount of resources as they advance. (Refer to the 10x multiple that GameChanger applies - as the project advances from early incubation to development to deployment)

7. Increase the involvement of the relevant business units as the project advances

Mostly there are three options for an RI projects. Either it is transferred to a relevant business unit, is spin-out/ partnered with external parties, or it is closed. In any of the three cases, it is better to get insights from the mainstream business on their opinion.

6. *Process of project transfer*

“Crossing the valley of death”, as Leo Roodhart puts it, is one of the major challenges of the venture units. The following instruments could help in solving this challenge

1. Do not put a wall between the mainstream and the venture unit(s)

Maintaining connections with mainstream business units is important, particularly when the key objective is to deploy/ commercialise the project through the business unit. Mainstream businesses have valuable knowledge, assets and skills. Keeping too much distance will allay the RI managers from the most valuable resources.

2. Encourage early ownership

The RI managers must be trained to stimulate early ownership from the business units. Early ownership can be gained by taking the opinion of the mainstream managers during the early stages and/ or by involving these managers during the screening panels. As the managers do not have to fund the projects with their money, they are often willing to participate in panels. With the knowledge of the project, they are often more inclined to adopt the project in the future.

Partial or full funding from the relevant business unit(s) often acts as a stimulator. But, whenever the funding from BU is involved, the senior leadership must ensure that the BU does not start steering the RI project too much to their business needs.

3. Fit the RI projects with business unit's roadmap

It is often easier to transfer the project to a relevant BU, if the project fits with the business unit's roadmap. Hence, let some of the projects in the portfolio be directed towards this roadmap.

4. Early vision of where the project will eventually go

Encourage the RI managers to have an early vision whether the project fits with the roadmap of one of the BU or they have to look out for external parties.

5. Define the process of project transfer

Sketch the goals, criteria and actions for different phases of the RI project. This can provide assistance to the RI managers to map the flow of the project.

6. Remove the technical and market risks

One of the main reasons that the RI projects do not pass the screening tests of business units is the presence of yet unresolved uncertainties (esp. technical and market). If the venture unit is able to remove these risks through pilot tests, the project becomes much more acceptable.

7. Human side of the RI capability

One of the important facts is that - the radical innovations are often the result of diligent efforts of capable and motivated individuals. It is the people (managers, champion, team members) who make the RI work. Firms must put diligent efforts in sourcing and training the right kind of RI managers.

1. Ensure sufficient T-shaped managers (§ 2.2. , §5.5.)

Managers of RI projects often need both the skills – technical as well as commercial. On one hand, they have to deal with scientists, while on the other hand, they have to deal with commercial people. Hence, the venture unit(s) need t-shaped managers who can handle this challenge. If the managers are not sufficiently skilled, then better train them.

2. Stimulate participation

Often employees are unwilling to participate in RI projects because of the higher risks involved. They consider that the failure of project might affect their career. Hence, senior management must create process to safeguard the participating employees from the potential hazards.

3. Manage disappointments

Employees are often disappointed when the decision is taken to terminate the project or it is transferred to another unit for further development. This distress can affect the next RI projects. During such cases, the RI managers must be able to abate the frustrations.

4. Hire external consultants, if necessary

If the RI managers need assistance (e.g. for deep dives on technological issues or on business model or market potential), it is advisable to hire external consultants.

5. Ensure the flow of fresh managers

The venturing initiative often starts with the zeal of a senior executive, but often ends when he retires/ leaves. Hence, the firm must ensure that a continuous flow new managers. The new managers can get trained while the senior managers are still there, and later they can take the charge.

“Knowing is not enough; we must apply. Being willing is not enough; we must act.”
Leonardo da Vinci, 1452-1519

APPENDIX

Appendix A - Disruptive innovation and ways to cope with it

Disruptive innovations are radical advances that may profoundly alter the basis of competition in an industry⁽⁶⁵⁾. They introduce products and value propositions that disturb prevailing consumer habits and behaviours in a major way. They are disruptive because they undermine the competences and complementary assets on which existing competitors have built their success. Like radical innovations, they result from a supply-push process originating from those responsible for developing new technologies.

Disruptive innovation is considered a form of RI because from the context of a firm an employee faces similar challenges while pursuing both these types of innovation. Disruptive innovation, however, is given a separate identity from RI because this innovation is self-disruptive in nature (cannibalising the firm's own established business). It must be kept in mind that a disruptive innovation is a RI; however a RI is not necessarily a disruptive innovation.

Disruptive innovation can be further classified as *product/ technology* innovation and *business model* innovation. Researchers refer to *business model disruptive* innovation as 'strategic innovation'.⁽²⁸⁾ Strategic innovation is given a distinct identity from disruptive (technological) innovation, because although the impact of both these innovations on a firm is similar, the challenges faced and the processes involved in deploying them are very different.

According to Christensen (2003), *disruptive (technological) innovations*²⁶ disrupt and redefine the trajectory by introducing products and services that are not as good as currently available products. But disruptive technologies offer other benefits – typically, they are simpler, more convenient and less expensive products that appeal to new or less-demanding customers. Examples of disruptive technological innovation include steel mini-mills, Canon's desktop copier, and the Korean automakers' entry into the North American market.

In stark contrast to Christensen's bottom-up disruption, Carr (2005) defines top-down disruptive innovation. *Top-down disruptive technological innovations* actually outperform existing products when they're introduced, and they sell for a premium price rather than at a discount.⁽¹⁵⁾ Examples of this innovation include iPod, satellite radio, flat panel television, and etcetera. While bottom-up disruptive technology (e.g. steel mini-mill) improves over a period of time to disrupt the established firm's technology (e.g. integrated steel mill), top-down disruptive technology (e.g. flat panel television) becomes cheaper with time and disturbs the presence of established technology (e.g. cathode ray television). It is often

²⁶ It should be noted that the definition of disruptive innovation in this research is different from Christensen's definition. While Christensen's disruptive innovation mainly focuses on low-end (bottom up) disruption, definition of this research also includes top-down disruption.

observed that disruptive innovation starts in a niche market and then scales up to the mass market. ⁽¹⁹⁾ They often create new-to-the-world products. ²⁷⁽²⁸⁾

Markides and Geroski (2005) argue with compelling examples that for such innovations a firm can either pioneer the market or scale it – but not both.⁽²⁷⁾ They demonstrate that individuals or companies that create radically new markets are not the ones that build them into mass markets. For example, Leica, Charles Stack, Apple and EMI introduced cameras, on-line bookselling, PDA and CAT scanners but Canon, Amazon, Palm and GE were the ones who captured the mass market.⁽²⁸⁾ They argue that the skills and mindset required to manage disruptive innovations are not only different from but are opposite to what is required to manage an existing business. Hence, the authors propagate a strategy that established firms should not invest in incubating and developing disruptive innovations. Rather they should focus on what they are doing best – exploiting current business. And when the time is right and innovation is ripe, established firms should deploy their resources to be a part of such innovation.

This strategy certainly has benefits, however it also has limitations. Some of these limitations are:

- It might be too late to be a part of the evolution of disruptive technology. Buying an IP could be an expensive endeavour
- Without having technological capability and insight about disruptive technology, it might be difficult to reap its benefits

²⁷ Markides and Geroski's 'radical product' innovation shares similar characteristics with Christensen's 'new-market disruptive technological' innovation

Appendix B - Strategic (Business model) innovation and ways to cope with it

*Business model innovation*²⁸ is the discovery of a fundamentally different business model in an existing business⁽²⁵⁾. For example, business model of Amazon, Charles Schwab, EasyJet, and Dell is fundamentally different from that of Barnes & Noble, Merrill Lynch, British Airways, and IBM.

Business model innovation captures a certain percentage of the existing market, but on the other hand they also attract new customers. It often happens that the new way of competing in the business grows quickly to a certain percentage of the market but fails to overtake the traditional way of competing. For example, budget no-frills flying has grown phenomenally since 1995 but has captured no more than 20% of the total market. Internet banking and brokerage similarly grew rapidly during the last five years but have captured only 10-20% of the market. Both these innovations captured a share of the market but failed to replace the established firms.

Charitou and Markides demonstrate that the established firms have several options at their disposal in deciding how to respond to the disruptive business model innovations.^(24, 26) They argue that most of the business model innovations are relatively less threatening to the established firms when compared to radical innovation and disruptive technological innovations.⁽²⁵⁾

²⁸ Markides and Geroski's thesis labels 'disruptive business model innovation' as 'strategic innovation'.⁽²⁵⁾

Appendix C - Differences between Disruptive and Radical innovation

There are no sharp lines between radical and disruptive innovation. They share similar characteristics. For example, they both disrupt consumer perception in a major way; they break the technology development path and often create entirely new markets. The terms, radical and disruptive are context based – radical innovation for one firm could be disruptive for other firms. For example, was PC a radical innovation (⁵⁵) or a disruptive (¹⁹)? Leifer et al. (2000) consider PC as a radical innovation based on their definition of a breakthrough, while Christensen (2003) consider PC as a disruptive innovation since it disrupted the market of Mainframes.

From the context of an individual firm, this research considers an innovation to be 'radical' if it meets the criteria of the RI definition of Leifer et al (2000) and if it *enhances* the competencies and complementary assets of the firm. This research considers an innovation as 'disruptive' if it *disrupts* the competencies and complementary assets (i.e. self-disruptive business).

Appendix D - Other challenges to managing RI projects

Table 17 – Other challenges to managing radical innovation projects ²⁹

Challenges to managing Radical Innovations	
Early warning Capturing radical ideas in the "fuzzy front end"	- Generation of good ideas - Recognition of opportunities enabled by breakthroughs - Development and implementation of an effective approach to initial evaluation
Process & Resource acquisition Managing projects	- Articulation of vision - Uncertainty-mapping capability - Recruitment of champions - Establishment and management of internal and external partnership - Development of people, practices, and structures for successful transition - Ability to build bridges between organizational units - Resolving uncertainties in the business model
Organisational structure Creating an infrastructure	- Management of organizational interfaces - Ability to effectively define the roles of senior management, key individuals, and the project team - Building of appropriate reward system and career path
Decision making	- Understanding of what should be outsourced and what new competencies should be developed - Adaptation of business model based on learning - Accurate assessment of transition readiness of project and the receiving unit - Accelerating transition from projects to operating status

²⁹ Adopted from Richard Leifer et al, Radical innovation: how mature companies can outsmart upstarts, 2000, page 8

Appendix E - Definitions related to venturing

Venture unit

A venture unit is an entity that executes venturing activities.

Chesbrough (2002) suggests that the objective of a venture unit could be either strategic or financial⁽¹⁸⁾. Later work suggests that the objective of the venture unit should be linked with an appropriate business model in order to be successful⁽¹⁴⁾. In other words, the venture unit should design its business model with respect to a particular objective. Based on the business model, Campbell and Birkinshaw divide the venture units into four main types – ecosystem, harvest, innovation and private equity venturing.

The objective of a venturing unit could be to spin-out innovative ideas that do not align with the company (harvest venturing), to stimulate innovation (innovation venturing), to enhance the activities of the ecosystem (ecosystem venturing), or to participate directly in the venture capital industry (private-equity venturing)⁽¹⁴⁾.

Venture program

While many companies have distinct venture units that serve one of the objectives mentioned above, few companies have a venturing program that is in charge of the separate venture units. For example, Shell has two distinct venture units – GameChanger and Shell Technology Ventures, while Nokia has a venturing program - Nokia Venture Organisation that is in control of separate venture units – Innovent, New Growth Business and BlueRun ventures. The distinction between a venture unit and a venturing program is mainly the organisational structure. A venture unit usually has a single objective (e.g. venture capital), while a venturing program might have multiple objectives.

Venture

A venture, in general, is a project carried by the venture unit. It involves activities that are new to the organisation. Venture projects involve significantly higher risk of failure or losses and greater uncertainty than the organisation's base business⁽⁸⁾.

Based on its organisational form, ventures can be divided into two types – internal and external. Internal ventures are legally part of the company and therefore funded and managed within the corporate context^(31, 73). External ventures are investments outside the boundary of the company. The emphasis is on creating strategic benefits for the company. Organisational modes for external ventures include venture capital investments, alliances, acquisitions and spin-offs⁽⁵³⁾.

The definition of a venture in this research includes both - internal as well as external ventures.

Appendix F - Systematic innovation management

Unfortunately, recognising the importance of RIs and successfully developing and commercialising them are two different things.

- » Covin & Miles (1999) conclude that innovation per se is insufficient to define the success of a company.⁽²⁹⁾ It is relatively simple to succeed once, but sustaining success requires active and purposeful management of innovation^(45, 78). Furthermore, management of innovation is inherently difficult and risky: most new technologies fail to be translated into products and services, and most new products and services are not commercial successes⁽⁷⁸⁾. Therefore, managing innovation is imperative.
- » Some of the innovations represent incremental developments and improvements on existing and proven products and processes, whilst others focus on more radical change. Therefore, a key skill in effective innovation management is balancing the composition of this portfolio and matching it to the firm's competencies and capabilities in technology and markets. Recognising the different types of innovation and the need to manage them differently should be the basis for an innovation strategy^(21, 68).
- » Even though innovations are born out of creativity they fail to add value if not pursued systematically^(36, 67, 78).
- » Thus the real challenge of innovation is not invention, inspiration, or coming up with good ideas – the hard part is making them work technically and commercially^(36, 57).
- » Effective innovation management is about discipline: recognizing innovation as a process not as a single event and managing it as such⁽⁷⁸⁾ – the context, the process and the performance.
- » Management cannot ensure innovation success but can improve its odds⁽⁸³⁾. Management of innovation includes finding the right people, establishing the right roles and processes, setting goals and relevant measures, and reviewing progress at every step⁽³⁶⁾. In addition it involves developing and using effective implementing mechanisms, structures and a supporting organisational context for innovation, as well as building and maintaining effective external linkages⁽⁷⁸⁾.

Appendix G - Research questionnaire for interviews

For the sake of simplicity, three set of questionnaires used for Shell are shown here. Level 3 indicates the managers that are part of the venture unit. Level 2 indicates senior managers who are in charge of the venture unit, and Level 3 indicates senior executives who often are in charge of the overall venture program.

Level 3

1. What is the mission/ aim of GameChanger, and what are its expected deliverables?
2. How does GameChanger fit into overall strategy of Shell?
3. What are your general criteria of investment?
4. How important is GC materially for new business funnel of Shell?
5. Does GC work complementary to internal R&D program or does it replaces it in some areas?
6. What is the logic that some projects are R&D, while some are externally financed thru GC?
7. What are other strategic benefits of GC? E.g. Is GC considered an indirect way of to source technical expertise or it is just for new ideas?

Venture projects

1. What is the average time within which a radical idea/technology can be commercialized in your industry?
2. What according to GameChanger is 'radical innovation'?
3. How important is radical innovation' (technology) for Shell?
4. Within how many years of their initiation, you expect a venture project/ technology to reach its target (e.g. be profitable or transferable)?
5. Approx. how many venture projects have your venture unit taken until now?
6. How do you define milestones of a venture? How do you track milestones?
7. How do you report current status of the project to senior management? *
8. How do you define success of a venture project? *
9. What is the current success rate (i.e. of the funded projects, what proportion of them reach their target)? According to you, how can this success rate be increased? *
10. Do you maintain venture portfolio? On which criteria is this portfolio made?
11. Is there a senior manager associated with the venture program who cuts the red tape (e.g. modify policies, procedures, rules when required)?*
12. Are GameChanger and STV formally connected thru a process? Do the ventures get transferred between GC and STV? If yes, how? How do you intend to formally connect GC and STV?
13. Do you evaluate cross-selling revenues between GameChanger and the corporate customer (e.g. BU, R&D)? If so, how do you do that?
14. Could you name a few successful radical innovations that have been recently developed by GameChanger? Have these innovations turned into profitable businesses/ new technologies/ products? *
15. Do you think that if a venture is closer to BU, then it has higher chances of success? *
16. How do you source venture champions? Is there a formal process for finding champions?
17. "Crossing the valley of death", that is transferring the projects from GC to a business unit is one of the major challenges of GC? According to you, how can this challenge be overcome? *
18. According to you, what are the three biggest challenges that GameChanger face (for example, it could be in terms of generating ideas, finding resources, transferring it to BU)? *

19. What do you think GameChanger need to head for in the future?

Level 2

Recognition

1. What according to you is 'radical innovation' in terms of current line of businesses?
2. How did GC initiated? Who gave a green light to initiate GC?
3. Does Shell have a system in place in order to provide early warning for radical innovation or emerging opportunities/ threats that comes from outside the company? Could you elaborate on Early warning system? * Who is responsible for it?

Interpretation

1. Shell uses scenario planning. Do we translate these scenarios into short-term actions/ insights/ projects? Could you elaborate on the back-casting process at Shell? *

Action and Mechanism

8. Is there an overall strategy of Shell, in terms of benefiting from radical innovations?
9. Where does GameChanger activities fit into the overall strategy of Shell?
10. What is the role of Group GameChanger, Innovation coalition, Shell Renewable and Hydrogen in terms of innovation at Shell?
11. How do you measure success of a venture project?
12. According to you, which are the biggest challenges of GameChanger?
13. According to you, which are the three biggest challenges that Shell face in terms of recognizing radical ideas to their deployment/ commercialization?
14. According to you, what should Shell do in the future to be able to better manage radical innovations?
15. Do you think that access to top management is reducing – maybe cause core business is booming and requires larger attention?
16. How does middle level management look at GC (because of the distractions that GC brings in)?
17. Do you think that top management is not supportive in securing resources from mid-level management?
18. Do you think that mindset of people at Shell can be changed in terms of accepting radical innovations?
19. Do you think that currently project hand-over is early – the managers with focus on core business cannot understand the entrepreneurial spirit/ mindset required for such innovations?
20. Will including more line-managers into early panels help?
21. Do you think HR needs to get involved to clarify support to champions?
22. Do you think that Shell is unwilling to embrace/ encourage new business development?
23. Do you think there is need of an innovation acceleration team (similar to Nokia) within Shell that pushes innovation through/ across divisional silos within Shell? *
24. Do you think that Shell lacks a holistic approach to manage emerging business opportunities and radical technological innovations?

Level 1

Recognition

1. What according to Shell is 'radical innovation' in terms of current line of businesses?
2. Are radical innovations important for Shell?
3. Does Shell have a system in place to recognize radical innovations/ ideas? Who is responsible for it?

Interpretation

1. Once a relevant radical innovation/ emerging opportunity is identified, who decides the best way to capture its value (e.g. incubate its development, buy license, M&A, kill)?
2. Shell uses scenario planning. Does Shell translate these scenarios into short-term actions?
3. Do you think that the venturing programs – '*GameChanger*' and '*Shell Technology Ventures*' are the best way to recognize, develop and deploy new radical ideas?

Action and Mechanism

1. How do the venturing activities of 'GameChanger' and 'STV' fit into the overall strategy of Shell?

Venture programs – GameChanger and STV

1. What are your expectations from GameChanger and STV?
2. Within how many years of initiation, you expect the venturing programs - GameChanger & STV to be profitable or at least be self-sufficient?
3. Is there innovation acceleration team (similar to Nokia) within Shell that pushes innovation through/ across divisional silos within Shell?
4. Is GameChanger valuable for Shell? In what terms it is valuable?
5. What do you wish to improve from the perspective of tapping radical innovations at Shell within coming three years?
6. According to you, what are the three biggest challenges that Shell face from recognizing radical ideas to their commercialization?
7. According to you, what should Shell do in the future to be able to better manage radical innovations?

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