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FROM IDEA TO MARKET IN RIPI: AN AGILE FRAME FOR NTD PROCESS

Reza Bandarian*
Address: Business Development Deputy, Research Institute of Petroleum Industry, Pazhouheshgah Blvd., Khairabad, Qom Road, Tehran, Iran
P.O. Box: 18745-4163
Tel.: +(9821) 55932387-8
Fax: +(9821) 88939520

Abstract

Each year research institutes develops many new technologies. Understanding the process of developing and bringing new technologies to market is important for researchers and managers of research organizations.
Condense the technology development process and keeping its quality is one of the major strategic challenges within the research institute. The only way is to assure a better interaction of the main process steps of the new technology development process: Research, Development, Engineering, Production and Operation. This could save time, reduce cost and potentially even improve the quality of the outputs.
Since NPD process in manufacturing companies is similar to NTD process in research organizations, the NPD paradigm provided a natural starting point for the commercialization process of new technologies.
We describe the technology development process based on a review of the literature and web sites addressing NPD processes and policies.
Our research effort is to better understand the steps prevalent in the new technology development process and we use a process modeling technique, namely, Process Approach View in our study.
The main limit of this study are lack of material in the literature and the a lack of a system level understanding of the dynamics of the technology development process, both from management and process perspectives among researchers and managers of research organizations.
This model has an integrated approach into a holistic development process of a technology and consists of various research and development (R&D) activities. The model performs better 'predictions of R&D projects' technical and commercial success and has the potential to be used as a conducting model for research projects in research organizations.

Keyword: Idea to Market Process, Technology Development, Technology Commercialization, New Product Development (NPD), stages of NPD Process, New Technology Development and Integration

* PH.D Student of Operation and Production Management of Tehran University, Academic Staff and Partnership Evaluation Director of RIPI, Business Development Department, Research Institute of Petroleum Industry, Tehran, Iran. Corresponding author: bandarianr@ripi.ir

1. Introduction

The connection between innovation and wealth generation has long been a given, leading governments and businesses to attempt to facilitate the process. The current model of innovation emphasizes on a linear process, research as its foundation. However, there are indications that innovation is a more complex system, having design and development as its core. Recognition of a more holistic innovation system would perhaps allow governments, as well as private businesses, to allocate resources for greater return (Martyniuk et al. 2002; 26; Reamer et al. 2003).
Innovation and its commercialization is a complicate process. In recent years, many studies have shown that the level of investment in research and development are increasing significantly. But numerous barriers to innovation are prevalent throughout idea to market process. Much has been stated about the R & D as a whole, but very little has been said about how to help individual innovators overcome the barriers to commercialization (Boer 1999, p.12; Logar et al. 2001; Siegel et al. 1995).

The RIPI[1] COMMERCIALIZATION TEAM sought the expertise to help research, introduce a model of idea to market process, which is designed for innovators striving to commercialize their technologies. While there are numerous publications available on technology commercialization and the innovation process in general, RIPI have developed a Model focused on the unique challenges of commercializing technologies.

Commercialization of new technologies and the entrepreneurial spirit pervades in the new economy. How, then, does an academic institutional designed specifically to serve industry by creating value-added chemical and petrochemical products in an entrepreneurial partnership with clients, commercialize its finding. (Kenny 2001)
The academic institution represented in this case study was a regional chemical and petrochemical products value-added center of excellence (hereafter referred to as the center). This innovative mix of academia and industry sought to combine university scientists and industry professionals to form a unit whose purpose was to create new value added products in order to keep raw commodities in the state and increase economic development. Scientists drawn from different disciplines were commissioned to serve entrepreneurial customers by assisting them in developing value-added chemical and petrochemical products.

The center's mission assumed that knowledge and information created by its scientists would lead to an increase in better benefiting of oil resource, health standards and job creation throughout the country. It also assumed that such outcomes would stimulate the regional economy and quality of life for citizens who supported the center. These assumptions could not be proven without systematic and continuous evaluation of center activities including assurance reaching the outputs to market; thus, the director commissioned an analysis and drawing stages of idea to market process for the center (RIPI 2006).
This paper describes a methodological process for commercialization of new technologies within an academic organization focused on research activities. In other word, the main steps of new technology development process in RIPI, focused management of the entire process from idea to market will be described.

1.1 Objective

The primary objective of the presented model is to stimulate and encourage innovation by describing the commercialization process in user-friendly terms, and help the innovator—whether a university researcher, a contractor, or a local public works official—successfully commercialize technologies. A secondary objective of the model is to provide general guidance and to suggest resources that provide assistance in overcoming the challenges associated with commercializing technologies. The third and last objective was to uphold a model that would be valuable to all participants, regardless of their role in the innovation and commercialization process.
The model is a result of a multi-year effort and involved of different commercialization projects of RIPI COMMERCIALIZATION TEAM. The model provides the basic knowledge and tools needed to successfully commercialize technologies. This model focused on five important areas of commercialization:

- Examining the barriers unique to infrastructure innovation and commercialization;
- Detailing the stages of the commercialization process, from concept to production to sales and application;
- Pinpointing the stakeholders and their various roles in the process;
- Highlighting the stages of concept development, market assessment and verification, prototype development and production; and

[1] Research Institute of Petroleum Industry; The Research Institute of Petroleum Industry (RIPI) is established under the funding of the Iranian Government and hosted by the Iranian Petroleum Ministry. RIPI aims to provide service for applied research, technology transfer and commercialization and to help facilitate petroleum, chemical & petrochemical industries to move up high value-added manufacturing and servicing activities.
Mission of RIPI is to support projects that contribute innovation and technology upgrading in petroleum, chemical & petrochemical industry. It aims to increase the added value, productivity and competitiveness. RIPI hopes that, through funding support, local petroleum, chemical & petrochemical companies could be encouraged and assisted to upgrade their technological level and introduce innovative ideas to their business.

- Providing guidance on business, management, marketing, and financing issues

The paper is organized in five sections, including the first section, which is an introduction to the research. Section 2 is a literature review in the fields of New Product Development Process and New Technology Development process and its commercialization. The development process model of new technologies in RIPI is presented in Section 3. The results obtained from the model and the testing, sensitivity analysis, validation and verification completed are presented in section 4. Section 5 concludes with an overview of the results, some policy suggestions, and a discussion on the future research areas.

2. Background

In order to review the literature of idea to market process for commercialization of new technologies, and because there is a lack of material in this area, the following areas have been reviewed:
1. New Technology Development Process (NTDP)
2. New Product Development Process (NPDP)

2.1. The Development Process

The new technology development process can be separated into three stages: idea generation, technology and product development, and commercialization. Figure 1 is a flow diagram depicting the major elements of these steps. A researcher first creates a marketable idea from theoretical breakthroughs, basic research, and a variety of communication activities. This idea is developed into a product or service in the development process, which involves significant expenditure of time and resources and may feature several false starts or dead ends. Once a marketable outcome is created, the product is ready for commercialization in one or several sectors. Although each step in the process is important for developing a new technology, our study focuses on conducting the first and last stages (White and Gallaher 2002).

2.1.1. Idea Generation

Idea generation is the first stage in the new technology production process. Researchers take the available body of knowledge in their field and combine it with new innovations and insights to create a marketable idea. Because the pure research undertaken in this phase has the characteristics of a public good, it is widely agreed that public support for this effort is needed. Universities, governmental organizations, and private firms all provide funding for basic research (White and Gallaher 2002).

2.1.2. Technology and Product Development

Once an idea has been created, the researcher needs to raise funds to pursue technology and product development. However, different sources of funding have different implications about the amount, type, intensity, and the probability of success of R&D. Different types of funding also have different implications regarding the appropriability and timing of financial returns that emerge from the product that is developed. These different implications can be viewed as constraints placed on the funding that the researcher attempts to raise. The researcher is assumed to be trying to raise sufficient funds to maximize the expected return on the development effort, conditional on the constraints imposed by each type of funding source. (White and Gallaher 2002)
Once a researcher has developed a marketable idea, he/she has to seek funding to engage in technology development (Mahdjoubi 1996).

After acquiring sufficient funding, the researcher engages in research to create new technologies, which can then be embodied in marketable products. Several potential outcomes are possible at this point. If the R&D invested in the marketable idea was successful and the researcher has produced new technologies and products, he/she can move to the commercialization stage. If the R&D has revealed that the idea was not feasible or the technology not marketable, the project ends.

Results from R&D efforts often do not fall into one of those two terminal outcomes. The more common result is that some innovations were made, but questions remain about the potential success of the marketable idea. In this case, the researcher needs to conduct more technology and/or product development to determine the ultimate success or failure of the project. At this stage of the R&D process, the researcher may need to engage in another round of fundraising to conduct the additional work (Hart et al. 1999; Monga 2001).

Because a significant amount of research has already been completed, the researcher has better and improved information about the marketable idea. By updating his/her understanding of the characteristics of the technology and potential products, the researcher may change his/her decision about where to obtain funding (Yates 1999).

2.1.3. Technology Commercialization

Once a researcher has developed one or more marketable products, he/she proceeds to commercialization. This process includes deciding where firms should try to sell their products, whether they should expand the scope of the

project to fit into multiple industries or uses, and how much of the market they should try to capture.

To be sure we are all on the same track, and for the purposes of this article, let us define "commercialization". By commercialization we mean converting or moving "technology" into a profit making position. By technology we are referring to know how, techniques, patented or otherwise proprietary processes, materials, equipment, systems, etc (Siegel et al. 1995).

Technology commercialization commonly defined as the process of creating a product that suits a particular market at an affordable price that fulfills the demand of the market. A more useful definition with the most coverage on our target in this article is "the process for commercialization of technology from R&D sector and laboratories to industrial companies" that is more common between experts (Allen 2003, p.26); Loftus and Meyers 1994; Logar et al. 2001).
To illustrate the importance of commercialization to the overall success of the venture, we quote the famous words that "Always think with the end in mind." By this, we mean that one should always keep the long run in mind before creating a technology to ensure that the development of this technology will produce positive cash flows once it is commercialized (Ghazinoori 2005).

The NTD process is not a simple linear process, but rather is a complex process involving many actors in many capacities. The commercialization process requires skills such as: product development, market assessment, market strategies, finance, manufacturing, accounting, etc (Allen 2003, p.26; Loftus and Meyers 1994; Boer 1999, p.12).
There are several barriers to NTD process. Barriers to the NTD process could arise at each stage of the idea to market process. They range from lack of information; insufficient human capabilities; political and economic barriers, such as lack of capital, high transaction costs, lack of full cost pricing, and trade and policy barriers; institutional and structural barriers; lack of understanding of local needs; business limitations, such as risk aversion in financial institutions; excessive and costly regulation; and inadequate environmental codes and standards. In addition, there may also be technology specific barriers (Ghazinoori 2005; Siegel et al.1995).

While there appears to be no shortage of barriers to NTD process, discovering methods to enhance the process is a difficult task. It is widely accepted that for successful and sustainable technology commercialization, there must exist a multi-faceted enabling environment. This environment should include favorable macroeconomic conditions, the involvement of social organizations, national institutions for technology innovation, human and institutional capacities for selecting and managing technologies, national legal institutions that reduce risk and protect intellectual property rights, codes and standards research and technology development, and the means for addressing equity issues and respecting existing property rights (Brown 1997; Jain et al. 2003).

The decision to commercialize a technology is often made by an organization or individual, often the developer(s) of the technology, without a complete understanding of the processes and requirements that will ensure success (Martyniuk et al. 2002; Babcock 1991, p. 181).

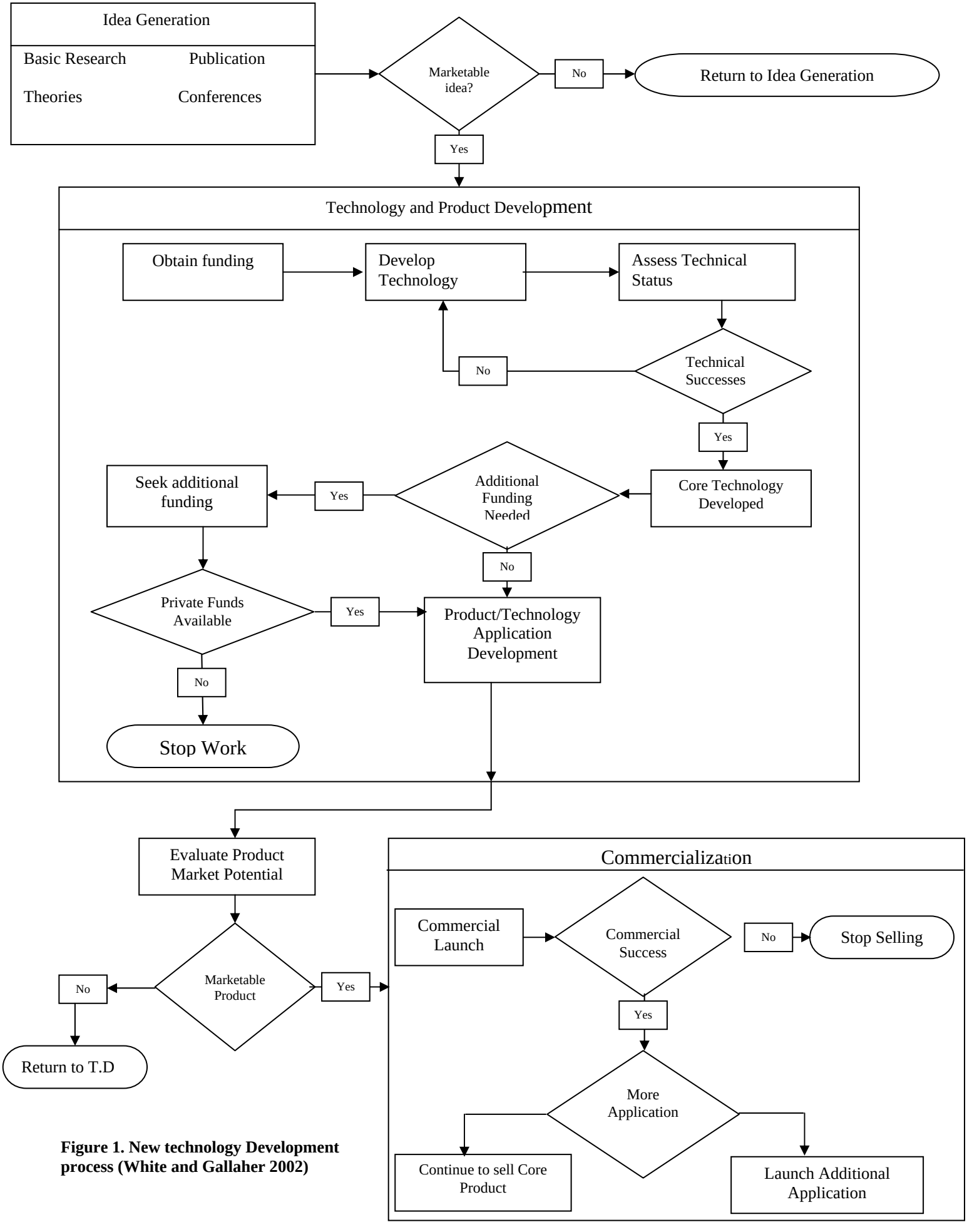


Figure 1. New technology Development process (White and Gallaher 2002)

While a number of tools such as Commercialization Assessment Index (CAI)(NASA 2001) and Technology Commercialization Success Index (TCSI) (Sohn and Moon 2003), have been developed to address some of the individual aspects of successful technology commercialization a more strategic and informed, comprehensive process is desirable. One such process will be described in section 3.

The process proposed for commercializing new technology development borrows heavily from the new product development process. The focus of the new product development model is to provide an orderly examination of the steps necessary to coordinate a new product development program (Siegel et al. 1995).
Hence, in the following, the new product development process will describe based on a review of the literature and Web sites addressing NPD processes and policies.

2.2. New Product Development Process

The business environment today is truly global, which requires high-speed product development to maintain and increase the competitiveness of companies; new product development (NPD) is essential for company survival and growth. (Nijssen and Frambach 1998) Companies are faced with a dynamic and turbulent environment that requires flexibility to change business needs. New products represent, on average, 35% of firms' annual sales. (Rowles 2000) The development of new products is perhaps the most significant activity within a firm. It is also one of the most risky decisions. Many years and millions of dollars are spent developing products that on average fail far more often than they succeed.

On the other hand, these companies need to develop new products or modify the current products in order to remain in the market and retain their market share. New product success almost always is linked to an understanding of customers' needs and wants. In fact, evidence suggests that new product failure often can be attributed to a lack of marketing research. (Managing NPD) Information plays a key role in reducing new product development (NPD) failure and thus increasing new product development (NPD) success (Nijssen and Frambach 1998).

The importance of new product development is due to recognize and understand the processes, which affect to manage and control many factors such as cost, time and information. On the other hand, the importance of the new product development process is related to many decisions, make during the product development. However, the firm's organization, specialist, human resources, technology knowledge and other facilities dictate which process is suitable or eligible for the company. By the new product development process (NPDP), firms are able to provide required and accurate information in a suitable time and cost. Furthermore they are able to allocate suitable resources such as human resources to different activities and tasks.

Therefore, one of the important purposes of this research is to describe the process of new product development and to identify the main points of the new product development, which one decision has to be made. In addition, these decisions need to be categorized in different aspects.
The activities of new product development most often are implemented as a sequence of technological-scientific efforts. It needs to be managed systematically in order to attain the optimization of project factors such as speed, quality and cost, and to achieve product attributes targets such as price, customers' needs, product quality, product performance and so on.

Thus, in order to implement an eligible new product development and to achieve the suitable product attributes targets, apart from scientific technology and marketing research, *process management and especially integrated management of different activities of process is critical.*

The new product development process (NPDP) has at least six stages. In each stage, information about the market and consumers is needed to support critical decisions about the product. (Rowles 2000) Since the decisions faced at each stage of the product development process are unique, marketing research activities must be structured to meet the unique information needs of each stage. Customer and market information is carried forward, refined, and updated as the surviving product concept moves from stage to stage. Early stage research tends to be more qualitative and unstructured, emphasizing customer interaction and creativity, while later-stage research is more quantitative and structured (Panfely 1996).

2.2.1. Stage-gate Process (SGP) for NPD Projects

Most types of new product development processes have some type of project review points. (Schmidt 2004) One of the most famous NPD processes is Stage-gate process (SGP). The stage-gate process is an operational roadmap for driving new product projects from idea to launch. (Cooper 2006). According to a recent study regarding new product development conducted across industries nearly 60% of firms use a stage-gate process to guide their development activities (Hogan 2006). The stage-gate process works by establishing and using separate stages of timely activities followed by decision points (gates) on deliverables (Cooper 2006).

2.2.2. Stages of NPD Process

Stages are where the action occurs. The players on the project team undertake key tasks to gather information needed to advance the project to the next gate or decision point. Stages are Cross Functional and each activity is undertaken in parallel to enhance speed to market.

New product development begins with an idea and ends with the successful launch of a new product. The figure 2 shows the general position of stages in new product development. The steps between these points can be viewed as a dynamic process. Stage-gate divides this process into a series of activities (stages) and decision points (gates) (Cooper 2006).

Figure 2: A stage-gate process

2.3. Section Summary:

Almost little literature exists that explores the development process of a technology and then its integration into a holistic system. The development process of a technology consists of various research and development (R&D) activities. The process includes project management, research, requirements definition, specification development, engineering, modeling and simulation, drawing development, hardware and software development, system architecture development, and testing. There is a lack of a system level understanding of the dynamics of the technology development process, both from management and process perspectives.

There are some references[2] in the literature on work done in the area of the process approach applied to NTD project management. (Chen and Liao 2004) The process approach to NTD project management is based on a holistic view of the project management process and focuses on the feedback processes that take place within the project system.

3. Idea to market model for new technology development process (NPDP) in RIPI:

Using new product development model as a guide, a modified commercialization paradigm was proposed. The premise of this paradigm is that the commercialization of new product ideas (intellectual property) must follow a coordinated and structured process.

RIPI's New Technology Development Process

Have you ever wondered how a technology or tool goes from inside innovator's head to the market? It's a long process that can have many steps along the way.
Innovation is a complex process. Research and development are becoming more interesting to investors, in recent years. R&D as a center of attention still is faced with lots of obstacles. Most of problems are located in the procedure of introducing new idea to the market as a product. There has been enormous amount of studies on R&D but those cannot deliver any consultants to individuals who are intending to initiate a completely new business with focus of innovation.

RIPI commercialization team has developed a procedure to help researchers in term of new technology commercialization. RIPI COMMERCIALIZATION TEAM developed and uses the following Product Implementation Process to move from initial concept to a marketable product for its discretionary science and technology initiatives. The RIPI process focuses on the chemical and petrochemical technologies and its need for a faster and less expensive route from idea to market. Figure 3 depicts a high-level view of the process.

This Process is not liner Process and actually is a several activity groups, which each group comprises of none-Liner and chaotic activities. This Modal is categorized as a Stochastic Model. According to the model, which was strongly influenced by NPD, there are gates between stages in the technology development process.

[2] Such as stage–gate (the best one is stage–gate which is described)

The report is a result of a multi-year effort and the complicated challenge of the commercialization process could be overcome and it provides basic knowledge and tools to enhance successful technology commercialization. This model contains five main concept of the procedure, which are as follows:

- Examining the barriers unique to infrastructure innovation and commercialization;
- Detailing the stages of the commercialization process, from concept to production to sales and application;
- Pinpointing the stakeholders and their various roles in the process;
- Highlighting the stages of concept development, market assessment and verification, prototype development and production; and
- Providing guidance on business, management, marketing, and financing issues

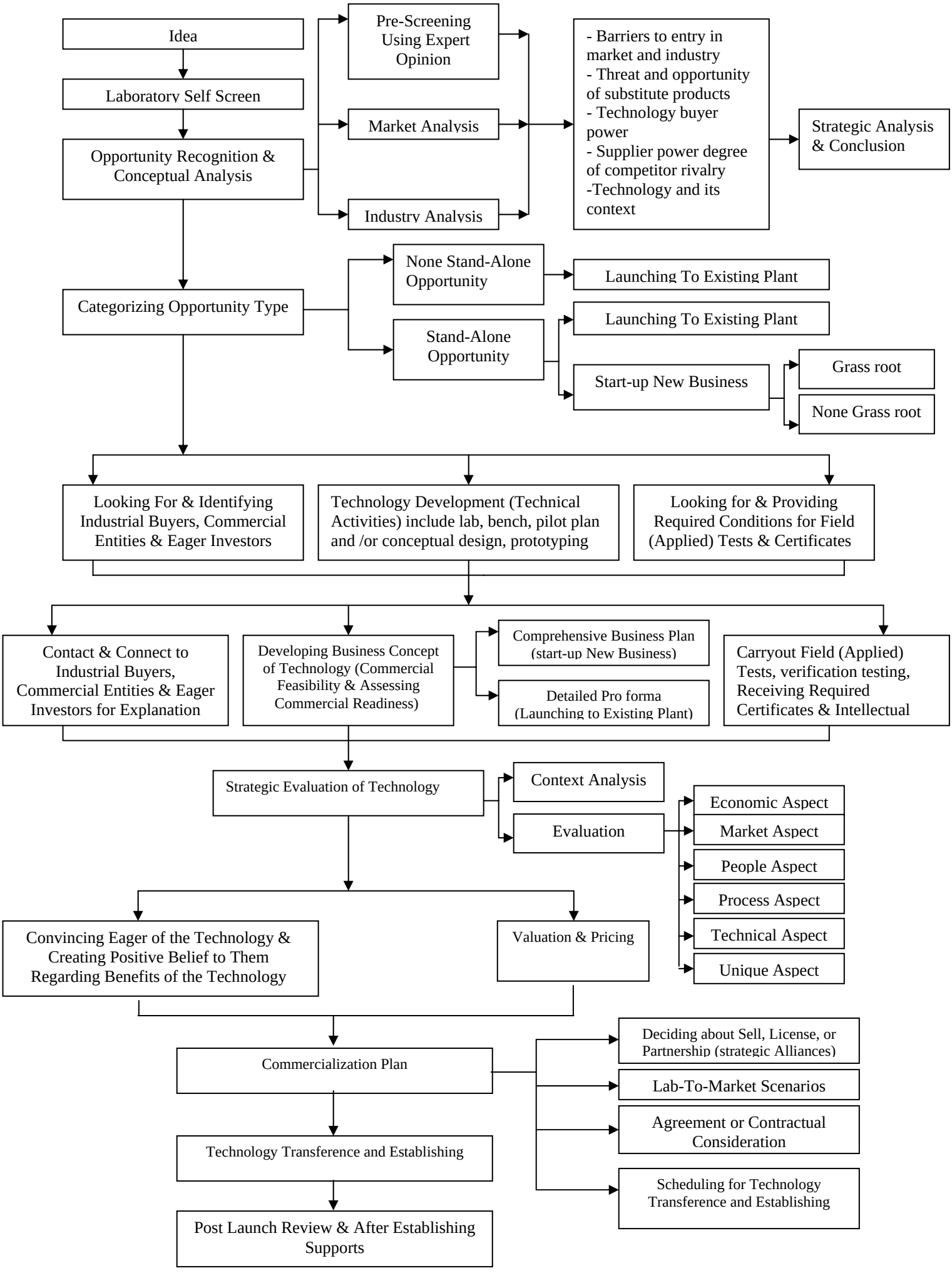


Figure 3. RIPI's New Technology Development Process from Idea to Market

As follows, activities of each stage (according to the model) are described:

1. Idea

Ideas are plentiful. They come to everyone throughout the day, but they are not typically dismissed or are not assigned any value or potential.
Sources of Idea:
Study an industry
Search the patent literature
Look into university opportunities
Investigate government sources
Finding new value in existing technology
Other sources include:

Trade association
Trade publication
Suppliers
Distributors
Entrepreneurs

2. Laboratory Self Screen

Conducting a self-screen process to choose technologies for submission for evaluation. Each lab used its own criteria and mechanisms. This will result in a wide variety of technologies at almost every phase of development.

1. Patent search completed and clean
2. Literature search completed and clean
3. No prior claims to the technology
4. Technology protectable by patents

3. Opportunity Recognition & Conceptual Analysis

An opportunity is an idea that can be turn into a business or commercialized in some manner.
An idea comes easily; it is more difficult to generate opportunities from ideas. Therefore, it makes sense to have a process for screening opportunities. Hence to opportunity recognition following procedure is designed:

3.1. Pre-Screening Using Expert Opinion

- The completion of a profile of the technology
  - Technology description and its trend
  - Embryonic technology trend (technology foresight)
  - Potential for commercialization
  - Potential constraints for technology transfer
- Expert-based pre-evaluation of the technical and commercial feasibility
  - Technical feasibility
  - Uniqueness
  - Viable solution
  - Timeframe to marketability (time duration)
  - Technology cost estimating (expenditure assessment)

3.2.Industry Analysis:

Is the industry experiencing growth?
Where are the opportunities in this industry?
How does the industry respond to new Technology?
How much is spent on R&D in the industry?
Who are the Major Competitors?
Are young firms surviving in the industry?
Where is the industry going?
What are the threats to the industry?
What are the grass Margins in the industry?
Is the technology basis of a new industry or company (major breakthrough)?
What are the Pioneer's and Follower's advantages and disadvantages?
Growth Cycle (Birth to Death) of Industry :
Birth, Growth and Adaptation, Differentiation and Competition, Shakeout, Maturity and Decline.

3.3. Market Analysis:

- Market structure analysis
- Describe the market environment
- Identify economic and industry trends
- Quantify the size of the market
- Identify the market segments
- Analyze market segment size, growth rate, competitive environment
- Analyze business capabilities for market share, competitive position, product capabilities, resource capabilities
- Identify three unique features or benefits of the product
- Identify the competition (competitor assessment and positioning)
- Establish customer requirements for the product
- Identify potential market barriers
- Identify market distribution channels
- Identify product pricing criteria

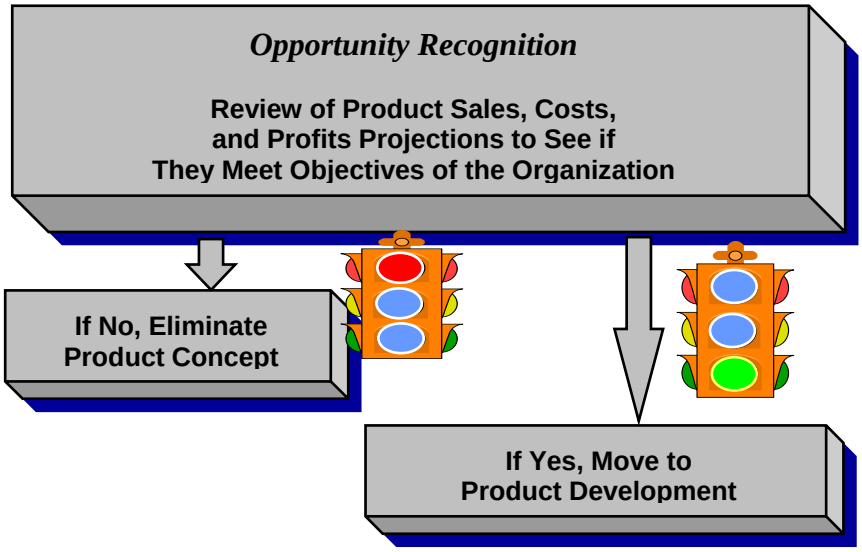
3.4. Concluding From Opportunity Recognition

Strategic Analysis & Conclusion will be carried out base on Porter five forces' model (with some modification to account for the effect of technology):

- Barriers to entry in market and industry
- Threat and opportunity of substitute products
- Technology buyer power
- Supplier power
- Degree of competitor rivalry

- Technology and its context

3.5. Decision Making Base on Opportunity Recognition *Conclusion*



4. Categorizing Opportunity Type

After recognition potential opportunities, at the next step, the nature of the opportunity should be determined by categorizing them into:

4.1. None Stand-Alone Opportunity

None stand-alone opportunities usually are market attractiveness and their market is not adequate to start new business and if there is possibility to benefiting current process (they being compatible to existing process) of industries to commercialization them, they will be suitable for commercialization.

4.2. Stand-Alone Opportunity

Stand-alone opportunities usually are market attractiveness and their market is enough to starting new business to commercialize the technology. Then, this kind of opportunity, if being lunch able in existing industries, has super potential for commercialization except cases which new technology involve starting new business.

5. Technology Development (Technical Activities)

Every new product goes through a design, development, and prototyping phase during this stage.
During the technical activities step the following measures should be completed:

- Test for technical feasibility
- Examine the operational requirements
- Identify potential safety and environmental hazards
- Conduct a preliminary manufacturing assessment
- Estimate engineering prototype costs
- Identify materials, processes, components, and manufacturing steps required to meet technical performance and specifications
- Test materials, components, and processes
- Lab and Bench prototype
- Design and construct a pilot process or engineering prototype
- Conduct a preliminary production feasibility assessment
- Optimize the design iterations
- Conduct final tests
- Estimate pre-production prototype costs–Pilot plant execute
- Documentation of findings and providing engineering documents
- Identifying Scale up requirement
- Planning for Scale up

6. Looking For & Identifying Industrial Buyers, Commercial Entities & Eager Investors

Selling technology need to understand the characteristics of buying firms which identify them as high-potential adopters of new technologies, and that the management of the early phases of buyer-seller relationships are critically important to pioneering success.
At the opportunity recognition stage, when the industry analysis is carry out usually some of the potential adopters will recognized.

7. Looking for & Providing Required Conditions for Field (Applied) Tests & Certificates

After accomplishing the opportunity recognition stage, some information about characteristics, required conditions of new technology and consumer viewpoint will be achieved. Based on this information, an action plan should be provided to preparing requirement and when technical activities were ended technology forwarded straight to field test and acquiring certificates.

8. Carryout Field (Applied) Tests, Verification Testing, Receiving Required Certificates & Intellectual Property Protection

- To be assured of technology performance, field (applied) test should be accomplished and result must be analyzed and compared to required and favorite condition.
- Field-testing with potential users at various stages in the process will reduce the chance of error in the final product.
- Design field support system
- Evaluation criteria
- Concept testing
- Prototype development
- Product testing
- Product-use test
- Safety testing
- Quality testing
- Possible errors in product testing

8.1. Intellectual Property Protection

- Together with the inventor (s), technology transfer staff attempts to develop an understanding of five main categories: background tests, technology tests, market tests, commercial tests and management tests. Based on the understanding developed, the Office of Intellectual Property will accept or reject a technology for protection

9. Developing Business Concept of Technology (Commercial Feasibility)

Every technology can benefit from the preparation of a carefully written business plan. The purpose of the business plan is to:

1. Help you think through the venture and ensure you have considered all your options and anticipated any potential difficulties.
2. Convince lenders and investors that you are in control of the project and that their money will be safe with you.
3. Serve as an operating guide as you turn your technology into a viable business.
4. Identify financial, physical, and human resources required for commercialization

9.1. Comprehensive Business Plan (start-up New Business)

Developing business concept of a technology not associated with any specific site

- Develop a financial analysis that identifies break-even scenarios based upon unit prices, volume of sales, and costs
- Determine whether the business opportunity presents sufficient profit margins to justify a business venture
- Assess the merits of licensing the opportunity compared to venturing

9.2. Detailed Pro forma (Launching to Existing Plant)

Developing business concept of a technology at a specific site

- Develop a detailed business plan for the product development stage including objectives, schedules, milestones and allocations of the required financial and human resources

10. Contact & Connect to Industrial Buyers, Commercial Entities & Eager Investors for Explanation

Relationships between buyers and sellers involve a complex set of characteristics, the understanding and management of which are crucial to the successful commercialization of new technologies.
Potential adopters in a new technology-buying situation are slow to decide; uncertain about needs; more concerned about finding a good solution than getting a low priced or assured supply.

Active management of the buyer-seller relationship when an emerging technology enters the marketplace can affect

the adoption of the technology by individual firms, contribute to the overall diffusion rate, assist in identifying and addressing a potential buyer's technological needs and determine the competitive positioning of the product and the supplier.

10.1. The Consumer Adoption Process

Adoption process: Stages which consumers go through in learning about a new technology, trying it, and deciding whether to purchase it again.

- Awareness
- Interest
- Evaluation
- Adoption or rejection

11. Strategic Evaluation of Technology To finalizing

11.1.Context Analysis

- Background
- Present regulations, which necessitate the technology
- Competition
    - Description of how the problem is currently being solved
    - Advantages and disadvantages of competition
    - Comparison of technology being evaluated with competition
- Related patents

11.2 Evaluation

- Economic Aspect
    - Economic feasibility
    - Cost/benefit analysis
- Market Aspect
    - Technology compatibility with market need or demand
    - Technology growth potential within the market
- People Aspect
    - Communicability/ the ease with which the technology can be described and understood
    - Desirability
    - Interest expressed by contact
    - Perceived risk as communicated by contact
- Process Aspect
    - Improvement vs. paradigm shift
    - Level of change required for potential buyer to effectively use the technology
    - Trialability/feasibility of small scale-up
    - Technology capabilities of potential users
- Technical Aspect
    - Technology feasibility
    - Relative advantage
    - Analysis of simplicity vs. complexity of new technology
- Unique Aspect
    - Incentives and disincentives for application
    - Regulation and polices which shape interest
    - Physical requirements
    - Cultural appropriateness

12. Valuation & Pricing

The process of valuation provides an opportunity for dialogue and collaboration. Researchers and businesspeople can bring their special knowledge and skill to this process, learn from each other, and share in its mutual benefits.

The term *valuation* has a specific meaning—it refers to the task of determining the monetary worth of an asset, object, or entity. Valuation seeks to answer a fundamental question: "What is it worth?" The valuation process has a long history. Whether the object is a piece of jewelry, a work of art, or residential real estate, people have always wanted an answer to the fundamental question of value. The valuation of technologies has become an important aspect of the world of commerce and is now the subject of increasingly specialized books. Their methods are highly quantitative, and in areas such as the valuation of financial and business options, mathematically sophisticated.

12.1. Technology Pricing

What Factors are relevant to the real Value of a Technology?
Usually pricing methods carry out following job:
• Measure of the relative Value provided by each Technology
• Linking the measure of the relative Value provided by each Technology to monetary Values

Four approaches for valuing intangible assets:

- Market approach: Values intangible assets in an active Market (measures the present value of future benefits by obtaining a consensus of what others in the marketplace have judged it to be).
- Cost approach: Values technology assets by measuring the expenditure necessary to create and develop the technology asset.
- Income approach: Present worth of the net anticipated economic benefit of the asset
- Real option method: is considered an extension of income analysis by considering the opportunity (but also the risk) embedded in them.

13. Commercialization Plan

This stage is the compilation of data, such as identification of potential markets, estimated costs and manufacturing and production needs, which can be used in the creation of a commercialization plan, and encompasses following activities:

- Deciding about Sell, License, or Partnership (strategic Alliances)
- Lab-To-Market Scenarios
- Agreement or Contractual Consideration
- Timing & Scheduling for Technology Transference and Establishing
- Form a cohesive commercialization team (design, manufacturing, marketing, management)

14. Convincing Eager of the Technology & Creating Positive Belief to Them Regarding Benefits of the Technology

There are two different categories risk regarding adapting a new technology that are technical risk and market risk.
In this stage should provide strong evidence to assurance technology buyers regarding technical and market consideration of new technology.

The technology transfer staff will discuss the technology with the potential buyer(s) and discuss detailed technical and market information that focus on the issues most affecting a technology's prospects for commercialization; information is exchanged on competitive products, other emerging technologies, the merits of the invention, and what current or potential need it may fill in the marketplace. Inventors usually have vital first-hand knowledge.

The market uncertainty in an emerging technologically driven industry can be a deterrent to the successful introduction of a new technology. The emerging buyer seller relationship, with its potential long-term loyalties and possible switching costs benefits for suppliers, can reduce market uncertainty by helping to position a new product strategically in the market.

15. Technology Transference and Establishing

- Technology establishing management
- The establishing team
- Crash-programs
- Establishing success and failures factors
- Product launching checklist
- Technology diffusion process
- Tracking the establish

16. Post Launch Review & After Establishing Supports

- Technology Administration after Establishing
- Sustainable relationship to technology adapter to solving
- Improving technology and keep it update
- Feed back of customer
- Different means of communication
- Advertising strategies campaigns
- Relationship with the production function
- Design and implement a customer survey
- Analyze customer feedback (price, design, function, packaging, delivery)
- Transmit design modifications to technicians
- Obtain direct market feedback
- Product development
- Process optimization
- Trouble shooting

4. Discussion

4.1. Why the framework is agile

A new competitive environment is emerging, which is acting as a driving force for changes in environment. Competitive advantage will accrue to those enterprises that develop the capability to rapidly respond to the environmental changes.

To compete effectively in the global marketplace of the twenty-first century, companies are trying to maintain at a high level of flexibility and responsiveness to achieve agility and to remain competitive.
Agility addresses new ways of running companies, to meet these challenges.

To achieve the agility required to respond to these driving forces and to develop the required capability.
Therefore, we can consider agility as decisions and actions, which are aimed at responding rapidly to the effects of the variability and uncertainty, in an environment.

A limited number of research papers have discussed agility in R&D organizations.
This paper presents and illustrates a strategic framework for developing new technologies in research organization from Idea to market.

This framework is intelligent and by continuous gathering and processing information from the environment is sensitive to environmental changes. Hence, this process based on its intelligence could take correcting measures. In

other words, decision-making points are distributed in throughout the process from beginning to end and each point of the process is go/not go decision-making gate.
Then, the process is able and ready to respond quickly to changes wherever and whenever. This is agility.

4.2. Sensitivity Analysis

This adapted model suggests an alliance process be followed in order for RIPI-sponsored research to effectively reach the commercialization stage with the private sector.
The model was simulated with three sets of key parameter combinations, namely, (1) very high technology complexity-very immature technology-no training, (2) medium technology complexity-medium mature technology-average training, and (3) very low technology complexity-very mature technology-high training. These were chosen to represent two extreme condition scenarios and an average condition scenario. This helped in understanding the sensitivity of the model results for different conditions of technology maturity, technology complexity, and the amount of training imparted to workers, technicians, and professionals involved in the technology development process.

The results show that the high compatibility of the model to different situation and condition.

RIPI is not always involved in each step with every technology. Some products are already beyond the initial when RIPI gets involved. Additionally, depending on the type of technology, some of the steps may be skipped.
This approach depicts technology development not as a one-way linear process, but rather as a continuous, dynamic process in which innovation can move forward from research to design to production to market, in reverse, from market to production to design to research, or in a cyclic manner inside any stage.

4. Conclusion

We create a more holistic model of innovation, which shows a dynamic process that is more consistent with reality than the linear model of innovation. This holistic model of innovation shows clearly that innovation can occur throughout a company's operations, triggered in some cases by new knowledge, but in other case by an opportunity to fulfill a market need.

For engineers, acceptance by policy makers, managers and academia of a more holistic model of innovation is important because such a model recognizes explicitly the range of activities in which they are most involved.

This model can be used to justify a more proactive role for design and engineering services in companies' investment and strategic decisions. On the other hand, as a taxonomy and hierarchy, the model can guide managers and policy makers in technology planning and provide support for creativity and innovation.
Finally, on a national level, looking at innovation holistically would allow policy makers to develop more effective policies to facilitate the innovation system.
If a more holistic model of innovation were recognized, scare funds could be reallocated to where they could achieve more bangs for the buck.

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