

A RAD Approach to New Products: Implementation of an Early-Stage Technology Assessment (ESTA) Diagnostic

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Introduction to New Product Development and Commercialization

Developing and commercializing new products (goods or services) is likely to be a topic of considerable interest if you are involved in one or more of the following pursuits:

- Inventing or investing in technology to increase personal or institutional wealth
- Transferring technology from a university or government (including military) lab to the marketplace
- Achieving financial growth for a company or organization
- Sustaining the economic vitality of a state, region, or country

What if you could develop and commercialize new products “better, faster, and cheaper” than conventional approaches allow? Whether you are creating an entirely new product platform or merely improving on an existing product line, the process of developing and commercializing a new product is a mix of faith, luck, and skill. You have to believe in yourself and your venture. You need to be in the right place at the right time. You have to know how to transform problems into opportunities (“*when-life-gives-you-lemons-make-lemonade*” effect). In addition, you need to know how to raise capital, assess technologies, analyze markets, distinguish facts from assumptions or opinions, calculate risks, predict rewards, as well as manage budgets, time, people and other resources. You have to know how to network and collaborate. Furthermore, you must understand how to balance seemingly opposing character traits like patience and perseverance, passion and practicality.

New product development and commercialization (NPDC) combines elements of art, science and business. Humans can push the envelope of what is acceptable or possible and create new realities by being creative, inventive and innovative. Experts say that the three basic ingredients of NPDC are: (1) the idea, (2) the people (critical mass needed to get things done), and (3) the money. What is the problem (as well as the proposed solution and implementation plan)? Who is doing the work and for whom? How will they get it done and how much will it cost?

On the surface, NPDC seems to leave a lot to chance (or fate). However, that is not the case when you immerse yourself into a project. NPDC entails thinking both strategically and tactically, and knowing when to choose one approach over the other. Leadership skills such as coordination (assignment of tasks), collaboration (teamwork), motivation (sense of purpose) and especially discipline (focus on results) are essential.

RADii Solutions, LLC, offers proprietary tools and systematic processes designed to minimize uncertainty, maximize potential reward, and optimize the use of resources in a NPDC endeavor. The aim is to pick the “winning” new products on a continuous basis, more accurately and more rapidly than the competition, and more cost effectively as well compared to standard methods.

The Origin of New Products

Where do ideas for new products come from? It begins with recognizing opportunities.

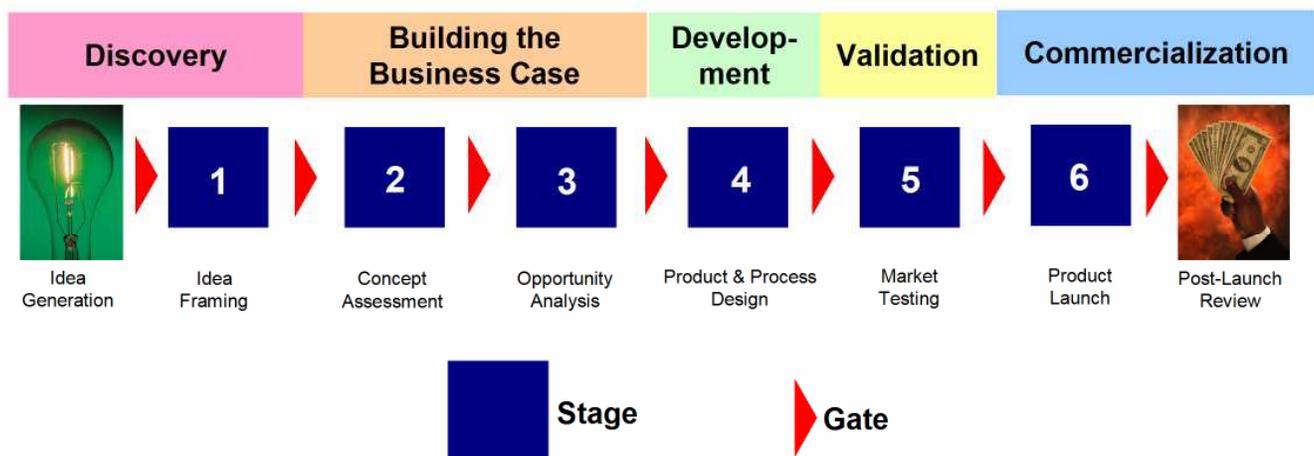
An opportunity is defined as a business or technical need that a company or individual realizes by design or default that they might want to pursue to capture competitive advantage, respond to a threat or solve a problem.

An opportunity can also emerge from research, whether basic research or applied (“use-inspired”) research. In such instances, the opportunity is usually identified through intimate knowledge of or firsthand experience with an application such that a target product specification, performance advantage, or customer benefit can be realized. Gaps are well understood so that unexpected or exceptional results (patterns or trends) can be recognized. This in turn may lead to a new discovery and possibly an invention or patent.

When pursuing an opportunity that involves developing a new technology-based product for customers (comprising a market) who will use that product for a particular application, a tried-and-true “stage-gate” process may be used to systematically approach the effort to ensure that a NPDC project remains on track, *i.e.*, focused on delivering meaningful results in a timely and cost-effective manner.

As illustrated in Fig. 1, a NPDC stage-gate process is a conceptual and operational road map for moving a new-product project from idea to launch through distinct time-sequenced stages separated by management decision gates. Multifunctional teams must successfully complete a prescribed set of related cross-functional tasks in each stage to obtain management approval to proceed to the next stage of product development.

Fig. 1. Typical Stage-Gate Process.



The starting point of the process is the Discovery Stage, with “idea generation” as the sub-stage. It is where new product ideas are conceived and nurtured. An *idea* is the most embryonic form of a new product, service or envisioned solution to a problem. Because ideas can come quickly, as thoughts or words, and from numerous sources, the Discovery Stage is often seen as an unstructured and rather chaotic regime. It is sometimes referred to as the “*Fuzzy Front End*” of NPDC.

Gates are in effect *screens, filters, or valves* that separate the different stages. At each gate, acceptance criteria or knock-out criteria are defined. An idea is tested or evaluated against those criteria to determine its maturity level, *i.e.*, technical and commercial readiness, allowing it to pass to the next higher stage.

As part of Discovery, an idea moves through the first gate into the “idea framing” sub-stage where it is refined, and through the second gate from Discovery to Building the Business Case, where it becomes a concept. Unlike an idea, which tends to be loosely structured, a *concept* has a defined form (*i.e.*, written and visual) with features and customer benefits combined with a broad understanding of the technology needed (hypotheses to be tested; claim to be validated). Think of the idea as a rough draft that needs to be worked into a final version - a concept - in which success can be predicted and risks calculated. Refining and focusing such rough drafts into assessable project proposals is a systematic process that can be divided and subdivided into manageable steps.

The stage-gate diagram above reveals the “pipeline” nature of the NPDC process. As ideas are refined, they “flow” into concepts. If the claims prove to be valid or true, they may lead to an invention and first-generation product (prototype). If all goes according to plan, the end-result is a full-commercial-scale manufactured product.

The illustration in Fig. 2 shows that the idea repository is more like a “funnel” instead of a straight pipe. There may be scores of ideas generated at the beginning of the NPDC process. At each gate, certain ideas may be “accepted” and others “rejected” based on preset criteria. For example, in Discovery there may be 100 newly generated ideas (represented as black circles), half of which are knocked out after idea framing. In this sub-stage, the ideas are refined by sorting, categorizing, consolidating, and prioritizing. (The increase in size of the black circles reflects the improvement of idea quality.) In Building the Business Case, 50 refined ideas become 20 concepts. These drop to 10 refined concepts after opportunity analyses are performed. In Development, five prototypes are made as part of product and process design. Validation is done by field testing three pre-products. Finally, one final product is launched as part of Commercialization.

Notice also in the diagram above that each successive stage from Discovery to Commercialization is shown to take more and more time to complete. In general, the cost of doing the work in each stage also increases over time, but risk is mitigated as one gets closer to introducing an actual product. These cost-risk trends are depicted in Fig. 3.

Fig. 2. Funnel diagram showing relative abundances of “deliverables” as technology matures during successive stages of NPDC.

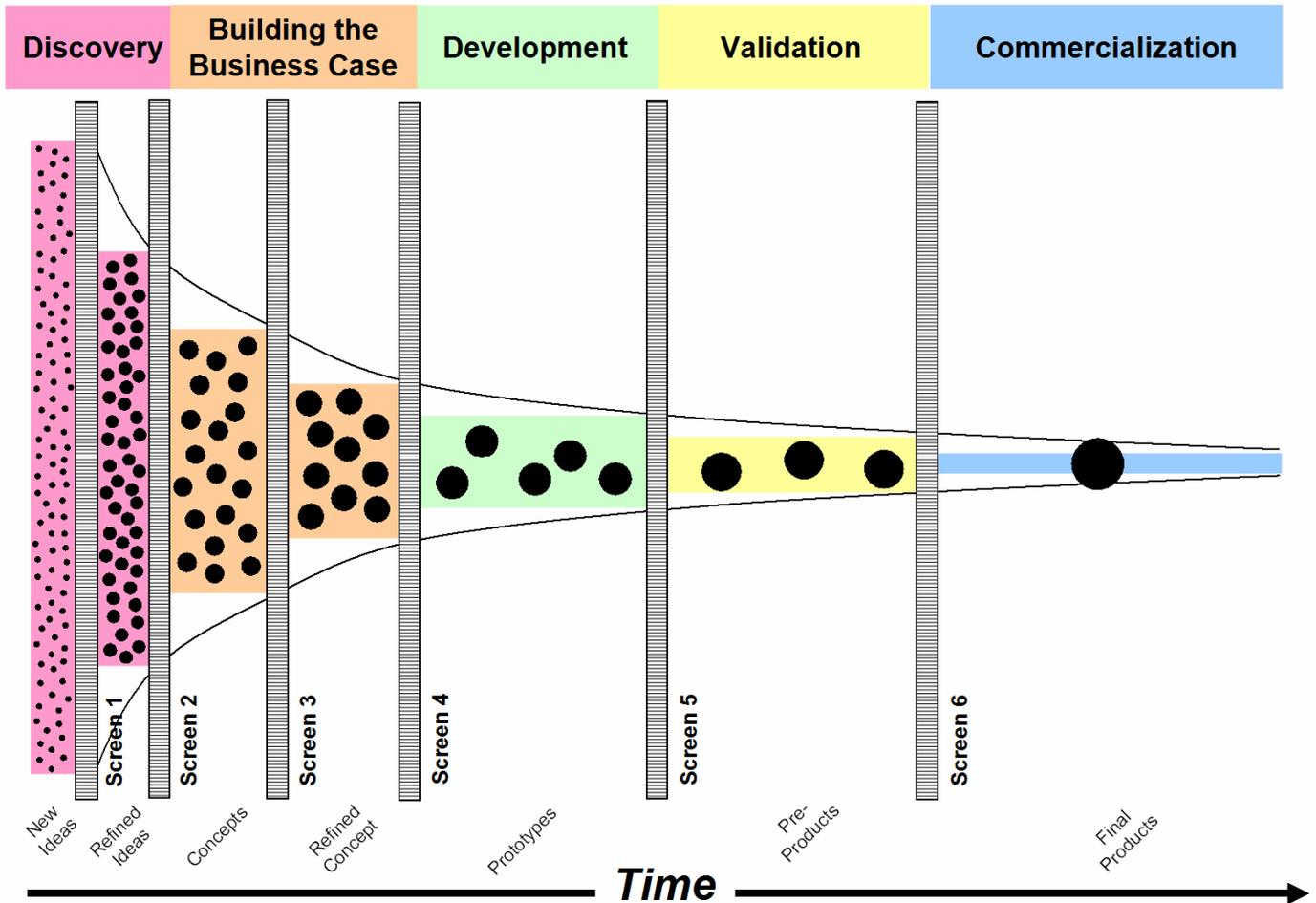
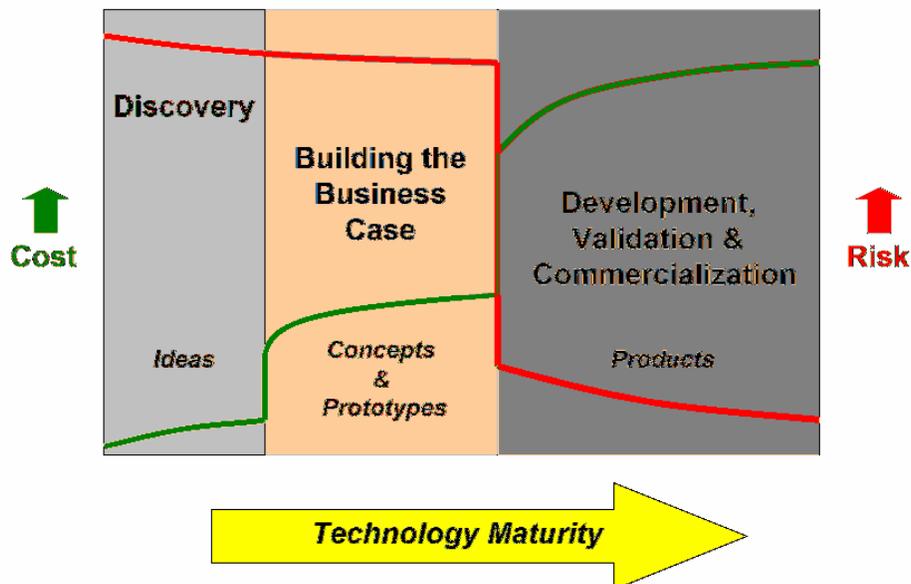


Fig. 3. Typical trends for cost and risk as technology matures.



In summary, NPDC begins with Discovery whereby many “risky” ideas have to be processed quickly, accurately and cost effectively. Over time, as the ideas are refined and transformed into concepts or inventions, prototypes and products, the assessment and screening takes longer and becomes more expensive, but the probability of commercial success increases as the technology matures.

The RAD Approach to “Winning” New Products

Linking technology-based ideas and concepts with the strategic goals of an organization or company at a very early stage increases the probability that superior products with obvious benefits for end-users will result. This is especially true if the organization or company places a high value on developing and commercializing products based on technologies that are application-dependant, customer-focused, market-orientated and, most importantly, profit-driven. To make a “winning” new product, it helps to know if you have a “winning” early-stage technology. This is the aim of Rapid Application Development (RAD).

Identifying early-stage technology winners when working for a company already manufacturing and selling successful products is hard enough. For the multitude of ideas originating outside of a profit-making organization, *e.g.*, in a university or other academic institution, government laboratory, or even an individual’s garage, transforming an early-stage technology into a successful new product is more challenging unless potential customers, distribution channels and competitors are identified early on in the process. However, using the RAD approach, even early-stage technology ideas can be assessed in light of certain parameters that relate to later stage product development and commercialization. These parameters can be used to create a NPDC strategy and thereby increase the likelihood that a new product will in fact be a winner.

How do “decision-makers” (*e.g.*, managers, investors, business developers) determine which ideas to work on or not? What are the “best” early-stage technology ideas to work on in the Discovery Stage? Management accountable for a portfolio of numerous projects at different stages of commercialization needs to answer this question on an ongoing basis to assess risk and reward, set budgets, allocate time, and assign resources (people, equipment, *etc.*) to projects at various stages. The aim is to always know the “health” of a project and to be able to judge whether it warrants continued support, sponsorship, or staffing, or whether it needs to be redirected, shelved temporarily or terminated forever.

Early-Stage Technology Assessment

Early-Stage Technology Assessment (ESTA) is a sequential question-and-answer process developed by RADii Solutions, LLC, for analyzing an idea or concept, regardless of its origin, using four interdependent parameters: *technical feasibility, commercial viability, legal sustainability, and financial profitability.*

Technical feasibility means that a technical concept derived from the idea can be proved or disproved in a finite amount of time (say one year or less) for a specified amount of money (say

\$500K). If all goes well, and the concept is proven to be sound, the next step is to make and test prototypes, followed by the demonstration of manufacturing of a product.

Commercial viability means that customers have articulated needs or wants in large, growing markets. Commercialization of a new or improved product based on a proven technology must be targeted for a relevant application for which success provides market traction.

Legal sustainability means that intellectual property (patents and trade secrets) offers a clear and continuous basis for building and maintaining competitive advantage.

Financial profitability means that both a product commercialization path and an exit strategy have been developed that shows how money will be made (revenue generated, profit earned, return on investment realized, *etc.*).

Fig. 4 describes the four ESTA parameters and provides the most general question for each parameter that starts off the Q&A. An early-stage technology idea can be efficiently and reliably scored, sorted and prioritized using ESTA in order to select the most promising new product candidates.

Fig. 4. Description of four ESTA parameters.

Parameter	Description	General Question
Technical Feasibility	Technical concept can be proven in a reasonable timeframe (one year or less)	Will it work?
Commercial Viability	Customers have articulated needs or wants in large, growing markets	Will someone buy it?
Legal Sustainability	Existing or emerging IP offers clear competitive advantage	Will it last?
Financial Profitability	Product commercialization path or exit strategy is known	Will it make money?

The ESTA process involves the idea originator(s) completing a written questionnaire and in-person interview with a *scorer* - an objective party who initially has no stake in the outcome of the assessment of the idea. The answers to the increasingly specific questions are scored in such a way to quantify the ESTA parameters. Results are compiled to determine strengths and weaknesses of the idea, and ways it can be improved. In addition to using the scores to sort ideas into categories and prioritize them at given point in time, they can also be used to monitor and track progress over the course of time. An idea is fashioned into a concept, then a demonstration prototype is synthesized or built, and if all goes well, a new product is manufactured.

In addition to the ESTA process, there are supporting RADii tools to facilitate working with early-stage technology: Technical and Commercial Readiness Assessment (TCRA) and Project Statement Definition (PSD).

TCRA is system that measures the maturity level of a technology from both technical and commercial perspectives. PSD assumes a stage-gate approach is being employed so that task-oriented projects with objectives (constraints, deliverables and milestones) are defined and executed at each stage. Expected performance can be predicted and actual performance measured based on objectives.

PSD describes a project's overall goal. The statement includes three elements: (1) an action word with an end result (the performance element); (2) a target date for completion (the time element); and (3) an overall project cost (the cost element). In effect, it is a clear and concise statement of what are you proposing to do, by when and for how much money?

In summary, a formidable challenge from the standpoint of managing risk-reward and resources is deciding which early-stage technology ideas are the most promising new product candidates to invest in. The challenge is compounded when there are many different ideas to choose from and the amount and type of information available for each idea varies. By employing the RAD approach, RADii Solutions offers our clients proprietary processes and services to efficiently navigate the *Fuzzy Front End* of NPDC and take nascent ideas in the Discovery Stage to refined concepts as the business case is built, eventually through to prototyping, testing, manufacturing demonstrations and finally product launch. Armed with our rapid application development tools, we provide compelling solutions to our clients that are fast, accurate and cost-effective.



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