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Why Add PPM Into an NPD Organization

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Intro



Innovation means something different to every person and every organization. Successful innovation, on the other hand, means converting ideas into profitable products and services by transforming customer needs into customer satisfaction.

At the heart of innovation is new product development (NPD). NPD involves more than just a process. Studies demonstrate that organizations that are the best in NPD are the best at integrating the essential elements of innovation. A systems view of innovation incorporates decisions from several business perspectives to simultaneously drive profits and customer satisfaction.

A Systems View of Innovation

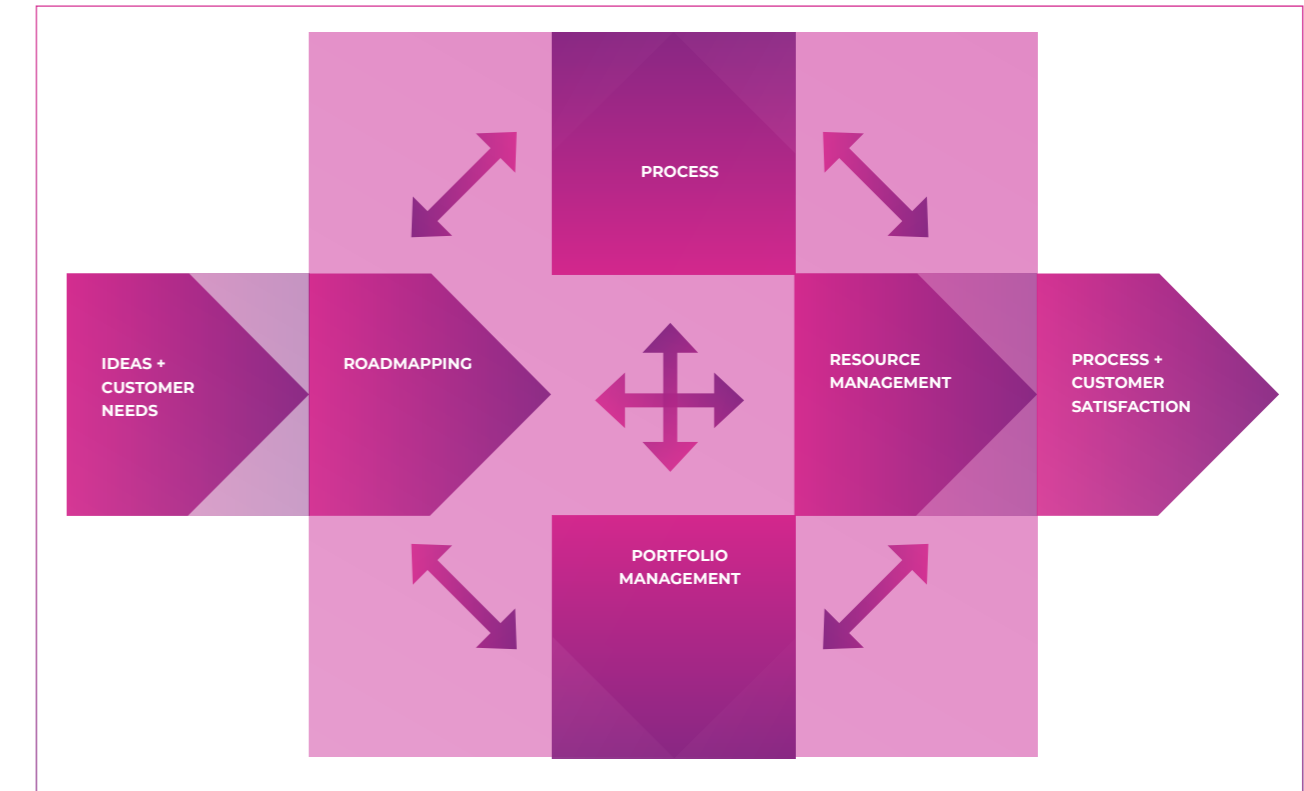
NPD Process

Many organizations first introduce structure into the innovation ecosystem through an NPD process. Organizations adopt and deploy NPD processes to manage the investment risk of designing and developing new technologies for new markets. Traditionally, a Stage-Gate® model is used for tangible product development in which small, inexpensive experiments are used to gather

data and knowledge. As more information is generated about the new product concept, tests are scaled until a decision is made to commercialize the new product.

Today, Agile processes dominate the software development landscape. These NPD processes are flexible with fast learning cycles (called “sprints”) to manage designs including consideration of the voice of customer at each stage of

development. Agile, or hybrid processes, are emerging for organizations developing joint hardware and software new products and for teams striving to accelerate traditional product development. While NPD process compliance provides structure to individual project execution, product development also needs the right resources assigned at the right time.





No NPD project can advance without allocating appropriate resources.

Resource Management

Of course, no NPD project can advance without allocating appropriate resources. Resources include time, money, equipment, and talent. In a systems view of innovation, resource management not only ensures that the right number of people are assigned to a project but also that the right people are assigned to the project.

Regardless of your industry, product development requires a balance of creators, researchers, engineers, designers, marketers, manufacturing, sales, and distribution. For an NPD project to advance quickly in transforming ideas into

commercial products, talent must be available when needed.

Resource management tools allow an organization to look at the “big picture” as well as drill down to individual project resource needs.

Effective resource management drives innovation by identifying critical project needs, resource gaps, and functional availability. Since knowledge talent accounts for about 80% of project costs, NPD estimates improve as planning capabilities increase with effective resource management. Typically, an organization will use specific software tools to trace planned and actual costs and resources for improved

NPD project. Rebalancing talent among active projects is facilitated through resource management as well.

Portfolio Management

With a systems view of innovation NPD processes are intimately linked to portfolio decisions. Product portfolio management (PPM) ensures a broad alignment of business objectives are enacted through new product development. PPM ranks and prioritizes the full set of ideas and new product projects to enact the highest value initiatives. In choosing which projects are in the active portfolio, senior leaders preferably commit resources (time, money, and talent) to those projects.

Obviously, PPM shares decisions with resource and talent management. Strategic growth goals for an organization necessitate talent acquisition, training, and development. With effective PPM, decision-makers allocate human and financial resources based on risk, return, and timing. Studies show that organizations that are best at PPM are more focused and realize new product profits faster than competitors. Having a global view of all active and “next-up” projects aids the decision-making process for NPD.

Roadmapping

Innovation is a strategic goal for many organizations. Business strategies are often described at a high-level with mission, vision, and values

statements that describe what the organization hopes to accomplish. A product roadmap describes how the organization will meet these goals. Product roadmaps are intertwined with functional roadmaps, like technology or market roadmaps. Collectively, these illustrate high-level milestones and product targets delivering strategic growth objectives.

Because roadmaps are visual tools, they also provide information for managing the NPD process and resources. Decisions within the product portfolio rely on subtle project dependencies to ensure manufacturing and/or marketing capabilities. A product roadmap shows functional, project, and product integrations at the information level needed to holistically support the

innovation system. Roadmaps provide a guide for portfolio, project, and resource decisions.

The Innovation System

Teams that succeed in one arena of innovation soon find they need to grow skills and tools to inform decisions in other areas. A systems view of innovation incorporates critical factors for success in converting customer needs to profitable products and services that customers seek to purchase and re-purchase. The four key elements for successful innovation include NPD Process Capability, Resource Management, Product Portfolio Management, and Roadmapping.

Effective integration of these components requires data inputs from a variety of sources and functions. Missing or incorrect information can lead to delays in product development, increased risk, and organizational churn. Holding key project data within a database minimizes errors. Being able to inspect, analyze, and visualize product development data from a systems perspective results in accelerated product commercialization, enhanced returns, and streamlined workflows. As an organization more efficiently converts ideas into new products, customer needs are transformed into customer satisfaction!

New Product Development (NPD) Processes

Effective and successful innovation does not happen by chance. Creative transformation of ideas into viable products requires a process to drive product development. Repetitive innovation success builds on a process to convert nascent concepts into saleable products and services while supporting data-driven decisions throughout an organization. An effective and efficient innovation ecosystem integrates four key elements:



**Structured
NPD Process**



**Resource
Management**



**Strategic
Product
Portfolio
Management**



Roadmapping





Structured NPD Processes

A structured new product development (NPD) process manages investment risk within the innovation ecosystem. Traditionally, tangible product development efforts rely on a Stage-Gate® system to transform ideas into marketable goods. Today, product development encompasses not only the design of tangible products but also the delivery of services, applications, and programs. We will use the phrase “product development” to incorporate both hardware and software development as well as bundles of products and services, and even SaaS.

Products are designed and developed for both external customers and internal customers. Success of external product development is marked by profits and increasing market share while success of internal product development (e.g., software systems) can be

measured by improved staff productivity, team collaboration, and effectiveness.

History of Stage-Gate®

Following lengthy research studies, Robert G. Cooper ^[1] identified several practices and decisions that differentiated successful innovators. He called the structured NPD process the Stage-Gate® model. Early implementations of structured NPD processes adhered strictly to rigorous definitions. Today, a typical staged-and-gated NPD process is molded to conform to organizational needs, especially data needs that drive investment decisions for product development. Stages include the following.

1. Opportunity Identification:

Determining customer wants and needs alongside market opportunities.

2. Concept Generation:

Identifying potential product ideas and concepts that will fill market and technology niches.

3. Concept Selection:

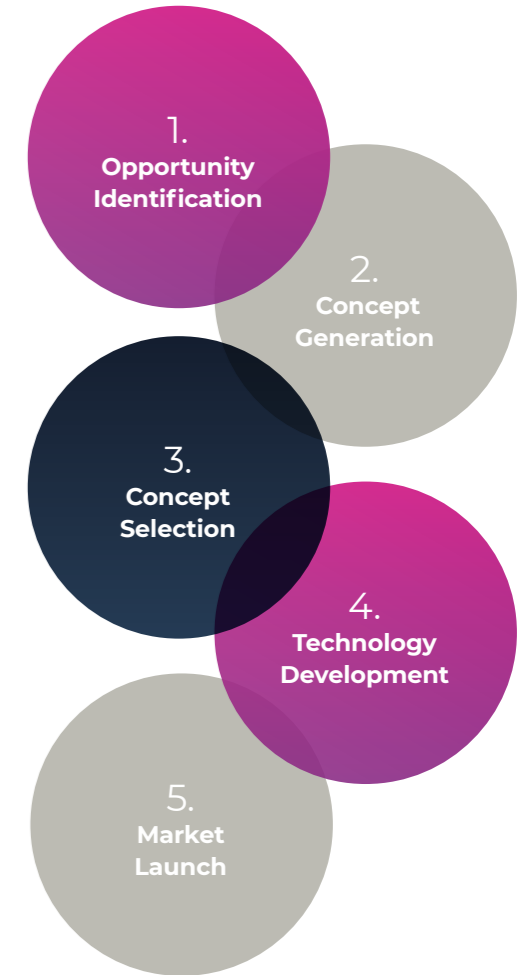
Choosing a few concepts to move forward through further testing and prototyping.

4. Technology Development:

Designing and developing the technical solution to the customer's problems.

5. Market Launch:

Commercializing the new product.





Purpose of NPD



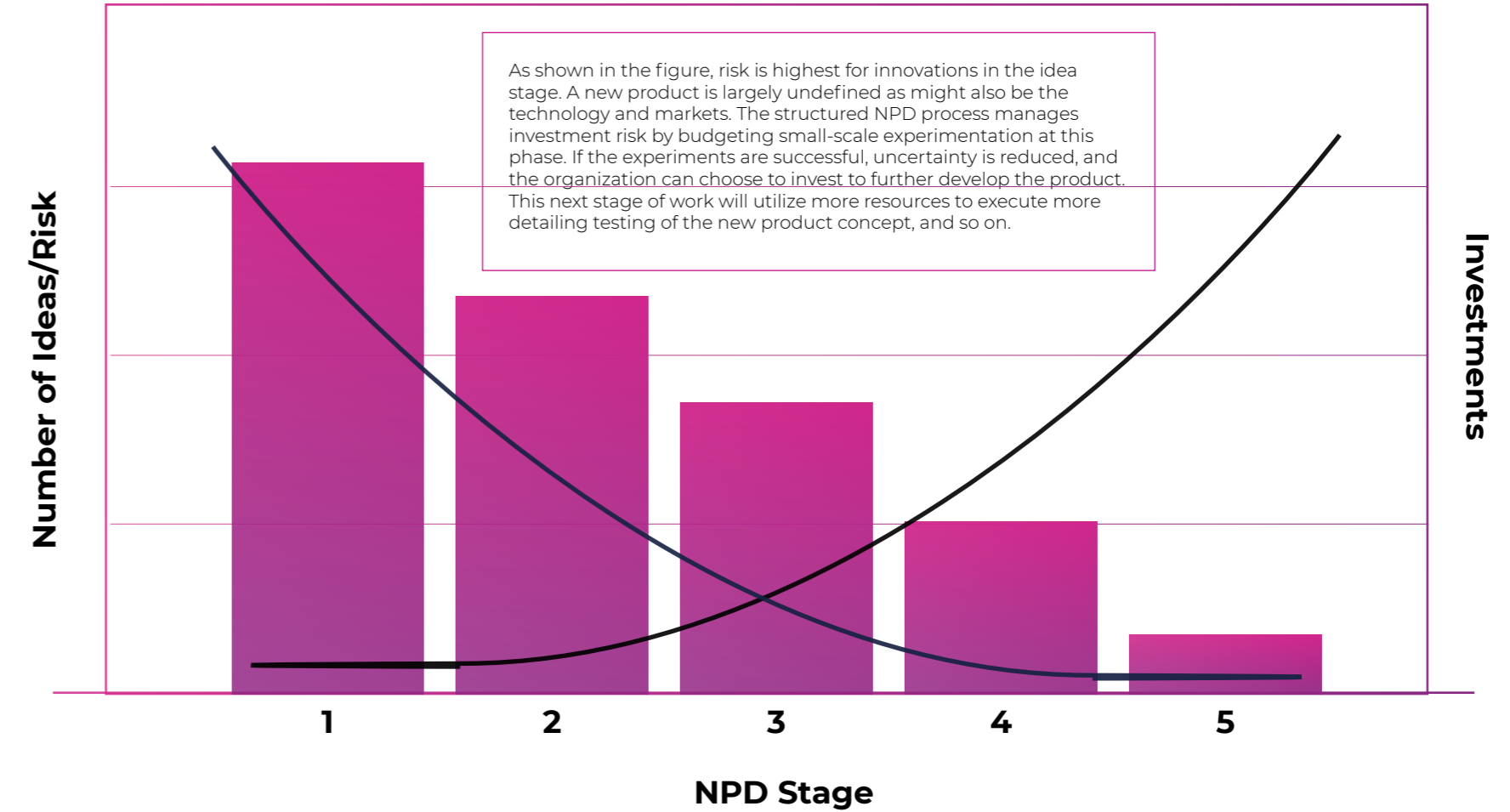
The new product development process is designed to help organizations make decisions, manage risk, and implement the strategy.

Innovation processes acknowledge that we have more ideas than time and resources, and that all ideas are not actionable. Compliance with an NPD process

drives investment decisions based on risk and strategic alignment. An NPD process involves stages, gates, and the post-launch review.

As shown in the figure, risk is highest for innovations in the idea stage. A new product is largely undefined as might also be the technology and markets. The structured NPD process manages investment risk by budgeting resources for small-scale

experimentation at this phase. If the experiments are successful, uncertainty is reduced, and the organization can choose to invest to further develop the product. This next stage of work will utilize more resources to execute more detailing testing of the new product concept, and so on.



NPD Process Stages

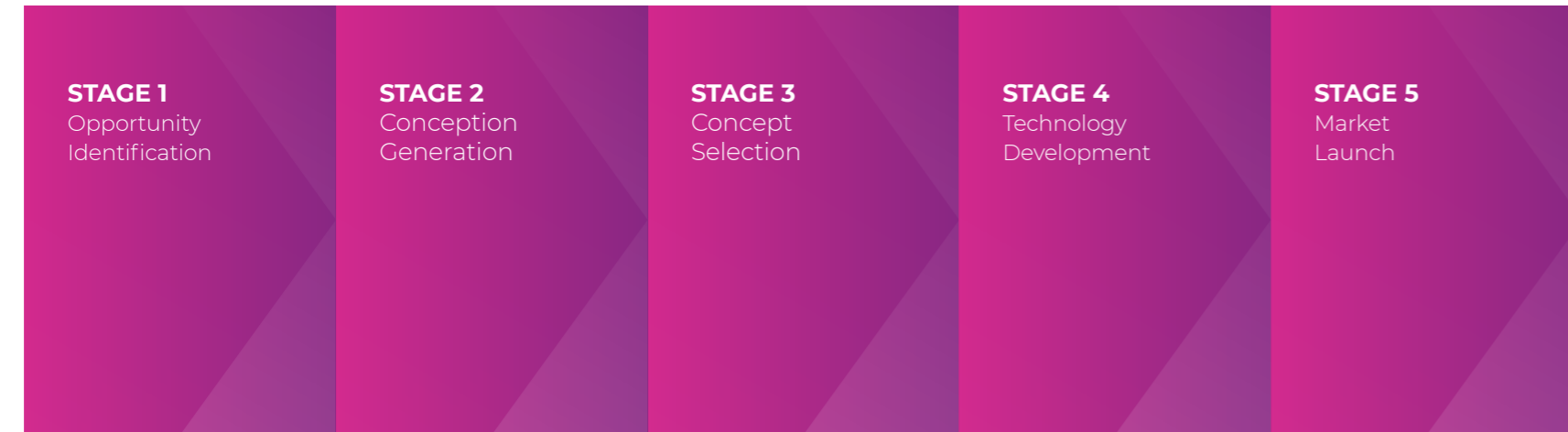
Naturally, the number of ideas advancing to the next stage decreases. Not all ideas will become commercial products – a mortality rate of 100:1 or more for ideas is not unusual in some industries. At each gate review, the new product idea is reviewed to ensure that the data and information gathered in the prior stage leave the concept

attractive enough for further investment.

Each subsequent stage has enhanced experimentation and trial of the new product concept and additional commitment of resources yet is accompanied by decreased risk. While the process of filtering ideas and refining product information with the staged-and-gated innovation system is traditionally shown as a funnel, you can also consider

that the product definition is like a telescope. An NPD team learns and refines product features and requirements with each stage of work, driving focus toward the final product launch. The team gains both technical and market knowledge upon completion of each stage of product development work, leading to more specific actions for innovation in the next stage of work.

As an example, consider the development of a new chemical process as shown in the figure below.



Stage	Scale of Experiment	Technical Uncertainty	Product Uncertainty	Investment
1	Test Tube	Very high	Very high	Very low
2	1-gallon R&D reactor	High	High	Low
3	5-gallon R&D reactor	Medium-high	Lower	Slowly increasing
4	5000-gallon continuous pilot plant	Lower	Very low	Substantial
5	100,000-gallon per day production facility	Very low	Ready for Next Generation	Full investment

In addition to managing investment and technology risk, each stage of work involves market testing and customer feedback. Even if the technology development is proceeding well, a new product project should not advance to the next stage without positive market feedback and a profitable business case. Innovation success requires all elements

(strategic alignment, budget, resourcing, and so on). Customer feedback is often informal and qualitative at early stages of product development. As technical designs mature, potential customers are involved in more detailed testing to validate features, functionality, and usability of the new product. A failure or inability to meet customer needs is reason

enough to cancel a project. Likewise, a new product must demonstrate a viable financial return over the long-run. In the early phases of innovation, a rough business case ($\pm 50\%$ profit) is adequate for decision-making. However, as more product information is gathered and as the technology uncertainty is reduced, manufacturing expenses

and product pricing models are refined. Organizations typically use a business case of $\pm 10\%$ to make a commercialization decision to launch the new product. This includes capital investment as well as ongoing resource commitments to manufacture, sell, and distribute the new product.

Gates

In a conventional NPD process, work is done in stages while decisions are made at gates. We have described some of the development and design elements for NPD phases in the previous section. Gate decisions reflect a commitment by the organization to fund the work going forward. There are four typical gate decisions.

Go

A “Go” decision advances a project to the next phase. Gatekeepers approve the project advancement and authorize budget and resources according to the plan of work for the next stage.

No-Go

Often called a “Kill” decision, the project is halted. The

new product may no longer be attractive to the target market, the technology may be infeasible, or the business case is unprofitable. Gatekeepers re-assign project resources and the NPD team documents the project closing, including lessons learned.

Hold

A “Hold” decision is a very short-term pause in the NPD project. For example, gatekeepers may hold a project while awaiting imminent funding or acquisition of critical resources.

Recycle

“Recycle” decisions are rare. Gatekeepers are not satisfied with the outcomes of the previous stage of work and request a second look at specific experiments or data. The project team repeats certain work

within the prior stage and a final decision is advanced.

An additional element to consider for gate review decisions is a subtle difference between entry gates and exit gates. Entry gates serve as perfunctory checkpoints, validating that the work of the prior stage was completed as planned. An exit gate, on the other hand, not only validates the prior stage work but also verifies that the next phase of work is appropriate, funded, and adequately resourced.

Go: Project moves to next phase
No-Go: Project is cancelled
Hold: Project is paused



Product innovation is crucial to the long-term survival of all companies.

Scaling the NPD Process

Not every NPD project is the same. Many NPD projects involve adding features to an existing product, updating the technology, or introducing an existing product to a new market. In contrast, designing and developing a brand-new product for a new market requires a broader scope of work and a larger, cross-functional team. A structured NPD process is easily scaled to accommodate project complexity.

For instance, revising an existing product with a small quality issue needs few resources. Such a project can either skip or combine phases in the staged and gated model. However, a complex, new project requiring multinational partners in the development effort might need additional milestones. Progress toward production and commercialization is then validated at “half-gates” such

as Gate 2½ or 3½. Adding incremental deliverables for a lengthy project further helps to minimize investment risk since the business case of a project can change over longer periods of time.

Likewise using additional milestones allows an organization to check for continued customer interest. During a long product development process, customer needs and market trends can vary, sometimes significantly. Scaling the NPD process based on the newness and complexity of the product development effort improves organizational flexibility and reduces overall portfolio investment risk. In such situations, it is useful to view innovation projects comprehensively with product and technology roadmaps.

Post-Launch Reviews

The US Air Force Thunderbirds precision flying teams conduct an “after-action” review of every

practice flight and of every air show performance. The purpose is to ensure that each flight is conducted safely and to apply learnings to the next mission. Pilots, controllers, and air crews review what went wrong, what can be improved next time, and what went well.

Innovation and project teams also benefit from after-action reviews (typically called a “Post-Launch Review” or PLR for NPD). Teams analyze the design and development process to identify weak points, create improvement plans, and transfer best practices. An important element of the PLR is to capture data to improve project planning and estimating across the organization.

For example, knowing that an “average” NPD project requires three full-time equivalent resources and two weeks in Stage 1 improves the budget and schedule estimates for the next similar project.

Successful innovators use software databases to maintain project appropriations and schedule information to improve planning. Further, such data yields trend analysis indicating bottlenecks in the innovation process. Organizations can streamline the NPD process then by applying hybrid tools and improving resource allocations.

Additional data collected at the PLR verify sales revenue and marketing effectiveness. Shortly after commercialization, the NPD team monitors market penetration and market share to validate retail product pricing and marketing collateral effectiveness. The PLR reveals whether targets are being met and if adjustments are necessary.

A formal PLR is recommended for every project. Too often, companies conduct lessons learned reviews only when projects have been

unsuccessful. While it is important to understand opportunities for improvement, it is also critical to identify best practices in managing product development.

Summary

Product innovation is crucial to the long-term survival of all companies in all industries. Organizations that have implemented structured new product development processes are most successful in meeting innovation goals. NPD processes help to reduce investment risk and maximize commercial success. Standard processes for tangible products use a staged-and-gated system for product innovation. In these processes, work is done in stages and decisions are made at gates. Product design and development is phased from small-scale experiments to larger scale tests and commercialization. Positive

market feedback and a viable business case are crucial for an NPD project to advance to the next stage. In this way, investment risk is minimized while technical and market development are optimized for the scale and scope of the new product project.

Agile processes use similar structure for developing software products with short iterations of work completed for the highest priority product features. As more features are designed and released, the product matures to meet a full set of customer needs. Many of the Agile tools, like user stories, iterations, and Kanban boards, are finding application today in hybrid NPD processes combining hardware and software development. NPD processes work together with resource management, product portfolio management (PPM), and strategic roadmapping.

An individual project is managed by a structured NPD process with both inputs and outputs to allocate talent and funding resources for all innovation projects. Decisions within the broad purview of product innovation are made through the PPM process which in turn aligns organizational objectives with innovation projects in a strategic roadmap. While NPD processes might be the most common element institutionalized across organizations, product innovation is most successful when all components of the innovation ecosystem are linked to exchange data and information.

References

^[1] R. G. Cooper, *Winning at New Products*, 5th ed., New York, NY: Basic Books, 2017.



Resource Management

Despite the different tone of each statement, the boss, team members, and customers are all pointing to one of the most common organizational issues in new product development - resource management. New product launches are often delayed because innovation projects are inadequately staffed. Sometimes there are enough people assigned to the project but to be successful you also need the right skills and experience for innovation.

Knowledge Work

New product development (NPD) requires a significant investment - in money, people, and time. Most innovation work today relies on sophisticated technologies and highly trained team members.

In fact, over half of all global jobs are considered to focus on “knowledge work”^[1].

Innovation teams utilize diverse skills and talents throughout the NPD process. Cross-functional development teams require representation from R&D, engineering, marketing, sales, and manufacturing. New product launches also need inputs from the legal department, supply chain, and distribution.

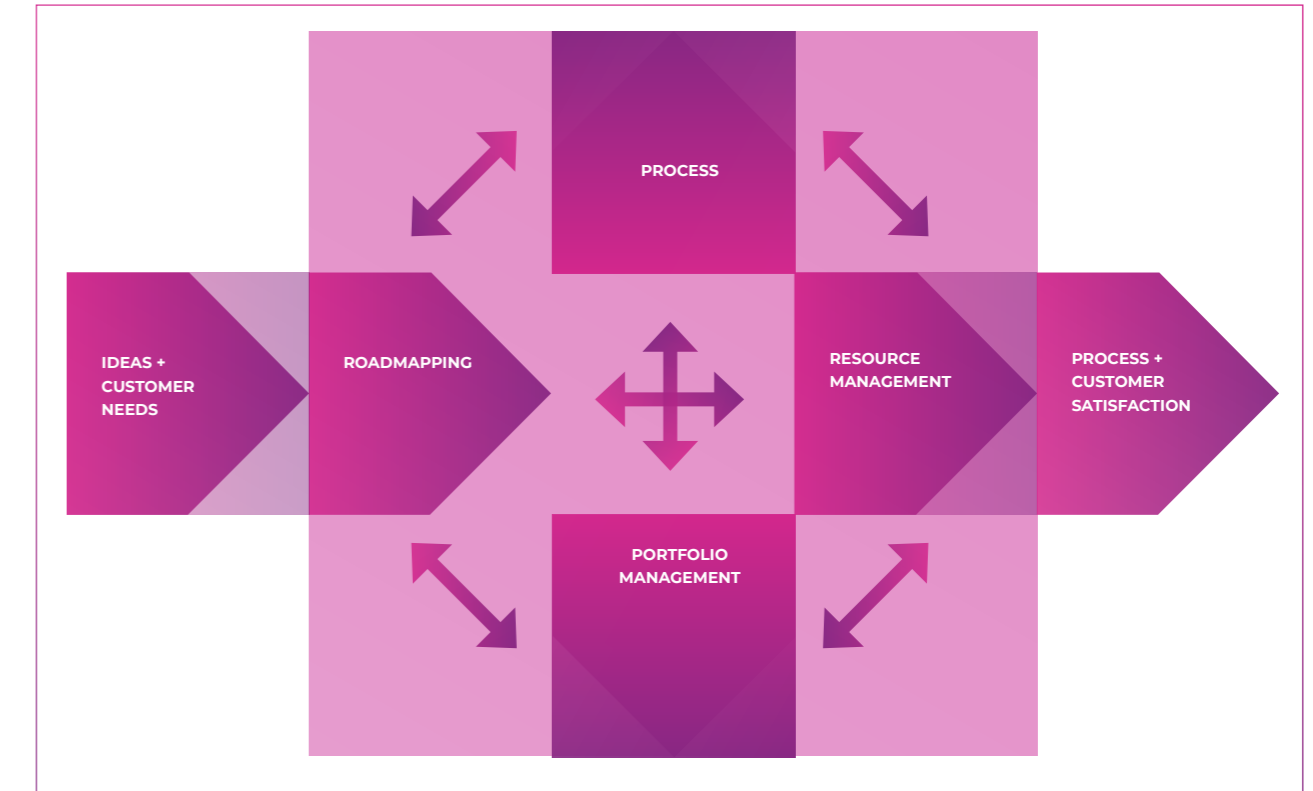
An NPD project leader is like an orchestra conductor - each function must play its part at the right time and in the right way for the project to be successful. Without resource management, an innovation system breaks down - projects are delayed and deadlines are missed.

An Integrated Innovation System

Managing NPD team resources is just one piece of the overall innovation system. Customer needs and strategic objectives are realized through:

- A disciplined NPD process
- Effective resource management
- Active product portfolio management
- Strategic roadmapping

As shown in the figure, resource management is integral to the success of an innovation ecosystem, yielding customer satisfaction and enhanced revenues.





Delayed
Launch

Poor
Quality

Wrong
Features

High
Cost

Low
Sales

Low
Market
Share

Dissatisfied
Customers

Projects Fail Due to Inadequate Resource Management

Inadequate resource management manifests itself with a variety of disappointing innovation outcomes.

Many of these poor outcomes can be avoided

with appropriate resource management. With effective allocation of talent resources, people with the right skills and experience are assigned to the highest value projects leading to streamlined product delivery.

For instance, in a typical organization, internal product

experts might be assigned to work on several projects simultaneously. Yet when people multi-task, their focus declines^[2] and completion of all tasks is delayed.

Alternatively, activities are “completed” on-time, but the product quality is lacking.

In extreme cases, individuals are assigned tasks with which they have limited experience so they must learn new skills and cannot properly execute their assigned project activities.

NPD Project A Planning Phase		
	#FTE	Duration (weeks)
R&D	2	3
Test Engineers	3	6
Manufacturing	2	12
Marketing	1	6
Logistics	1	2
Legal	0.5	1

NPD Project A Execution Phase	
Resources	Duration (weeks)
Mary Sam	3 3
Nancy Pat	8 10
Joe Tracy Jim	12 7 5
John Margaret	4 2
Matthew	2
Don	0.5

Matching Project Tasks and Talent

Resource management allows efficient planning of projects so that the right talent is available at the right time. Effective resource management builds on project prioritization from product portfolio management (PPM) and project timetables are linked to expected deliverables in the product roadmap. Organizations that best utilize resource management tools match future project tasks with appropriate resources to maintain flow.

Early in the project planning phase, required resources are identified by function. A realistic assumption for resource utilization and task

duration is input from the NPD process post-launch review from similar projects. As the innovation work proceeds, resources are identified by name, as well as function, to determine staffing needs and/or gaps. With a staged-and-gated process, projects are advanced through exit gates meaning that the plans for the next project stage are approved at gates.

These plans include staffing and budgeting to properly assign resources to the next stage tasks. Allocating NPD resources is tied to organizational deliverables (the roadmap), project prioritization (PPM), and the individual project needs (NPD process). An example is shown in the figure on page 24.



Benefits of Resource Management

One benefit of resource planning is to ensure each innovation project is adequately staffed so it can meet expected deliverables and target launch dates. In the example on page 24, NPD Project A has a need for three test engineers for six weeks. However, resource planning illustrates that only Nancy and Pat have the right skill sets and are available. The immediate impact on the project schedule is an extension of the testing phase from an estimated duration of six weeks to 10 weeks since Pat's work is the limiting factor. The delay in this project can impact other innovation projects and portfolio managers will consider this information during their product portfolio prioritization discussions. Alternatively, during PPM reviews, the portfolio managers may choose to de-prioritize a lower value project. This decision can free resources to work on other projects. For example, if Ted

is a test engineer assigned to NPD Project B, and Project B is de-prioritized, Ted is now free to work on NPD Project A. Ted can either replace another test engineer assigned to the project or be available to accelerate this phase of work on the new product. Without efficient and consistent information exchange among projects, managing resource allocation becomes time-consuming and error-prone with some resources over-allocated and others under-utilized.

Tools for Resource Management

Traditional project management tools can help with resource management. For example, linking a Gantt chart to an individual NPD project plan can indicate which internal resources on the critical path are over-allocated. A bigger challenge for most organizations, however, is the exchange of talent among active projects. Without an integrated system, project

resources are managed within functions instead of across the organization. This results in a lack of collaboration and knowledge transfer. Both elements are essential for long-term successful innovation.

Summary

Resource management is at the core of a successful and repeatable innovation system. When new product launch windows are fleeting and global competition is fierce, an organization must manage the innovation talent pool with intelligence and flexibility. Utilizing an integrated resource management tool helps an organization plan and train the right talent at the right time.

With effective resource management the boss now says, "We can get the project done on time and on-budget." Team members say, "We'll get the project done on time and with high quality." Customers say, "Wow!"

Linking resource planning with the product roadmap and PPM allows organizational leaders to acquire skills and talent for necessary growth. Finally, effective resource management ensures the NPD process operates smoothly so that resources are allocated throughout the project lifecycle.

References

^[1] Gartner, "Gartner Forecasts 51% of Global Knowledge Workers Will Be Remote by the End of 2021," 22 June 2021. [Online]. Available: <https://www.gartner.com/en/newsroom/press-releases/2021-06-22-gartner-forecasts-51-percent-of-global-knowledge-workers-will-be-remote-by-2021>. [Accessed 27 September 2021].

^[2] D. Crenshaw, *The Myth of Multitasking*, 2nd ed., Coral Gables, FL: Mango, 2021.



Resource management is at the core of a successful and repeatable innovation system.



Product Portfolio Management

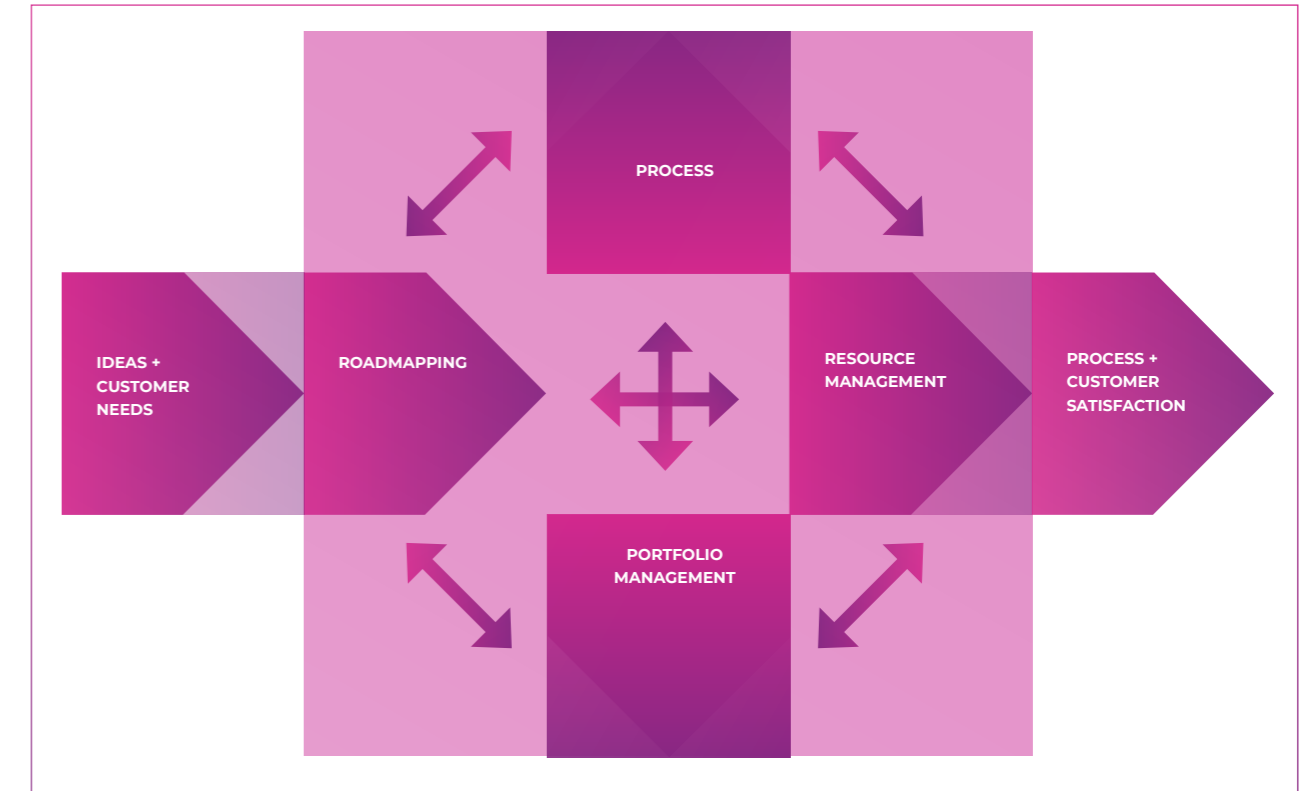
Innovation is successful when companies profit from products and services that deliver value to customers. New product development (NPD) plays a crucial role for continuous fulfillment of business goals. New products allow customers to adopt new technologies for convenience, cost-savings, or pleasure. For our purposes “new products” include tangible consumer goods, hardware, software, programs, bundles, and applications.

Key components for successful and repetitive product development include:

An effective NPD process,

- **Balanced resource management**
- **Efficient decision-making (product portfolio management)**
- **Strategic goal alignment (roadmapping)**

Each component is important to plan and execute on its own, but the most successful innovators are organizations that integrate all four elements. Exchanging data and information among these components achieves seamless planning and project execution, saving time and resources, to accelerate the innovation process.





Decision-Making

Most individuals, teams, and organizations have more ideas than available resources. Product ideas range from improving existing offerings to new-to-the-world concepts. An idea management tool can help organize and prioritize concepts; however, organizations must also select the new product projects that will deliver the highest value and satisfaction to customers while also creating value (profit) for the organization.

Product portfolio management (PPM) is a process to organize and evaluate new product ideas and projects. PPM goes beyond idea management to rank and prioritize all new product projects including ideas, concepts, and prototypes. New products are evaluated at all stages of completion from opportunity identification

through production and scale-up. PPM is different than the NPD process because leaders examine the entire suite of new products with PPM while the new product development process provides guidance in executing a single project.

According to PDMA's CPAS study ^[1], the "best" organizations utilize PPM 60% of the time (as compared to less than 50% for the "rest"). Interestingly, more organizations (74%) are using structured portfolio analysis for NPD decision-making than previously reported (55%). These decisions include project selection, investment, and continuation. New product decisions are multi-faceted and involve technical capability, market acceptance, and financial attractiveness. Therefore, implementing an efficient, data-driven PPM process within the innovation ecosystem leads to competitive differentiation.

A Standard Decision-Making Process

Organizational leaders and team members make hundreds of decisions daily. Many of these decisions involve little risk and are simple choices. Yet, an organization's reputation and financial future are higher risk decisions that must carefully align with the organization strategic goals and objectives. Using a formal decision-making process, like portfolio management, helps to understand project innovation risks better so that the quality of the decision improves.

A standard decision-making process consists of the following steps.

1. Identify the problem.

Specify clearly and concisely what problem needs to be solved. For PPM, organizations want to maximize value; yet value might mean sales revenue, profits, or market share. Understanding which strategic objectives the company seeks to optimize with NPD is the key to successful PPM decisions.

2. Gather data.

Collect relevant data to address the question at hand. For PPM, data and information often reside in different systems and within different project teams. A software tool provides an efficient way to collect and organize data for all new product projects. Furthermore, when all NPD data is in one place, it is easier for decision-makers to check consistency and quality of the information.

3. Generate alternatives.

There are typically many different options to address a problem and decision-makers must consider alternate solutions (including doing nothing and continuing the status quo) to make a choice. In PPM, senior leaders and NPD project teams compare different situations and combinations of new products that will deliver the organization's strategic goals. Often these alternatives involve different timing or variations in the product mix. Tools that allow live scenario analysis of the new product portfolio help decision-makers view different returns for different configurations of active innovation projects.

4. Make a choice.

After considering various alternatives, the decision-makers choose one option to move forward. In product

portfolio management, this means selecting a set of active NPD projects that will meet the organization's strategic revenue goals within boundaries of resources, budget, schedule, and risk tolerance.

5. Evaluate the selection.

Once a choice is made, the effectiveness of that decision must be evaluated both qualitatively and quantitatively. Portfolio managers meet on a regular basis (perhaps monthly) to evaluate whether the selected set of new product projects is delivering as expected. In the most successful organizations, senior executives and NPD team leaders can view a continuously updated product portfolio dashboard to view the status and balance of all innovation efforts at any time.

6. Follow-up. Decisions that support solving the problem (Step 1) are continued while alternatives that are ineffective are re-evaluated (Step 3).

Again, regular meetings of the portfolio managers utilizing real-time innovation project data verifies and validates decisions for an active set of NPD projects. PPM decisions are closely integrated with the NPD process and with resource management to ensure innovation objectives are met. Longer range goals for the innovation portfolio are linked with the organization's strategic mission through roadmaps such that timing and the mix of new products is continually optimized.

Benefits of PPM

Using PPM for innovation decisions has several benefits. Organizations using portfolio management realize more effective resource utilization as well as better balance within the new product portfolio. Decisions are focused on data to support the long-term innovation goals.

Strategic Alignment

First and foremost, PPM aligns active innovation projects with strategic objectives. An organization seeking growth in a particular market can prioritize those NPD projects without sacrificing support for the base. One of the tools used to evaluate, rank, and prioritize projects within PPM uses a scoring model to assess strategic alignment.

Scoring Model Example

Project	Strategic	Product	Market	Core	Technical Feasibility	Reward	Points	Normalized Score	Number Resources	Status
Thorium	5	5	5	5	4	5	29	97%	16	Active
Helium	2	5	5	5	4	5	26	87%	20	Active
Neon	5	4	4	4	5	4	26	87%	15	Active
Hydrogen	5	4	3	4	3	3	22	73%	20	Active
Oxygen	5	3	4	3	4	2	21	70%	15	Hold
Nitrogen	2	2	5	2	5	4	20	67%	30	Hold
Fluoride	4	4	2	4	2	4	20	67%	20	Hold
Radium	3	5	5	1	1	4	19	63%	25	Hold

Balance Product Risk

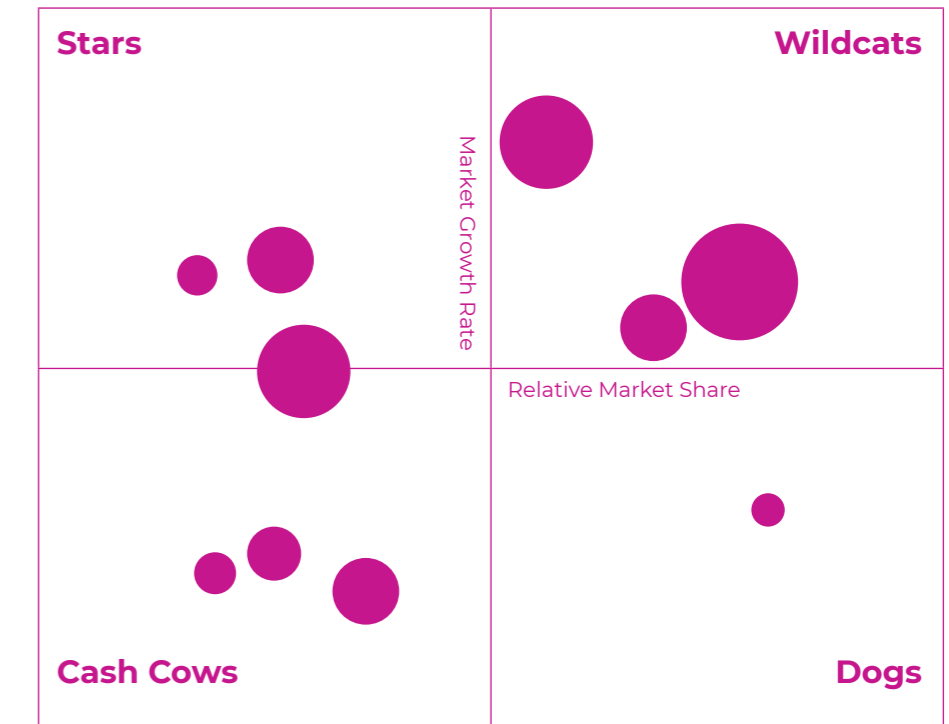
Another benefit of using PPM for data-driven NPD decisions is rooted in managing risk. Of course, innovation involves risk yet organizations with effective PPM systems can balance the overall uncertainty of innovation projects to match the risk tolerance level of the organization. This means managing investments over the short-run as well as the long-term, in familiar markets and with new customers, and utilizing existing technologies while also developing new applications.

For example, as shown in the bubble chart, projects in the upper right quadrant are higher risk (technical,

market, investment). An organization that is risk-seeking can optimize the new product portfolio for more of these types of projects relative to less risky derivatives or support projects. On the other hand, a risk-averse organization would prefer to see more projects in the lower left quadrant for technologies and markets are well-established with known expectations.

PPM is also used to balance the strategic product mix. Taken together with the product roadmaps, PPM offers a snapshot of the product mix at a point in time. In this way, the organization can balance new products planned for specific markets or within particular technology platforms.

New Product Portfolio Risk-Reward





Project Prioritization

An important outcome of effective PPM is to ensure that organizational strategy is implemented according to plan. When all NPD projects are viewed through the portfolio lenses of risk, investment, and product mix, prioritization decisions become clear to meet business objectives. Moreover, since many of the PPM tools are graphical, scenario analysis is simple and allows decision-makers to easily visualize different alternatives.

For example, a portfolio dashboard showing the schedule of active NPD projects coupled with risk and resource utilization leads to better decision-making. Senior leaders can quickly envision and understand if the new product mix is balanced to generate appropriate revenues over the short-, medium-, and long-term.

Resource Management

Senior management is responsible for hiring and training the right talent. NPD projects require a broad set of skills, including fundamental R&D, technical, engineering, manufacturing, marketing, sales, and supply chain. Both human resources and equipment resources are limited in most organizations. PPM provides inputs to resource management to indicate which resources are needed and when. Taken together with product roadmaps, portfolio decisions yield the “big picture” view of the talent necessary to execute the selected new product portfolio. Data exchanges between PPM and resource management tools helps to streamline talent acquisition and training so that right resources are available for NPD projects at the right time.

Long-Range Perspective

Finally, PPM is foundational to implementing the strategic objectives of the organization. Product roadmaps illustrate long-term innovation needs of customers and how the organization plans to address those needs with new products. Technology roadmaps demonstrate development and acquisition of technical solutions for innovation and new product development. Overlaying the product and technical roadmaps with PPM decisions provides a plan of execution for individual NPD projects to meet long-term customer needs and internal business goals.

PPM provides insights for innovation project selection and execution that balances the organization's short-term and long-term needs based on financial investment and availability of talent. Especially

when PPM data is exchanged with resource management tools, properly skilled innovation professionals and team members are available and NPD projects are appropriately staffed to implement long-term strategic objectives. A snapshot view of the portfolio at any time reveals talent needs and/or gaps as well as the total expected portfolio valuation.

Summary

Product portfolio management (PPM) is a decision-making tool to select, rank, and prioritize new product development projects. It contrasts with the NPD process since PPM examines risk, resources, and investment for all projects in the portfolio. The NPD process focuses more narrowly on individual project execution as a new product moves from idea to commercialization.

Organizations that hold frequent, in-depth, data-driven portfolio reviews are most effective at realizing strategic objectives for innovation. Many of the tools for PPM are visual and when PPM is fully integrated with the NPD process, resource management, and strategic roadmapping, live scenario analysis yields improved decisions and product outcomes. Senior leaders can select and prioritize a set of innovation projects to address customer needs to balance risk and deliver revenue. Implementing PPM delivers a competitive innovation advantage.

References

[1] H. Lee and S. K. Markham, "PDMA Comparative Performance Assessment Study (CPAS): Methods and Future Research Directions," *Journal of Product Innovation and Management*, vol. 33, no. S1, pp. 3-19, 2016.





Product Roadmapping

Innovation success means something different for every organization. But in all cases a business must design and develop new products and services that meet customer needs while delivering revenues for continued growth. Companies therefore must approach product innovation from multiple angles.

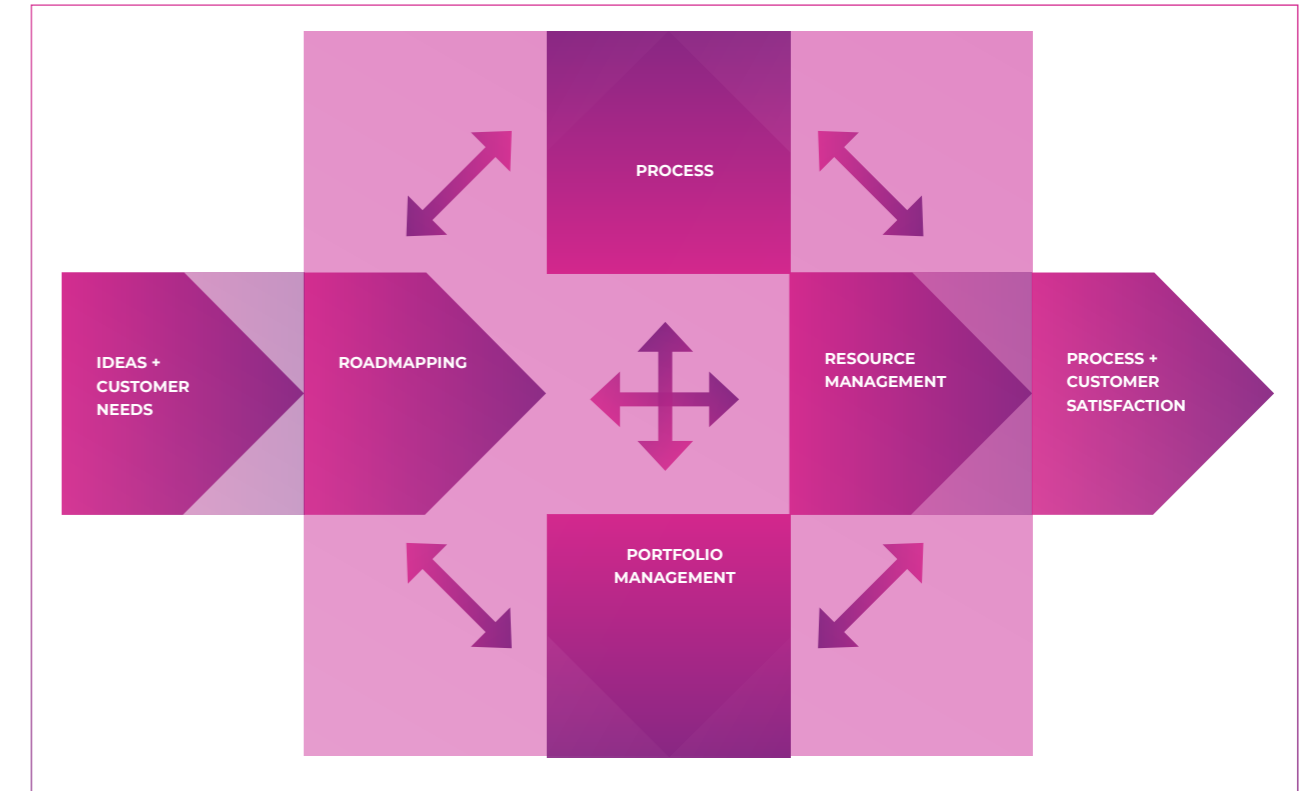
In a systems view of innovation an organization addresses strategic questions to yield long-term growth.

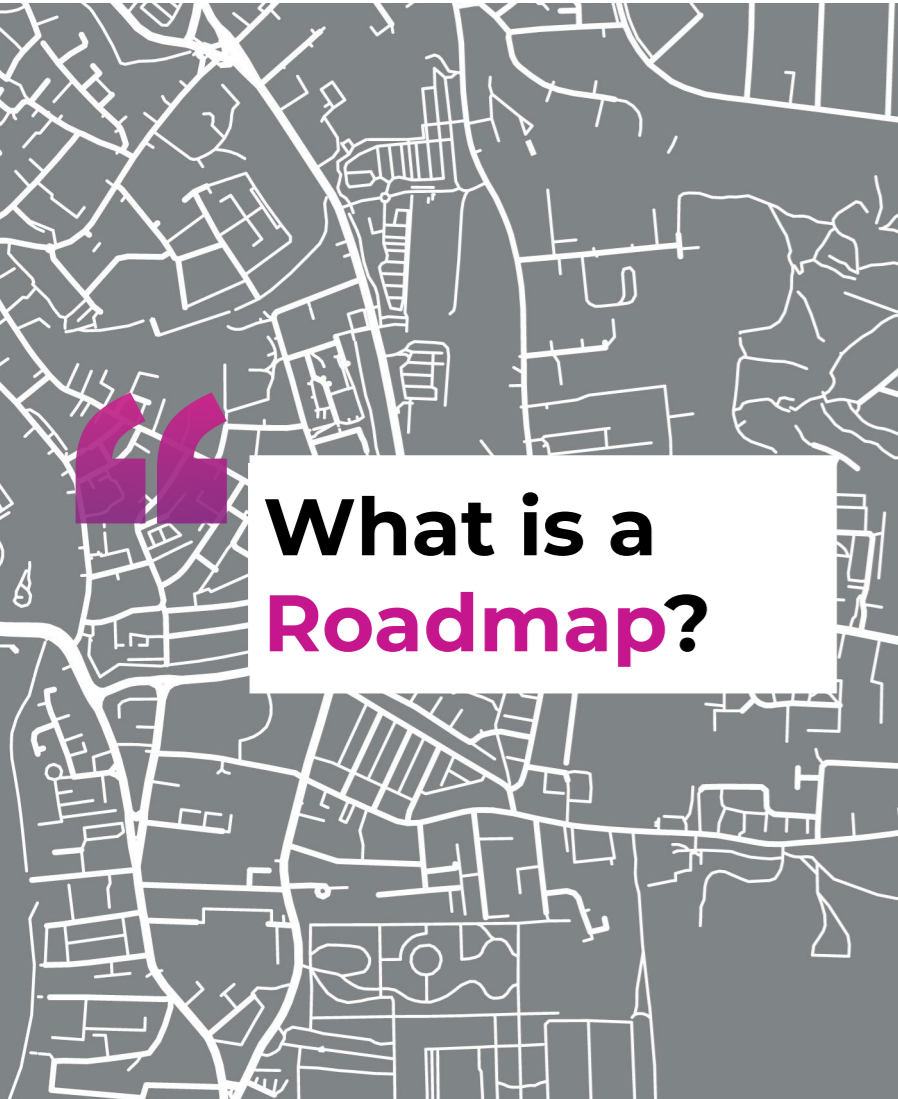
How:
the New Product Development (NPD) Process

Who:
Resource Management

What:
Product Portfolio Management (PPM)

When:
Strategic Roadmapping





What is a Roadmap?

Before GPS, turn-by-turn navigation, and real-time traffic reports, roadmaps helped travelers plan their route to a destination. Often, there are several options to travel between two cities. An interstate highway allows higher speeds and perhaps a shorter travel time. Smaller county roads encourage the traveler to stop and investigate sites along the way. Sometimes the traveler chooses the fastest route and other times he chooses the scenic route. The route a traveler selects depends upon goals, available time, and other factors.

A product roadmap is like a traveler's route map. It illustrates the vision of a product over time, including major releases and revisions. It is the element of time - when new products are planned - that makes the roadmap unique in the systems view of innovation.

Purpose of a Product Roadmap

Roadmaps serve as communication tools. Just as a traditional roadmap illustrates the distance between two cities, a product roadmap facilitates the implementation of the innovation strategy. Roadmaps describe the vision and strategy through a high-level visual summary sketching product offerings over time. While the primary question answered by the roadmap is "when," it links directly to the strategic "why." A product roadmap provides guidance to executing the product strategy. Along with the purpose of communication, the roadmap illustrates a vision of a product family over time, driving stakeholder alignment. Individual new product development (NPD) projects cannot be executed independently,

and the roadmap ensures that product linkages are strategically integrated throughout the organization.

For internal consumers, the innovation roadmaps help to explain NPD project goals and timing across the firm. The product roadmap communicates product planning to departments and functions such as supply chain, operations, and legal. In this way, organizational alignment is maintained among existing products, new products, and other company initiatives.

Additionally, taken with product portfolio management (PPM), the roadmap facilitates a discussion of alternatives and scenarios. The purpose of PPM is to examine the entire suite of projects to maximize value.

Yet without a corresponding roadmap, new product launches and steady revenue streams are difficult to envision. Roadmaps help executives and project teams identify gaps in product offerings to improve innovation planning.

Finally, product roadmaps are used as marketing tools. A company may share its high-level product development plans with customers and other external stakeholders to gather market insights. For example, customers can provide feedback on future feature releases that drive NPD decisions. Likewise, suppliers and vendors can use high-level product roadmaps to plan availability of raw materials and integration of new products with other products, services, and applications (both upstream and downstream).

What Information is on a Product Roadmap?

Because product roadmaps are visual tools, they are very versatile. A product or brand manager uses a roadmap to plan revisions and feature improvements for a single product or product family. Senior executives use product roadmaps to share the strategic vision of the entire product portfolio. In conjunction with portfolio analysis, the roadmap highlights gaps in revenues, investments, and resourcing. Likewise, the roadmap view of multiple product families on a single dashboard facilitates growth plans, including acquisition and training of innovation team resources.

Depending on the audience (project team versus executive team), the roadmap may show different time horizons. Similarly, depending on the maturity of the product, the roadmap may show initial launch of an MVP (minimally viable product) or plans for feature updates and product derivatives for more mature products. Roadmaps illustrate high-level organizational innovation plans as well as detailed product offerings over time. Software allows a user to view the roadmap at an appropriate level to visualize strategic objectives.



The Product Lifecycle

All products go through a standard lifecycle and the product roadmap helps firms recognize product phases for better decision-making. When new products are introduced into a market, growth might be slow as customers learn about the new product and its applications. As target customers adopt the product, revenues increase sharply. However, it is at this stage that competition starts to steal market share and profit pressures increase.

A product roadmap helps a firm identify the transition between growth and product maturity. Innovation teams focus on adding features and other market differentiating moves during the product maturity phase to maintain revenue and profit margins. Both technology development and

market insights help companies preserve sales during this stage of the product lifecycle.

Finally, recognizing product decline is one of the most challenging elements in product innovation. Product roadmaps help firms balance decisions to retire or reinvest in products when profits and revenues decrease due to market maturity or product obsolescence. Having a strategic pipeline of new products to fill market offerings at the right time is a benefit in planning illustrated from the product roadmap.

Project Dependencies

Without a product roadmap, it is difficult for project leaders and executives to determine linkages among innovation projects. Viewing the strategic new product development plan on a single chart aids

planning and strategic decision-making. All personnel in the firm can quickly view their activities and alignment with the organization's longer-term vision. Drilling down into details or rolling up product and brand plans into a high-level vision is accomplished with integrated software databases.

For instance, if one product is facing a growth phase in its lifecycle, the organization can balance innovation investment and resources to support that project. It is also clear from the visual presentation of the roadmap if there are too many products at the maturity phase or too few resources to support continued growth across the entire set of innovation projects. In this way, the roadmap helps to integrate the complex task of resource management with strategic growth objectives.



A product roadmap helps a firm identify the transition between growth and product maturity.

As innovation professionals, we measure and evaluate success of individual project implementation through the NPD process.

TOTAL INCOME

37.91%

LINE ITEMS
SHIPPING
TAXES
TOTAL16.15 M\$
0.15 M\$
0%
16.3 M\$

31.86%

LINE ITEMS
SHIPPING
TAXES
TOTAL13.5 M\$
0.2 M\$
0%
13.7 M\$

30.23%

LINE ITEMS
SHIPPING
TAXES
TOTAL13.00 M\$
0.5
0%
13.00 M\$

Benefits of Roadmapping

In today's world, we are bombarded with information. As innovation professionals, we measure and evaluate success of individual project implementation through the NPD process. Yet it is only when all projects are presented graphically that long-range, strategic decisions are highlighted. The product roadmap provides a single dashboard to visualize new product enhancements, feature releases, and new applications across product categories.

In innovation systems with significant information and data exchange, product roadmaps are updated continuously. This gives executives and decision-

makers real-time scenario views to implement the organization's strategic vision. With product launch timing for individual products, product families, and applications shown on a single sheet of paper, decisions to speed up (or slow down) projects facilitates optimal use of all resources (people, money, time, and equipment).

Summary

Product roadmaps are graphical tools to illustrate how an organization's innovation strategy will be executed over time. Because all new products are shown on the same chart, decision-making improves. Companies that use product roadmaps are able to smooth resource consumption and optimize investment over

time.

Organizations that use product roadmaps answer the most important strategic innovation questions. Linking NPD process information from individual innovation projects gives real-time scenario analysis (how). Likewise, integrating PPM (what) with product roadmaps (when) illustrates the overall vision for innovation along with risk-weighted investment decisions. Finally, product roadmaps stabilize and optimize resource utilization (who) so that experts are deployed consistently to design and develop new products bringing value to the company and to the organization.



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