



## Product Roadmaps

### Transforming Strategy into Growth

Strategy by itself only defines the destination and the basic means of travel – there is no growth engine without value added products and services. They provide the means to capture market share and earn superior margins. For industrial products, this requires an understanding of market trends; in-depth knowledge of customer needs and business constraints; analysis of competitive offerings; and assessment of internal development capabilities.

Product Roadmaps provide a useful tool to layout the time phased sequence for new product development and to manage lifecycle cost and performance enhancements. The primary value of the roadmap, however, is drawn from the analysis and decision making embedded in the road mapping process. Key process steps are:

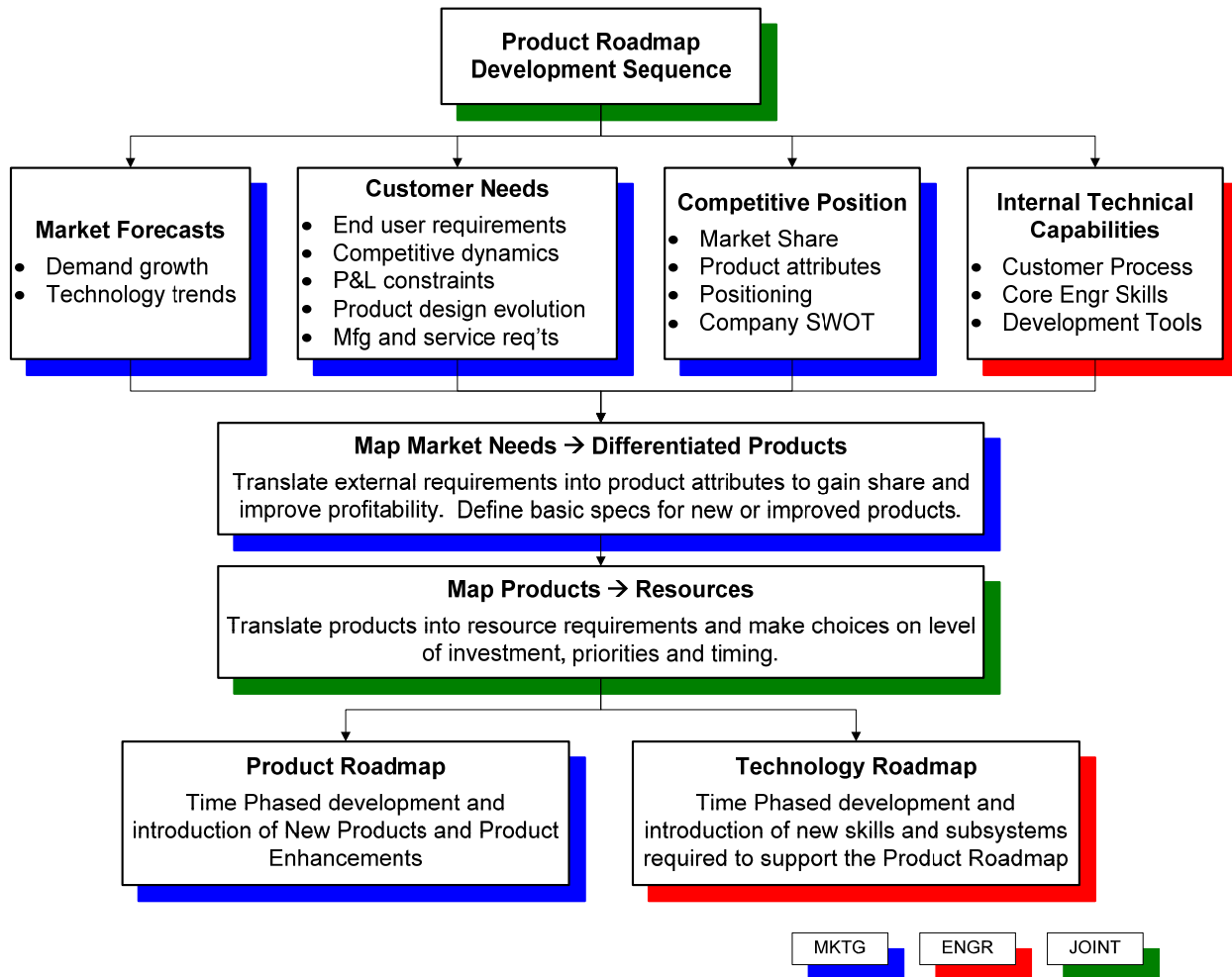


Figure 1 – Roadmap Development Process



Gaining market share is all about anticipating the future and having the right product at the right time. Understanding future requirements includes four types of analysis represented by the second row of the process map (Fig 1).

### **A. Market Forecasts**

Market Forecasts are usually based on publically available data and focus on both industry growth and the evolution of technology.

**Industry Growth** – This is a forecast of the total available market and is used to estimate how much additional revenue should be available with current or expanded market share. These forecasts can be subject to considerable error in the short term. In the semiconductor capital equipment market, the joke was that these frequently had the wrong sign (+/-) when estimating growth for the following year. Over the long haul, however, they are reasonable estimates of the trend line or growth rate for industry sales and provide a useful starting point for internal extrapolation.

**Technology Evolution** – This forecast attempts to predict transitions in product and manufacturing technology that will impact customer needs and buying behavior. These forecasts are also subject to error and are often premature in predicting the obsolescence of existing technology by overlooking the level of innovation and risk aversion that tends to keep existing products and processes in place. They are useful, however, to identify impending change in market requirements.

### **B. Customer Needs**

This analysis is performed by the marketing staff (sometimes supplemented by industry consulting reports). The objective is to understand the dynamics of current and potential customers within well defined market segments. In the case of high value, low volume or heavily customized products, these segments may represent individual customers. The first requirement is to understand the customers' business model:

- How do their products and services address their customers' needs?
- What is the basis of competition within their industry?
- What are their financial metrics – cost drivers, profitability, capital spending?

The intent is to gain insight into how your products can provide the most value and, therefore, generate the highest margin and market share. Value is derived from (a) increasing customer revenue (typically by making their product more competitive), (b) reducing life cycle costs with attributes like faster delivery or higher reliability or (c) providing valuable business assistance such as product design and applications expertise or manufacturing process support.

The next step is to understand how your customers' products are currently designed and how they are likely to evolve. This is best done by establishing relationships with customer R&D personnel and is likely to require some persistence – since these people tend to be isolated from suppliers. To help gain an audience and establish a relationship, you will need to share information that they value about the industry, technology or new products – merely picking their brain over lunch won't work. The most effective people to forge such relationships are your senior technologists and strategic marketing personnel. Their goal is to establish a personal relationship and a



level of trust that supports an on-going dialog – thereby providing early insight into evolving customer needs.

Another valuable source of information can be accessed through your Sales and Service group. They are generally knowledgeable regarding customer manufacturing and support requirements. This gives them insight into (a) situations where current customers’ needs are not being met – creating a performance gap that can be filled or (b) proposed changes in customer business processes that will impact future product and service requirements for your company.

**C. Competitive Position**

The objective of this analysis is to understand how your products compare to competitive offerings and to assess your competitors’ business capabilities.

**Positioning** – There are two elements to this assessment – the first is a simple comparison of market share over several years to see your relative position and market share trend. The second and more complex assessment is a comparison of product attributes to better understand what is driving changes in market share. The two dimensional map in Figure 2 provides an example of how price and some measure of product performance might stack up for two hypothetical firms (blue and yellow). This example suggests the following product evolution:

1. Blue had a performance advantage with first generation products (A & X).
2. This advantage was extended to both price and performance with second generation products (B & Y).
3. The yellow competitor appears to have released a slightly improved third generation product (Z) at a significantly lower price.
4. Blue must now consider whether their third generation product (C) will succeed with substantially higher performance but higher price as well.

While this example is oversimplified, it represents how you might characterize where your products fall relative to the alternatives. In practice, product attributes would be analyzed in much more detail to make comparisons that are relevant to specific customer decision criteria.

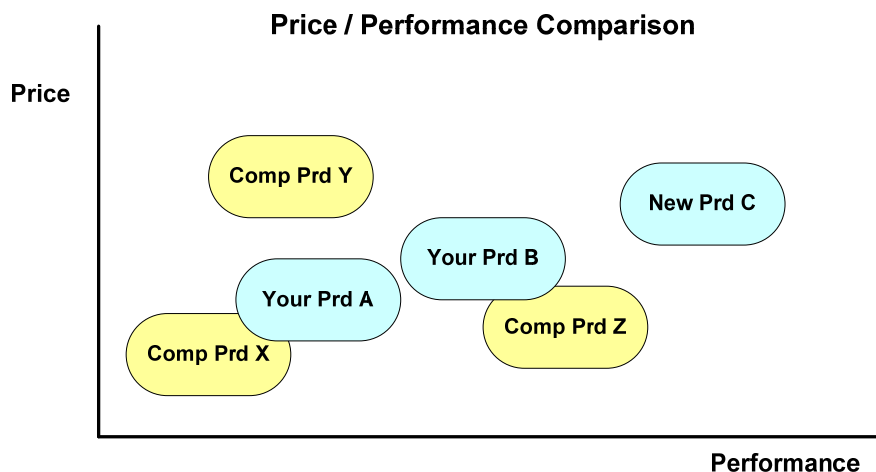


Figure 2 – Simple Positioning Example



**Business Attributes** – Beyond comparing products, it is essential to understand your competitors’ business constraints and strategy. A simple but effective tool for this assessment is SWOT Analysis. In figure 3 below, Strengths and Weaknesses in the top row reflect internal company capabilities. Opportunities and Threats in the second row represent external factors. This summary table provides a snapshot for communicating key factors that will influence a competitor’s business decisions.

<p style="text-align: center;"><b>Strengths</b></p> <ul style="list-style-type: none"> <li>■ Access to critical expertise</li> <li>■ Exclusive access to resources</li> <li>■ Patents or New product or service</li> <li>■ Location or Cost advantage</li> <li>■ Quality of processes and procedures</li> <li>■ Strong brand / reputation</li> </ul>	<p style="text-align: center;"><b>Weaknesses</b></p> <ul style="list-style-type: none"> <li>■ Lack of critical expertise</li> <li>■ Competitors have access to better resources</li> <li>■ Commodity products or services</li> <li>■ Location or cost disadvantage</li> <li>■ Poor quality of goods and services</li> <li>■ Poor brand / reputation</li> </ul>
<p style="text-align: center;"><b>Opportunities</b></p> <ul style="list-style-type: none"> <li>■ Developing or new market, new segment</li> <li>■ Mergers, JV, alliances</li> <li>■ Improving regulations, trade barriers</li> <li>■ Weak competitors</li> </ul>	<p style="text-align: center;"><b>Threats</b></p> <ul style="list-style-type: none"> <li>■ New competitor in home market</li> <li>■ Price war</li> <li>■ Competitor has new product or service</li> <li>■ New regulation, trade barriers</li> </ul>

*Figure 3 – Strengths, Weaknesses, Opportunities and Threats (SWOT) Analysis*

Coupled with product positioning, the SWOT analysis can be used to anticipate competitors’ actions and find weaknesses to exploit. Some companies formalize this process by assigning employee teams to develop business plans as though they were working for the competition. These are used to test various scenarios such as:

- Assuming competitor A follows the strategy predicted by your role playing team, how should you respond?
- Assuming that your company introduces new product Z, how is competitor A most likely to respond?

These “war games” are useful to help develop and test your business strategy and product line development plans.

**D. Internal Technical Capabilities**

Existing technical resources represent opportunities or constraints on your ability to define and develop competitive products. The team should determine the implications of proposed new products or product design changes on:

**Customer Product & Process Knowledge** – As suggested in the Customer Needs section, it is critical that you have the expertise to intelligently engage customer R&D personnel. This is only possible when you have a thorough understanding of how their products are designed and used. For capital equipment, this extends to an understanding of how end users’ apply the equipment in manufacturing.

**Core Engineering Skills** – The scientific and engineering disciplines required to conceive of and design new products. These include traditional engineering skills, control / software expertise and PhD level scientists in areas unique to your market.



**Development Tools** – The computational and physical assets required to perform the design and development work. They include both software (FEA, CAD, PDM, etc) and hardware / lab space required to test designs and/or simulate field applications.

Returning to the process map in Figure 1, the third and fourth rows represent the steps where creativity and decision making dominate the roadmap exercise. It is here that the insight gained during the analysis phase must be channeled into creative product concepts and then distilled into an action plan by making the inevitable trade-offs in technical performance versus cost, risk, time to market and available resources.

**E. Map Market Needs → Differentiated Products**

The process of defining next generation products is largely intuitive and iterative. Experience with existing products and insight gained from the analysis steps - when combined with creative personnel and strong marketing & technical leadership – is used as the basis for brainstorming new product ideas. These are evaluated and refined, searching for a combination of features that provide unique value to customers at an appropriate price point. Either as part of this creative process or as part of the subsequent product definition, the relationships between product attributes and customer needs must be clearly elaborated. This linkage is essential in order to communicate the requirements to engineering, sell the investment to management and provide sales materials that emphasize customer value. Figure 4 below represents a visual tool to help display these relationships.

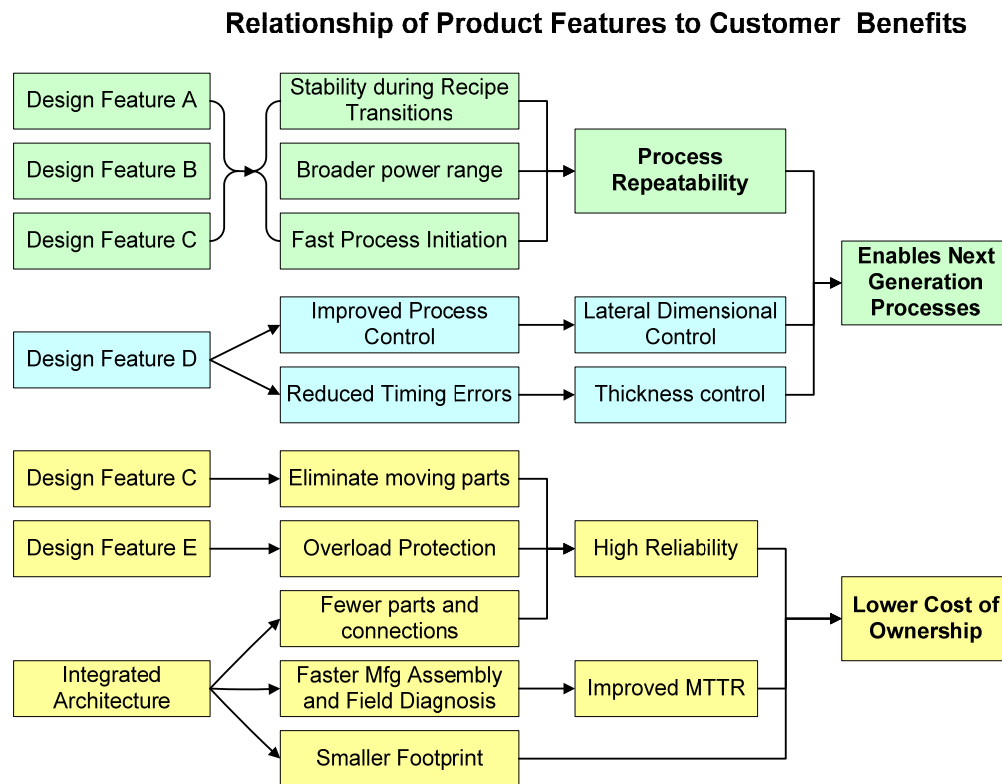


Figure 4 – Mapping Design Features to Customer Benefits



In practice, all proposed new products and product enhancements are subjected to this feature / benefit analysis. They are then rank ordered according to strategic importance and margin potential. Those near the top of the list are further defined with a preliminary business plan – often referred to as a “Marketing Requirements Statement” (MRS) – which documents in more detail the market need, product features, competitive positioning and impact on product line share & profitability.

**F. Map Products → Resources**

Unfortunately, regardless of company size, the list of potential projects always exceeds available resources. As a result, the project list must be consolidated to a feasible set of actions. Engineering is brought into this decision making since they will be providing the bulk of the resources for design, development, qualification and release of the products. When any of the potential products represents a significant change in the manufacturing or support processes, it is critical to add these functions to the resource assessment as well. Ignoring these functions can lead to delays in market introduction and missed cost targets – significantly impacting customer acceptance and ultimate market share. Once all the functional groups have estimated the resources, cost and schedule implications of candidate products, marketing can perform a final rank ordering based on the combined market, financial and resource impacts. A cut-off point for project funding is established based on the available financial and human resources.

Returning again to Figure 1, the last line of the process map displays the deliverables used to communicate decisions and track progress. Each roadmap displays a time phased sequence of projects to deliver the selected set of products or technologies according to the schedule agreed to by the functional participants. A sample product roadmap is:

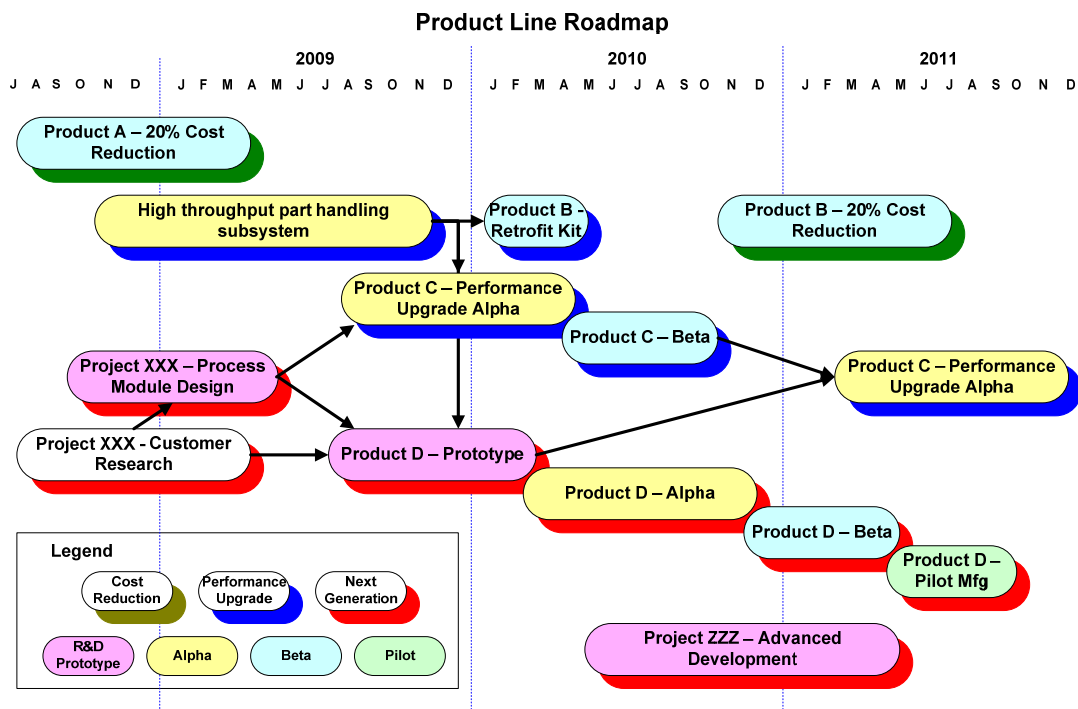


Figure 5 – Sample Product Roadmap



### **G. Product Roadmap**

The roadmap in Figure 5 has color shadows to identify projects driven by cost reduction, performance enhancement or next generation requirements. Individual project blocks are also color coded according to the step in a typical phase gate development process (prototype, alpha, beta and pilot). Once completed, the roadmap becomes the primary communication tool to summarize development priorities and timing. It must, of course, be backed up with detailed product specifications and on-going project management.

The project schedules embedded in the roadmap were developed on the basis of external market requirements and internal resource constraints. Both during the creation of these schedules and when reacting to contingencies during product development, it is critical to remember the importance of “time to market”. Innovative products and services have the most impact when they arrive just as customers are discovering new requirements and before competitive offerings are available. In addition, industrial customers often have a “market window” or time period when they are evaluating new products and are most open to changing suppliers. These market windows are typically based the industry moving to a new technology or a customer developing a next generation product. Failure to meet this timing can result in step function losses of market share that last several years. As a result, marketing product managers must provide strong leadership to avoid over committing internal resources and to adjust priorities (including dropping projects) to ensure that the most critical projects meet market timing requirements.

### **H. Technology Roadmap**

The same type of tradeoffs and graphical representation can be applied to new, high risk technologies (such as a new process module or control system). For example, project ZZZ on the roadmap in Figure 5 may well require a new subsystem unlike anything previously developed. Embedding such a “science project” within a tight product development schedule is almost certain to result in delays, cost overruns and potential project failure. R&D projects such as these are typically performed in advance of a full scale product development commitment. The technology roadmap is the right place to identify the staffing, funding and priority of these more speculative developments. The technology roadmap can also be used to identify new development tools and qualification facilities required for future products. When completed, it will have a format similar to the product roadmap and will represent the investment being made to support long term, breakthrough capabilities.

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Product Roadmaps are simple diagrams that enable companies to communicate, manage and measure complex product development activities. Their effectiveness, however, relies on extensive analysis of the market, customers, competitors and internal capabilities. The insight gained from this exercise is used to create new product concepts, refine their relative priority and define requirements for capital and human resources. This process can be both complex and controversial since, as the saying goes, “The devil is in the details”. A process



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map and several conceptual tools have been presented that help with the analysis and communication of new product requirements and the resulting development priorities. The end result, however, will depend upon the dedication of your team to gain in-depth understanding of customer opportunities and their ability to define and develop innovative, high value products and services.

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