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An R&D Leader's Guide to Technology Roadmap Models



Technology roadmaps are powerful tools for visually communicating technology-driven opportunities and plans. R&D leaders have three models to choose from — market-pull, technology-push and hybrid. This research explains when to use each.

Overview

Key findings

- Translating technology strategy into a roadmap is a challenging exercise. Successful companies build models that align to their planning approaches and that help inform relevant decisions.
- R&D technology roadmaps tend to fall on a spectrum between fully market-driven and fully technology-driven, with hybrid variations in between.
- Gartner has seen use of the three roadmap models change over time, with a moderate trend toward market-pull models. Regardless of trends, however, each option has both strengths and drawbacks.

Recommendations

R&D leaders responsible for technology strategy and roadmapping should follow these recommendations:

- Use market-pull technology roadmaps to support known business goals. These roadmaps are most effective at helping teams prioritize technology project goals based on business partner needs.
- Use technology-push roadmaps to create new market opportunities. These roadmaps challenge organizations to think beyond their near-term product strategy and to identify capability gaps that must be filled via acquisition, partnerships, recruiting, internal technology or talent development.
- Use hybrid technology roadmaps to support both near-term product needs and long-term technology opportunities. These roadmaps encourage long-term planning and enterprisewide capability development, while grounding those plans in tangible business needs and goals.

Introduction

Technology roadmaps are visual frameworks that depict how technologies will evolve to support technology and business strategy. They help R&D leaders assess and communicate capability gaps, prioritize technologies to support growth opportunities, and drive stakeholder alignment on key technologies. Translating a technology strategy into a roadmap is a challenging exercise. To ensure a roadmap clearly communicates technology strategy and informs critical discussions and decisions, R&D leaders need to reflect on the three options they have for modeling a technology roadmap:

- Market-pull
- Technology-push
- Hybrid

Gartner has seen use of the three roadmap models change over time, with a moderate trend toward market-pull models. Regardless of trends, however, each option has both strengths and drawbacks. To maximize benefit from their technology roadmap, R&D leaders must choose the model that best aligns to their use case, goals, scope and time horizon. Table 1 compares the three models, summarizing when to apply each.

Table 1: Comparative Analysis of the 3 Technology Roadmap Models

	Market-Pull	Hybrid	Technology-Push
Objective	How can technology support business goals?	How can technology support product roadmaps and create new growth opportunities?	How can technology create new market opportunities?
Use Cases	<ul style="list-style-type: none"> • Plan technology investments to support product roadmaps or launch plans • Respond to market shifts • Optimize capability allocation for portfolio management • Support decentralized R&D planning 	<ul style="list-style-type: none"> • Articulate R&D support for near-term product needs and long-term technology opportunities • Emphasize centralized technology investments with enterprisewide impact • Encourage longer-term planning and vision-setting 	<ul style="list-style-type: none"> • Create a long-term vision for R&D • Identify organizationwide platform or capability development • Prioritize competencies for strategic advantage or future differentiation • Outline a partnership or acquisition strategy for emerging technologies
Key Inputs	<ul style="list-style-type: none"> • Product roadmap, plan or strategy • Business and consumer trends • Prioritized list of customer needs and product attributes 	<ul style="list-style-type: none"> • Same as market-pull and technology-push 	<ul style="list-style-type: none"> • Technology trends and competencies • Growth opportunities from differentiated technical competencies

Features	<ul style="list-style-type: none"> Aligns technology to business needs or product strategy Assists in resourcing decisions 	<ul style="list-style-type: none"> Assists in resource planning and strategic innovation Serves as a useful communication tool to highlight technology-push opportunities or needs with business partners Highlights critical technology investments for growth 	<ul style="list-style-type: none"> Encourages longer-term thinking Assists in transformational ideation Enables strategic workforce planning Identifies centralized technology investment opportunities
Drawbacks	<ul style="list-style-type: none"> Difficulty diagnosing longer-term capability gaps, as product plans tend to be detailed only in the short term Blindspots in the product strategy Difficulty planning cross-product technology investments 	<ul style="list-style-type: none"> Tendency to overemphasize the product support components, resulting in a market-pull roadmap Extensive collaboration between multiple stakeholders Extensive, and often enterprisewide, data collection and analysis Difficulty organizing data into one visual 	<ul style="list-style-type: none"> Time demands Difficulty getting buy-in on technology ideas not explicitly linked to product plans Challenges identifying longer-term product applications or technology-based growth opportunities
Time Horizon	3 to 5 years	5+ years	5+ years
Scope	Product categories, BUs or regions	Technology platforms and product lines	Technology platforms or areas
Owners	Technology and marketing leaders, product managers, or general managers	Technology and marketing leaders, product managers, or general managers	Technology leaders

BU = business unit

Use market-pull technology roadmaps to support known business goals

R&D organizations use market-pull roadmaps to plan how technology can support known business goals or customer needs. In their simplest form, these roadmaps depict the technology competencies required to support product roadmaps or launch plans (see Figure 1). These roadmaps are most effective at helping teams prioritize technology project goals based on business partner needs.

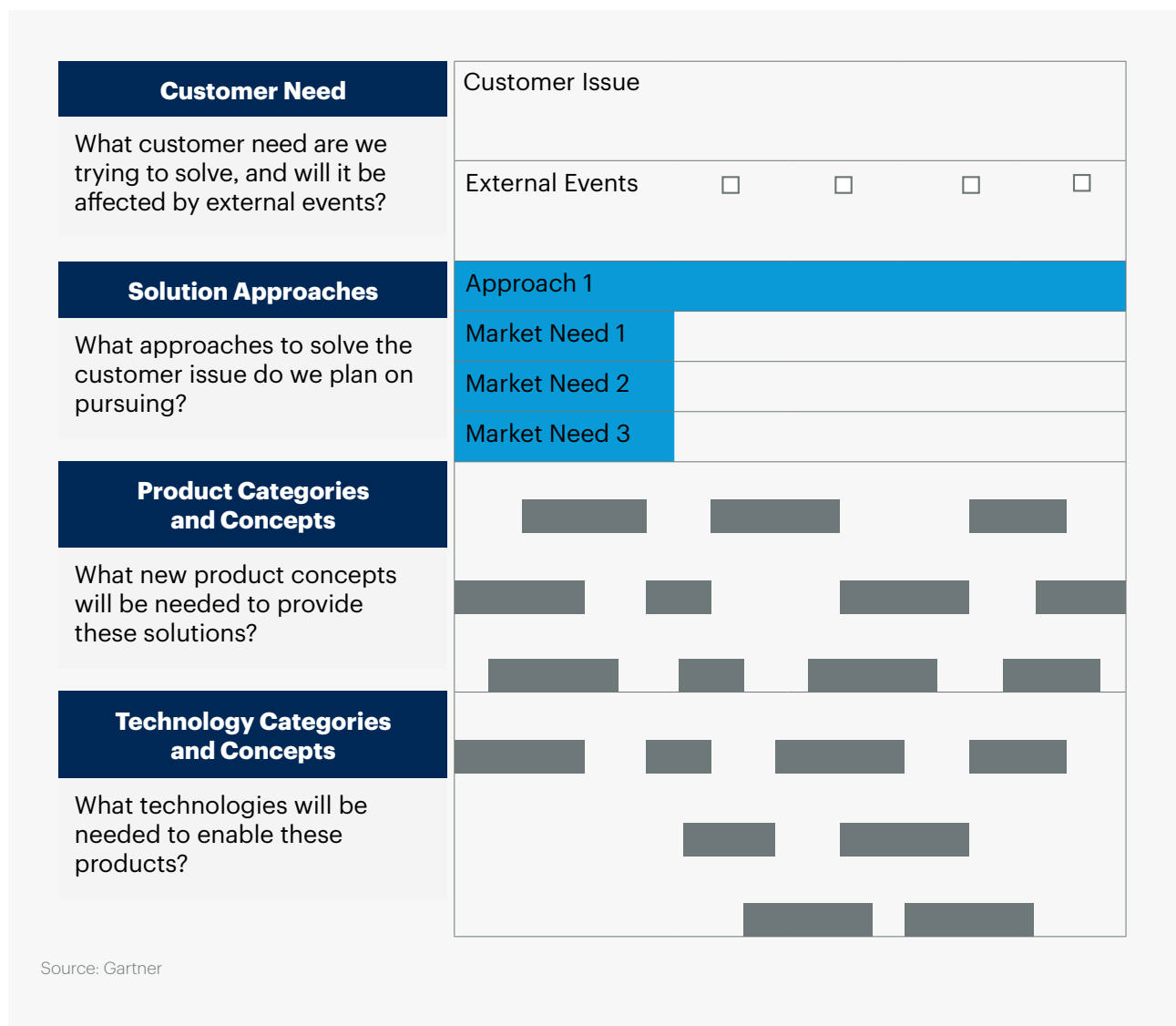
Companies typically use product needs (i.e., features, attributes and specifications) outlined in product roadmaps as a starting point to diagnose capability gaps and technology needs. In the absence of a detailed product strategy, R&D should work with business partners to:

1. Understand their assumptions about emerging trends, industry dynamics and future customer needs
2. Help them articulate the critical product attributes required to fulfill these needs

Roadmapping teams can also identify future customer needs by conducting their own trend, technology, market and industry analyses to understand the impact of customer needs on the business in the roadmap time horizon.

Market-pull roadmaps tend to have shorter time horizons, three to five years on average, and are most often scoped to support a specific business or product category. Given their product orientation, market-pull roadmaps require R&D teams to closely collaborate with their marketing and business stakeholders during the scoping and analysis phases.

Figure 1: Market-Pull Technology Roadmaps



Source: Gartner

While market-pull roadmaps are effective for clarifying the specific technologies needed to support product plans, they have a few drawbacks. For example, they often become quite tactical and struggle to push the organization to think beyond near-term, well-defined customer or market product needs. If the company needs to generate a fresh longer-term vision for the technology organization, market-pull roadmaps may not be the appropriate model to select. In addition, it is difficult to identify cross-BU or cross-product opportunities because the analysis tends to be reflected in separate siloed roadmaps.

That said, for R&D organizations that are brand new to roadmapping, market-pull roadmaps can be a useful starting point. Roadmapping teams will build know-how and experience by going through the roadmapping exercise, even if it focuses at first on adding more detail to the nearer-term, business-driven needs. After building a market-pull roadmap, teams can add on technology-push portions and create a hybridized version over time.

Use technology-push technology roadmaps to create new market opportunities

Technology-push roadmaps depict potential product and market growth opportunities driven by differentiated technologies. Technology-push roadmaps tend to be longer-term, often including analysis that recommends investments over the next five to 10 years.

Two styles of technology-push analysis exist:

- **Differentiating internal capabilities:** This approach involves prioritizing the most valuable, differentiated, existing internal technologies and brainstorming a future-technology-led development pathway. Roadmapping teams can use the following questions to identify technology focus areas:
 - What technical discoveries have we made that provide substantial differentiation versus competitors?
 - What privileged insight do we have into customer needs and behavior that is unavailable to our competitors?
 - What unique ways of applying technology to problems have we identified that competitors have yet to recognize?
- **Integrating emerging (often external) technology opportunities:** This approach involves tracking new technologies (or those used in adjacent spaces) and brainstorming how they can improve existing offerings or deliver new product/features. New technologies can be sourced directly from technology scans or the organization's recent technology scouting.

These styles are not mutually exclusive, and many companies reflect both types of analyses in the same roadmap. In both approaches, roadmapping teams should prioritize the technology competencies to be developed based on their ability to create competitive advantage and future differentiation.

Technology-push roadmaps challenge organizations to think beyond their near-term product strategy and to identify capability gaps that need to be filled via acquisition, partnerships, recruiting or talent development. However, true technology-push roadmaps are often disconnected from core product strategy, making it difficult to get buy-in from business stakeholders to pursue riskier or new types of technology investments. As a result, recommended investments in these roadmaps tend to have a lower commercialization rate than investments in market-pull roadmaps.

Use hybrid roadmaps to support both near-term product needs and long-term technology opportunities

Hybrid roadmaps are a combination of the market-pull and technology-push models. These depict both:

- The technology competencies required for product launches
- A prioritized set of technologies with potential to create long-term competitive advantage

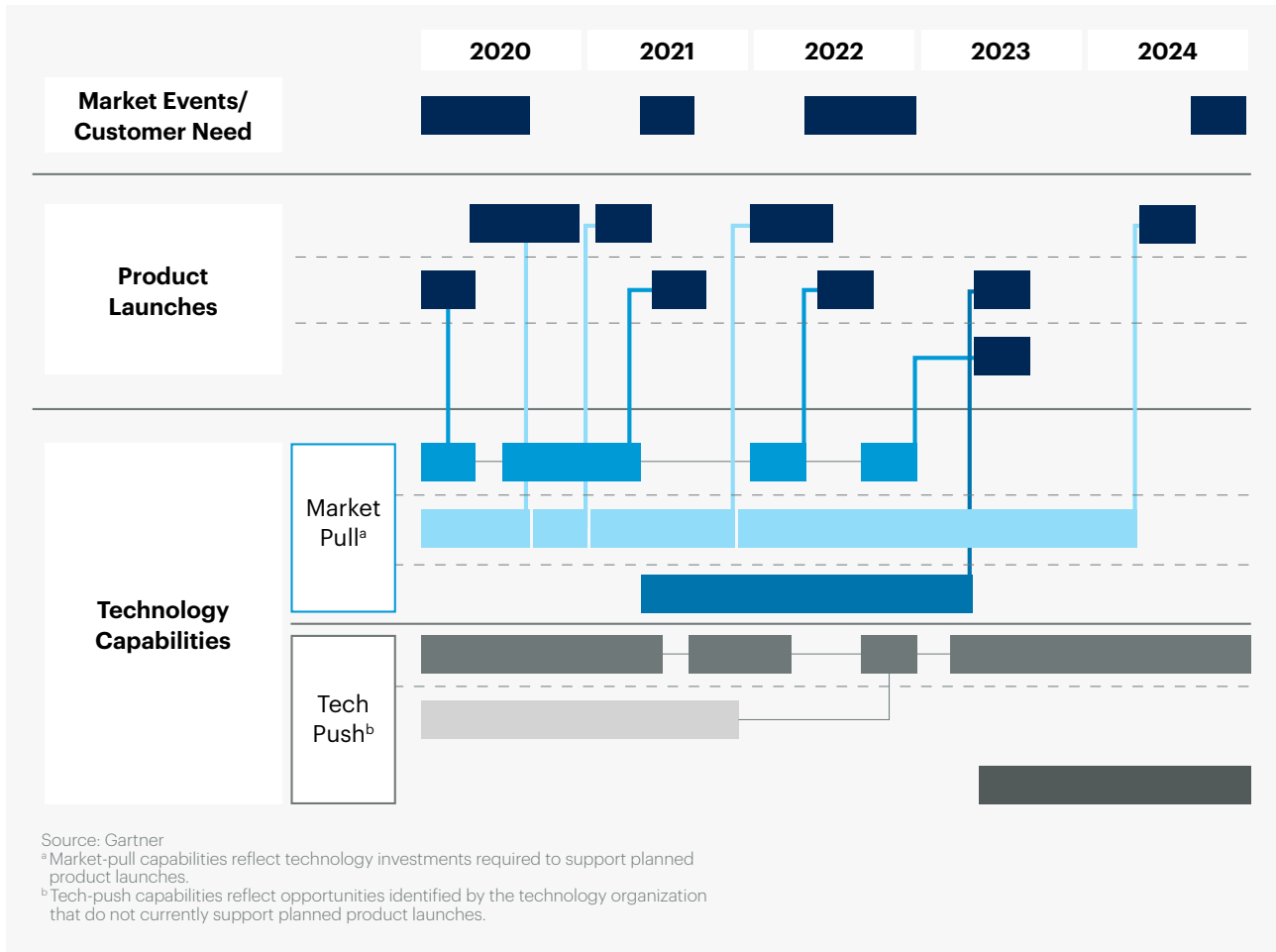
Gartner has seen numerous versions of hybrid roadmaps — some that are closer to market-pull, others that closer to technology-push, and some that are a 50%-50% split.

In practice, most companies first conduct the near-term market analysis that identifies the technologies needed to support product strategy (market-pull activities). They then identify additional growth opportunities from either differentiated internal technology platforms or emerging technologies (technology-push activities). These growth opportunities often span multiple BUs or product lines. This model allows R&D leaders to create a roadmap that encourages long-term planning and enterprisewide capability development, while still grounding those plans in tangible business needs and goals (see Figure 2).

Hybrid roadmaps are particularly well-suited for planning the organization's reaction to emerging market and technology developments, or for charting R&D's support of a business transformation. Given the volume of analysis that could be included in these roadmaps, some organizations struggle to build elegant one-page visuals. In those cases, a hybrid roadmap might take the form of a multipage story that walks stakeholders through the various components or levels of analysis and related recommendations.

At the start of a roadmapping exercise, most companies report that they plan to build a hybrid roadmap. However, in practice, many companies deprioritize the technology-push analysis to accelerate completion of the roadmap. In other cases, they end up building a market-pull roadmap because business stakeholders are not interested in the technology-push aspects. To avoid these pitfalls, R&D leaders should build a realistic project plan for the roadmapping team, with specific time allocated for conducting technology-push analysis. In addition, they should front-load the technology-push work to avoid the speed trade-off toward the end of roadmapping.

Figure 2: Hybrid Technology Roadmap



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