

Strategic and Technology Planning on a Roadmapping Foundation

**Philip J. Whalen
Principal
Whalen Management Group**

OVERVIEW: Growth through innovation requires not only good technical ideas but alignment of priorities between all the functions responsible for successfully developing and commercializing the idea. The ability to create, modify, and maintain this alignment as business conditions change, new opportunities arise, and new capabilities are developed can mean the difference between capturing the benefits of being a market leader versus a market follower. Roadmapping has emerged as a best practice, particularly for large, global organizations (i.e. Honeywell Intl., Boeing Corp, Motorola), in providing the framework for technology strategy creation and management where cross-functional alignment and integration is a key requirement. By employing roadmapping from an enterprise perspective, where key functions in the business “own” their individual strategies which are fully integrated as needed to meet business priorities, an organization can fully exploit its entire spectrum of capabilities to drive growth.

Key Concepts: Technology Roadmapping, Strategic Planning, Technology Alignment

1.0 Introduction

Effective enterprise strategy and technology management for the purpose of driving growth through innovation has two basic challenges:

1- Elements of business strategy will need to be continuously modified to respond to changing market conditions - strategic business and technology planning processes must become integrated and “real-time” as opposed to annual or serial events in order to maintain competitiveness

2 – Maintaining strategy alignment between business functions (i.e. marketing, product ownership, technology...) and across the extended enterprise (corporate, divisions, business units, product lines, partners, suppliers...) while strengthening the ability to continuously innovate and address new business opportunities is key.

Strategic Planning has been defined as “a disciplined effort to produce fundamental decisions and actions that shape and guide what an organization is, what it does, and why it does it.”¹ For the purposes of driving growth, a strategic plan is a business process which combines an analysis of the markets a company currently or wishes to participate in, with the necessary capabilities, products or competencies required to fulfill customer needs in those markets, in a plan that produces a desired business result. Roadmapping.^{2,3,4} has emerged as an extremely effective process for creating and visualizing these relationships. If applied as an enterprise framework, roadmapping has the potential to provide a bridge between all the tactical decision processes, different business functions, and organizations through the common element of time. Roadmapping has been applied to support a number of different specific objectives in a number of different formats⁵ and is flexible enough to be customized to adapt to most functional and organizational structures. If the definition of a roadmap is generalized to being a visualization of strategy or strategy elements, then the use of roadmaps can be extended to support any decision process. Roadmaps should not just be viewed as the outputs of a process, but rather a snapshot of a “rolling” strategy at any moment in time. Within this definition, roadmaps play two very distinct roles; 1) they establish the

Whalen, P. J. 2007. Strategic and Technology Planning on a Roadmapping Foundation. *Research-Technology Management*. May-June. pp. 40-51.

necessary linkages over the planning period between all business functions to meet prioritized targets and 2) they provide a palette upon which alternative strategies, future business scenarios and innovation driven opportunities can be assessed. Roadmaps in this sense, provide the framework within which all the time based business function strategies of an enterprise can be aligned on a continuous basis in support of the business's goals.

The proposed enterprise planning approach treats roadmapping as a foundation management process, providing both the input and communicating the output of any decision process and not a separate, isolated company initiative. This article will provide the reader with a generic enterprise roadmapping framework that can be applied to support innovation driven growth strategies and technology management process improvement.

2. Enterprise Planning Boundary Conditions and Framework

The term "Enterprise planning" is defined here as being the process by which each function (i.e. marketing, product ownership, technology, etc) in an enterprise creates, modifies, and maintains their own strategy in support of ongoing business decision processes. An enterprise plan is the integrated combination of all the functional plans representing that organization's strategy. Functions within the business own responsibility for gathering, evaluating, and prioritizing certain elements of strategy (business decisions) on an ongoing basis. For example, Marketing might own the responsibility of sensing trends, evaluating customer needs, and prioritizing opportunities in a specific market segment; therefore Marketing would "own" the strategic elements containing that information and would update, validate, and maintain those elements as part of their basic business function. This ownership includes the creation and maintenance of a roadmap (visualization of strategy) containing those strategy elements on a time baseline. Ownership also implies responsibility for creating and maintaining the necessary relationship linkages between strategy elements from other functions. These linkages are created in response to meeting specific business objectives; for example, linking all the product and technology development elements required to satisfy a particular key business opportunity "owned" by marketing.

The second key tenet of the enterprise planning approach is that the individual functional strategies/plans and their associated linkages to other plans are created and maintained in support of ongoing business processes and not as a separate initiative. The associated enterprise planning roadmap framework should be derived from the information flow and decision requirements of the key processes under consideration. The most obvious process driving the creation and maintenance of a fully integrated enterprise plan would be the company's strategic and technology planning process; but other processes like Product Portfolio management and Gated Product Development, Ideation Processes, Future Scenario Analysis, Key Account Management, Competitive Analysis, Business Intelligence Analysis etc. all require enterprise planning information and roadmaps as input and to communicate output (decisions). For example, decisions in gate review processes require roadmaps for assessing strategic fit (input), and those same roadmaps would then need to be modified based on the Go/NoGo decisions rendered in those same

Whalen, P. J. 2007. Strategic and Technology Planning on a Roadmapping Foundation. *Research-Technology Management*. May-June. pp. 40-51.

gate reviews (output) – essentially updating the strategy and associated roadmaps as needed. GM has made an assessment of their technology roadmaps a designed part of their technology planning gate review process leading to a consistent review (and maintenance) of their roadmaps throughout the year⁶. In this fashion, the enterprise plan is continuously reviewed and updated by those responsible for the information and the alignment of the organization to the current strategy is maintained as a natural course of business.

These two tenets, when taken together, define a roadmapping based strategy creation and management framework which supports strategic and technology planning and management. The approach is general and can be applied in support of any specific roadmapping architecture or planning process. It does not obviate the need for rigorous planning and business process discipline which are required to create the necessary knowledge, cross-functional relationships and linkages, and decisions which will be captured in the enterprise plan. A study lead by the University of Cambridge on the implementation of technology roadmapping indicated that one of the key challenges to maintaining a successful technology roadmapping practice is “keeping the process alive.”⁷ This challenge is significantly reduced when roadmap creation and update requirements are made, as needed, in support of ongoing decision processes and are made by the responsible functional owners of the data as part of routine business operations.

3. Model Enterprise Planning Framework

To better illustrate the features of the proposed enterprise planning approach, a model roadmapping framework will be described based on the enterprise planning architecture the author developed for Honeywell, Inc. in 2001. It is important to re-iterate at this point that any enterprise planning framework will only be successful if it is derived from the key planning and decision processes of the organization in question. The large variation from company to company in culture, management styles, and process specifics precludes the use of this exact framework across the board.

Prioritizing the key objectives of the planning process improvement and identifying the major processes which will be used to define the basic architecture of the enterprise plan, is the first step in creating the framework. At Honeywell, the need for an improved roadmapping discipline grew out of a desire to improve the link between technology innovation, product development and customer needs. In this case, the basic strategic and technology planning processes were used to define the enterprise planning framework with particular focus on product development sub-processes. A high level process map of the key elements of strategic planning showing information flow inputs and outputs, and required linkages was created and is shown in Figure 1. This process map fits very well with the industry standard roadmap framework which has been used successfully in many different roadmapping initiatives.^{8,9} Creating relationships and alignment between specific Goals, Drivers, Customer Need, or Priority, with the organization’s ability to produce revenue (products, services, systems, etc) and the ability to develop the required capability to support that revenue (innovation, technology, partners, suppliers...) is the basis of the framework. The two-way arrows in the flow diagram indicate the iterative

Whalen, P. J. 2007. Strategic and Technology Planning on a Roadmapping Foundation. *Research-Technology Management*. May-June. pp. 40-51.

nature of the process which should be anchored in meeting customer needs from either an “outside-in” (market pull) or “inside-out” approach (innovation and technology push). Both approaches need to be included in the framework to optimize the potential of an organization’s current and developing capability.

Evidence has shown that strictly following the market pull approach will eventually result in commoditization of the market, shrinking returns for ever more difficult improvements and potentially missing high value disruptive technology commercialization opportunities.¹⁰ The development of a strategy which includes an assessment of potential disruptive and game changing innovations is key to sustaining a viable long term business. Commoditization and obsolescence need to be dealt with in a planned way, with a constant stream of innovation to continuously refresh existing capability, fill gaps and deal with planned product end of life.

The three tiered framework represented in Figure 1 is highly generalized and should not be read to infer that only three levels of strategy or three kinds of roadmaps are needed to fully represent a strategy. The actual framework selected should be a direct reflection of the planning processes used in the business and adding additional categories of roadmaps and process steps as needed is appropriate. For example; many public sector, non-commercial technology organizations include a set of roadmaps succinctly calling out the “Goals” or “Objectives” the organization is targeting over time in place of prioritized Growth Opportunities.

The multi-dimensional nature of strategy, means that each function in a business has a different perspective of what should be emphasized and what needs to be represented in a roadmap to meet their particular management needs, based on their role in the organization. For the purposes of this discussion, the individual Function Strategy roadmaps will be called the Foundation roadmaps; Figure 2. Each Foundation roadmap contains only that information that is pertinent to the scope of responsibility of the owner of that roadmap. The owner of the roadmap has full responsibility for creating and maintaining their piece of the Foundation. Linkage between elements of strategy from the different functions form cohesive business strategies or Strategic Initiatives such as Key Account strategies, Key Growth Program strategies, and Solution and Services strategies. By clearly separating Foundation roadmaps from Strategic Initiative roadmaps, the framework enables the ability to maintain synchronization of strategy between individual roadmaps and integrated, higher level strategies which may be combinations of pieces of several Foundation roadmaps. Configuration control and accountability of the data is maintained by ensuring that the person responsible for the data is the only one who can modify the information. This construct also enables each individual roadmap owner to clearly view their participation in the overall strategy, by creating linkages that only pertain to their scope of responsibility; Figure 3. For example, the person responsible for a particular Technology platform can construct linkages to all the specific Product platforms that technology supports, and perform analyses to determine impact and evaluate trade-offs. Likewise, all the product and technology development activities required to support a particular Key Driver or Opportunity can be

Whalen, P. J. 2007. Strategic and Technology Planning on a Roadmapping Foundation. *Research-Technology Management*. May-June. pp. 40-51.

extracted from the Foundation roadmaps, illustrating the strategy from the Driver perspective. Both views are created by pulling data from a different subset of the Foundation roadmaps to maintain synchronization across the enterprise.

The following sections will give a brief description of the kind of formats and data that can be captured in each section of the roadmap framework to support overall planning process improvement. It is important to note that the Gantt chart representation, while commonly used for roadmapping, is not sufficient to completely represent the intended strategy. Additional supporting documentation such as detailed forecasts, trend analyses, gap closure plans, action plans, and alternative visual formats (i.e. decision matrices, bubble charts, spider diagrams) provide the necessary back-up to support fact based decision making based on the strategy.

3.1 Environment Analysis/Marketing Strategy: External Drivers and Goals

In the three tiered framework represented in Figure 1, the Environmental Analysis and Market Strategy level needs to have the most flexibility in terms of how information and decisions will be represented in corresponding roadmaps. The basic intent of this level is to provide a means for Marketing and Business development to capture and analyze all the external drivers which help frame the identification of windows of opportunity. This section should have a decided “outside-in” flavor where the data should be represented from an industry or customer’s perspective. Examples of information that might be included in this section would be:

1. Pertinent sections of standard industry roadmaps (i.e. ITRS roadmap) in which the business participates in or is a supplier to.
2. Planned government regulatory actions or new standards which will influence participation in a certain market
3. Customer roadmaps indicating planned entry into service of certain platforms the business would like to supply including required supplier specifications
4. Results of Voice of the Customer tools indicating both immediate and future customer needs
5. Industry trends – even if speculative, help provide guidance for future development
6. Competitor positioning; description of competitive business models, launch dates, attributes

A second tier in this section would be a clear representation of the prioritized targets, goals, or opportunities that result from the market analysis and which will be the basis for aligning tactical development investment decisions. Often times this analysis is done in ancillary processes using tools such as Decision Matrices where segments and opportunities are ranked using an agreed upon set of weighted criteria. The final output represented in the Environment roadmap should clearly indicate the results of the distilled marketing strategy and the preferred direction for the business, Figure 4.

3.2 Product Strategy: Product Roadmaps

Whalen, P. J. 2007. Strategic and Technology Planning on a Roadmapping Foundation. *Research-Technology Management*. May-June. pp. 40-51.

The term “Product” here is used to represent any form of offering the business uses to generate revenue which could include hardware, software, components, systems or services. The Product strategy should represent the manner in which the business will respond to the marketing strategy and goals/targets laid out in the Environment section. This strategy should detail how the business has decided to convert the key customer needs into product offerings which will be differentiated from competition and win in the marketplace. To ensure accountability and ownership of the data in this section, roadmaps can be organized in terms of the defined profit and loss centers at any level of the business organization hierarchy which own the revenue targets for those products represented in the roadmaps. For example, a manager or product owner of a specific product line should “own” the product platform roadmap representing the current and future products used to generate the revenue forecast he/she is responsible for in the overall business strategy.

Product roadmaps should represent all the elements of product lifecycle which need to be managed to hit financial targets and help guide technology/capability development. In general the map should contain information on the current products/platforms available in the market and at least two generations of new products evolving from that platform. These can be represented in a variety of ways but the basic information captured could include: (Figure 5)

1. Product development start and finish dates
2. Product launch dates
3. Indication of Product availability in the market including End of Life date
4. Specific Key Attributes/Specifications for each Product which are required for financial success of that product in the market (validated with marketing). These attributes should represent those key specifications that technology/capability development will target.
5. Product roadmaps from critical suppliers or partners providing subcomponents or system elements required for or embedded in this particular product/platform.

Other optional information could include competing product roadmaps (attributes and availability), intellectual property strategy (plan for what and when products will be patented, trademarks will be issued, or decision to designate as a trade secret).

A variety of graphical methods can be used to convey aspects of the Product Strategy in a Product Roadmap. Experience has shown that minimizing the range of choices of both symbols and color coding will ensure quick and easy interpretation of roadmaps from across the organization. Only critical information needs to be represented visually on the roadmap with the understanding that provisions for storing and accessing back-up detail will be made. This back-up detail can include data supporting the New Product Development process used in the business such as the full product commercialization plan, development costs and funding models, development issues and risk mitigation plans.

Capturing product availability in the Product Roadmap enables the business to plan and manage both product introduction as well as product obsolescence. Too often, roadmaps only represent future product introduction plans which neglect to account for current products which will be affected by those introductions. Actively managing the retirement of current products also helps avoid getting locked into price sensitive commoditization strategies which can significantly reduce margins.

3.3 Technology Strategy: Technology Roadmaps

While Product Strategy details how the business will generate revenue, the baseline Technology Strategy should represent all those capabilities requiring investment or alignment to achieve the key product attributes defined in the Product Strategy. These technologies or capabilities can come from both internal development or external sources so a strong link with the supply chain function is useful here. The specific architecture of this section will depend on how technology is managed in the business; whether by cross business technology platforms or by business/product specific technology groups. Either or both cases can easily be represented in a roadmap framework with the key criteria being that the roadmap is owned by the person responsible for developing (or purchasing) that capability in the business.

The technology strategy as viewed from the technology manager's perspective will include more than just the baseline "outside-in" approach where elements are defined to meet specific attributes in product roadmaps. Elements should also be included on the roadmap to capture effort being expended to extend the current capability, assess potential game changing and/or disruptive technologies in support of the general strategy of the business. These sections need to be descriptive enough to provide both the Product and Marketing functions with some idea of potential future capability that may be exploited.

In general, the Technology roadmap should include elements representing the technology investment managed by that platform or group covering all the areas mentioned above. Specifically (Figure 6),

1. Technology development start and finish dates (sometimes segmented in Technology Readiness Levels)¹¹
2. Alternative Technology Approaches and Downselect Decision Points
3. Start and finish dates Technology will be commercially available and supported in the market
4. Specific Key Performance Specs or Goals for each Technology Development effort which satisfy key Attributes in Product Roadmaps or define targets for assessing feasibility in technology extensions or disruptive technology assessments.
5. Technology roadmaps from critical suppliers or partners providing ancillary technology embedded in or critical for success of this particular technology/capability area.

Whalen, P. J. 2007. Strategic and Technology Planning on a Roadmapping Foundation. *Research-Technology Management*. May-June. pp. 40-51.

Other optional information could include competitor technology roadmaps (specs and availability), intellectual property strategy (plan for what and when specific technology aspects will be patented or decision to designate as a trade secret). In addition, back up information supporting technology project portfolio analyses such as development cost per year, funding source, and risk need to be associated with each roadmap element.

The graphical methods and conventions used in the Product Roadmap should be applied to the Technology roadmap as much as possible to avoid confusion and to simplify roadmap to roadmap interpretation. One of the frustrating aspects of roadmapping in representing strategy, especially in large organizations, has been the rapid proliferation of different styles and conventions within the same organization, making it impossible to relate one roadmap to another. As stated above, only critical information needs to be captured in the roadmap representation – supporting data and information should always be available in back-up document management systems.

3.4 Cross-Functional/Business Strategies: Strategic Initiatives

The alignment of the strategic elements owned by each function (i.e. Marketing, Business Development, Product Lines, Technology, etc), creating inter-related “threads” of strategy required to meet business objectives, is what constitutes the enterprise strategic plan. So far, general strategy and roadmaps from the Marketing, Product and Technology perspectives have been defined. In reality, those perspectives would never be created in isolation and would most likely result from the decomposition of business strategies or business plans which require alignment and linking of elements from each of the Marketing, Product, and Technology functions. The term Strategic Initiatives will be used here to describe these specific business strategies which are often direct outputs of annual strategic planning exercises. The Strategic Initiatives are composed of strategy elements from the basic framework aligned along threads from Marketing through Products to Technology; Figure 7. The ability to construct a new Strategic Initiative from the Foundation information or in reverse, create/modify the Foundation through the deconstruction of a Strategic Initiative is an important aspect of this approach. This concept is critical to understanding how the roadmapping management system can be constructed gradually over time, using available roadmapping best practices.

It is important to emphasize that setting up the roadmapping framework in this way enables the use of the same, unique, strategy elements in both the Foundation and Strategic Initiatives. For example, assume a particular product is being developed in a Product Line and is being considered for use in a Strategic Initiative. That product development activity and associated product launch will be represented in a Product Roadmap owned by the person responsible for that Product Line/Platform, consistent with the overall strategy of that Product Line. At the same time, the Strategic Initiative owner will have a Strategic Initiative Roadmap with that same product development/launch data, referenced from the original Product Roadmap. The Product roadmap data (i.e. timing, attributes,...) are negotiated by the Product owner with all those interested in including that product in any number of different strategies. This ensures alignment between the Product Development/Launch strategy with all the

Whalen, P. J. 2007. Strategic and Technology Planning on a Roadmapping Foundation. *Research-Technology Management*. May-June. pp. 40-51.

Strategic Initiatives at any one time in the organization. A change in the timing of that product launch event will be reflected in all the strategies and roadmaps related to that event. While different Initiatives will create and maintain roadmaps to represent their strategies, each element of strategy has a unique owner, which is then referenced again and again as needed, preventing the proliferation of different versions of the same development activity – a serious source of strategic misalignment and miscommunication in any organization.

Several different examples of Strategic Initiatives which cut across both functional and organizational are given below. Consider the value of roadmapping in maintaining strategic integration in each case; without which organizations struggle to maintain priorities across the enterprise.

Account Management Strategy; Key Account Roadmaps: Most businesses can define a short list of customers (Key Accounts) they would consider critical to meeting business objectives. To ensure that the business strategy is in line with the needs of these critical customers, and to expand the penetration of the business's products with those customers, companies are dedicating effort to developing specific account management strategies. These customer specific strategies would represent those elements in each level of the framework which pertain to that customer; i.e. the pertinent Environment/Market information, selection of current and future Products to be offered, and the corresponding Technology supporting those products and potential future directions to explore with this customer. In large multi-business unit organizations, this strategy can span several different businesses at several different levels in the organization to completely capture all elements of business strategy for a specific Key Account. The Account Management Strategy would be represented in a Key Account Roadmap owned by a Key Account Manager. Ownership in this sense means that the Key Account Manager is responsible for ensuring that all the elements of strategy from the Foundation framework, which pertain to that account, are aligned with business expectations. This includes negotiating with the respective Product Line/Platform and Technology owners to align development with issues associated with this particular Key Account.

Key Growth Initiative Strategy; Key Growth Program Roadmaps: One important output of most strategic planning exercises is a prioritization of investment for driving new growth opportunities leading to a Key Growth Initiative. These growth opportunities typically have their own self contained strategies and business plans touching every element of commercialization including marketing analysis, product planning, operations, technology planning and a financial pro forma. Key Growth Initiatives should have a defined manager who owns a Key Growth Program strategy and roadmap which represents all the Foundation and potentially new strategy elements required to drive the success of that program. Similar to the case of the Key Account strategy, Key Growth Initiative strategies should contain referenced Foundation strategy elements to ensure alignment and coordination with the ongoing business.

Solutions and Services Strategy; Solutions and Services Roadmaps: Growth through innovation is not always the result of breakthrough technology but rather innovative new ways of integrating existing or developing technologies into a high value solution. These solutions often times span several elements of a particular value chain and require integration across internal and external business boundaries. The customer is satisfied by the “one-stop buying” aspect of the business model as well as any additional positive cost or performance synergies resulting from the better integration of the individual components from one supplier. Roadmapping enables the clear alignment of all the necessary ingredients required for a solution while maintaining the integrity of the base (Foundation) organization.

4. Implementation

A study lead by the University of Cambridge on the implementation of technology roadmapping indicated that the top four success factors were:¹²

1. Clear business need
2. Commitment from Senior management
3. Right people/functions involved
4. Desire to develop effective business processes

To effectively implement the proposed enterprise roadmapping management system, requires a change management plan based on the maturity of existing strategy and business development processes and having sufficient answers for the four success factors listed above. In this section, some general practical suggestions for how an organization may get on the road to implementing a roadmapping based strategy management system will be discussed. These suggestions can help frame proposals to deal with each of the success factors in the context (culture, existing processes, financial situation) of the business implementing the process.

4.1 Getting Started

The two dimensional nature of the proposed enterprise roadmapping system requires that the serial process approach to strategic and technology planning must be abandoned since in reality, strategy management is very much an iterative process. It does not matter whether the entire Foundation roadmap database is fully populated to create the necessary linkages for Strategic Initiatives, or visa versa. The enterprise roadmapping management system can be gradually built from both dimensions as long as the basic architectural rules and process guidelines are adhered to.

Building roadmaps through facilitated cross-functional events (i.e. Cambridge University’s T-Plan¹³) is a good way to engage an organization in roadmapping and begin the culture change that is required. However, these events can result in a collection of strategies and roadmaps that may not necessarily be linked to an ongoing business process or decision framework. The integration of the roadmap system with well established processes and metrics ensures that they will be maintained by those who “own” the impact of their content and will be updated as needed. Emphasizing

Whalen, P. J. 2007. Strategic and Technology Planning on a Roadmapping Foundation. *Research-Technology Management*. May-June. pp. 40-51.

ownership and accountability in each case is key. Several examples where integration with standard processes can drive implementation are given below:

Strategic Planning: Establish roadmapping as an essential element of the annual Strategic and Technology planning for representing both functional and strategic initiative strategy. Requiring that the roadmaps represent strategies that are fully supported by planning budgets and other financial strategic plan deliverables, ensures that the information they represent is accountable and can be used for decision making.

Portfolio Management and Gated New Product Development: The enterprise roadmapping system supports the evaluation of input criteria for gate reviews and at the same time, supports the communication of the results of any decisions made during gate reviews. Establishing the requirement that roadmaps in the standard architecture be included in all portfolio management and new product development reviews adds tremendous value in the assessment of strategic balance of the portfolio. The result will be better informed portfolio decisions and also much better communication and understanding of the impact of those decisions in real time.

Quality Processes: Correctly defining key customer needs and converting those needs into product attributes, while differentiating the offering from competitive offerings, is the basis of many quality approaches to design such as Design for Six Sigma.¹⁴ The roadmapping framework enables the communication and evaluation of both customer needs and product attributes to support design and development decisions. Requiring that roadmaps be included in design reviews showing the link between development, product attributes and customer needs in the proper strategic context supports better decision making and quality system continuous improvement.

4.2 Enabling Infrastructure and Tools

The implementation of this roadmapping framework requires a certain level of management oversight and support. At Honeywell, roadmapping quickly became an integrated piece of strategic and technology planning and was managed at the individual business level with corporate oversight for only the IT element of the system. However, initial implementation does require training in the architecture, various functional responsibilities, and tool usage. Coordinating the scheduling of training with the current company strategy planning calendar and the execution of other strategy processes where possible, will help support the idea that this is part of continuous improvement of existing processes and not a brand new, separate initiative. Modification of existing process protocols and documentation to reflect the integration of this roadmapping framework with current practice will also be required (i.e.: include roadmap review as criteria in Gate reviews in NPD process). Also, since the data captured in the roadmapping system is proprietary and possibly subject to export control regulations, certain security considerations must be included and administered on an ongoing basis.

To this point, little mention has been made of how the strategies, roadmaps and associated supporting data will be captured and managed in real time. A thorough understanding of the process first is critical to successful implementation before

Whalen, P. J. 2007. Strategic and Technology Planning on a Roadmapping Foundation. *Research-Technology Management*. May-June. pp. 40-51.

considering what tools to use. Paper based processes, such as flip charts or regular paper representations, may be suitable to capture information from initial data gathering sessions but will not be sufficient in the long run and are extremely limited in scope for communication and access purposes. It would be extremely cost prohibitive to have to create a new paper (i.e. Excel, Powerpoint) roadmap each time an event occurred which needed to be reflected in the strategy. Also, it is virtually impossible to capture all the different perspectives described above, along with their relationships to other functions or parts of the organization in a single page roadmap.

The obvious solution is to utilize a database software application that enables the real time, web-based access to the strategy information and roadmaps. A good list of the high level requirements of such a software application has been given elsewhere¹⁵ but the ability to link strategy elements from different functions or organizational entities in a way that will communicate when a modification has occurred is key. Also, having the roadmap representation available as the “front end” of supporting strategy data and information, enables simple communication of strategy as well as the ability to dive deeper into specific areas if called for. Very few commercial tools exist which combine all these aspects of data visualization and management. One tool, based on an open architecture SQL database, called Vision Strategist¹⁶ comes closest to meeting all the unique requirements of the real time strategy knowledge management system and was implemented at Honeywell as well as elsewhere (i.e. Boeing, Motorola, Corning). Utilizing any web-based, database approach requires a secure, robust IT infrastructure where issues with internal and external firewalls and other potential communication barriers can be dealt with appropriately.

5.0 Summary

The increased complexity and rapid pace of change of doing business in today’s economy puts a premium on real time information access and exchange within and between organizations to support business growth through innovation. The productivity and efficiency of current strategic planning and decision processes suffer from an inability to maintain and manage strategy alignment and a robust innovation pipeline in this rapidly changing environment. Using a roadmapping framework based on distributed functional ownership of strategy elements, a strategy management architecture and process has been proposed which significantly increases the productivity of strategy creation and management. The framework is two dimensional with functional strategies and roadmaps sharing perspectives with Strategic Initiative strategies like Key Growth Programs and Key Account Management. Key success factors for realizing the full benefit of the approach include the full integration of the framework in existing business processes across all functions. Implementation can be staged and planned to coincide with current planning schedules and processes to minimize disruption of the current business process calendar. The process and roadmapping architecture, when combined with a web-based, relational database for storing, accessing and communicating strategy elements, provides the ability to develop, optimize, and maintain the strategy alignment necessary to grow businesses through innovation.

-
- ¹ Bryson, J. M., *Strategic Planning for Public and Nonprofit Organizations* (John Wiley & Sons, Inc., San Francisco, CA) 1995, pp. 4-5.
- ² Willyard, C. H. and McClees, C. W. "Motorola's technology roadmap process," *Research Management*, Sept-Oct., 1987, pp. 13-19.
- ³ Groenveld, P. "Roadmapping integrates business and technology," *Research · Technology Management*, Vol. 40, NO. 5, pp. 48-55, 1997
- ⁴ Phaal, R. Farrukh, C., and Probert, D. "Customizing Roadmapping," *Research · Technology Management*, Vol 47. No. 2, pp. 26-37, 2004
- ⁵ Phaal, R., Farrukh, C., and Probert, D., "Characterisation of technology roadmaps: purpose and format," *Proceedings of the Portland International Conference on Management of Engineering and Technology (PICMET '01)*, Portland, July 29th – August 2nd, 2001, pp. 367-374.
- ⁶ Grossman, D. S., "Rutting Technology on the Road," *Research · Technology Management*, Vol 47. No. 2, p. 44, 2004.
- ⁷ Phaal, R. and Farrukh, C., "Technology Planning Survey – Results," Institute for Manufacturing, University of Cambridge, project report, 14th March, 2000.
- ⁸ R. Phaal, R. Farrukh, C. and Probert, D., Fast Start Technology Roadmapping, International Association for Management of Technology, <http://www.iamot.org/paperarchive/gstbb.pdf>, 2001.
- ⁹ Albright, R., "Roadmapping for Global Platforms Products," *Product Development and Management Association Visions Magazine*, Vol. 26, No. 4, , 2002 pp.19-22
- ¹⁰ Christensen, C. M, and Raynor, M. E. *The Innovator's Solution* (Harvard Business School Press, Boston MA) 2003
- ¹¹ Mankins, John, C., [Technology Readiness Levels: A White Paper](#), April 6, 1995
John C. Mankins, Advanced Concepts Office, Office of Space Access and Technology, NASA
- ¹² Phaal, R. and Farrukh, C., "Technology Planning Survey – Results," Institute for Manufacturing, University of Cambridge, project report, 14th March, 2000.
- ¹³ Phaal, R. Farrukh, C., and Probert D., "T-Plan The Fast Start to Technology Roadmapping – planning your route to success," (University of Cambridge, Cambridge, UK) 2001.
- ¹⁴ Creveling, C. M., Slutsky, J. L. and Antis, D., "Design for Six Sigma: in technology & product development," (Pearson Education Inc., NJ) 2003.
- ¹⁵ Phaal, R. Farrukh, C. and Probert, D., "Technology Roadmapping; linking technology resources to business objectives," Center for Technology Management, University of Cambridge, Nov., 2001, pp. 15-16.
- ¹⁶ Marketed by Alignment Software, Carlsbad, CA, 760-438-9100, www.alignment.com

Strategic and Technology Planning on a Roadmapping Foundation

Figures

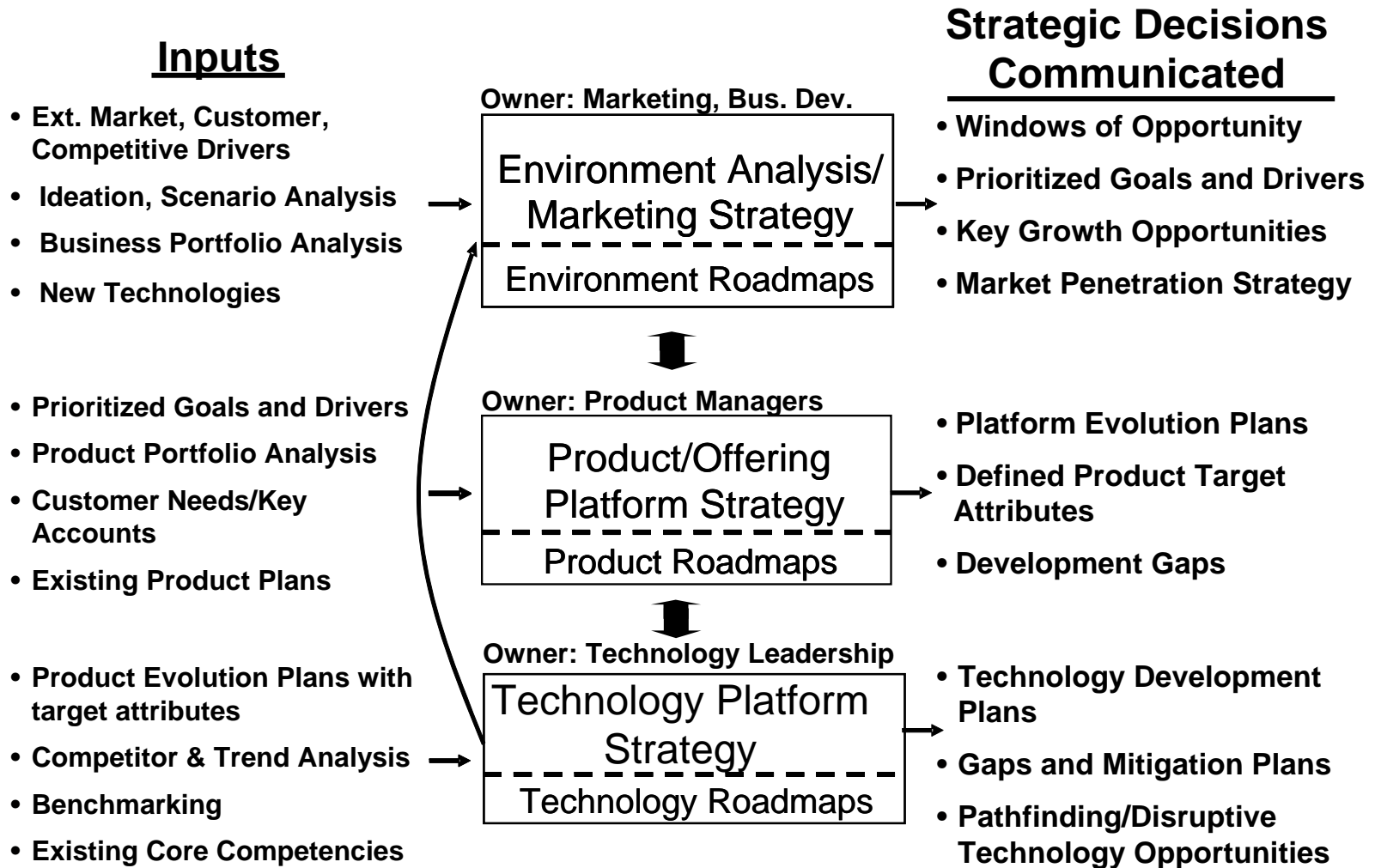


Figure 1. Generalized planning process flow showing where different roadmap types can support both the Input and Output (Decisions) of information required by each function in a business

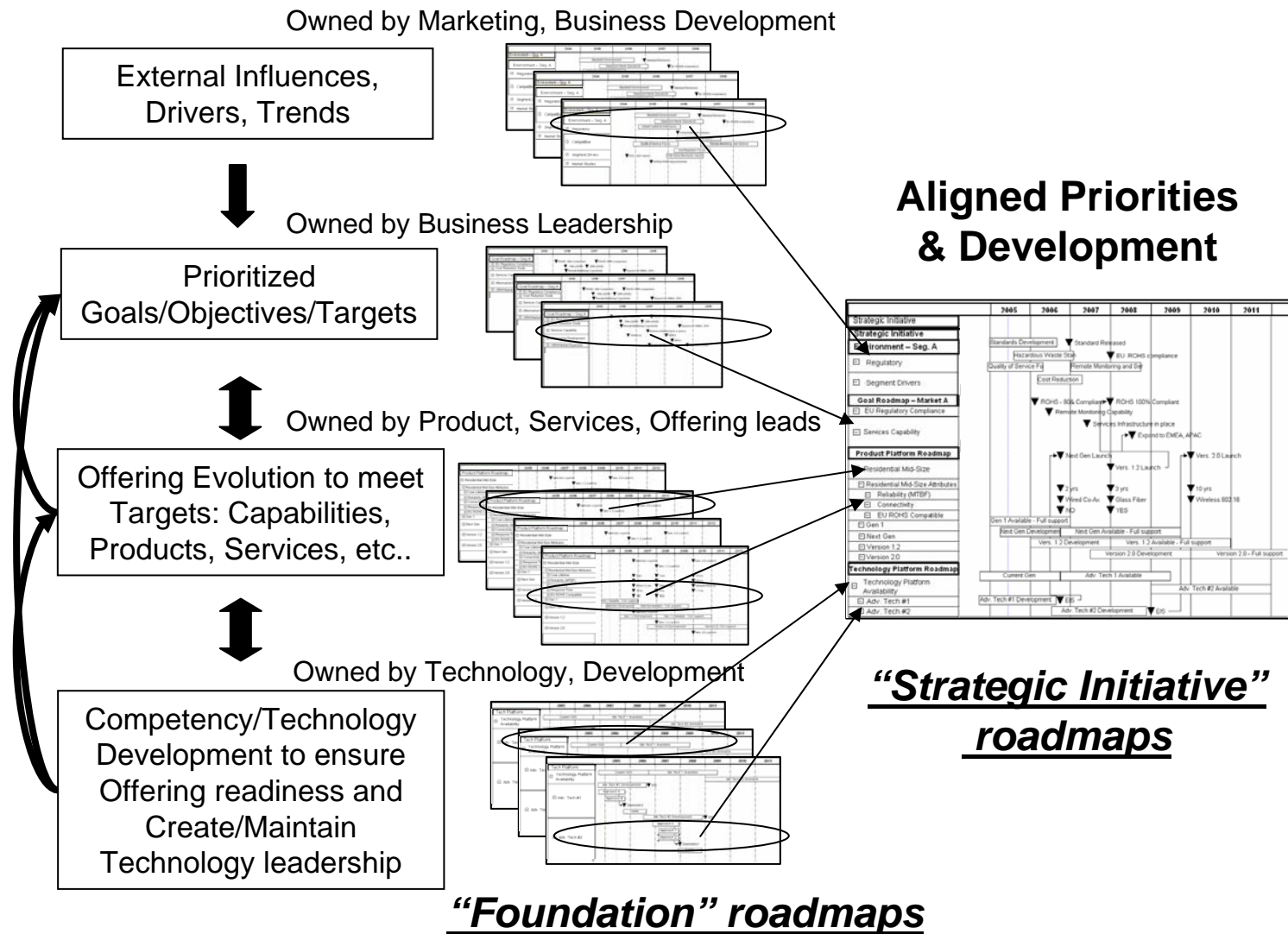


Figure 2. Selected elements from “Foundation” roadmaps, representing the perspective of each function are combined to create alignment and new strategies to support prioritized “Strategic Initiatives.”

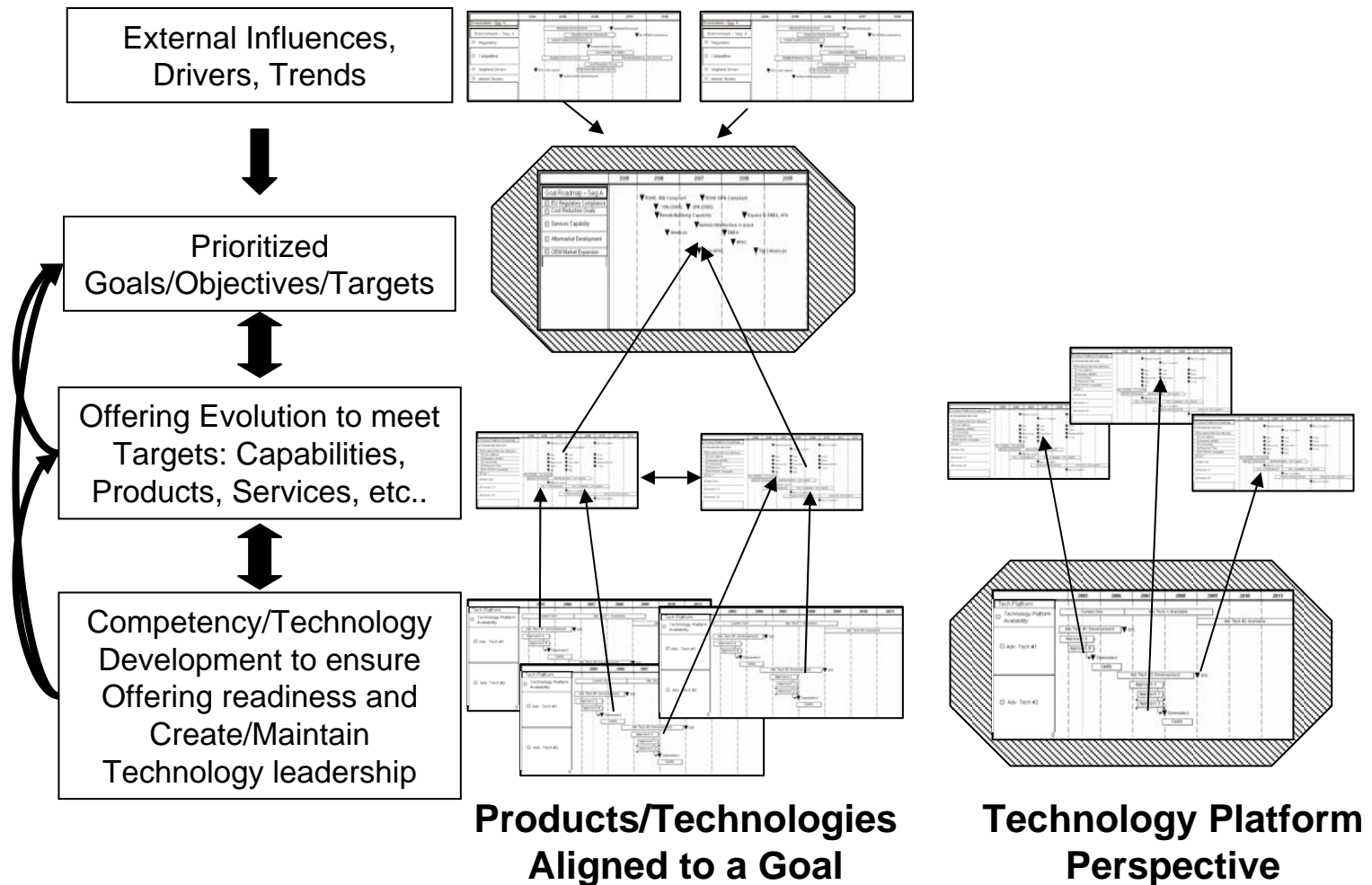


Figure 3. Conceptual view of how roadmap framework supports the development of interrelated views of strategy from any perspective. For example, the framework supports the creation of a view that shows all the products and technologies required to support a particular Goal while a Technology Leader may want a view of only those products that technology platform supports.

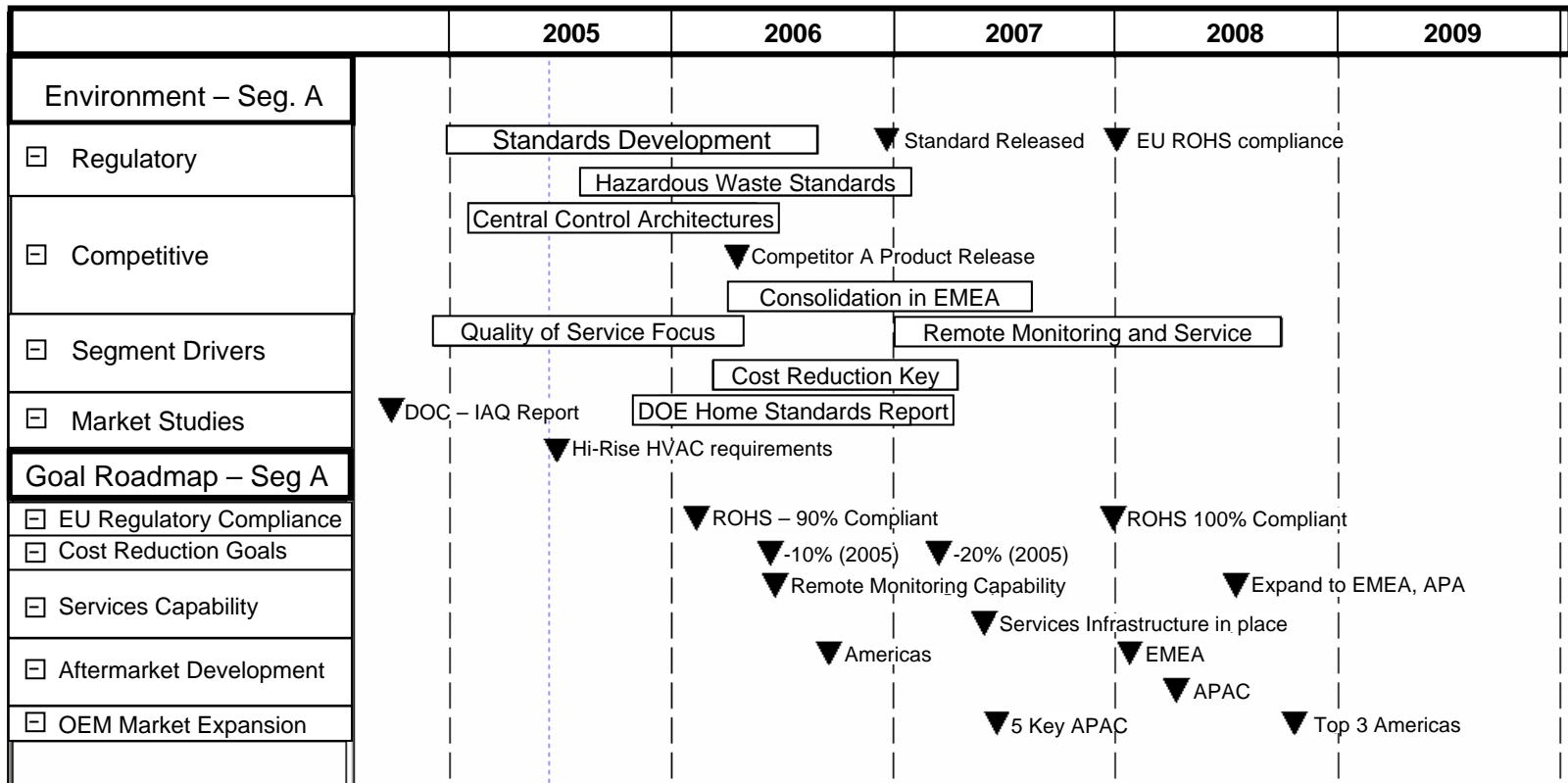


Figure 4. Example Environment/Goal Roadmap illustrating roadmap elements captured for Market Segment “A” and the corresponding prioritized strategies goals created to respond to the Environmental drivers

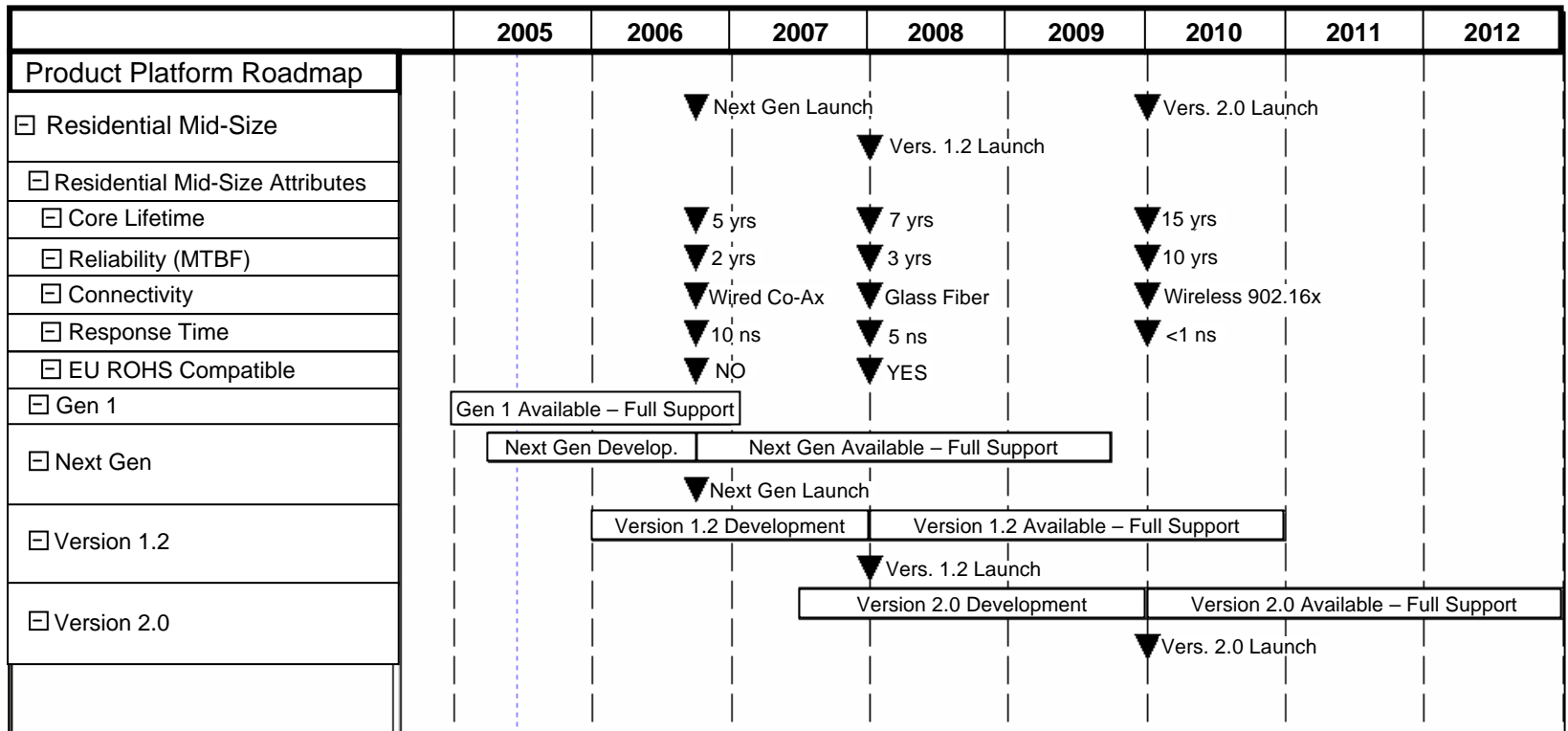


Figure 5. Example Product Platform showing roadmap elements for product evolution, key attributes for each release, when product development would start and finish, and the period over which the product or release would be available and supported in the market.

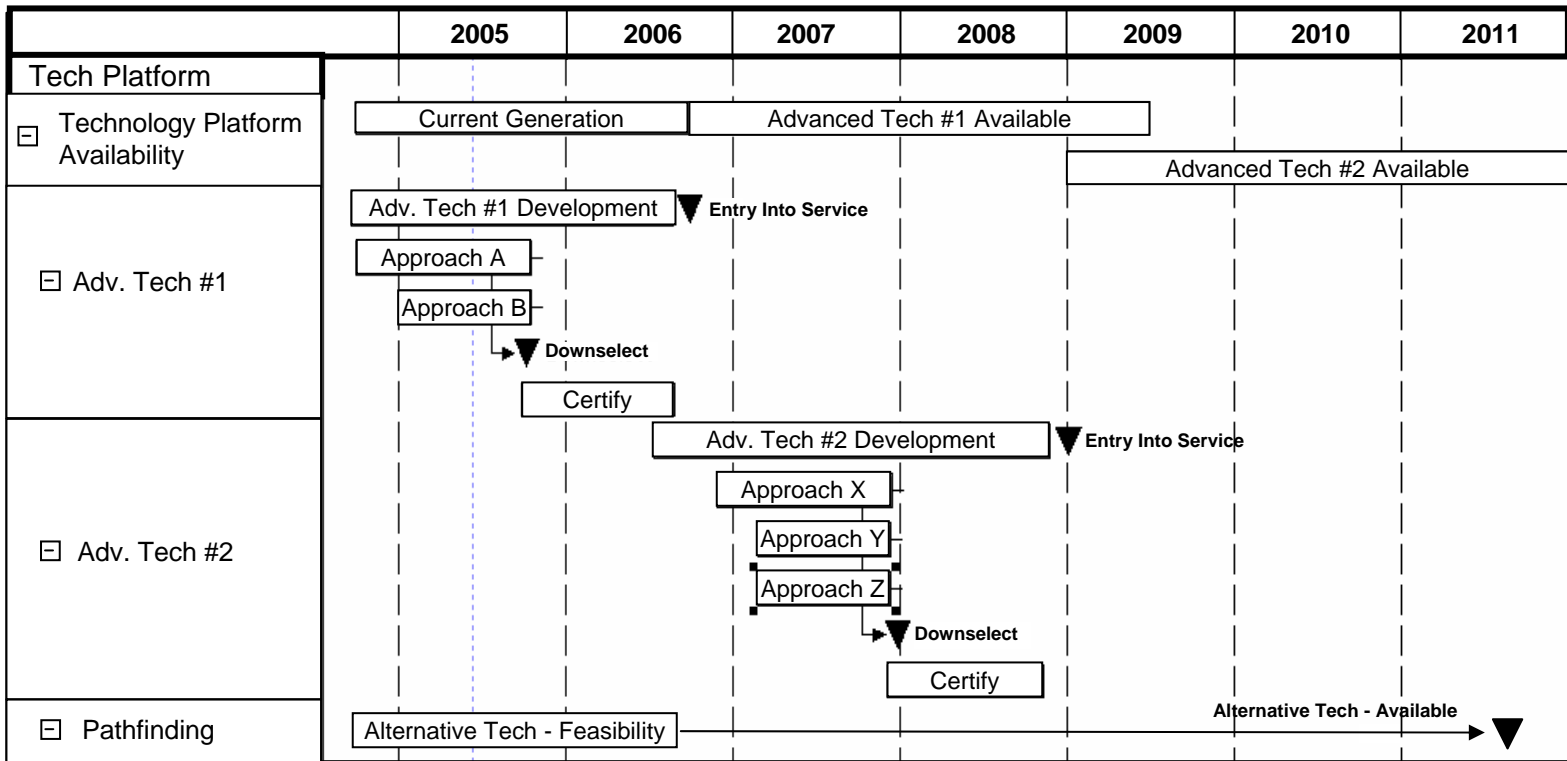


Figure 6. Example Technology Roadmap showing roadmap elements for technology development start and finish (including alternative approaches), downselect milestones, and technology availability periods. Each Entry Into Service milestone would have associated technology performance targets (not shown here).

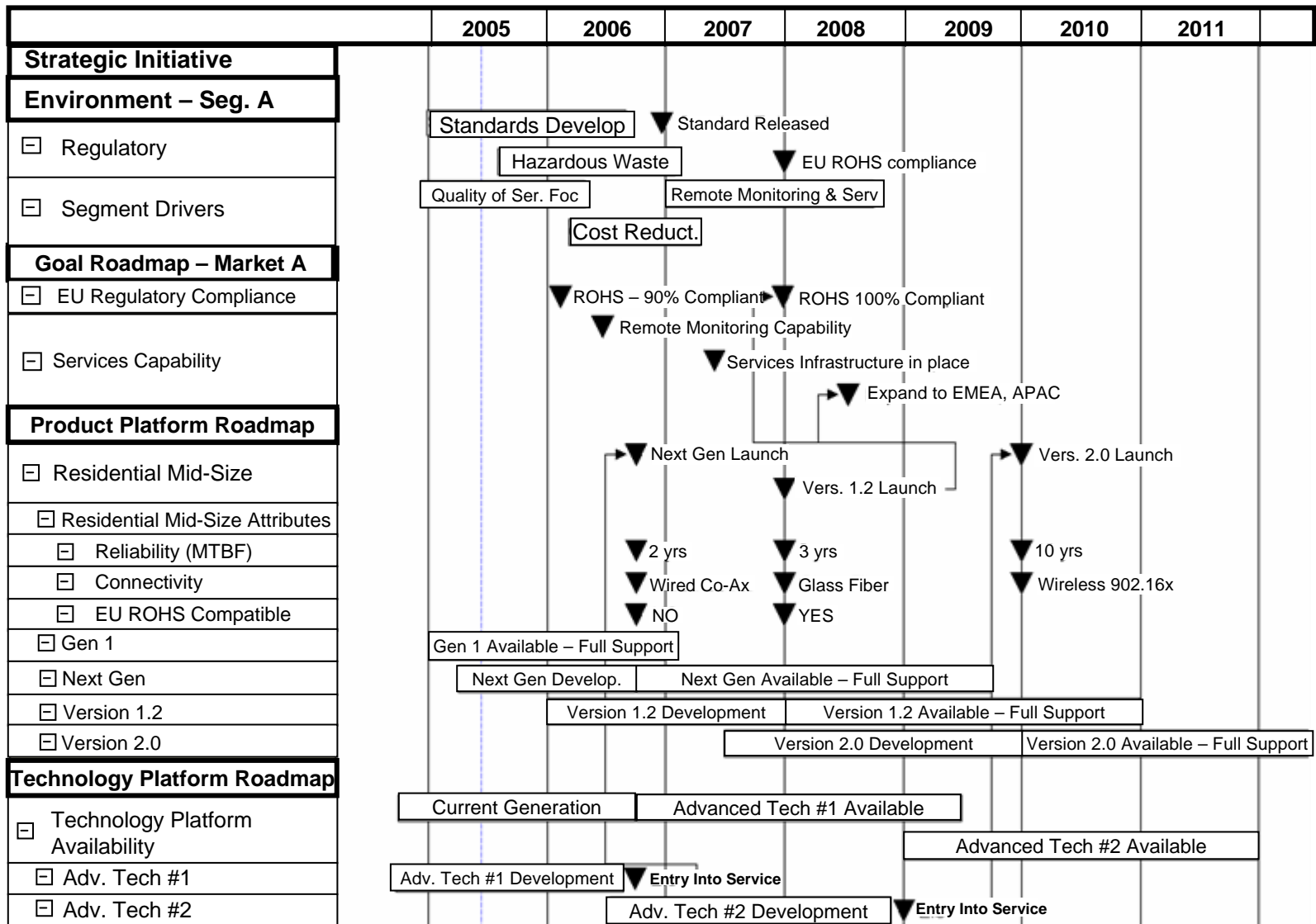


Figure 7. Example Cross Functional roadmap (i.e. Strategic Initiative) created using segments of Foundation roadmaps showing alignment from Environment and Goals to Products and Technology Development. Foundation roadmap elements