Elements of Technology Strategy:

Identification of Key Technologies and Developing Sourcing, Innovation and Balancing Strategies.

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Abstract

The technology base of your business is a resource that requires the same strategic positioning as do your marketing, product, and manufacturing assets. While most firms have technology components of business and marketing strategies, they also need a specific technology strategy that guides investment in and positioning of both their short term and long term technology assets. Which technologies are truly critical both now and in the future? What new technologies required to support the future needs of the business? What current technologies are likely to be replaced, when and why? This session provides a framework for understanding which technologies are important and provides guidelines for developing strategies for their development.

Introduction

Thinking strategically means that you make decisions based not just on your immediate needs and goals, but also with an understanding of the long term implications of those decisions. Strategic thinking ensures that you are positioned to take advantage of future demands on your business and provides a framework for focusing your energies on long term business objectives.

While strategic thinking has been a critical component to business, marketing and operational planning for years, too often firms fail to recognize the importance of thinking strategically about their technology. Technology strategy is not just the technology component of your marketing

or business plans. It is driven by these other planning activities, and must be consistent with them, but it goes beyond them to identify which technology capabilities are most important and identifies specific actions to be taken to ensure that the technical capability needed to support future business needs is in place when it is required. Technology strategy not only helps position your technology for the future, but also helps you make allocation decisions for technology programs and projects that help use scarce technical resources in ways that optimize support of the business and balance longer term and shorter term business needs.

There are four major parts to a Technology Strategy:
- *Core Technology Component* identifies current and future critical technologies and platforms
- I*nnovation Component* outlines objectives regarding technology leadership in core technologies: the decision to be a leader or follower.
- S*ourcing Component* directs whether core technologies should be sourced internally or externally: the decision to make or buy.
- B*alancing Component* provides criteria for project selection and prioritization

Core Technology Component

Core Technologies are those technologies that represent the basis of your technology advantage – those technologies that need to be developed and nurtured to provide the basis for meeting current and future market needs. There are several ways in which firms can determine which of the various technologies they use are truly critical: comprehensive annual technology planning exercises, competitive intelligence on what technologies are emerging and what competitors are investing in, and other strategic assessments regarding the support required for future business initiatives and thrusts. In general, a technology is considered as critical or key if it has one or more of the following characteristics:
- it is critical to meeting current and future process, customer, or consumer needs
- it provides a distinct and sustainable competitive advantage
- it positions the firm to take advantage of new business opportunities

One mistake that firms do when identifying their Core Technologies is to look at what they are good at and declare those as critical. What is required is to look at the technology requirements of the businesses or markets in which you intend to participate and identify those technologies that are valuable to those strategic areas of your business, regardless of whether you have them.

It is also important to realize that the inventory of Core Technologies does not remain constant over time. Today's Core Technologies may not be critical in the future; and tomorrow's may be totally new technologies. Often the needs that the technology addresses may mature or change as new needs emerge to drive the business. In such cases, the old technology may no longer be appropriate and a new core technology may emerge. Other times the barriers to a competitor's use of the technology may erode thus the technology may still be important, but no longer provides a competitive advantage. And last, the old technology may reach a point where it no longer meets the customer's or operations need for increased performance (it matures relative to that need) and a new technology emerges. In all these cases, the old Core Technology – while still perhaps a significant internal strength – may have no business value.

One last point is important to point out. Technology maturity has to do with a technology's ability to create a change. At some point, most technologies mature relative to that performance characteristic it has been used to create a change. *If* it matures, *and* there are unmet needs, *and* there is a new technology able to make further changes, there will be substitution and the old Core Technology will lose its status. However, if there is not a need for further change, or a new technology is not available to move things further, then the old technology, even while being mature, can continue to be a source of competitive advantage and still justify the special strategic attention of a Core Technology. Just because a technology is mature does not mean that it cannot be a Core Technology and provide a competitive advantage.

Once you have identified your Core Technologies it is then necessary to decide how these should be handled along three dimensions: should you be an innovator of the technology, should you be the primary developer of the technology, and how should you manage your portfolio to protect and nurture your core technologies.

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Innovation Component

The first question has to do with whether you or another firm should be the development leader in the application of the technology in your industry. There are clear benefits to being the innovator. It can give you preferred technical capabilities that permit you to be the first to make the changes in your processes, products or services. Being first allows you to set the standards, influence the support structure, and attract the early adopters who often pay a premium. It can also enhance your image which can translate into being able to attract better talent, better partners, and command higher margins. All of these can be leveraged into an improved competitive position.

The advantages of being first come at a cost. The mistakes of the innovator can often result in market failures and development losses that wipe out the financial gains of the success. It can also lock you into a platform or approach that ends up being unviable.

In general, most major firms find that it is important to be an innovator in at least some areas if they have the resources and capability to do so. One key question is to ask yourself whether after an initial commercialization of an innovation the firm will be in a position to redesign or refocus its effort if it learns that the initial approach was flawed.

There are no shortcuts to making the innovative posture decision. It requires a careful assessment of the potential costs and benefits of different innovative positions: being a first mover, a fast second, or a follower. The senior technology managers must look at such factors as the costs and benefits, the risk tolerance of the firm, the risks of not being an innovator, the ability to respond to mistakes, the availability of resources, and the actions and reactions of current and potential competitors.

Once they consider these various forces they then can make informed decisions regarding the desired innovative position and provide the rationale to those that allocate funding and support for these innovative activities. It often requires that a firm develop alternate development paths – corporate venturing if you will – that allows you to insulate the innovative activity from the mainstream developments.

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Sourcing Component

The Sourcing Strategy determines the optimal approach for developing and supporting Core Technologies. The analysis is supported by using the Technology Sourcing Matrix (Figure 1). This divides current and potential technical capabilities into one of focus areas:

- Core competencies – Core Technologies you source by yourself
- Complements – Coe Technologies that you acquire outside or jointly develop
- Orphans – technologies that are a major source of internal effort but which have no strong strategic justification since they provide little competitive advantage
- Distractions – capabilities that are weak and unnecessary, and probably should not exist

Strategic Relevance

		Primary	Ancillary
	Self	**Core Competencies**	**Orphans**
Primary Source of Competent Technology	**Others**	**Complements**	**Distractions**

Figure 1 Technology Sourcing Matrix

There are three steps to determining a Sourcing Strategy:

- Identify the existing Sourcing Portfolio
- Determine the ideal Sourcing Portfolio
- Develop plans to move form the existing to the desired

Identify the existing Sourcing Portfolio. The existing sourcing portfolio is profiled by examining the role of the current technical capabilities in terms of their ability to provide a strong or 'Primary' Strategic capability, usually due to their providing a competitive advantage and/or being important and in scarce supply. 'Ancillary' capabilities, while possibly important to achieving the business objectives are usually available externally. You may still want to source

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these internally to leverage existing resources, achieve greater control, reduce costs, or other practical reasons; however, strategically internal sourcing offers no significant advantage. This analysis of 'strategic versus ancillary' is applied to both the existing and ideal assessments.

The next step is to actually look at whether you are sourcing the technologies internally. It is not enough to have the capability to do so, the assessment requires that you are the actual source of the expertise. This is done be carrying out a technology audit where you examine both the level and quality of support. Due to tendencies to inflate ones own self assessment, it is often useful to look outside for confirmation of competence.

Barriers to Internal Development. Often you realize that you have the capability but it is not being used. There are several reasons for this and it is not necessarily a weakness. There are usually good reasons why potential is not leveraged, reasons that can be summarized as the Three Rs: Resources, Risk and Resistance.
- Resources refers to having insufficient numbers given other demands on time or an inadequate skill base or level of expertise given technical demands
- Risk refers to the level of investment given other priorities and the tolerance of the organization for the potential downside
- Resistance comes from both individuals who fail to see benefit of new technology (NIH) and from bureaucratic controls that tend to suppress entrepreneurial activities

Determine the ideal Sourcing Portfolio. Second, determine the optimal sourcing portfolio by looking at both quantitative and qualitative factors, for example:
- the value of technology in providing a competitive advantage
- the relative maturity and likelihood of substitution
- the investment level needed to maintain technical position
- alternative sources: internal resources and external complements
- organizational, cultural, and political realities

Note: An important aspect of this assessment is that you look at the ideal over different time frames and identify both short term and long term sourcing demands. Assessment of emerging

technologies and shifting business drivers is critical to ensure that the technology is being sourced to support not just the current business reality but to help you intercept the future demands as well.

Develop plans to move form the existing to the desired. Last, compare the existing portfolio to the optimal and develop strategies to either maintain the existing sourcing path or manage transitions between a current source and a future source. Examples of typical approaches to maintaining or transitioning between different sources of Core technologies is shown in Figure 2.

Desired

	Core Competencies	Complements

Core Competencies	Internal development
	Blocking efforts:
	    Alliances
	    License out
		Spin-out:
		    Subsidiary
		    Equity carve-out
		    Joint venture
		Alliance

Complements	Acquisition
	Internal development
	Transition efforts:
	    License in
	    Alliance
	    Consortium
		Alliance
		Joint venture
		License in

Current

Figure 2 Sourcing Options

Balancing Component

Few firms have sufficient resources to pursue all projects of value, and most firms have a problem protecting strategic, long term projects from the distractions of short term projects. A balancing strategy provides the basis for addressing the when and how for projects of value. The basic idea is to use a two part project review process that looks at both the specific value of the project on its own and most importantly provides a *strategic overlay* which provides a way of assessing the value of a project in terms of its contribution to your overall development objectives. This process (Figure 3) asks two questions:

- Is the project worth doing in its own right?
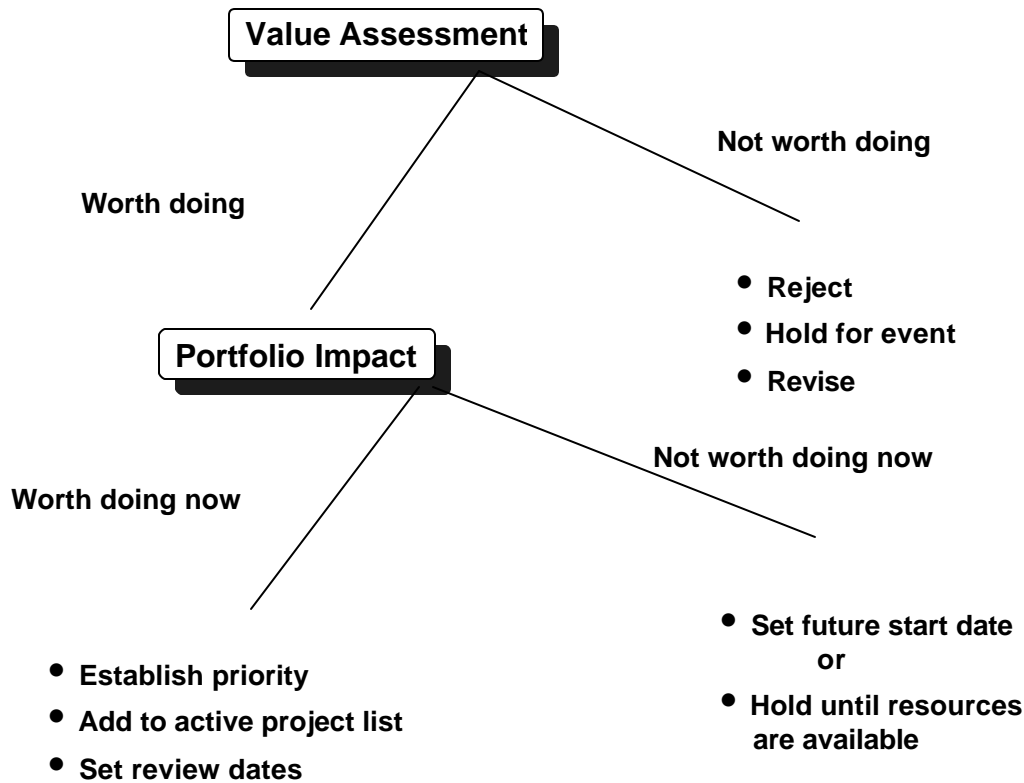- Is it worth doing now given the portfolio impact and options?

Value Assessment

Not worth doing

Worth doing

- Reject
- Hold for event
- Revise

Portfolio Impact

Not worth doing now

Worth doing now

- Set future start date
  or
- Hold until resources are available

- Establish priority
- Add to active project list
- Set review dates

Figure 3 Two Step Project Review

Balancing criteria developed with strategic and organizational goals in mind help guide the choices. Most often, these criteria are developed in the Technology Strategy process and applied as part of a stage-gate project management system with ongoing portfolio adjustments that ensure the portfolio stays in balance as the world changes.

There are four basic steps in selecting a project portfolio:

- Assess projects individually in terms of their contribution to the business using both hard data (such as cost, time, risk, benefits, sponsor, etc.) as well as soft data (such as competitive impact, newness, synergy, champion, etc.).
- Select a "package" that appears consistent with your strategic targets and the balancing factors decided on earlier
- Use matrices to provide an aggregate view (see Appendix 1)
- Fine-tune to improve balance, conserve resources, and satisfy politics

The following are some of the most commonly used balancing criteria.

- Technology maturity
- Competitive impact of the technologies employed
- Type of R&D
- Competitive technology strength
- Technology/market familiarity
- Project focus
- Cost
- Sponsor/market
- Technology source – internal vs. external
- Time to completion
- Probability of success – both technical and market
- Overall project attractiveness
- Risk
- Potential resistance/politics

Some project management software programs offer over 100 such measures, although most firms use no more than 6 or 7. The specific dimensions used depend on such issues as the key challenges facing the firm, the availability of data to complete the assessment, and the biases of the decision makers.

Protecting Long Term Projects. One important aspect of using a portfolio overlay is that it makes it much easier to protect long term projects. This is a continuing challenge for firms that are attempting to be responsive to short term business demands, which usually have clearly defined costs and benefits, and at the same time invest in reasonable amounts of longer term developments designed to position the firm for the future. Such strategic initiatives often lack the hard numbers of short term support.

There are several steps firms can take to attempt to protect strategic investments. Top level commitment is starting point – not the end point – and is absolutely critical. While '*good numbers*' are desirable, having a technology planning or strategy process that allows you to create '*good stories*' that demonstrate clear business relevance and impact on competitive position can help sell long term projects.

Probably the most important lesson from studies of innovation is the need to avoid forced choices between long and short term projects. In most firms the longer term efforts never have a chance. Ways to separate these activities include the use of separate funding or separate organizations, but probably the most common and most effective, is to create separate planning categories or "buckets" that are used with a 'strategic overlay' as part a two part project review process. Short term projects (with hard numbers and clear cost benefit analysis) are compared *only* to other short term projects; and strategic projects using different, and often 'softer'; criteria are compared to each other.

One role of Technology Strategy is to select the criteria to be used in these reviews. More importantly, the Balancing Strategy component determines the target allocation of resources to each of the categories of projects, e.g., 50% for short term, 25% for extension, and 25% for strategic positioning. This is how strategic and tactical needs a can be meshed.

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Conclusions

A Technology Strategy helps you position your technology resources to support both short and long term business needs. An effective technology strategy requires that you:

- Understand which technologies are the most important
- Decide whether you need to be an innovator or follower
- Select whether you develop capabilities internally or work with outside firms to acquire or jointly develop them
- Provide a strategic overlay to your project selection process to balance conflicting demands on your firm

Technology Strategy is driven by and is consistent with your other business planning efforts. However, it provides a focused examination of the role of technology, the value of technology, and choice of technology and outlines the major criteria for assessing alternative innovative, sourcing and balancing decisions. The value of Technology Strategy is not in the reports that are often generated but in the development of a rational, business based framework for investing scarce technology resources, and to make those investments in a focused and timely way.

Appendix – Sample Portfolio Matrices

Sample Matrix 1: Uncertainty
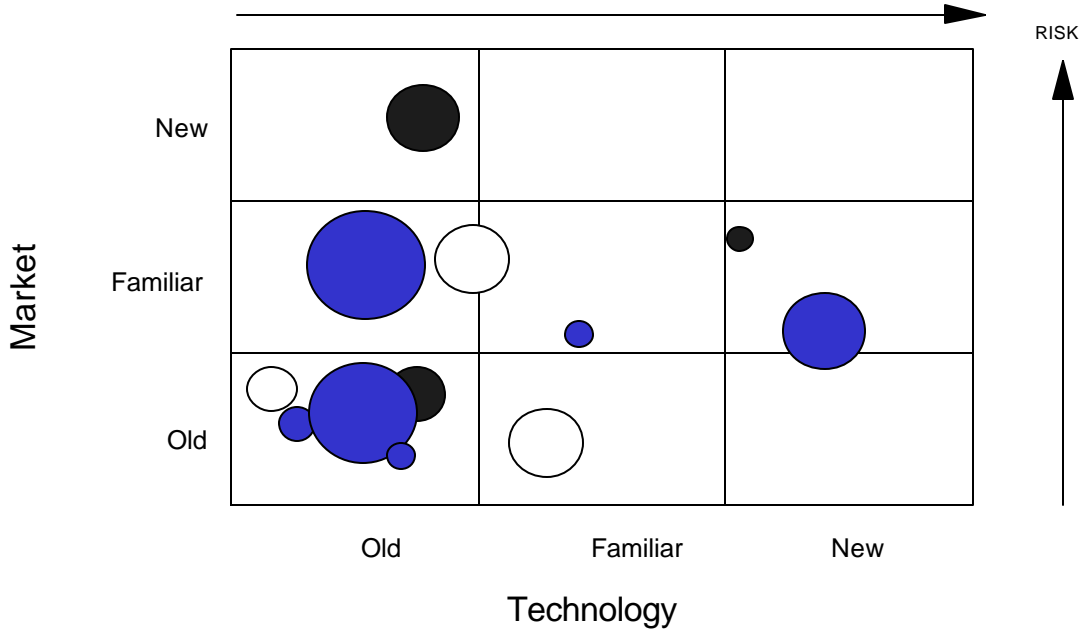
Sample Matrix 2: Competitive Impact

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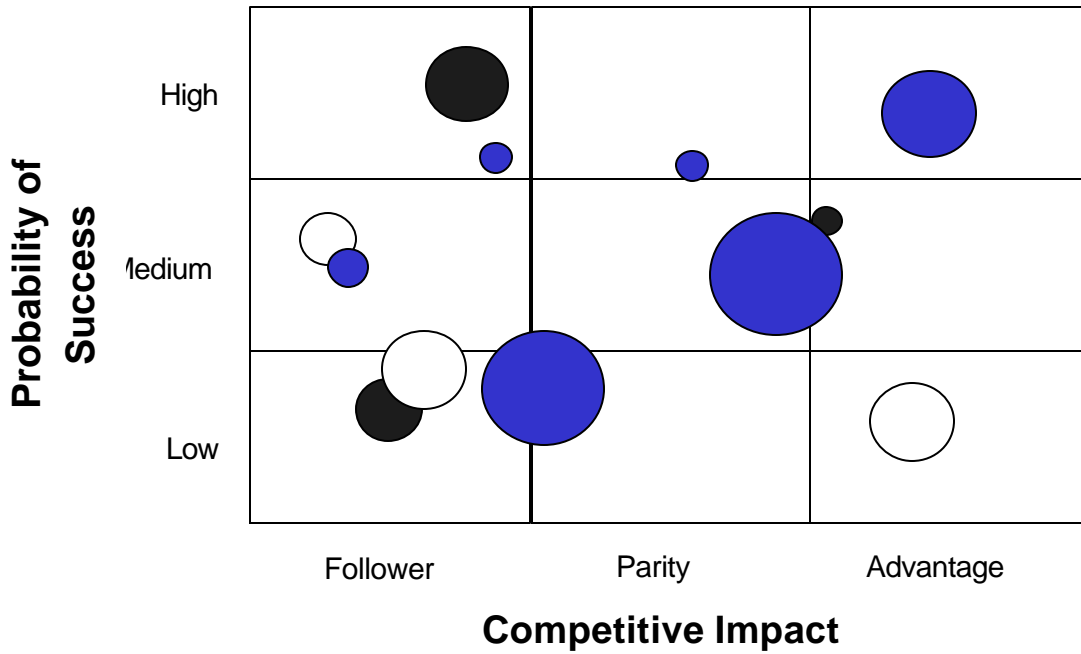
Sample Matrix 3: Technology Leverage

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