

Strategic Technology Planning: Picking the Winners

Creating a strategic technology planning function with a defined process for prioritizing and transferring potentially high-impact emerging technologies will enable your company to avoid the potential disasters of personality-driven investment decisions.

Management Summary

CEOs and CIOs are discovering that, in a difficult economy, early adoption of emerging technologies can give their companies a competitive edge. Many are looking to set up a formal procedure that would smooth the way for the introduction and implementation of these technologies. Of course, technology eventually will find its way into the workplace, with or without planning — but companies that fall back on a reactive, "as needed" approach in their adoption of new technologies run the risk of making costly, personality-driven choices, rather than tactical decisions that align with their larger corporate strategy and goals.

Benefits achieved by companies that take a deliberate and planned approach to adopting new technologies include:

- Identifying strategic opportunities that combine technology "push" (for example, through technology tracking) with business "pull" (for example, based on business context and goals).
- Prioritizing their options, which ensures more intelligent selection of the technologies most likely to have a major positive impact.
- Coordinating all activities related to emerging technology across the company, enabling them to build on successes and avoid redundancies.
- Educating staff to become skilled in the risk management associated with introducing new technologies, including stopping investments if appropriate.

This *Strategic Analysis Report* presents recommended activities and best practices associated with strategic technology planning. These recommendations apply whether the enterprise has a formal advanced technology group (ATG) or a less structured strategic technology planning function. The focus of the report is on ATGs that support the IS organization with technology planning, rather than on product innovation groups within high technology and other product companies.

Gartner

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Strategic Technology Planning Process

Gartner has identified a common set of steps — scope, track, rank, evaluate, evangelize and transfer (STREET) — that make up a typical strategic technology planning process. The STREET framework forms a basis for discussing best practices at each stage of the process.

- **Scope:** Provide focus and scope for technology investments through an understanding of corporate objectives, industry direction and business process bottlenecks. Other activities include competitive analysis, visioning and scenario building, as well as gathering requests from business units for assistance in evaluating technology or addressing business problems and opportunities.
- **Track:** Scan for new technology opportunities, and capture the results in a format (for example, a technology portfolio consisting of a set of technology profiles) that lends itself to further decision making.
- **Rank:** Select the subset of technologies, initiatives and project ideas that look most likely to bring significant benefit to the enterprise. Ranking involves balancing resources between and within two sets of activities: supporting business unit and management requests, and identifying and driving forward strategic technologies proactively, such as ahead of business unit requests. Techniques include technology radar screens, balanced scorecards and hype cycles that examine the relative costs, benefits and risks of the technologies.
- **Evaluate:** Investigate areas where insufficient knowledge of the technology or its impact is preventing a final determination of whether to deploy the technology operationally. Activities include laboratory and paper investigations, prototyping and pilots. The result of the evaluation is a decision to take one of four courses:
 - Proceed to operational deployment
 - Revisit the evaluation in a revised form (for example, with a different application or alternative product)
 - Return the technology to the tracking stage until it matures further
 - Remove the technology from the portfolio being tracked.
- **Evangelize:** Influence those in a position to bring the technology to production. Marketing, educating, networking and inspiring others are a core part of ATG activities and take place throughout the life cycle, but their importance is most apparent following the evaluation phase, as ATGs typically do not have the authority to require that their recommendations be adopted. Staff members therefore need to be proactive in overcoming organizational resistance to a new technology, application or business process.
- **Transfer:** Transfer knowledge and responsibility to those who will develop the operational system. In most cases, the only way technology transfer succeeds is as knowledge transfer through people — that is, having knowledgeable staff work alongside those who need to learn the skills. The aim of the ATG is to help create and support a self-sufficient project with a high likelihood of success, and then to move on to another initiative.

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Five Styles of Advanced Technology Group

For companies with a formal ATG, Gartner has identified five styles of ATG that exhibit distinct characteristics, strengths and challenges. Although most ATGs combine qualities from more than one style, a single style is usually dominant.

- **Navigator:** Determining the strategic business impact of emerging technologies, through tracking and evaluation. *Challenge:* Finding a willing home for a technology at the end of a successful evaluation.
- **Guerrilla:** Tactical and pragmatic "SWAT" team helping business units deploy new technologies. *Challenge:* Carving out time for strategic planning and tracking activities.
- **Priest:** Educating senior management on emerging technology issues and potential. *Challenge:* Lack of hands-on evaluation activities.
- **Conductor:** Coordinating and leveraging advanced technology activities performed in other parts of the organization. *Challenge:* Making its recommendations a reality by working primarily through other groups
- **Scholar:** Research and development group investigating technologies ahead of business need. *Challenge:* Avoiding acquiring a reputation as an "ivory tower" out of touch with current business needs.

The activities of an ATG range from a hands-on involvement in specific technology-oriented projects (guerrilla or scholar style) to strategic planning and evaluation activities, with responsibility for implementation handed over to others at the beginning (priest and conductor) or end (navigator) of the evaluation phase. The goals and activities of the ATG should be established to complement other groups involved in technology planning and delivery.

Top 10 Success Factors for ATGs

- **Affirm senior management commitment.** An ATG that does not have the support of top management will not survive for long. While this is mostly outside of the direct control of the ATG, the ATG can help by supporting, influencing and making their successes visible to senior management. Aligning with corporate goals (and executive bonuses) also drives support.
- **Network, network, network.** Much of an ATG's success hinges on its ability to build bridges to the business units, end users and other parts of the IS organization. All ATG staff can be ambassadors, but the head of the ATG in particular needs to become an expert at turning an idea into reality by inspiring others with his or her vision.
- **Balance short- and long-term objectives.** Newly formed ATGs need to emphasize activities with short-term results. Faster payback on their efforts accelerates organizational clout, which then allows the ATG to embrace longer-term goals. Over time, the emphasis shifts to strategic activities, but short-term projects in support of business units or executives remain key in maintaining an ATG that is viewed as "in touch with the business."
- **Balance the ATG staffing mix.** The ATG must be staffed with a balance of technology and interpersonal skills. An ATG staffed mainly with "propeller heads" will have far less chance for success applying and transferring technology to business needs.
- **Plan the route to deployment.** A common failure point is when the ATG recommends proceeding with a technology, but nobody picks up on the recommendation. Before expending significant effort on

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investigating and evaluating a technology, the ATG should ensure that a business champion or other key management advocate will drive the project forward on a positive recommendation.

- **Make prioritization explicit.** Using a visible prioritization process, such as a radar screen or balanced scorecard, provides an objective basis and justification for investment decisions. The prioritization process helps decision makers inside and outside the ATG avoid becoming over-enamored with a technology at the expense of others that may be more worthwhile.
- **Tie technologies to business need.** In presenting opportunities for technology to the business, ATGs must take the additional step of showing how the technology will impact business processes.
- **Be prepared to say “no.”** In pursuing the risk-taking that will drive high-impact technology adoption, ATGs will inevitably encounter technologies that are not ready for mainstream adoption. To avoid driving forward a suboptimal technology investment, all parties involved in strategic technology planning should promote a culture where a project is valid and useful if it ends with “Let’s hold off on this one for a while.” Political factors may also lead the ATG to decline a potential project at any stage in its life cycle: if the ATG feels it is being used inappropriately to broker a sensitive political battle, then it may be wiser to look for alternative project candidates.
- **Start transfer early.** Projects “thrown over the fence” to a business unit or the IS organization almost never find fertile ground. To promote the transfer of promising technologies, ATGs must involve relevant staff during evaluation activities and at key decision points.
- **Keep an open mind as to the best solution.** The ATG may be asked to investigate process problems or bottlenecks where advanced or emerging technologies are not necessarily the best solution. Instead the solution could be process changes, or even established technologies (such as simple spreadsheets). In these cases, the ATG should not push pet technologies for their own sake.

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1.0 Strategic Technology Planning: Make It Somebody's Job

1.1 Why Engage in Strategic Technology Planning?

CEOs and CIOs are discovering that, in a difficult economy, early adoption of emerging technologies can give their companies a competitive edge. Many are looking to set up a formal procedure that would smooth the way for the introduction and implementation of these technologies. Of course, technology eventually will find its way into the workplace, with or without planning — but companies that fall back on a reactive, "as needed" approach in their adoption of new technologies run the risk of making costly, personality-driven choices, rather than tactical decisions that align with their larger corporate strategy and goals. Benefits achieved by companies that take a deliberate and planned approach to adopting new technologies include:

- Identifying strategic opportunities that combine technology "push" (that is, through technology tracking) with business "pull" (that is, based on business context and goals).
- Prioritizing their options, which ensures more intelligent selection of the technologies most likely to have a major positive impact.
- Coordinating all activities related to emerging technology across the company, enabling them to build on successes and avoid redundancies.
- Educating staff to become skilled in the risk management associated with introducing new technologies, including stopping investments if appropriate.

Often, companies create a dedicated function for the introduction of new technologies because they realize that, in the past, they have been too slow to adopt key technologies.

1.2 Terminology of Technology Planning

The terms "advanced technology" and "emerging technology" are used relatively interchangeably. "Advanced technology," which was widely used in the 1980s and early 1990s by "ivory tower" research groups, has acquired some negative associations. At times, it was interpreted to mean technologies that are esoteric or immature. Gartner prefers "emerging technology" because it stresses that this is a temporary stage in a technology's life cycle. However, the organizations that investigate emerging technologies are still frequently called advanced technology groups (ATGs), so we will continue to use the ATG moniker in our discussion of these groups. When we describe the process by which companies determine which emerging technologies are most important to them, we will refer to "strategic technology planning" to highlight the emphasis on technologies that will have a strategic impact.

1.3 Definitions

Emerging Technologies (synonymous with "advanced technologies"): Emerging technologies are those that are technologically immature, or those that are mature but have not yet achieved their potential level of acceptance and market penetration.

Strategic Technology Planning: The process of determining which technologies not yet adopted will have a strategic impact on the company.

Advanced Technology Group: A group with the mission of performing strategic IT planning in support of the company's business goals.

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1.4 Technology Aggressiveness: Type A, B, C Enterprises

The one factor that Gartner finds most consistently predicts the way a company engages in strategic technology planning is its tolerance for risk with respect to technology adoption. We express these differences by referring to *enterprise types*. Gartner distinguishes three enterprise types with respect to technology adoption: Type A are early IT adopters; Type B are mainstream adopters; Type C are late adopters.

- *Type A* enterprises are pioneers of advanced technologies and aggressively adopt high-risk strategies to gain the high-potential rewards. They are frequently among the first companies to pilot innovative technology
- *Type B* enterprises are the most widespread. They are willing to take moderate risks in the implementation of new technology. They want to keep in step with their competitors, but not at the risk of using technology that is not yet proven.
- *Type C* enterprises are cautious adopters of technology. They typically use IT as a defensive weapon or as a means of reducing costs in their operations. They prefer to lag in acquiring new technologies to take advantage of cheaper costs and wider availability.

Pockets of Type A, B and C behavior can occur in various parts of the same company; however, most companies can identify one dominant category that drives their corporate IT behavior. This behavior is not necessarily the result of a conscious corporate decision, but rather a consequence of how much importance the company's executive management assigns to technology in achieving the company's business goals. Some industries have a higher-than-average proportion of type A organizations (such as financial services and pharmaceuticals) compared to other, less-aggressive industries (such as retail or manufacturing).

Interestingly, Gartner has found that the number of companies that identify themselves as Type A has increased recently. For years, the distribution of the number of Type A, B, and C enterprises was stable, at approximately these proportions:

- 15 percent Type A
- 65 percent Type B
- 20 percent Type C

Recent surveys show the distribution has shifted to approximately these proportions:

- 30 percent Type A
- 60 percent Type B
- 10 percent Type C

Our surveys demonstrate a twofold increase of Type As and a twofold decline of Type Cs. See SPA-17-3620, "Adopting IT Innovations Earlier: More Attempts and Failures" for more information.

1.5 Who Does Strategic Technology Planning?

Most large companies have attempted to formalize the strategic technology planning process in some manner. Approaches may include:

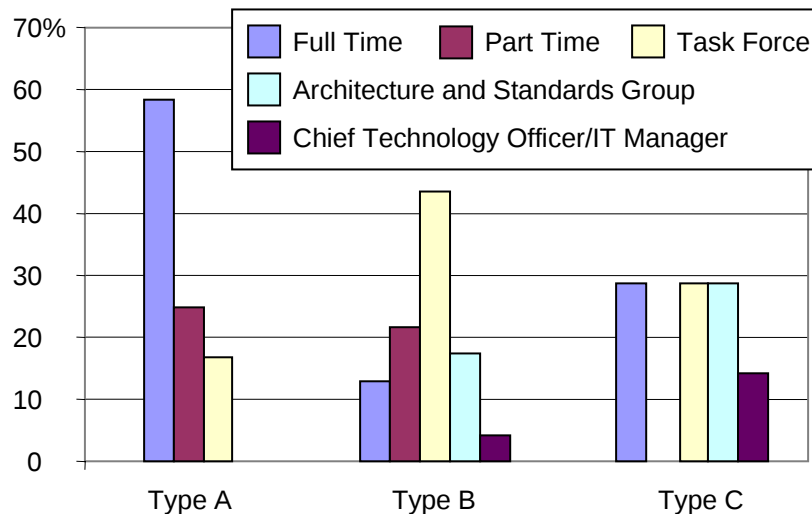
- Establishing a full-time ATG

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- Distributing responsibility among domain experts within various areas of IT
- Establishing or leveraging a task force or committee
- Expanding the role of the architecture group
- Assigning responsibility to a key individual (for example, the CTO or senior IT manager)

A survey of technology planners in approximately 45 companies examined approaches to strategic technology planning (see TG-18-6377, "Technology Adoption and Value: Survey Results" and TG-18-6218, "Funding for Strategic Technology Planning: Survey Results"). The survey cut across industries, with a strong representation from manufacturing, government and financial services.

Survey respondents were asked: "Who in your enterprise is responsible for identifying and assessing new technologies?" Their replies varied significantly according to how aggressive the company considered itself with respect to technology — Type A, leading-edge technology adopters; Type B, mainstream technology adopters; or Type C, conservative technology adopters (see Figure 1).



Source: Gartner Research

Figure 1. Responsibility for Strategic Technology Planning

A majority of Type A enterprises have a full-time ATG. In most of these companies, strategic technology planning is typically a distinct function from architecture and standards planning.

Type B enterprises are more likely to perform strategic technology planning through part-time or task-force activities than through a full-time group.

Type C enterprises are similarly more likely to leverage other task forces or groups, such as an architecture and standards group.

In this *Strategic Analysis Report*, we will refer primarily to the ATG and ATG staff when discussing activities and best practices associated with strategic technology planning. However, the recommended approaches apply equally to a less-structured strategic technology planning function. This report focuses on ATGs that support the IS organization with technology planning, rather than on product innovation groups within high-technology and other product companies.

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2.0 Strategic Technology Planning Process – Inspire and Retire

2.1 Overview of the Process: STREET

The mission of an ATG is broadly defined as managing the evaluation, introduction and deployment of the emerging technologies that will most effectively further the company's strategic objectives. While every company has its own particular approach to support this mission, Gartner has identified a common set of steps — Scope, Track, Rank, Evaluate, Evangelize and Transfer (STREET) — that make up a typical strategic technology planning process. The STREET framework forms a basis for discussing best practices at each stage of the process.

2.2 Scope: Aligning With the Business

The main purpose of the Scope phase of the strategic technology planning process is to provide focus and scope for technology investments. New technology planners commonly begin with "tracking" activities, without a clear idea of the business objectives and priorities the technology will support. Understanding the importance of aligning business goals with technology investment is critical to the Scope phase. Alignment is a two-way flow: Technologists must understand and align with the business objectives, but also must expect to influence the direction of the company by helping business planners understand how technology will shape business models and processes.

Understanding the business priorities is particularly critical in the high-risk environment of emerging-technology adoption. To make the additional risk inherent in adopting an immature technology worthwhile, the potential benefits of a successful deployment must be correspondingly high. Focusing on high-impact and strategic business issues may be counterintuitive for some technology planners, who may be tempted to keep a low profile by selecting a simple or noncritical function until the technology is proven. However, the risk inherent in new technologies can only be mitigated if the company seeks to improve core business processes.

The Scope phase has three major aspects:

- A top-down perspective looking at corporate direction,
- A bottom-up perspective driven by specific business issues
- An "out of the box" perspective imagining new ways of doing business

2.2.1 Top Down: Strategic Planning

The top-down perspective involves identifying the high-level corporate goals and strategic planning initiatives of the company, including any specific, near-term objectives (such as improved customer service or faster product development). It also incorporates an understanding of broader industry directions and market dynamics that will have an impact on future business and process models.

Even companies that lack a formal strategic plan usually have a mission, set of goals or statement of core competencies that acts as a focus for investment of resources. Successful ATG managers seek out these goals and objectives, frequently through informal "corridor" dialogues with the company's strategic planners and executive management.

In some organizations, the ATG explicitly reiterates these goals and priorities in a written document or presentation, to lay out the assumptions against which it will pursue its technology planning agenda. This enables misunderstandings to be addressed early in the life cycle (and, in some cases, acts as the only written resource for such information).

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Where possible, the ATG manager should be formally involved at key points of strategic business planning through his or her participation in relevant committees or planning meetings. This is a highly effective way to identify the common objectives of the company and to help decision makers understand the potential impact of technology. For particularly large or geographically dispersed enterprises, this role may need to be delegated among the ATG staff, with different staff members responsible for different business units.

2.2.2 Bottom Up: Business Unit Requests

The bottom-up perspective highlights business problems or process bottlenecks that may be alleviated through IT solutions. Representatives from the business units are typically in the best position to identify where this type of opportunity occurs.

Business unit directors and corporate management should be involved in regular or periodic brainstorming activities to facilitate the flow of information and to encourage early support. Cross-functional high-level committees should be included, if possible (for example, by having emerging technologies becoming a regular agenda item). Visits to remote business units are important for gaining a first-hand perspective of the problems.

In some cases, the best way to address a business issue or bottleneck may not be through an emerging technology, or even through IT at all. ATG staff may at times need to dive into “common sense” solutions to help business units make progress. The ATG staff often brings the appropriate problem-solving approach and outside perspective. Even though this is not the primary function of the ATG, it can be worth spending time on such problems to enhance the group’s credibility and value.

Business units, managers and executives may also make specific project requests to the ATG, often to evaluate specific products (such as mobile devices). While these may not be particularly strategic or high-impact opportunities, it is again important to acknowledge these requests and support them to the extent possible to maintain good relationships and credibility.

2.2.3 Out of the Box: Visioning and Scenarios

The “out of the box” perspective encourages creative thinking and deliberately expands the space of future opportunities for the company. Since a strategic perspective can be difficult to attain amid day-to-day pressures and priorities, a session dedicated to strategic “brainstorming” or scenario planning can be an effective way to facilitate longer-term thinking. Such sessions are typically a one- to two-day off-site event, often featuring an invited speaker with an industry or technology perspective. The audience is drawn from a cross section of business and IS functions to attain a diverse set of perspectives. A professional facilitator is frequently invited to maintain a cooperative and nonjudgmental atmosphere that encourages full participation. The agenda includes understanding and brainstorming possible industry directions, technology candidates and internal applications and prioritizing potential application or technology initiatives. As these off-site sessions can be costly, they are usually performed infrequently (for example, every one or two years) at the launch of a major initiative to re-evaluate technology positioning and priorities. Smaller-scale versions may be performed internally much more frequently – some ATGs have weekly brainstorming sessions within the group.

2.3 Track: Watching for the Winners

Although technology tracking is viewed as a core function of many ATGs, it is important to consider the technologies in terms of their relevance to the strategic business initiatives, processes and bottlenecks identified in the Scope activities. Technology tracking involves scanning and watching for new technology

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opportunities, and capturing the results in a format (such as a technology portfolio consisting of a set of technology profiles) that lends itself to further decision making.

2.3.1 Technology Scan

A technology scan consists of polling a range of sources for ideas on technologies and applications that might be relevant to the business. Since "knowing what you don't know" is one of the most challenging aspects of technology planning, the possibility of overlooking a potentially key technology is an ongoing fear among advanced technology managers. The aim at this stage is to gather as broad a set of ideas as possible — selection and prioritization comes later. Sources include:

- Analyst companies
- Consultants
- Vendor presentations
- Government and university labs
- Trade and scientific press
- Conferences
- Networking with other technology planners within and outside the organization.

Some companies also conduct a comprehensive assessment of what technology initiatives their competitors are undertaking.

Some ATG managers try to promote the discovery process by ensuring that each member of the group spends a certain amount of time (for example, 15 percent to 20 percent) on unfocused (in other words, non-project-related) technology tracking activities.

Involving other internal resources is also important. Even larger ATGs (those with more than eight people) are required to understand, to some degree, an exceedingly large range of relevant technologies. To improve the quality of the technology scans, companies can divide the work across several groups and among interested individuals by assigning part-time responsibility for monitoring:

- Information sources (for example, e-mail-lists, magazines, conferences)
- Application areas (for example, customer relationship management, security, knowledge management, business intelligence)
- Technology areas (for example, Web services, portals, wireless, data mining and user interfaces)

2.3.2 Technology Profiles

For each potentially interesting technology identified during a technology scan, the ATG should develop a technology profile to document the investigation. The initial profile may be very brief — just a note of the technology, its definition, and potential areas of relevance within the business. As the investigation progresses, more information about the technology and its applications will be added to the profile.

Technologies with multiple distinct applications within the company (such as speech recognition for the call center vs. speech recognition for dictation in the legal department) should have a profile for each application, as characteristics such as costs, benefits, vendors and other fields may be significantly different for each application.

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A technology profile may include the following characteristics:

- Name and definition of technology
- Business application — Where would this be used within the company?
- Benefit to company — What are the anticipated business returns for the application (for example, reduced costs, increased revenue or profits) and impact (positive, from successful exploitation, or negative, from late or missed implementation)? Will the technology change business processes (incrementally or drastically), affect problem types (enable previously intractable functions to be performed), or upset the competitive dynamics of an industry? Will the impact be confined to one business unit, or can it be leveraged across the company?
- Potential business champion — Is there an enthusiastic and influential champion for selected business applications?
- Activity inside company — Is there already investigation or adoption of this technology that can be leveraged?
- Competitors' adoption — Is the company losing a competitive advantage by not adopting the technology?
- Level of maturity — What is the level of robustness and stability of the technology, and how fast is it progressing? This also incorporates such factors as the existence of accepted standards, the stability and legitimacy of vendors in the market, and academic and research initiatives in the area.
- Level of risk — What factors would inhibit the adoption of this technology? Risk factors to consider include:
 - Technology or process failure (for example, frequent crashes, low accuracy, slow performance)
 - Disruption of architecture or processes
 - Lack of management support
 - Nonadoption or resistance by users
 - Benefits not achieved
 - Lack of maintainability
 - Rate of obsolescence
 - Lock-in risks
 - Regulatory environment
 - For consumer-facing technologies, social acceptance and new business models are additional risk factors. Note that the level of risk is generally inversely proportional to the level of maturity.
- Approximate costs — What level of investment is required to bring this technology into production in the application? Factors to be considered include costs of acquisition, development, integration, maintenance, staff and subsequent process and architecture changes (such as performance upgrades required). The cost may be presented as a range for the best and worst cases, depending on how the technology progresses.

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- Leading vendors — Who is shipping products with this capability? Is the technology available from established vendors?

2.3.3 Emerging Technology Portfolio

The emerging technology portfolio is the set of technology profiles representing candidate information technologies and technology-led initiatives (such as business intelligence or knowledge management) the company has not yet adopted or fully exploited.

The technology portfolio may be divided into subcategories according to the level of maturity of the technologies for the desired applications. For example, the portfolio may range from technologies that will be mature within five to 10 years, which the company is only tracking superficially, to technologies that are already relatively mature but not yet adopted, which the ATG is actively evaluating or ready to transfer into mainstream deployment.

The technology portfolio and the technology profiles it contains should be viewed as a living document that is updated as new technologies are identified or new potential uses are discovered.

Some companies maintain the technology portfolio on the company intranet, with each entry containing a brief summary of each technology and its potential uses. Others compile an updated document annually as part of the technology planning cycle.

2.4 Rank: Make the Prioritization Explicit

The objective of the Rank stage is to select the subset of technologies, initiatives and project ideas that look most likely to bring significant benefit to the company. Ranking candidates need not take significant amounts of an ATG's time, but it is a critical activity in avoiding the "personality driven" technology investment decisions that a strategic technology planning process seeks to avoid.

Ranking involves balancing resources between and within two sets of activities:

- Supporting business unit and management requests
- Identifying and driving forward strategic technologies proactively, that is, ahead of business unit requests.

Project requests from the business units and executive management are typically prioritized by considering a combination of the status of the requestor, the amount of time required to fulfil the request, and the extent to which the topic aligns with the ATG's strategic tracking activities. For example, a short project for the CEO would inevitably receive high priority, whereas a business unit looking for time-consuming support on multiple niche, nonstrategic projects may not have all its requests met by the ATG. However, a request from a business unit to evaluate a technology that the ATG feels will be strategic to the company may be selected, even if it requires significant investment in ATG staff.

Prioritizing the most strategic technologies for the ATG to investigate proactively involves refining and ranking the technologies in the technology portfolio. This ranking is achieved in multiple stages.

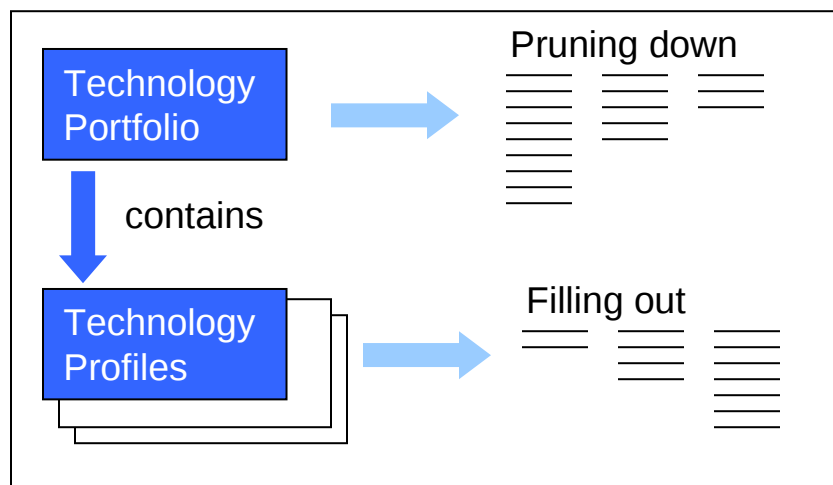
- The first level occurs during technology scan, when the ATG staff will typically encounter more technologies than it includes in the technology portfolio. Technologies and applications that are considered irrelevant to the business (such as robotics for an insurance company) or those whose time to maturity lies outside of the appropriate planning horizon (such as quantum computing) will be implicitly or explicitly excluded.

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- With a technology portfolio of approximately 40 to 60 technologies, the ATG should understand each technology or initiative just enough to determine which are likely to generate the highest return, based on a general sense of benefit, cost and risk. The team picks the 15 to 20 that seem to offer the best potential return and creates more detailed technology profiles for this subset.
- Through an explicit prioritization process (see sections 2.4.1 through 2.4.3 for examples of approaches to prioritization), the ATG selects a further subset, perhaps four to six, to turn into funded evaluation projects. The level of available funding and number of staff determines how many projects can go forward. As previously discussed, to maintain a reputation for being “connected with the business,” the ATG must balance these prioritized technologies with high-priority requests from the business (such as those from key executives), even if the business requests provide fewer overall benefits for the company.

Depending on the culture of the company, the final determination of which project candidates receive funding may be based on the objective prioritization by the ATG, a democratic vote by relevant parties (such as a steering committee) or a unilateral decision by a key executive (for example, the CIO or manager of the ATG).

In summary, the aim of the proactive technology assessment in the Rank phase is to prune down the set of candidate technologies to those that are most strategic, in parallel with filling out the level of knowledge regarding each of the candidates (see Figure 2). Adding to and maintaining the technology portfolio is an ongoing process. Prioritizing is performed periodically (for example, once a year), typically to feed into broader IT funding decisions, although midterm adjustments and additions in response to new opportunities are common.



Source: Gartner Research

Figure 2. Creating a Technology Portfolio

2.4.1 Technology Radar Screen

One relatively simple prioritization technique is the technology radar screen. A technology radar screen is a graphical tool that compares the candidates along key dimensions or axes, to highlight why certain technologies deserve to be selected over other candidates.

Several of the characteristics described in the technology profile could be used as axes in a radar screen. Before these characteristics can be applied as axes, values must be set to describe the different positions along the axis. For example:

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- **Level of Maturity**

- *High*: Usable anywhere the technology confers benefit
- *Moderate*: Usable with some motivation (in other words, in some clearly defined applications, the benefits outweigh the problems)
- *Low*: Demonstrations, prototypes and pilots; few deployed applications

- **Level of Disruption**

- *High*: Complete replacement of network, hardware, software or business infrastructure
- *Moderate*: Replacement of major elements of infrastructure
- *Low*: Modification or addition of specific applications, workstations, peripherals or processes

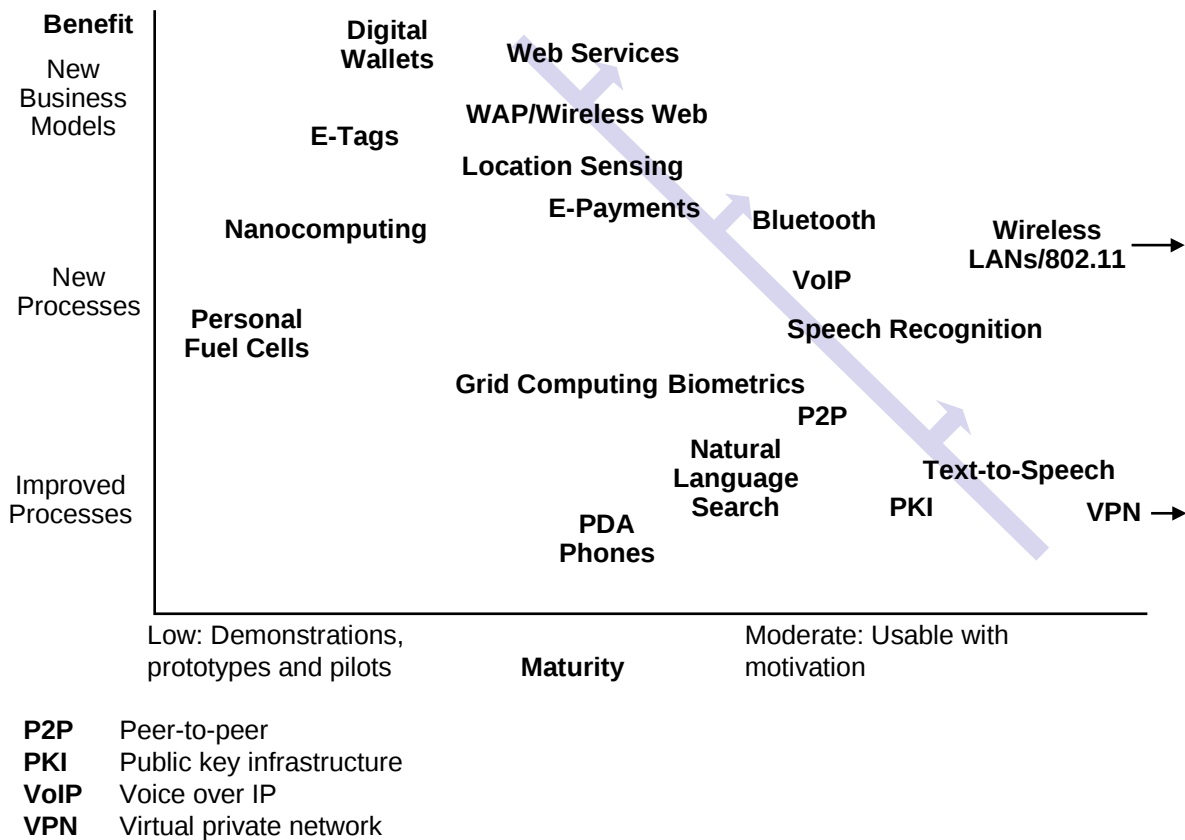
- **Benefit to the Company**

- *Transformational*: Enables totally new ways of doing business across industries that will result in dramatically increased revenue generation or cost savings
- *High*: Enables new ways of performing specific horizontal or vertical applications that will result in significantly increased revenue or cost savings
- *Moderate*: Provides incremental but significant improvements to established processes that will result in increased revenue or cost savings

Characteristics could also be combined to create a composite axis; for example risk, cost and level of disruption could be combined to distinguish “quick hits” from those that involve more significant investment. Similarly, a “likelihood of success” axis might include the availability of a business champion with risk and maturity considerations.

Figure 3 shows a technology radar screen that positions technologies according to the level of benefit and the level of maturity. Although any of the technologies may be worthwhile investments, those on the right half of the radar screen, particularly those in the top two-thirds, should be the focus of more detailed evaluation activities.

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Source: Gartner Research

Figure 3. 2002 Technology Radar Screen

2.4.2 Technology Scorecards

The technology scorecard offers a more detailed approach to prioritization. The scorecard provides a format for assessing the relative value of the technology when weighed against the costs and risks. This technique is particularly suitable for prioritization of fully developed project candidates that have already undergone some level of evaluation to determine more detailed information regarding benefit, costs and risk.

To create a scorecard, the factors contributing to the potential benefit/impact of the technology are enumerated and assigned a number (for example, one to 10, where higher benefits receive a higher number). Likewise, the factors contributing to cost and risk are enumerated and assigned a number (where higher risks or costs receive a *lower* number). The factors are then added up, and the technologies can be ordered by rank. An even more rigorous scorecard would assign different levels of importance to various factors, so that the score for highly important factors counts more toward the final score than those factors that are deemed less important.

Note that risks often can have nonadditive effects on the technology scoring exercise. Even if a technology scores high in most categories, a single risk factor may make investment inappropriate, at least for the moment. A common risk factor of this type is the subtle political issues that may conspire to jeopardize a project's success. For example, even a project involving a highly compelling technology candidate with demonstrable business value can be sent awry by a single user, manager or local IS representative with a personal agenda that runs counter to that of the project. In these cases, the safest

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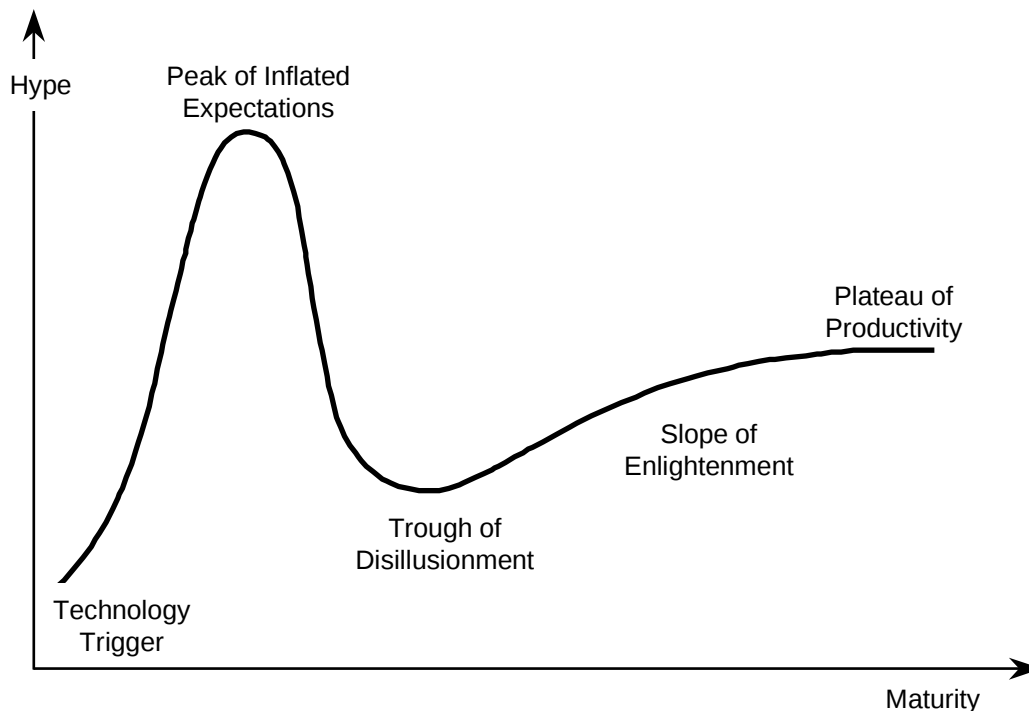
route may be to delay pursuing the technology until another test bed with a strong champion can be found, so that the risk factor no longer outweighs the otherwise favorable ranking.

When following a scorecard approach, the discussions around assigning the individual values are often more useful than the final ranking. In particular, breaking down the evaluation into smaller units forces an explicit discussion around all key factors and minimizes the risk of overlooking an important aspect.

2.4.3 The Hype Cycle: Timing the Adoption Opportunities

In performing the prioritization process, it is also important to identify, and thus avoid, the commonly occurring *wrong* reasons for which companies adopt technology. The high level of hype surrounding technology in the marketplace is one of the factors that frequently drives companies to a poorly timed adoption of technology (typically too early).

The role that hype plays in the early stages of a technology's life cycle can be represented by the Hype Cycle model of emerging technologies, introduced by Gartner in 1995 (see Figure 4). The Hype Cycle characterizes the typical progression of a technology, from over-enthusiasm through a period of disillusionment (because of the inevitable failures that arise from inappropriate application), to an eventual understanding of the technology's relevance and role. If a company launches its efforts too soon, it will suffer unnecessarily through the painful and expensive lessons associated with deploying an immature technology. If it delays action for too long, it runs the even greater risk of being left behind by competitors that have succeeded in making the technology work to their advantage.



Source: Gartner Research

Figure 4. The Hype Cycle

The Hype Cycle has five phases:

- **Technology Trigger:** A breakthrough, public demonstration, product launch or other event generates significant press and industry interest.

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- **Peak of Inflated Expectations:** During this phase of overenthusiasm and unrealistic projections, a flurry of well-publicized activity by technology leaders results in some successes, but more failures, as the technology is pushed to its limits. The only companies making money are conference organizers and magazine publishers.
- **Trough of Disillusionment:** Because the technology does not live up to its overinflated expectations, it rapidly becomes unfashionable. Media interest wanes, except for a few cautionary tales.
- **Slope of Enlightenment:** Focused experimentation and solid hard work by an increasingly diverse range of organizations lead to a true understanding of the technology's applicability, risks and benefits. Commercial, off-the-shelf methodologies and tools ease the development process.
- **Plateau of Productivity:** The real-world benefits of the technology are demonstrated and accepted. Tools and methodologies are increasingly stable as they enter their second and third generations. The final height of the plateau varies according to whether the technology is broadly applicable or benefits only a niche market. Approximately 30 percent of the technology's target audience has adopted or is adopting, the technology as it enters the Plateau.

The main lesson of the hype cycle is that companies should not invest in a technology just because it is being hyped, nor should they ignore a technology just because it is not living up to early overexpectations (see R-20-1971, "Understanding Gartner Hype Cycles"). The Hype Cycle is also useful in explaining why the recommendations from technology planning groups may be different than what companies are hearing or reading in the media. At the Peak of Inflated Expectations, technology planners will caution: "Don't get caught up in the hype. Let's adopt it only if it is strategically important to us. Otherwise, let's wait for others to learn the hard lessons." In the Trough of Disillusionment, technology planners will recommend: "Let's start looking at the technology now because there are some solid products emerging and real-world experience about how to use the technology."

2.5 Evaluate: The Deliverable Is a Decision

2.5.1 Planning the Evaluation Project

The project plan for a technology evaluation project should contain all the normal components of an IT project plan (such as detailed work breakdown, milestones, staffing, timeline, cost, deliverables). In addition, the plan should include the explicit goals for the evaluation, and the criteria by which success will be determined. It is also advisable to include an initial indication of longer-term plans, particularly staffing and funding, to ensure that a path to deployment exists if the initial investigations succeed.

The overall goal of the evaluation project is to investigate areas where insufficient knowledge of the technology or its impact is preventing a final determination of whether to deploy the technology operationally. Gaps or weak areas in the technology profile can highlight where the investigations should be focused. The evaluation typically focuses on a specific application of the technology, not on the technology's potential in the abstract. If a business champion has not yet been identified for the application, this should be addressed during project planning. In addition, involvement of business unit and IT staff should be considered to begin the technology transfer process and ensure a path forward if the evaluation is successful.

Risk factors are a particularly uncertain area with emerging technologies, so evaluations frequently focus around understanding and minimizing the types of risk enumerated in Section 2.3.2. Cost and benefit considerations can progress from "ballpark" estimates to more reasoned cost/benefit or return on investment (ROI) calculations.

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Note that technologies can have ripple effects, both positive and negative, on the whole company. For example, implementing a workflow and imaging architecture not only affects the volume of paper, but reduces clerical and data-entry staff. It can also improve employee information access, which often translates into better customer responsiveness and faster product turnaround. It is also particularly important to quantify the expenses incurred by the company due to the problem or ineffective process. Throwing expensive technology at an inexpensive problem results in a net negative for the organization. Evaluation projects should aim to identify these ripple effects, in addition to the direct costs and benefits.

2.5.2 Technology Evaluation Documents

Technology evaluation documents present the results of evaluation efforts. They can include the results of ad hoc experimentation, surveys, user or business model analysis, or prototyping and pilot activities as outlined above.

A technology evaluation document typically follows a similar structure to the technology profile (such as benefit, cost, availability of a business champion), but contains significantly more detail on each topic. In particular, it should include a more detailed assessment of the costs, benefits, ROI and requirements for implementation and adoption.

The technology evaluation document concludes with a recommendation based on the evaluation activities that have been performed.

2.5.3 Prototypes

Prototypes are used primarily as a risk-reduction tool to investigate areas of high technical uncertainty, and also sometimes as a marketing tool to increase internal awareness of a technology's potential. Examples of uses of prototypes include:

- Assessing the robustness, performance or accuracy of the technology
- Determining the impact on established architecture and infrastructure
- Refining the scope of the application
- Estimating the costs of deploying a pilot or full-scale application
- Inspiring management and users by demonstrating potential business benefits

The team must clearly define the role and function of the prototype in advance, as some goals may be incompatible in a single prototype. For example, a technical prototype may uncover performance issues but is unsuitable for a high-impact management presentation, while a proof-of-concept screen show can highlight changes in business processes, but will not test a technology's limitations. Most importantly, the evaluation team should not deliver prototype code for operational use despite enthusiastic and urgent requests from users. All operational systems should go through the company's normal quality and deployment procedures.

Selecting a vendor for a prototype activity can be as critical as selecting one for deployment, but for different reasons. Whereas the vendor requirements for an operational system are based on reliability, longevity and ease of development, a prototype demands optimal technology performance (for example, the most accurate speech recognition, the smoothest and highest-resolution video). Although performance often comes at the expense of product maturity, it provides technologists, users and management with a better appreciation of what the technology capabilities will be once the technology is mature.

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Prototyping can serve as a vehicle to begin to address technology transfer. For example, business unit representatives might help formulate requirements for a prototype of a new workflow that takes advantage of the technology, or the architecture group might support an assessment of what upgrades would be required to the corporate network were the technology to be deployed.

A particular kind of prototype sometimes adopted by future-oriented ATGs can be characterized as “experiential prototyping,” whereby the ATG members use the technology themselves for a period of time. This is particularly appropriate for devices, personal productivity or collaboration technologies. The ATG evaluates products, realizing that the products are necessarily imperfect at this early stage of their evolution, and selects one or more for implementation within the ATG. The ATG uses the technology in its daily operations to determine the impact and potential problems. This approach combines technical evaluation with marketing: As senior managers and other key individuals see the technology in use within the ATG, they may be inspired as to the broader potential of the technology.

2.5.4 Pilots

Pilot systems are developed to investigate the impact of the technology in the operational environment. The focus of the pilot is to evaluate the usability and effectiveness of the system with a small number of users, prior to a wider introduction.

To fully assess the technology’s potential benefits and issues, the pilot must be evaluated by typical users trying to perform their normal tasks. The evaluation should include users new to the system as well as those who were involved in the pilot development, as each will have different preconceptions and prejudices. Both quantitative and subjective evaluation criteria should be used with the aim of addressing one key issue: the extent to which the system improves the process; for example, through reduced transaction time or increased efficiency.

All parties involved in the evaluation must be made aware of the impact on their time. Users typically become less productive because of the learning curve and developers often find themselves involved full-time with fixing problems and implementing user suggestions for improvements.

Assessing the success of the pilot must take human behavior into account, in particular people’s natural resistance to change. Users must be given appropriate incentives to adopt change, especially change they perceive as negative. The following examples from Gartner clients illustrate how *not* to present pilots to business users:

- A midlevel manager was asked to evaluate a speech recognition system for dictation, and was told that if the technology worked well, he would lose his administrator, as she would no longer be required to take dictation for him. Needless to say, his findings were that the technology did not work well enough.
- Warehouse employees responsible for unloading trucks were provided with a speech-based data entry system that meant they could continue unloading as they entered data, rather than stopping to enter the information in a nearby PC. Although unloading a greater number of trucks per employee per day was an excellent outcome for the company, the individuals were not strongly motivated to work harder unloading more trucks for no personal benefit.

An additional purpose of a pilot may be to evaluate the relative benefit of a new approach. As changes to the operational system can be risky, a “champion-challenger” test can reduce the risk of exposing the entire current system to new approach. This test is a statistical real-world validation that aims to measure

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the effectiveness of an established system (called the champion) in comparison to a new system (called the challenger).

For example, a former handcrafted marketing strategy is compared to a statistical response model. The test is executed on two comparable sets of real cases (accounts) satisfying two conditions: statistical significance (in other words, of large enough quantity), and from the same distribution. The objective is, for example, to verify that the challenger has improved performance on the majority of cases compared to the traditional method. Example measures of effectiveness include ROI, retention, customer satisfaction, time-to-solution, direct costs, or incremental sales or any other metrics that is countable.

A less-expensive alternative to a champion/challenger test would be a simulation or validation that just considers historical data. The advantage of a champion/challenger test is a more up-to-date validation, given the sometimes rapidly changing environmental conditions (markets, customers, economics, products and competition). A further advantage of a champion/challenger test is that, once implemented, it can provide an ongoing test bed for recalibration of further improvements.

Depending on the scope of the pilot, a major portion of the funding and staffing for the project may come primarily from the ATG. Later-stage or more ambitious pilots may be funded by the relevant business unit that would lead the implementation, with support from the ATG. Whoever leads the effort, the pilot represents a critical phase in the technology transfer process as ATG and business unit staff work together. By the end of the pilot phase, the ultimate owner must be positioned to lead the operational systems' development, deployment and ongoing support.

2.5.5 Making the Decision

The technology evaluation documents, presentations, prototypes and pilots created as part of the evaluation stager are only interim deliverables. The key deliverable from an evaluation activity is a *decision* about whether or not to proceed with the technology in a specific application. At the end of the evaluation, the team recommends one of four alternatives:

- Proceed to operational deployment
- Revisit the evaluation in a revised form (for example, with a different application or alternative product)
- Return the technology to the tracking stage until it matures further
- Remove the technology from the portfolio being tracked

A decision not to proceed immediately with further development of a technology should not be viewed as a failure. Such a decision may save the company considerable expense, compared to an approach that forces all projects, once commenced, to be fully deployed. Companies that encourage controlled risk-taking (for example, by using well-defined decision points) are better able to identify which technology or application, from the multitude of possibilities, will have the most significant impact. By making a small investment in a number of evaluations, a company can identify technologies with a high chances of success, in the same way a venture capitalist invests in many companies, most of which will fail, for the sake of the few that will generate high returns.

In addition, halting a project may help the company avoid serious problems downstream if the technology were to be adopted prematurely. It is preferable that the drop-off occurs early in the evaluation process rather than later, as it is harder to halt development of a technology after a significant investment has been made.

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For evaluation projects that result in a recommendation to proceed, the next stage is to promote the recommendation to key decision makers. ATGs are rarely in a position to lead operational deployment; therefore, the role of the ATG shifts to influencing and supporting the managers or executives outside of the ATG who will make the relevant funding decisions.

2.6 Evangelize: Planting the Seeds

The activities associated with influencing those in a position to bring the technology to production can be divided into the more formally recognized activities of marketing and education, and their less formal but equally important counterparts of networking and evangelism.

These activities are a core part of ATG activities and take place throughout the life cycle of scoping, tracking, ranking, evaluating and transferring. Their importance is most apparent following the evaluation phase, as ATGs typically do not have the authority to require that their recommendations be adopted. However, teams that leave the marketing of their ideas to this stage rarely have success — the seeds must be planted much earlier in the life cycle.

2.6.1 Marketing

Marketing activities include making others aware of the role and capabilities of the ATG itself, and selling the value of specific technology and application opportunities.

The ATG will generally be most successful if it can present itself as a resource to the rest of the organization. As a centrally funded group, a major part of the ATG's role is to investigate technologies ahead of a firm business case. The ATG should encourage the business units to approach it with technology or project ideas that require additional investigation before feeding into mainstream business or IT funding and adoption processes. Some ATGs put out specific requests for ideas through the intranet or other communications channels. Some companies explicitly encourage innovation at all levels of the organization by offering individuals the opportunity to work on the project if their proposal is accepted. For this approach to work, all affected parts of the company must agree to support the program ahead of time so that business units are prepared to free up the time of successful applicants.

Marketing a particular idea or concept is most influential when the technology is showcased in a business context. This is particularly true in cases where the ATG has identified a promising new technology and is trying to “push” it into the business, rather than being driven by a business “pull.” In these cases, the ATG needs to take the extra step of identifying potential business impact points and presenting the technology in terms of its business benefit (for example, “Let me show you how we can reduce our customer portfolio calculation times for the same cost,” rather than “Let me tell you about grid computing.”).

A particularly effective way of inspiring relevant parties with the potential impact of new technologies is to create a mock-up of how the business will function after the technology is in place. The mock-up could be a series of computer screens showing a new workflow (such as the environment for a call center agent), or a video showing a “day in the life” of an employee or customer (such as a customer trying to complete a transaction using a new channel). Such demonstrations can create a unifying vision for a major technology and business initiative. However, expectations must be set carefully when laying out the vision. A common response from executives who have viewed a five-year vision video is “Why can't we have this now?”

2.6.2 Networking

One of the most important success factors for ATGs is the strength of the ATG manager's connection with the key decision makers in the company. The ATG manager needs to be politically aware, and respected

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by the business and other IT managers. Allocating specific time and effort to hallway discussions and other meetings with key players is an essential part of preparing for the point at which the ATG transfers responsibility to other groups. In most cultures, this type of face-to-face communication wins out in both efficiency and effectiveness compared to lengthy work-in-progress reports and memos. Networking needs to go beyond a single business champion for a technology or application, because in many cases, multiple groups are affected by funding and staffing requirements. ATG staff can also help forge connections at various levels in the company.

2.6.3 Education

Most ATGs play a role in educating key IT executives as well as the broader IT and business community. The process of educating IT executives typically focuses on preparing a position on a technology that is generating interest, and involves face-to-face sessions as well as supporting presentation material and other written justification.

More speculative educational sessions can consist of seminars or lunchtime sessions where a local expert or external speaker presents a tutorial on a technology. The technology profiles and evaluation white papers created by the ATG can also be made broadly available as an educational resource. Some ATGs publish regular technology updates and distribute them on paper or e-mail for both educational and marketing purposes.

2.6.4 Evangelism

It is important for an ATG staff to provide a realistic perspective of a technology's potential, rather than promoting its current "pet" technologies at all costs. However, it is also advisable for ATG staff to err on the side of "evangelism" in presenting the advantages and challenges of a technology. Organizational inertia frequently must be overcome by an additional boost in effort, particularly in the post-dot-com backlash against inappropriate levels of IT investment. The ATG should make an effort to be visionary and inspire others with the potential benefits of technology — always within the context of business impact.

2.6.5 Overcoming Organizational Resistance

Even when the ATG has identified a technology that promises to bring significant benefits to the organization, attempts to push the technology out into deployment may be met with resistance. This natural organizational reluctance to change is compounded when the new technology replaces existing technology (such as a new network architecture) rather than augmenting it (as would, for example, a new analytical tool). Particular resistance may come from the operations group, which must throw out established procedures, expertise and experience and start over with the new technology.

Resistance can be overcome in a number of ways:

- Present or introduce the technology in such a way that the business unit feels it discovered the idea and so feels a sense of ownership. Encouraging "grass roots" interaction between technology and business representatives helps in this respect, as does identifying sponsors in the business units.
- Seed the technology among interested users or teams and observe who uses the technology, for how long and for what purposes. If usage dries up after the initial enthusiasm, there may not be enough business value at this time.
- Create a center of excellence separate from the ATG to act as an owner and evangelist for the technology. This can leverage existing pockets of expertise. The center of excellence creates a

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platform or prototype that demonstrates the capabilities of the technology. As with ATG-led project, development beyond the prototype requires a business case and a business unit sponsor.

- **Mandate adoption** among relevant classes of users. While this does not necessarily ensure the long-term success of the technology, forcing users to try the technology gives them a chance to appreciate the benefits of the new work models the technology enables.

Ultimately, the technology must offer significant enough benefits that it stands by its own merit over time. If a technology does not gain momentum following initial introduction, it might be wise to wait until some significant change occurs (for example, in the maturity of the technology or in the processes it supports).

2.7 Technology Transfer: People Transfer

Because the role of the ATG is to provide a continuing stream of technology opportunities to the company, other groups (such as the IS group or a business unit) must take on responsibility for deploying and maintaining each new technology that has been identified as worthy of adoption. As with influencing decision makers, technology transfer is a process that needs to begin early in the evaluation life cycle for a technology, but becomes particularly important as the technology migrates to operational development or deployment.

2.7.1 Transferring Knowledge Through People

While education, training, briefings, demonstrations and reports can help raise awareness of a technology's potential, most ATGs have found that the only guaranteed way to achieve technology transfer is to focus on knowledge transfer through people. That is, knowledgeable staff work must alongside those who need to learn the skills. Depending on the culture and resources available, a number of alternative scenarios are available for transferring technology through staff assignments.

- **Bringing in staff.** Even though the ATG typically takes the lead in prototype and evaluation projects, it is essential to involve key staff from the IS group or the relevant business unit at all stages of the evaluation. A common way to achieve this is to assign IS or business unit personnel to work as part of the project team. These personnel will learn the required technology skills during the early stages and will be in a position to take a leadership role during deployment, when the ATG staff should draw back to act in a consulting role. Some technology transfer works in the opposite direction: the IS or business unit staff come to the project with a specialist technology or business skill that is a strong asset to the project.
- **Sending out staff temporarily.** ATG staff can be temporarily assigned (for example, a bridge assignment) to implementation, usually for several months, to transfer specific technology skills and to ensure that the typical issues associated with the adoption of any new technology are addressed. Once the deployment is well under way and other team members are fully up to speed, the ATG representatives rejoin the ATG to work on new assignments.
- **Sending out staff permanently.** Under some circumstances, ATG staff follows the technology into the company by joining the implementation and support team. This can work well if the ATG representative is comfortable being aligned with a specific technology and if the ongoing support requirements are likely to be significant and challenging for the individual (for example, maintaining a data mining competency center). The representative can also act as a champion for rolling out the technology into other applications or departments.
- **Rotating staff.** Some companies augment a core ATG team (or individual) with additional staff on a rotating basis. Staff with specific skills (such as networking) are drawn in, usually from other parts of

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the IS group, for only as long as a specific technology area is under investigation. Compared to the approach of bringing someone in for a specific project, the members of the rotating ATG become fully involved in all of the investigational aspects of the ATG's activities. Knowledge transfer is two-way, and this approach can be an appropriate way to capitalize on specialist skills and experience from the broader IS group.

- **Transferring across the business.** One of the most difficult stages of technology transfer is transferring the technology across business units after a successful initial deployment. The ideal situation is to create enough ground swell from business units that see the value and want to become involved to give the technology "a life of its own." To maximize credibility, transfer between business units should always be championed by the unit that has already adopted the technology, although the ATG can and should help coordinate activities. Demonstrations and holding an open house are useful for raising awareness, but the biggest driver is word-of-mouth about the success and benefits of the initial deployment. The ATG or project staff from the business unit implementation should be available to help jump-start deployment in other units.

2.7.2 Consulting to Operational Development

Depending on its mission, the ATG staff may become deeply involved in the operational deployment, or may play a peripheral role. Tasks that may be appropriate for the ATG staff with previous experience of the technology might include vendor selection, user requirements definition, or integration activities. Whatever the level of involvement, a major part of the activity should center on technology transfer, as previously described. ATG staff should not generally lead tasks requiring an ongoing commitment, such as user training, system maintenance and technical support. The goal of the ATG is to help create and support a self-sufficient project with a high likelihood of success, and then to move on to another initiative.

3.0 Starting and Managing an ATG

3.1 Mission and Goals

As discussed in Section 1, the mission of the ATG is to perform strategic technology planning, which is the process of determining which technologies not yet adopted will be of strategic impact to the company. A typical mission statement for an ATG might be "to exploit emerging technologies to develop and maintain the company's competitive position."

While the primary purpose of the ATG is to identify and promote strategic, high-impact technology, in practice ATGs need to balance short- and long-term initiatives. When an ATG is disbanded, it is most often because it is perceived as too "ivory tower" and removed from the business needs. On the other hand, a group that swings too far in the other direction and becomes focused on short-term activities is not likely to add value over other areas of IT. The solution is to maintain a balance between technologies with a high likelihood of being successfully deployed (even if they are not the ones with the highest impact) and those that are potentially high impact but also high risk.

To attain this balance, a newly created ATG should identify a few "quick hit" projects with a high chance of success. These projects should center around technologies that are relatively mature but that the company has not yet adopted, or on servicing executive or business unit requests for support (for example, to select a vendor or evaluate a new device). Outside requests have the additional benefit of maintaining goodwill and executive support for the ATG, in addition to giving evidence of visible early success. This buys the group time to pursue the more strategic activities (such as technology tracking, evaluation, prototyping and contributing to corporate strategy) that are critical to the company's long-term success and ATG's longevity. The split between quick hits and strategic activities may evolve over time:

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for example, from 70 percent to 80 percent quick hits during the first year, down to 30 percent to 50 percent during subsequent years.

3.2 Reporting and Governance

The ATG or other strategic technology planning function typically reports within the IS organization, as a direct report to the CIO or CTO, or to a senior IS manager or vice president who reports to the CIO. An ATG that reports high in the organization will typically be more effective than one that is buried in a drill-down area, as its members will be more able to gather and influence a broad range of ideas.

An alternative structure is to have business and technology planners report to a common manager outside the IS department (for example, to a vice president of strategic planning or corporate development). This can dramatically improve alignment, particularly the company's appreciation of technology's potential, but the separation from IS may make later, more "hands-on" stages of technology introduction more challenging.

Some ATGs are overseen by a technology council or similar groups, whereby business unit representatives and advanced technology specialists meet regularly to discuss problems, priorities and candidate technology projects. Involving council members in key ATG decisions and directions can help drive support for the ATG's recommendations.

On the whole, ATGs are most effective when they are centralized. This organization separates emerging technology efforts from mainstream operational IS functions and also centralizes planning efforts so that they can be leveraged across business units and contribute more to technology strategy. However, centralized ATGs in large organizations can distance staff from the mainstream business. The overall size of the organization will play a determining role in weighing the costs vs. benefits of centralizing the ATG. Very large companies whose divisions act as subsidiaries will likely prefer to align ATGs with the divisions and have a smaller corporate ATG focused on coordination. Companies with more unified strategies can more easily take advantage of the benefits of centralized ATG efforts.

3.3 Relationship With Architecture Groups

One decision facing many companies is whether the ATG should be part of the architecture/infrastructure team or a separate group. Type A and Type B enterprises that are more aggressive in technology adoption are likely to prefer a distinct ATG that examines the strategic potential for technology within the company. In these cases, the ATG has its own manager, who often reports to the same manager as the architecture group. A stand-alone ATG typically focuses primarily on the requirements and opportunities of the business units, with a secondary focus on how emerging technologies will impact application development and architecture.

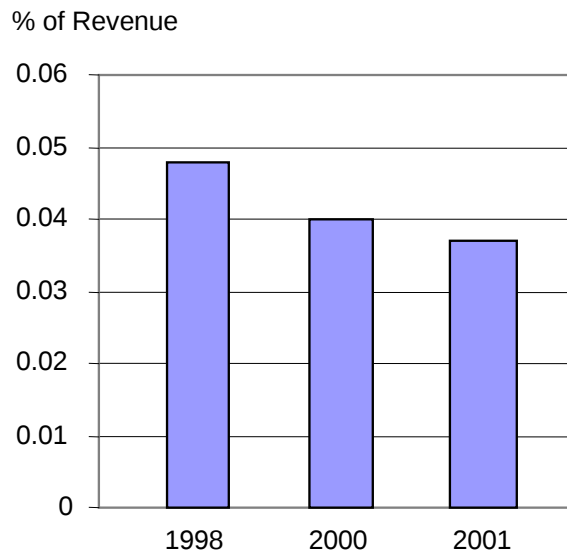
Less aggressive Type B and Type C enterprises frequently incorporate ATG activities in the same group as standards and architectures. However, these integrated groups most often end up evaluating products rather than fundamentally new technologies. Integrated groups also tend to be concerned with whether the technology is mature enough for a broad rollout, rather than whether a competitive advantage is associated with the technology. Whereas the ATG asks, "Should anyone be using this technology?" the architecture group focuses on the question, "Should everyone be using this technology?" To summarize: Companies wishing to promote strategic activities should separate the groups, while those with a more tactical, risk-averse culture may prefer a combined group.

3.4 Funding the ATG

Funding for the salaries and overhead of ATG personnel is almost universally provided out of a central IT budget (most often as a distinct sub-budget), with no direct chargeback to the business units that avail themselves of the ATG services. This approach encourages business units to accept the somewhat experimental nature of the ATG's activities, which is particularly important at the early stages of technology assessment when a particular technology or application has not fully proven its utility. Most ATGs also have some central equipment budget that is used for technology evaluation. As assessment moves into the pilot phase (by which time the business case for the technology is more firmly established), the business unit usually funds or contributes to any additional equipment.

The level of funding varies significantly between companies. As a guideline, the 2001/2002 Gartner Emerging Technology Survey examined the funding of strategic technology planning groups. The survey's respondents included companies reporting annual revenue that ranged from less than \$1 million up to \$60 billion, with the majority reporting more than \$1 billion. For the purposes of the survey, emerging technology activities were defined as tracking, evaluating and piloting new technologies in the IS organization, excluding R&D for product development. The respondents all had some interest in emerging technology (by virtue of responding to the survey), so we expect that the results show averages that are higher than a typical cross-section of Gartner clients.

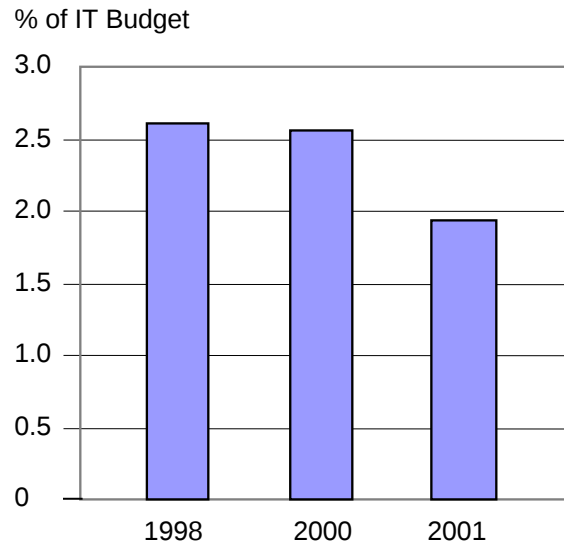
The median amount budgeted in 2001 for emerging technology activities expressed as a percentage of revenue was 0.037 percent. As a percentage of IT spending, the median budgeted for emerging technology in 2001 was 1.94 percent. This shows a steady decline since 1998 (see Figure 5 and Figure 6).



Source: Gartner Research

Figure 5. Emerging Technology Budget as a Percentage of Revenue

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Source: Gartner Research

Figure 6. Emerging Technology Budget as a Percentage of IT Budget

Company size was the most-significant variable in the budget percentages, with larger enterprises spending proportionally less of their revenue on emerging technology (see Figure 7). This demonstrates the economies of scale afforded larger enterprises, and the minimum amount of spending required for emerging technology, regardless of company size. Spending as a percentage of IT budget showed a similar pattern, with emerging technology spending ranging from 0.83 percent of overall IT spending for the largest (more than \$5 billion revenue) companies, up to 7.5 percent of IT spending for companies with less than \$100 million in revenue.

Company Size (Revenue)	% Revenue	% IT Budget
Less than \$100 million	0.68	7.50
\$100 million to \$1 billion	0.11	4.00
\$1 billion to \$5 billion	0.03	1.25
More than \$5 billion	0.02	0.83
Median	0.037%	1.94%

Source: Gartner Research

Figure 7. Emerging Technology Budget as a Percentage of Revenue and IT Budget, by Company Size

These survey results should be used primarily as a "sanity check." Companies should determine their own appropriate funding levels for emerging technology based on industry norms, competitive pressure, desired technology aggressiveness, company culture and the fiscal health of the company.

3.5 Staffing the ATG

The Size of the ATG. An ATG typically include a smaller group of two to four staff members or a larger group size of six to 15 staff members. Size is not correlated with success, but rather with the scope and volume of coverage. Larger groups can expand the number of technologies tracked and projects undertaken, as well as increase the variety of individual expertise. Smaller groups focus more on tracking and education. ATGs consisting of a single individual are usually at an interim stage before the group enlarges or the role is completely eliminated.

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ATG Manager. The single most important attribute of the head of the ATG is his or her ability to network within the organization. As the ATG has no authority to enforce its recommendations, it must exert its influence by inspiring others to lead the charge. ATG managers must be politically astute and able to connect with and influence key individuals in business units and IT who have the authority to drive technologies into deployment. In addition, the ATG manager must exhibit a breadth and depth of technical expertise that allows fluid, value-added communication and direction of the AT staff. He or she requires skills that enable effective project management, staff evaluation, innovative approaches, and upper-management negotiation and expectation setting.

An example job description for an ATG manager might be as follows:

- Initiate relationship and joint planning activities with strategic business planners, to understand the company's direction and to help educate the planners on the impact that technology will have.
- Track and understand emerging technologies and how they might apply within the company.
- For promising technologies, manage the technology evaluation process, including laboratory prototypes and pilots with users.
- Maintain relationship with business units or functions, to identify potential applications for emerging technologies.
- Assist in (but do not manage) the development of operational systems involving new technologies.
- Coordinate and leverage other emerging technology activities within the organization.
- Define and manage the emerging technology evaluation, adoption and technology transfer process.
- Manage staff permanently or temporarily assigned to ATG activities.
- Act as champion and visionary for emerging technologies.

The ATG Staff. Members of an ATG generally have engineering or scientific backgrounds, a master's degree, and experience in system design and implementation. Most of the staff should be generalists who can learn a new technology area rapidly, rather than specialists in a single topic. In addition to their technical abilities, the ATG staff members need to communicate and relate to managers and users in the business units. Some successful ATGs accomplish these staffing requirements by having specified roles for individuals with skills in personal communications and other roles for more technical staff. The preferred situation, however, is finding individuals that combine both of these characteristics, thus minimizing the possibilities for misunderstandings. Under conditions in which skills vary, a working ratio for ATGs is one communicator per two to three technical contributors. Larger groups may introduce one or more dedicated project managers, while most rely on the technical staff to act as project leads. Larger groups may also add individuals with nontechnical backgrounds, such as sociologists, anthropologists or economists.

3.6 Metrics for the ATG

Metrics is a challenge for all ATGs, as the route from evaluation to deployment can be circuitous, and investigations may take several years to pay off. As quantitative assessments of value (such as ROI) are tied to specific projects and can only be performed after a technology has been operational for a period of time, attempts to predict the overall value of an ATG are impossible. An ATG that is asked to quantify the future value it will provide to the company will not be able to do so successfully, and one that is required to do so to ensure its survival will not last long. ATGs are created and thrive primarily because senior

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executives (in particular, the CIO) believe that their company cannot move forward without following a procedure for selectively and proactively adopting key technologies.

It is, however, important to provide goals that will drive appropriate activities within the ATG. The most common goal that provides a metric to evaluate success is the number of projects the ATG undertakes each year. To make this number more meaningful, ATGs should plan for a certain percent of dropout as technologies progress through the evaluation process, as described in Section 2.2 on prioritizing technologies. For example, a relatively aggressive company may plan each year to investigate 15 to 20 technologies relevant to the company's objectives; it will then test, prototype or pilot eight and deploy three of those. While the specific ratios will vary with each company, the philosophy of planning for a certain percentage of "dropout" promotes a culture in which a decision not to deploy at a given point in time is perceived, not as a failure, but as an informed assessment of the relative values of multiple investment candidates.

Once the ATG has been in operation for a while, metrics can start to focus on the value of specific projects and activities that the group has undertaken. Quantitative value can be assigned to:

- Projects initiated by the ATG that have moved into operational deployment and are providing calculable ROI.
- Projects resulting in a decision not to proceed, which the company would otherwise have undertaken and would have resulted in failure from an ROI perspective. These figures are necessarily extremely approximate, but provide a way to focus on the value the ATG brings in risk avoidance.

Additional but nonquantifiable credit can be claimed for:

- Educational activities delivered to the company
- Support for strategic planning activities
- Projects targeting infrastructure, application development or other functions where ROI is difficult to quantify
- Projects that promote the company's brand as a technology innovator (if applicable).

3.7 Top 10 Success Factors for ATGs

- **Affirm senior management commitment.** An ATG that does not have the support of top management will not survive for long. While this is mostly outside of the direct control of the ATG, the ATG can help by supporting, influencing and making their successes visible to senior management. Aligning with corporate goals (and executive bonuses) also drives support.
- **Network, network, network.** Much of an ATG's success hinges on its ability to build bridges to the business units, end users and other parts of the IS organization. All ATG staff can be ambassadors, but the head of the ATG in particular needs to become an expert at turning an idea into reality by inspiring others with his or her vision.
- **Balance short- and long-term objectives.** Newly formed ATGs need to emphasize activities with short-term results. Faster payback on their efforts accelerates organizational clout, which then allows the ATG to embrace longer-term goals. Over time, the emphasis shifts to strategic activities, but short-term projects in support of business units or executives remain key in maintaining an ATG that is viewed as "in touch with the business."

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- **Balance the ATG staffing mix.** The ATG must be staffed with a balance of technology and interpersonal skills. An ATG staffed mainly with people who are more adept at technology than they are at communication and relationship building is likely to be less successful in applying and transferring technology to business needs.
- **Plan the route to deployment.** A common failure point is when the ATG recommends proceeding with a technology, but nobody picks up on the recommendation. Before expending significant effort on investigating and evaluating a technology, the ATG should ensure that a business champion or other key management advocate will drive the project forward on a positive recommendation.
- **Make prioritization explicit.** Using a visible prioritization process, such as a radar screen or balanced scorecard, provides an objective basis and justification for investment decisions. The prioritization process helps decision makers inside and outside the ATG avoid becoming over-enamored with a technology at the expense of others that may be more worthwhile.
- **Tie technologies to business need.** In presenting opportunities for technology to the business, ATGs must take the additional step of showing how the technology will impact business processes.
- **Be prepared to say “no.”** In pursuing the risk-taking that will drive high-impact technology adoption, ATGs will inevitably encounter technologies that are not ready for mainstream adoption. To avoid driving forward a suboptimal technology investment, all parties involved in strategic technology planning should promote a culture where a project is valid and useful if it ends with “Let’s hold off on this one for a while.” Political factors may also lead the ATG to decline a potential project at any stage in its life cycle: if the ATG feels it is being used inappropriately to broker a sensitive political battle, then it may be wiser to look for alternative project candidates.
- **Start transfer early.** Projects “thrown over the fence” to a business unit or the IS organization almost never find fertile ground. To promote the transfer of promising technologies, ATGs must involve relevant staff during evaluation activities and at key decision points.
- **Keep an open mind as to the best solution.** The ATG may be asked to investigate process problems or bottlenecks where advanced or emerging technologies are not necessarily the best solution. Instead the solution could be process changes, or even established technologies (such as simple spreadsheets). In these cases, the ATG should not push pet technologies for their own sake.

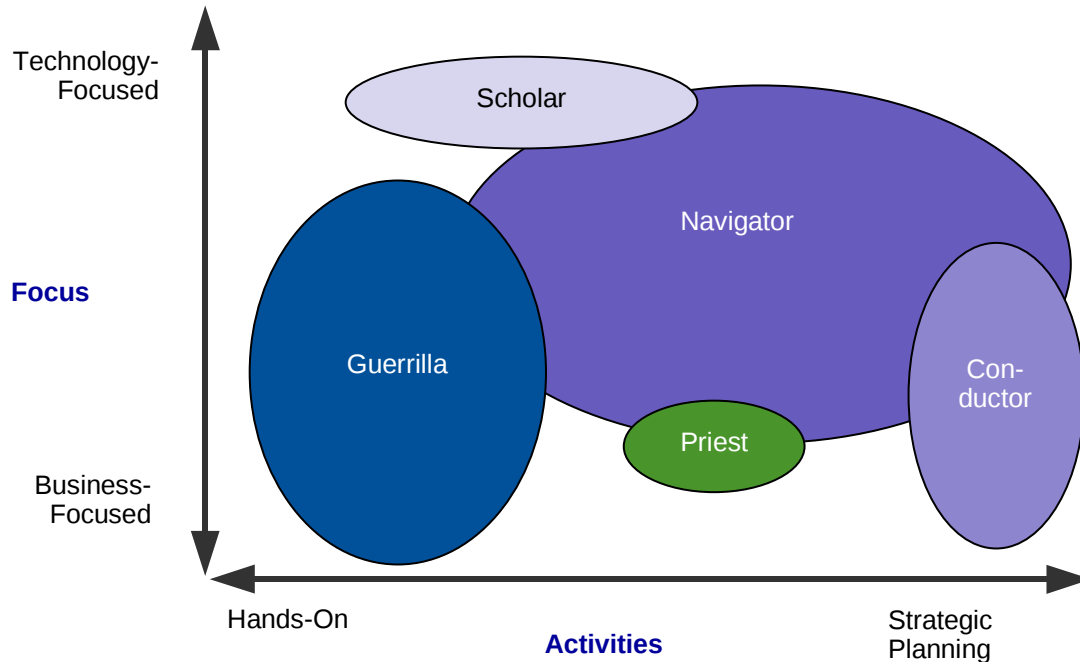
4.0 Styles for Advanced Technology Groups

An ATG’s primary goal is to encourage technological change in ways that make its parent organization more competitive. The way an ATG mobilizes its resources to effect this change varies between companies and also over time. We have identified five styles of ATG that exhibit distinct characteristics, strengths and challenges. Although most ATGs combine qualities from more than one style, a single style is usually dominant.

- **Navigator:** Determining the strategic business impact of emerging technologies, through tracking and evaluation
- **Guerrilla:** Tactical and pragmatic “SWAT” team helping business units deploy new technologies
- **Priest:** Educating senior management on emerging technology issues and potential
- **Conductor:** Coordinating and leveraging advanced technology activities performed in other parts of the organization
- **Scholar:** Research and development group investigating technologies ahead of business need.

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The activities of an ATG range from a hands-on involvement in specific technology-oriented projects (guerrilla or scholar style) to strategic planning and evaluation activities, with responsibility for implementation handed over to others at the beginning (priest and conductor) or end (navigator) of the evaluation phase (see Figure 8). The goals and activities of the ATG should be established to complement other groups involved in technology planning and delivery.



Source: Gartner Research

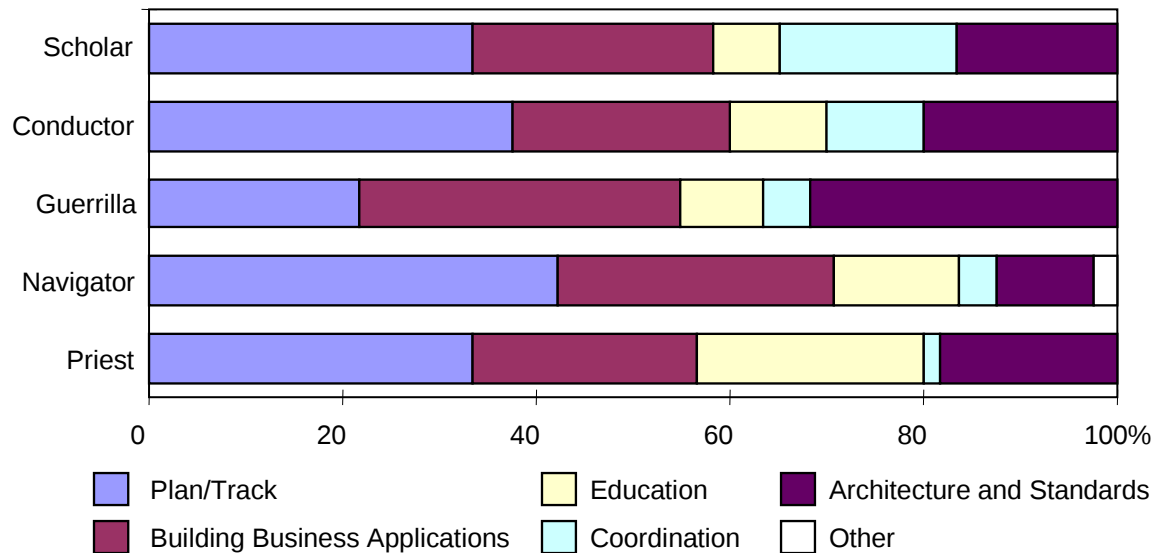
Figure 8. Focus and Activities of ATG Style

4.1 Navigator ATGs

Mission. The "navigator" ATG's mission is to determine which technologies will be strategically important to the company. Navigator ATGs are intimately concerned with understanding current and future business processes, as well as architectural plans, as a means of ascertaining which technologies warrant investment. They are found mainly in larger enterprises (those with \$500 million or more in revenue). Navigator ATGs are spread across all levels of technology aggressiveness (Type A, B and C organizations), but are particularly common in those companies that have made a conscious decision to increase their aggressiveness.

Activities. Navigator ATGs spend between 10 percent and 30 percent of their effort (which is more than any other style; see Figure 9) on strategic planning activities. While the size of the large enterprise precludes the direct involvement of navigator ATGs in strategic business planning, they spend significant effort in understanding the corporate direction and the priorities of individual business units. They devote about another 25 percent of their effort to tracking and evaluating technologies. Unlike scholar and guerrilla styles, which both play a major role in operational development, navigator ATGs typically hand over responsibility during the pilot stage and have little or no involvement in actual deployment. Establishing educational activities, standards and architectures are also significant components of most navigator ATGs.

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Source: Gartner Research

Figure 9. Activities for the Five Styles of ATG

Funding and Staffing. Navigator ATGs average six to 15 full-time staff. Larger groups are often subdivided into smaller teams focused, for example, on near-term opportunities, business planning or longer-term technologies. The staff includes technically oriented individuals as well as good communicators or generalists. More than any other style, the navigator ATG is likely to report directly to the CIO or equivalent.

Success Factors. The navigator ATG faces the challenging task of injecting a strategic perspective of technology into the company while maintaining relevance to the business. An understanding of the strategic picture can best be obtained by direct involvement with the company's strategic business planning group, or by including the business and IT planning groups in a single work unit. If this is not possible, the group can obtain a broad business perspective by leveraging the experience of IS committees and councils (for example, many companies already have a technology council consisting of the senior IS manager from each business unit). Informal networking is also critically important.

Demonstrating relevance to the business is an ongoing battle for many navigator ATGs, particularly since many groups intentionally investigate a broad range of technologies to ensure that they are selecting the optimal subset. Also, most navigator groups rely on others to implement their recommendations, which can lead to problems with peer groups that may feel threatened by territory overlaps. The best defenses against both issues are a broad blend of staff with strong communication as well as technical skills, and an emphasis on involving business unit and other IS staff as early as possible in the evaluation process. As always, a strong focus on business relevance is key; an overemphasis on technical fervor has led to problems for some groups.

Bottom Line: The navigator ATG is an appropriate model for companies seeking to improve their technology aggressiveness. A navigator ATG can introduce a strategic perspective into companies that are otherwise too focused on short-term objectives by helping corporate planners, business units and IS professionals understand the potentially broad-ranging impact of emerging technologies.

4.2 Guerrilla ATGs

Mission. The mission of the "guerrilla" ATG is to establish that a relevant technology is mature enough for deployment and to support the development activities the first time the technology is used within the

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company. Guerrilla ATGs are also frequently involved in setting standards and defining architectures for the rest of the company. Focusing on hands-on development rather than strategic impact, guerrilla groups are most often associated with less technologically aggressive (Type B and Type C) organizations. Typically, the technology time frame of interest is around 18 months. Some guerrilla ATGs also fulfill the priest ATG's responsibility for educating management about the potential of key technologies. In some companies, guerrilla-style groups may be referred to as "in-house consultants" or a "solution group," rather than an ATG.

Activities. The main focus of the guerrilla ATG's activities (at least 25 percent) is on prototyping, piloting and development activities. Many guerrilla groups also spend more than 20 percent of their time on standards and architecture definition, whereas companies with other styles of ATG typically have a separate group to perform these functions. Evaluation and assessment activities are often focused on benchmarking, competitive product evaluation and beta testing, rather than on the more exploratory approach of other styles. Educational activities are important in hybrid guerrilla/priest groups, but of minimal importance or nonexistent in pure guerrilla styles. Technology tracking, while present in all ATGs, may be allocated to as little as 5 percent of the total effort in guerrilla groups.

Funding and Staffing. Critical mass for a guerrilla ATG is approximately four to five staff members, with a strong emphasis on technical skills. Some groups are full time, others consist mainly of specialists in a distinct area of expertise (such as networking) who split their time between tactical projects and advanced technology responsibilities. On occasion, guerrilla ATG staff members rotate out of the group to follow a project into deployment and are back-filled by a representative with skills in a new area of technology. Even though much of the guerrilla ATG's focus lies in project work for business units, funding is usually central rather than on a chargeback basis. The organization views this ATG as a resource to jump-start the company in a new technology or product standard. The business unit (rather than the ATG) is usually responsible for project management and the business case is the driver from the outset (rather than the desire to showcase a strategically important technology).

Success Factors. Guerrilla ATGs cultivate a strong nonproprietary attitude toward their role in the organization. They work side-by-side with staff from other groups and their expertise is viewed as a continuation of existing areas of specialization, rather than a "hot house" for fundamentally new approaches. Successful groups are in constant contact with the business units and target their agenda to the units' needs. Technology evaluation is rarely speculative; projects only begin when driven by a stated business need and championed strongly by a user group. Guerrilla ATGs acknowledge that they may not be at the forefront of new developments, but the culture of the companies in which they operate is driven by near- to medium-term results, not strategic imperatives. Because they are working within a more risk-averse environment, guerrilla ATGs focus their attention only on projects that are highly likely to succeed. The result is that more than 50 percent of their projects continue into deployment. Because the impact and benefit is often relatively easy to measure and quantify compared with other styles, guerrilla groups are among the most secure and long-lived of all ATGs.

Bottom Line: A guerrilla-style ATG is an appropriate structure for companies with a results-oriented culture. While a guerrilla group may evolve from another ATG style as the result of funding pressures, the short-term focus is won at the expense of strategic vision. Only companies willing to let others suffer the trials and win the consequent benefits of leading-edge technology should move to this model. In an appropriate culture, the guerrilla ATG is prized for the speed and aggression with which it enables its company to adopt more proven technology.

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4.3 Priest ATGs

Mission. As with most styles of ATG, the underlying mission of a "priest" ATG is to identify and apply emerging technologies that will benefit the company. The distinguishing feature of the priest style is that it achieves its objective primarily through education and inspiration, rather than direct responsibility. The priest ATG's role is to champion and recommend technologies, and to coordinate and support (but not usually manage) the evaluation and deployment.

Activities. Most priest ATGs also incorporate elements of other styles: the guerrilla because they support business units in the development of specific projects, and the navigator because they lead the organization in determining the strategic relevance of emerging technologies. However, the priest ATG spends significantly more time (as much as 50 percent) than other styles on educational activities, including presentations, reports, white papers and meetings with senior management (both formal and "hallway"). Educational activities are focused mainly on the senior vice president level and above, both in the business units and in the IS department. A certain amount of education is also targeted at the end-user community. Like other ATG styles, priest ATGs spend a significant amount of time tracking technology developments. They also allocate some effort to planning and supporting prototypes and pilots, but usually hand over responsibility to others prior to operational development.

Priest ATGs work closely with senior management in the business units and in the IS organization to identify and evaluate potential project and technology candidates. Once a project has been prototyped or piloted, it is usually up to the business unit, supported by the ATG, to develop the business case to take the project further.

Funding and Staffing. Since the educational role of the priest group is key, the staff profile favors generalists who combine technical and business- or user-oriented skills; or a group that balances these skills fairly evenly across the team. The average size of a priest ATG is three to five staff members, although the size may range from one to 12 staff members. Most groups have a full-time staff, but some involve only part-timers with other responsibilities within the IS organization. In some cases, the staff revolves in and out of the ATG to enable a smaller group to draw in the specialist skills required for specific projects. At any point, additional staff may supplement most priest groups for specific projects, but remain under the control of the business unit, rather than the ATG.

Success Factors. Because the priest ATG makes its impact primarily by persuading others, good communication is essential. The priest ATG needs to cultivate a strong network, particularly among senior management, and must balance technical and marketing skills within the group. As with all styles, finding a supportive user "champion" significantly increases a project's chances of success as does constant communication about the project's progress to all parties involved.

Bottom Line: The priest ATG is an appropriate model for organizations that:

- Have had some success at tactical technology deployment
- Want to introduce a more strategic approach to technology planning
- Have a management team that would benefit from an increased awareness of the potential of technology within their companies.

The priest style is particularly successful where good communication already exists between senior management in business units and IS organizations that foster a flow of "bottom up" ideas

4.4 Conductor ATGs

Mission. The mission of a "conductor" ATG is to track technologies and changing business processes to identify technologies that can add value to the business. This mission is similar to the navigator style of ATG, but it is achieved in a different way. The conductor ATG coordinates and leverages the work of other groups within the company, rather than directly managing advanced technology projects. The conductor ATG is most often found in product companies and in decentralized companies, where it acts as a point of centralized coordination and communication. It frequently forms a pocket of Type A (technologically aggressive) behavior in an otherwise risk-averse (Type B or Type C) enterprise.

Activities. Conductor ATGs are the most focused of the five ATG styles. They spend the largest portion of their effort (as much as 40 percent) on coordination activities. This includes organizing and attending internal visits and meetings aimed at understanding the business needs and technology activities of the various parts of the company. It may also include participation on external committees. Conductor ATGs commit at least 20 percent of their effort to educational activities, such as helping management and users understand the potential of technology. Strategic planning and technology tracking are also common to all conductor groups. While some groups are involved in technology evaluation and needs assessment, the conductor style is the least "hands-on" in terms of development (for example, prototyping, pilot development and implementation are almost always handed off to another group).

Funding and Staffing. The conductor style is most often adopted to maximize the impact of a small ATG. A one- or two-person group is as common as a group that consists of three to six staff members with part of their time dedicated to the ATG. The dedicated budget, if any, is relatively small to cover only salaries and travel; equipment and consultant expenses are picked up by those that move forward with the projects recommended by the conductor ATG.

Success Factors. With typically few staff members, the conductor ATG's biggest challenge is to make its recommendations a reality. Because it needs to hand over ownership of a proposed technology solution at a very early stage in the life cycle (for example, before even a prototype has been explored), the conductor ATG must develop particularly strong communication channels with all levels in the company. Successful conductor ATGs forge their own links into the business units, trying to motivate acceptance of their ideas wherever they find a willing person, which may involve sidestepping the usual IS organization channels and working directly with the business units. While striving to achieve the consensus to move forward, the group generally continues its own background involvement to take the investigation as far as possible. Once the ATG has generated sufficient buy-in to a technology's potential, it progresses by encouraging and coordinating the formation of small teams (drawn from IS or business unit staff) dedicated to exploring the technology and its application for a fixed period of time (for example, four to six months). Some conductor ATGs find themselves in cultures where their offer to coordinate activities is enough to inspire others to commit time to the cause; other conductor ATGs struggle constantly to find staff to perform the hands-on evaluation required to begin each new initiative.

Bottom Line: With an operating model designed to leverage the activities and manpower of others outside the ATG, the conductor style is appropriate for ATGs with limited staffing resources. Its value comes from its primary focus on activities that are difficult to achieve without a centralized group (such as strategic planning, tracking, education and coordination). While a successful conductor ATG can spawn a continuous stream of technology teams that stimulate innovation, the model should be avoided if the group lacks the influence or authority to initiate the formation of such teams.

4.5 Scholar ATGs

Mission. The underlying objective of most "scholar" ATGs is to stay ahead of the rest of the company so that they can be ready to help when specific technology and business requirements arise. While all successful ATGs are aware of the business needs and directions of the company, scholar ATGs are more likely than other styles to be proactive and even speculative about the technologies they pursue. They are most often (but not exclusively) found in technologically aggressive (Type A) organizations.

Activities. Scholar ATGs spend significant time and effort (as much as 40 percent of total activities) on technology tracking and evaluation. They are less active than other styles in strategic planning and educational activities. Many groups also become heavily involved in development activities, both at the prototype and operational stages, and some operate as a scholar/guerrilla hybrid group by working hand-in-hand with project development groups. They are frequently involved in decisions surrounding infrastructure and communications; for example, by recommending when a new technology is mature enough to introduce. Scholar ATGs also are likely to be active outside the company in standards committees, collaborative projects or beta testing relationships with vendors.

Because of its proactive nature, the scholar group frequently becomes involved in tracking a technology's maturity, sometimes over a period of years. Once the group has identified a technology that may be relevant to the business, the group tracks vendor and technological advances until the technology reaches a stage the group can comfortably recommend to its company.

Funding and Staffing. Maintaining a scholar ATG requires a relatively large staff (10 to 20 is common, although some smaller product companies operate with a group of approximately five). The majority of the staff is technically oriented, with little emphasis on end-user analysis or business skills. Scholar ATGs are among the best-funded groups in terms of travel and equipment budgets. Some scholar groups also obtain outside funds from government or scientific research and development programs.

Success Factors. The principal characteristic of a successful scholar ATG is its ability to maintain broad coverage of potential technologies and stay ahead of others in the company, while also working with other units to bring in technologies deemed stable and mature enough. An atmosphere that encourages creativity and experimentation is key, but this should be tempered with management or peer review of the group's activities to ensure that investigations are headed in a direction meaningful to the company. Scholar ATGs rarely migrate to another form of ATG. The most likely fate of a failed group is that it will be disbanded and the staff moved into business units to perform uncoordinated, guerrilla-style project work.

Unlike other ATG styles, a scholar ATG's standing and reputation outside of its company can be a decisive factor in its perceived success. Some groups have gained international fame through committees or joint activities that has swept them along for many years, although this can also cause the group to lose its focus.

Bottom Line: Scholar ATGs are appropriate in organizations that are serious about maintaining a competitive edge through advanced technologies, particularly product companies that need to be constantly ahead of the curve. While the public image value may be a contributing factor in the decision to fund a scholar group, it is no longer sufficient as the only reason. Today's scholar groups are rarely "ivory towers" of pure research; instead, they combine tracking and development activities to act as the company's vanguard in introducing new technologies. The most successful groups are perceived as critical to the company's survival in a world of rapid technological evolution.

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Appendix A: Further Reading

A.1 External Resources

- MIT Sloan Management Review
- MIT Technology Review
- Harvard Business Review
- Wired
- ACM's TechNews (www.acm.org/technews/)
- Release 1.0
- Specific technology publications such as Speech Recognition Update and Biometrics Today

A.2 Gartner Publications

- COM-19-1914, "How to Improve and Exploit Predictions"
- M-16-9413, "Emerging Technology Vendors: Who Survives?"
- DF-08-6751, "When to Leap on the Hype Cycle 1999"
- TG-15-2648, "Escaping the Hype Cycle: Dead or Alive?"
- DF-16-2554, "Hype Cycle Variations: A Case Study of Latin America"
- COM-13-4953, "Hottest of the Hot: Discontinuities of the Next Decade"
- DF-16-3875, "The Value Proposition in Emerging Technologies"
- DF-17-0235, "The Total Value of Opportunity Approach"

Appendix B:

Strategic Technology Planning: Picking the Winners

Advanced Technology Case Studies

B.1 Marketing an Advanced Technology Group Internally

No matter how successful ATGs are in introducing new, high-impact technology into a company, most are constantly fighting to be recognized as useful and relevant. Here, we examine the approach that one ATG has taken to market itself proactively within its company.

Problem. The Vanguard Group is a leading U.S. mutual fund company. Vanguard has a unique corporate structure whereby its funds are independent investment companies that jointly own The Vanguard Group (in other words, shareholders of the Vanguard funds essentially own The Vanguard Group). One of Vanguard's market differentiators from other mutual funds is its low management fees. It views technology as a key enabler of its business model and makes major investments in technology spending, applying more than 40 percent of the company's entire operational budget to technology. Of that, about 1 percent is spent toward strategic technology research efforts.

In the late 1990s, Vanguard's scattered R&D activities were revamped under new management as a centralized strategic technology research (STR) group. STR needed to establish itself rapidly as an asset to the company and to avoid the negative perceptions that the previous groups had suffered as being technology "playgrounds" that were out of touch with the business.

Objective. The STR group realized early that it had to market its capabilities to:

- Gain the business input it needed to provide real value
- Ensure that its efforts were recognized broadly within the company

Approach. Partnering with an external marketing consultant, STR conducted a one-day session to carve out a strategy that included a business model and marketing activities that now form the core of the group's deliverables and focus. The strategy included three specific initiatives.

- Taking marketing seriously. Two of the group's 25 staff members are assigned specifically to marketing efforts. A monthly marketing plan details educational and promotional activities, and deliverables include a common logo and other style elements to convey a professional image. STR embraced the film industry's terminology to help internal customers understand the group's deliverables:
 - Interview: A meeting with an STR client to learn the business objectives and scope of the project.
 - Pitch: A high-level overview of the technology, including descriptions of the technology, business opportunities and the group's recommendations.
 - Treatment: A detailed document/white paper describing the pros and cons of the technology, and potential opportunities and benefits for Vanguard. The document also includes vendor information and, most importantly, a list of suggested next steps and recommendations.
 - Preview: A comprehensive presentation in which the group demonstrates the technology and provides a competitive analysis for its clients.
 - Screen Test: A demonstration in the Vanguard studio incorporating the technology with a current or future Vanguard business scenario.

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- Pilot: A working program of the technology with the required inputs and outputs. Vanguard's systems integration division heads the pilots to ensure a smooth transition of emerging technologies into the production environment.

Additional services include data on how competitors are using emerging technologies.

- *Delivering the message.* Consistent with the "movie" theme, the Vanguard "studio" was created with state-of-the-art audio and video capabilities that include a video wall, videoconferencing, and hardware and software demonstrations. Team members conduct frequent "brown bag" lunch-hour presentations on STR research for Vanguard employees, emphasizing how a technology applies to Vanguard's business processes.
- *Selecting the team.* STR adopts a rotational staffing model, whereby team members who become subject-matter experts on a particular technology are rotated into other areas of the company after 12 to 18 months, for technology transfer and continued evangelism. This model also ensures that the group is staffed by senior-level company veterans, which is key to the success of any ATG, and that fresh ideas are continuously infused into the group. To ensure ongoing enthusiasm and follow-up from the business units, three business liaison representatives with strong communication skills were added to STR, each aligned with one business unit.

Results. The formation of STR has significantly increased the visibility of the group within Vanguard. STR now partners with the sales and marketing group to host external client visits in the studio. In a conference for Vanguard's institutional clients, STR will set up a mini-studio, demonstrate emerging technologies incorporating real business situations, and present the STR process and technologies under research. Its monthly status report, which is distributed to all leaders of the company, communicates specific metrics relating to the group's effectiveness as well as a description and status of all its projects.

Vanguard measures the success of STR by its short-term deliverables, internal client feedback (through periodic surveys), repeat business and integration with business planning. Specific metrics include progress against project plans, number of studio visits, number of brown-bag sessions and attendees, and the number of informal and formal client visits. Longer term, as with any ATG, STR will be judged by the impact that its projects achieve for the business. Where possible, ATGs should attempt to capture metrics that demonstrate the value of the technology to the business in as concrete terms as possible (for example, for a Web callback button, a relevant metric is reduced hold time for the customers).

The true measure of STR's success is the number of emergent technologies that become a reality for Vanguard. Examples of such technologies are streaming multimedia, collaborative browsing, callback button on the Web site, e-meetings and IP-based videoconferencing. Longer term, a measure of value to the business units of these innovations (such as increased revenue, reduction in support costs) will be the key metric for the impact of STR.

Bottom Line. Just as a product company needs to market externally to gain "mind share," an internal function such as an ATG (or an entire IS organization) needs to market internally to create awareness of the services it offers and the successes it achieves. While not all ATGs will be able to dedicate staff and budget solely to marketing, most can benefit from introducing formal initiatives (for example, develop a marketing plan) to ensure that the group's findings can be translated into programs that have an impact on the business.

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Critical Success Factors and Lessons Learned

- Connect business strategy with technology.
- Create a dedicated marketing function with a marketing plan.
- Create an appropriate image and manage perceptions within the company (for example, through the presentation of deliverables).
- Communicate projects and progress continually.
- Include staff with strong communication and networking skills.

B.2 Case Study: Adopting New Technologies in Conservative Environments

A large and particularly conservative (Type C) banking institution in Europe had a rebel group at its heart. While its aim was "to move as little dust as possible," the group found ways to delicately introduce new techniques (in this case neural networks — "neural nets") in the IT agenda.

Problem. In continental Europe, except for Switzerland and England, banks are more conservative than their counterparts in the United States. They face many application domains where data and systems that could model their behavior are too complex for classical linear econometric techniques. For example, in interest-rate calculations where it is possible to find series with high frequencies and no clearly defined trends, neural nets yield significant improvements over traditional techniques.

Objective. Members of the bank's advanced technology team identified the potential for analysts and econometric specialists to use neural net techniques in parallel to, and in combination with, classical linear techniques on problems such as company scoring, foreign exchange rates, cash flow and interest rate predictions. They first had to integrate the new techniques with the analysts' workstations and be able to distribute the models on any platform at the bank with sustainable performance to run the models. Then they needed to deploy these techniques and have them work systematically against databases and large amounts of data for specific banking products such as securities.

Finally, the bank's ultimate challenge was convincing users accustomed to mathematically proven and theoretically mastered traditional techniques that these "black boxes" (the neural nets) could, for specific applications, reliably outperform classic techniques in areas key to the users' overall productivity.

Approach. The advanced technology team wanted to achieve a rapid technology adoption, as it was aware that being late in adopting a new technology has more dramatic consequences than it had a few years ago. However, the team found that the critical path was not the technical solution, but the user community's understanding and acceptance. After some success in applying neural nets to tackle the company scoring problem, the bank moved on to address prediction models. To balance the time and user acceptance issues, the team used a large amount of historical data and compared its model against conventional algorithms, with strong involvement from the econometric analysts.

Results. The neural net approach encountered mixed results, depending on the type data analyzed. For example, data and economic systems behavior (simple neural nets) did not add any significant improvements; where data and monetary systems were very complex (such as foreign exchange rates), neither traditional nor advanced techniques could provide analysts with models producing a margin that would make the additional risk of these models worthwhile. On the other hand, for data series with high frequencies and no clearly defined trends, neural nets produced better results. The professional analysts involved in the process were, in general, ready to acknowledge the improvement and accept the

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technology with some reserve. The reserve had to do with the fact that these analysts are used to very specific analysis protocols that are well founded mathematically and irreproachable in their theory.

However, advanced technology users have found that analysts without strong mathematics backgrounds (who are thus not hooked on mathematical purity) often overlook the theoretical fuzziness associated with neural net techniques. These analysts tend to judge the technique more on its practical results than on its theoretical merits. Today, neural nets are part of the analyst's toolbox. The group acting as the ATG is looking into deploying the techniques widely, smoothly and still quietly in other bank processes where the technology makes business sense.

Bottom Line. Creating Type A behavior in a Type C organization should be done with extreme political caution. The objective for leaders of the mission-critical activities is to fuel the advanced technology flame, not extinguish it. The key factor for their success is to firmly, but gently, convince the rest of the organization (management as well as operators) about the value of the technology.

Critical Success Factors and Lessons Learned

Pioneers of change in this large institution privately admit that fighting the tide has been extremely challenging. However, important lessons have been learned for future efforts:

- In an environment hostile to advanced techniques, it is essential to realize and be prepared for the high cost of technology transfer.
- Any Type C organization has the potential to create Type A behavior in highly focused and mission-critical segments of its activity.
- Determination, coupled with keen business awareness and cost-consciousness, can ultimately prevail over pure conservatism (that is, lack of vision).
- Challenges to advanced technology adoption in Type C organizations are mostly political and rarely technical.

Appendix C:

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Acronym Key

ATG advanced technology group

R&D research and development

ROI return on investment