

NINE NEW ROLES FOR TECHNOLOGY MANAGERS

Connecting technology creation to profitable markets requires today's technology manager to perform the new and much more comprehensive and integrative roles of a "technology development manager."

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OVERVIEW: *Success in technology development depends increasingly on speed to profitable commercialization. This calls for a new type of technology development management. As projects move from opportunity creation through market entry through commercial takeoff, the technology manager needs to perform nine integrative roles at three distinct levels: the venture level, where the business-building is taking place; the championing level, where resources are secured in the internal competition for staff and funds; and the heat-shielding level, where the issues of project legitimacy are resolved. The nine roles range from creating options to keeping venture teams focused.*

Competitive success today demands business-building programs in which technologies generated in the lab are rapidly converted into deployable capabilities and speedily commercialized and diffused into new markets.

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The leader of a technology development program, therefore, needs to assume a much more comprehensive and integrative role than the traditional R&D manager. No longer can technology be developed in silos in which R hands off to D and D hands off to market development, which in turn hands off to business development. Instead, companies need innovation programs focused on moving an evolving technology through the commercialization cycle as a continuous chain of interrelated processes.

In this article, we describe an approach to technology development that focuses not so much on developing technology as on business-building, which connects technology creation to the market. For example, consider how Aventis approaches linking technology and markets. Its executives start by seeking to identify unmet medical needs. Then they focus on opportunities that are

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scientifically and technologically feasible. They have replaced traditional R&D with a three-phased development approach that focuses their discovery and development efforts on drugs that will have a competitive label and are therefore differentiated from those currently in the market. The unit of action is no longer the scientist within a silo, but a team comprising multiple disciplines. The focus is on the patient, not the technology.

The research upon which this article is based had its beginnings in a 37-venture study of successful and failed ventures in a major financial institution. It was followed by a five-company, 35-venture study of the process through which new ventures lead to new competences for established organizations. It draws upon extensive earlier work on the corporate venturing process, and manifold subsequent observations of, and interactions with, companies in the field. Our focus here is not on individual technology projects, but on the challenges facing the technology program manager who is responsible for the innovation program as a whole.

Critical Processes in Business-Building

Companies that manage to create a successful business-building program develop a set of relatively simple, but consistent, management processes that cover the entire life cycle of activities associated with the new business start-up: from concept to market entry to business take-off. When these processes are either not handled or mis-handled, we observed progress to be slowed. When processes were missing, business-building efforts often failed. The successful management processes that we have observed are integrated and drive growth through the three stages listed in Table 1. For the sake of keeping our discussion focused, we describe these stages sequentially, but stress that they often do not unfold in an orderly, linear way (1,2) and that a thriving business-building program would have different activities at each stage:

- Identification and screening of opportunities.
- Introduction of fruitful opportunities into the market.
- Managing the takeoff of the businesses.

The first set of activities involves processes that create an opportunity pipeline, or register—like an inventory of potential opportunities. A successful business-building program requires a large inventory of potential opportu-

The first set of activities involves processes that create an opportunity pipeline.

nities and a process by which to select a few excellent ones for market launch (3). Crucial activities here involve creating the conditions for the discovery and recognition of opportunities, together with a disciplined screening process that winnows them for investment in development. Among technology-intensive companies, this is often the process through which ideas from the technology development arena are introduced to business development managers for possible development, or through which problems in the marketplace are posed to the technologists to identify a solution (4).

The next set of activities, which we refer to as market entry activities, involve offering new technologies and business concepts to the market. Sometimes, this exposure is experimental, intended primarily to find out what the real and appropriate applications might be. Sometimes, this is a more aggressive and direct business launch, intended to create a substantial new business. In either case, a crucial challenge is managing learning—learning about the market and learning how the firm's offerings perform for that market (5,6).

Following market entry, the third set of activities involves investing in and growing those opportunities that are gaining traction in the market. These activities require significant attention to timing and patterns of investment. Recognizing when growth should be aggressive and when it can be brought forward more slowly is a key skill here. Given multiple opportunities, focus is also key, otherwise a program may over-extend managers' energy and resources, diluting their ability to make a substantial impact in any one arena.

Table 1.—Nine Processes for Sustaining a Healthy Business-Building Program

Level	Opportunity Pipeline	Market Entry	Takeoff
Venture	Create options	Redefine: launch and experiment	Cope and build routines
Champion	Select and screen	Mesh venture and firm needs	Redirect resources
Heatshield	Create climate	Path clearing	Maintain focus

Three Levels, Nine Roles

Within each of these sets of activities, different individuals within the organization assume different roles, which partially reflect the level of action of the role. Depending on the company, a single person can take on more than one of these roles, but for explicative purposes we break these roles into three different levels of challenge: Venturing, Championing and Heatshielding.

At the Venturing level, people's primary jobs involve those tasks that are needed to do the entrepreneurial work of building new businesses. These people have the job of finding out what customers need and how the company might address those needs profitably. Their goal here is to form a set of stable transactions between the new entity and customers, suppliers, distributors, employees, and others necessary to forming the new business.

The Championing level of a business-building program involves a set of tasks having to do with making sure the emerging new business is not damaged by other parts of the firm. At this level, resources must be allocated to new business development, plans must be established and monitored, rewards determined, and the often political and informal process of supporting new businesses carried out (7).

At the Heatshielding level, a different set of tasks becomes important. Here, goals are broader. A key task at this level is the establishment of what we call a ballpark, or overall framework, for determining which types of new ventures are desirable and undesirable. A climate that encourages new business development is created and led, and processes that ensure external and internal support for ventures are established. At this level as well, major resource allocations are determined. In addition, this level of the program establishes company-wide cultural norms, such as how failures are handled, and what gets prioritized.

Combining the three levels with the three stages of activities yields nine roles associated with a healthy business-building program (see Table 1).

Creating Opportunity Pipelines

Effective business-building companies are characterized by widespread enthusiasm for identifying opportunities and making them happen, as well as widespread understanding of what to do with a bright idea once it has been articulated.

Heatshielding challenges: climate creation

Creating an innovation-friendly climate poses two challenges. The first is to heatshield by establishing a climate of positive acceptance for the legitimacy of your program throughout the rest of the organization. You

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need to demonstrate to the players in your company that the firm as a whole is committed to business-building.

The second climate-creation challenge is to delineate a powerful, compelling and coherent direction for your business-building program to follow and build commitment in your technology program to follow it.

Create organizational legitimacy: Particularly in organizations in which business-building has been an on-again/off-again endeavor, people will understandably look for evidence that this time around there is firm-wide commitment to business-building. Otherwise why should they bother? "This too shall pass—I'm going to stick to my silo." And people in the rest of the organization will view your efforts to create a business-building program with attitudes ranging from skepticism about its usefulness to the firm to active resentment at the resources you are usurping, which they feel they could legitimately employ in the existing business.

Creation of legitimacy involves two sets of actions. The first is securing commitment from senior management that they mean it with business-building. We discuss the form of this commitment below. The second is to develop with senior management a coherent and compelling direction by specifying a convincing ballpark for your innovation activity.

Create a ballpark: While it is important to encourage plenty of innovative ideas, it is also essential to have an overall coherence to your innovative activity. People need to know what type of innovations to pursue. For an innovation program to be coherent and directed, the technology development manager needs to establish what we call a "ballpark" or directive framework specifying the types of arenas in which the firm seeks to compete. You, as technology development manager, will be asked to strike a balance between encouraging great variety and many opportunities and the need for an underlying coherence that will allow your firm to develop deep capabilities that can be deployed to maximum effect. We call this difficult task, specifying the innovative ballpark—delineating a large arena in which to pursue many types of innovation, while at the same time delineating limits

beyond which people should not be seeking opportunities that don't fit the firm's strategy and capabilities.

Consider 3M, respected as one of the exemplars of innovation. When Jim McNerney took over in 2000, 3M was struggling to build profitable growth while coping with an array of 60,000 products, creating huge problems for operational efficiencies and drags on the balance sheet and return on investment. McNerney and his senior managers have been wrestling with the articulation of a new ballpark. At the corporate level, he has articulated a high-level ballpark that is designed to drive growth in profits by delineating the large array of businesses into three types: mature diversified businesses that will grow profits by creating scale, growth-potential businesses that will grow profits by innovative organic growth, and premier technology businesses that will grow by business development. Although these are still early days for the strategy, 3M's people seem to be responding favorably, as is the investor community.

Create commitment: Specification of a directive ballpark is a powerful organizer of a company's innovation direction. The technology development manager also needs to provide impetus to that direction. This means demonstrating sustained commitment to pursuit of the ballpark.

To create a business-building climate you need evidence of commitment from senior management and you need to display commitment to the people who depend on you. Hard evidence of commitment is easy to detect by the people who report to you; it comes from positive answers to the following questions:

- Is business-building a priority item on the senior management's agenda? On your personal agenda? Or is the real emphasis on short-term results? Not just once or twice, but at every meeting, week in and week out, month in and month out? If business-building is not a recurring high-priority agenda item, people are likely to assume that it isn't all that important to you and turn their attention back to the lab bench or to other, easier things (often with a sigh of relief!).
- Are requested business-building initiatives receiving care and attention disproportionate to their small size? If you and your senior executives pay the most attention only to those initiatives that are well developed, people will read this as a lack of genuine interest in newer ventures. Just as babies need more attention in their early years, so too do new businesses demand more, relative to their size, than grown-up ones.
- Do the business-building ventures get the resources that they need—or does the funding always go to the established business when resources are tight? Are the best people allocated to business-building initiatives? If the business-building group becomes the purgatory from which people's careers never return, good people will

quickly figure out that they should avoid such initiatives like the plague.

Your ability to get agenda, attention, resources, and staff when needed is an important heatshielding function that not only secures the necessary resources, but also builds legitimacy in the eyes of the rest of the firm and the commitment of your people to join the battle to build.

It is important to recognize that this commitment is not made with impunity. Whatever resources your business-building projects get are diverted from the ongoing business. If the base business is not healthy enough to sustain its activities without being weakened by resources going into innovation, it is highly unlikely that innovation alone will be sufficient for organizational renewal. Making the choice to divert such resources is a decision with considerable potential impact. One lesson is that the time to start a business-building initiative is when the base business is healthy and generating solid cash flows, not when it has already begun to falter.

Championing challenges: "Tough-love" selection

The ballpark's somewhat generic specification needs to be translated at the championing level into decisions about whether to select and allocate resources to specific projects. The processes by which this is done are critical contributors to the success of a business-building program. In successful companies, the presence of uncertainty is recognized. This is quite a contrast from companies in which all management resource allocation processes (such as budgeting and planning) are done in the same way, using the same process irrespective of the uncertainty.

The logic is simple: when a business is fairly predictable, one can comfortably use conventional heuristics, such as management by exception for monitoring, and discounted cash flow for valuation. When a business is unpredictable by virtue of its novelty or uncertainty, disciplines that recognize that uncertainty are far more beneficial. Although this would seem like sheer common sense, we continue to be astonished by the tendency of companies to apply "one size fits all" management to both established businesses and new ventures.

The first difference between conventional project selection and selection of projects under uncertainty is that the latter are best thought of as "real options" (8,9). Real options reasoning suggests that you make low-cost investments with substantial future upside, but that you are also preserving the right to discontinue the investment should certain assumptions not be validated (10). Among the best practices in this area are spending your imagination instead of money by assembling a staged, incremental investment plan, releasing each subsequent funding only after the previous one has delivered knowledge to justify further investment. The theory here

is that the smaller each incremental investment is, the less you stand to lose in the event that things don't work out. With real options reasoning you concern yourself far more with how to keep failure costs low than with how many failures you have. After all, you can afford hundreds of failures if each of them is inexpensive. Using such real options reasoning is a mindset that you can easily bring to highly uncertain ventures, since most of their value lies in the future opportunities they open up.

The ballpark specifies what kinds of ventures are desirable. At the championing level, the characteristics of the venture should be made very clear. Among the approaches we have observed to work well are disseminating screening statements, consisting of widely disseminated criteria that will be used to evaluate ideas. The more clear and widely disseminated these screens, the more they help everyone to make intelligent choices about which opportunities to pursue, ideally resulting in both a more focused search for new opportunities and an ability to self-screen.

We like to look at screens in two passes: first, a process through which screening-out occurs—those criteria that disqualify a venture completely if they are not met. Next, we look at criteria that suggest venture attractiveness as they accumulate. So the “screen-out” criteria are go/no-go while the screen-in criteria are cumulative.

At DuPont, for example, venture teams we are working with have adopted a variation on this idea, specifying first “no-go” criteria in their screening process, then providing guidance as to what they call “where and how” growth should be built. The DuPont groups have incorporated these principles in scoring documents, which help make the criteria explicit so that they are well understood, and so that different projects can be examined in a

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consistent manner. The DuPont scorecards draw on Six Sigma technology, making a clear distinction between extremely attractive and less attractive opportunities. Table 2 is an example of such a scorecard. Note that it is not the scorecard that is the magic; rather, it is the thought process lying behind it, the discussion of ventures’ features that it precipitates and its consistent use that creates results.

Finally, although it is in theory a great idea to develop screening criteria so that everyone understands which

Table 2.—Scorecard for Evaluating and Screening Opportunities (Conditions in each cell decide the score to put in the last column, and the total score of all the columns is used for comparisons with the scores of alternative projects). (18)

Dimension	Exceptional	Acceptable	Unfavorable	Score
Strategic Intent	If this opportunity takes us exactly where we want to go in terms of our strategy, score it a 9.	If this opportunity is not inconsistent with our strategy, but offers no engine to drive it, score it a 3.	If this opportunity, even if we succeed, is inconsistent with our strategy, score it a 1.	
Builds competitive advantage	If the idea builds both short-term revenue streams and long-term competitive advantage, score it a 9.	If the idea has either long-or short-term benefits, but not both, score it a 3.	If the idea provides only short-term benefits, and may interfere with a long-term opportunity, score it a 1.	
Builds knowledge capabilities	If the opportunity will help us enhance our capabilities significantly, score it a 9.	If the opportunity will let us build new capabilities, but only in very limited areas, score it a 3.	If the opportunity will not lead us to extend our capabilities in any meaningful way, score it a 1.	
Use of existing assets	If the opportunity requires no investment in new assets, score it a 9.	If the opportunity does require some investment but takes advantage of assets in place, score it a 3.	If the opportunity will require entirely new investment in assets, score it a 1.	
			Total score	

ventures are desirable and which are not, an uncomfortable part of this job is informing those proposing or otherwise involved with a new project that it has fallen short of a screen. The wrong way to communicate these decisions is through a subordinate, a phone call or (worst of all) some impersonal medium like email. What is needed here is evidence of a careful, but rapid decision process, coupled with detailed feedback to facilitate learning in the organization.

If ideas are rejected, a champion should always explain why and demonstrate the logic. It is a way of helping the whole organization learn how to pursue better, more strategic, opportunities.

Venturing challenges: running launches and creating options

At the program's venturing level, the main activity in the opportunity pipeline space consists of creating options for further business development. Contrary to many popular business publications, finding opportunities is seldom the problem. Quite the contrary—for many companies, the real challenge is capturing the ideas in some systematic way, sorting them into different categories with respect to whether and when they might be pursued, and creating the process through which they receive assessment and attention.

Ironically, one of the most important challenges you can face at the venturing level consists of recognizing the uncertainties intimidating your team and reducing their impact. Some call this "absorbing" uncertainty. If you are running a venture, you need to be telling your people what to focus on and what to ignore, which you can do only by essentially creating an artificial feeling of certainty when in fact you are still dealing with many assumptions.

Sometimes this requires a bit of bravado, for instance when Steve Jobs of Apple declares a particularly uncertain new venture to be an "insanely awesome" product that everyone can throw their weight behind. Sometimes it is more mundane, as when the leaders behind P&G's Spinbrush electric toothbrush venture declared that the target competition for their electric toothbrushes was a \$5 conventional brush, rather than the \$50 versions then dominating the electric brush market (11). In either case, the job of a venture leader who wishes to free the team from the paralyzing effects of uncertainty is to create a confidence that the cost of failing or being wrong will not fall on them.

Options thinking has implications for the quantity of ideas to be considered. That's because the whole concept behind options is to skew the distribution of potential outcomes—limiting the downside risk while uncertainty is still high, and making sure that the potential upside is substantial. One implication is that at the opportunity

development stage, you want to be able to consider many options—many more, in fact, than you could possibly develop given your resources. The concept at the venturing stage is to pursue many ideas, recognizing that most of them will be discarded or redirected as resource commitments to them become more substantial. Think of this as a funnel, with many ideas at the beginning that will be narrowed down to a few very robust ideas over time.

3M's McNerney has used this idea as a cornerstone of his organic growth strategy, pushing the company to deliver what he calls 2x/3x performance in venturing—twice the number of ideas considered, three times the number pushed through to development. At the venture level, this translates into operationally considering many opportunities.

Market Entry

Very few projects work out exactly as expected. Most of the time, you won't really know what customers are looking for until you receive their feedback. Moreover, even the customers often don't know what they want until they have experienced an offering.

The uncertainty of this process creates challenges. The goal in the market entry stage is for the company to engage in continuous experimentation to convert assumptions into knowledge at the lowest possible cost. Key objectives are learning and redirecting while uncertainty is still high.

Heatshielding challenges: path clearing

A typical high-tech opportunity usually has some potential to upset an existing status quo (otherwise why bother with it?). This potential for upset can create widespread perception of risk among potential customers, perceptions of threat from those whose jobs might be changed as a consequence of a venture's possible success, wariness on the part of potential supply chain partners, and so on. Overcoming the risk-averting resistance to a new venture's success is a critical heatshielding challenge you may have to address, and your obligation as the technology development manager may be to clear the path of resistance via support of senior managers, lest your team's venture stumbles in the absence of such path-clearing.

The first path that needs to be cleared for a new venture is often internal. Managers in established businesses frequently withhold time, talent or resources from something new. Worse, new ventures are often forced by the parent firm to go to market in the same way as existing businesses, which can completely undermine them.

One of our clients, for instance, is attempting to start a venture that will move the company beyond an established customer base of corporate IT managers who buy specific products from them to a solutions-sale at the

enterprise level. Among the challenges facing the venture teams is the presumption at the corporate level that they will use the same marketing and distribution channels for both the new and existing businesses—a potentially fatal problem, because the new business appeals to a different level in the target companies and offers benefits that extend beyond the sphere of a typical IT manager. The technology development manager needs to reach a senior level to clear away that particular obstacle—by giving the venture team permission to develop an alternative channel and managing the accompanying channel conflict. (Fortunately, this problem has now been recognized and the appropriate paths are being cleared.)

Similar conflicts and obstacles need to be addressed with outside parties. Even great products and services can meet with resistance from customers, who are rightly concerned with the costs versus benefits of trying something new (12). To heatshield, assurances need to be given that the company is deeply committed to the offering, that it is prepared to support it, and that the risks to customers are manageable.

For instance, in the global new elevator construction business, Finland's KONE Corporation developed a radically new elevator technology that eliminated the need for a separate machine room, creating substantial cost and design advantages for customers. Before this innovation could grow, however, an enormous amount of external path-clearing needed to take place. Not only did the new technology have to run a gamut of demanding regulatory approvals, but nervous prospective customers needed to be assured of its safety and reliability. In an appropriate series of heatshielding moves, KONE management created enormous focus and drive around this activity, with its most senior leaders making sure that the obstacles to the adoption of the new technology (based on a patented innovation called the EcoDisc®) were removed, enabling five years of rapid growth based on that innovation.

Sometimes, other members of the supply chain—distributors, suppliers, joint venture partners, and so forth—are needed to facilitate the new business launch. All too often, ventures have failed either because of resistance from these essential collaborators or because they were not adequately prepared. The standards battle between Circuit City's Divx technology and the technology that is now commonplace in DVD players is an interesting example.

Circuit City's sponsored Divx technology was an attempted replacement for video-store rental. Consumers would pay the price of a regular video rental to bring a disk home and view it within 48 hours, then either throw it away or pay an additional \$15 to keep it permanently. Circuit City, however, failed to create critical mass around the new technology and only three manufacturers

One of the great dangers is falling victim to what psychologists call the "confirmation bias."

agreed to produce Divx disks. At the same time, other retailers flatly refused to carry the Divx product because of Circuit City's sponsorship, while video store rental outlets accelerated their move to offer DVD rentals because they viewed the success of Divx as a threat to their traffic. Circuit City ended up terminating the Divx venture at a reported loss of \$375 million (13). Regardless of the merits of the technology, clearly an inadequate job of aligning key stakeholders was done.

For publicly traded firms, a final constituency that needs to be attended to are a firm's stockholders and the analysts who assess its prospects. Failure to properly manage expectations while at the same time signaling growth potential can lead firms to suffer in the assessment of the market (14).

This all sounds straightforward, and so it is, if the technology development manager can persuade senior executives to make a significant commitment to launching a new venture. The dilemma is that this judgment typically needs to be made well before the potential risks and gains from a project are well understood. Waiting to get absolute confirmation of a venture's potential, brings about paralyzing delays. But jumping in too early can do enormous damage as well—witness the years of disappointing launches for personal digital assistants, which led to ridicule and brand-image damage to the firms leaping too early in the market. This will naturally lead senior management to be skittish about requests to "bet the ranch" before they have evidence that the risk is worth the bet. Your challenge as a technology development manager will be to find convincing evidence that the upside potential is there and the downside risk can be contained. Real options reasoning is useful in making this judgment, because it mandates limiting downside exposure until the upside potential of a venture is demonstrated.

Championing challenges: meshing venture and firm needs

As a venture team begins to gather resources to enter the market, finding the right resources and getting them to

the right places involves more than making sure budget lines are approved. Team members with the right mix of process and content experience need to be recruited from existing operations, and the managers of these operations will not necessarily be delighted to release their valuable employees.

The venture needs to be designed and launched in a way that meshes with the parent firm's policies and its strategy. Organizational politics need to be considered (15)—one problem is that the resources going into a new venture are often both coveted and needed by managers of established businesses. You may have to champion the political process of securing their release from powerful incumbents in the existing business.

A second integration challenge involves negotiating realistic terms under which the venture can operate. Attracting team members means providing them with appropriate incentives to join and grow the venture. Rules must often be bent to get a new venture going—for instance, rules about hiring, about job titles or hierarchical positions that are perfectly appropriate for a large mainstream business typically make no sense for a small team working on a new venture. When you think about it, most large and complex organizations are full of rules that are there for good reasons, but which can choke the momentum of a small venture—everything from building use policies, to internal corporate “taxes,” to human resource restrictions. It falls to the champion to decide which rules should be heeded and which rules need re-negotiation. Often, internal accounting policies like corporate expense and asset allocations seriously and unrealistically distort venture performance unless you champion their removal.

A particular challenge for champions engaged in the integration task is that to succeed they must influence decisions at both the venture level and the senior management level without being in formal control of either. This can be immensely frustrating, as seemingly vast amounts of time are consumed by the delicate processes of negotiating agreements, keeping the necessary parties informed of progress and making sure that senior leaders are sending the right signals. Managing both “up” and “down” in the organization requires some skill, but even more a willingness to dedicate time and thoughtful planning to the task (16).

Venturing challenges: redefinition and pruning

Market entry can seem paradoxical at the venture management level. On the one hand, venture managers must be ruthless in breaking down obstacles to the venture's success. On the other hand, market entry usually reveals lots of new information, which can suggest that a venture's path forward needs to be redirected.

We would argue that the first set of behaviors is the most appropriate when uncertainty has to some extent been reduced, or the goal is to break into a clearly defined market quickly. The second, involving the capacity to redirect and change the venture, is essential when uncertainty is high and a clear business model does not yet exist.

In either case, venture launch is facilitated by the extent to which a team concentrates on identifying a few critical customers who will provide huge amounts of information about what is truly needed in the market.

Launch is further facilitated by the use of a discovery-driven process that identifies the key assumptions underpinning the venture proposition, and then insists that key assumptions be tested at clearly defined milestones. Funds are then released at each milestone, contingent on replanning and redirection that take into account new knowledge revealed at that milestone (17).

One of the great dangers in this part of the venturing process is falling victim to what psychologists call the “confirmation bias.” This is quite simply the natural human tendency not to take in new information that calls strongly held assumptions into question. When a venture team has formed a set of beliefs, it will be very difficult to shake those beliefs, even in the face of disconfirming evidence, unless the venture leader makes it clear that even cherished assumptions are up for challenge.

Our examination of great venturing flops revealed a pattern in which teams fix early on some guiding assumptions and never look back to re-examine them. The frenzied bidding by telecommunications companies for so-called 3G UMTS spectrum licenses fits this pattern—every bidder assumed that spectrum would be scarce and that operators would move rapidly to deploy the new networks. Despite challenges to this assumption, and some pointed observations from firms electing to bid, the dominant assumptions about the benefits of these 3G networks were not really questioned until some time after the bidding concluded, leaving many firms such as Deutsche Telekom with hugely expensive assets that at least in the near term do not show promise of generating new profits.

This is one of the places where the technology development manager must exercise the critical but highly unpopular role of pruning. As soon as it becomes clear at a major milestone that the assumptions are flawed and that there is no reasonable prospect of redirection you must shut the venture down and redeploy your team members to programs where they are needed. It is so difficult but so important to do this—to build an image that uncertain ventures will often be disappointing and that we need to try, to learn, and to move on to better things. How you handle such (increasingly frequent) disappointments that accompany increasing uncertainty

will fundamentally imprint the spirit and motivation of those involved in business-building.

This is complicated by the fact that it makes no sense to reward foolish failure. You need to have a process in place that assures a sound post-mortem and then celebrates by assignment to exciting new projects those team members who made good decisions but experienced bad luck, without rewarding those who made poor decisions.

Takeoff: Managing Business-Building

When the venture takes off and begins to generate accelerating revenues, project performance begins to impact the firm's overall performance for the first time. This can have unexpected consequences for the rest of the firm—positive and negative.

At the same time, the nature of the venture's problem set fundamentally shifts; instead of the relatively few tough challenges of learning and transaction generation, operational problems now multiply as demands increase on facilities and people. Often, the managers who are best able to secure those tough first few transactions are not good at handling growing numbers of urgent problems. As technology development manager, you need to be able to anticipate and prepare for this new set of challenges.

Heatshielding challenges: maintaining focus

One of your technology development manager tasks in this phase is to make sure that the venture team stays focused despite enormous distractions and associated temptations to cut corners. Insisting that quality, service, reliability of supply, and customer satisfaction remain high, for instance, can counterbalance the temptation to short-cut these conditions in the interest of expediency. Absent a focus on sustained high standards, high growth provokes rapid competitive entry into the vacuum created by declining standards, and competitors capitalize on the distractions created by growing operational challenges to the venture.

Together with focus, you need to be prepared to find and release financial and staffing resources—fast—for the growing operations of the new business.

In some cases, the growth of a new venture requires a complete rewrite of the venture and even the company's budget and staffing plans. In one case we studied of a rapidly growing financial services venture, the explosion of accounts receivable essentially sucked up all available free cash flow in the business. At a corporate level, money had to be found from wherever it could be released—necessitating complete budget reviews with every company division to find ways in which to free resources. That year, the organization nearly imploded as the success of the new business overwhelmed the cash flows of the company.

You need to put in place processes that anticipate and counteract competitive attack.

Obviously, decisions to rebudget and restaff are not popular, and because they often have to be taken to senior levels of the company fast and decisively, you need to be able to anticipate this unpopular move and take it to higher levels before the venture starves from lack of resources.

Championing challenges: redirecting resources

It is highly likely that the venture team embroiled in a takeoff will be so distracted that it will have difficulty being proactive. As technology development manager, you need to be on the lookout for indications that the pressures and distractions of takeoff are not letting the following problems develop:

- Production capacity, for instance, may suddenly become scarce. If the new venture is operating with common capacity with existing businesses, tensions can erupt into deep internal conflict as the established business managers hold on to their "rightful" share of the line.
- Good people become scarcer than ever, creating enormous pressure on staffing plans and heavy workloads for support operations such as training, customer service and human resources.
- Quality can become strained, as capacity under pressure precipitates a drop in quality that is then baked into your product, which creates competitive vulnerability.
- Inability to supply the burgeoning demand can cause distributors or value chain partners to become disgruntled, again creating an opportunity for competition.

Somewhat more subtle are the decisions involving which customer receives deliveries or services and who doesn't. The wrong way to ration capacity is first-come-first-served. The right way is through some system that customers find fair but which aligns strategically important customers and distributors.

Among the most subtle processes to try to anticipate proactively are requirements for training. This might include

training in customer service operations, training for people who actually work with the offerings or even training for customers and outside supply chain partners. Because training is not an instantaneous process, failing to anticipate the need for it can become a huge setback. Similarly, recruitment (ahead of need) of operations and service staff and qualified middle managers is often left to chance, and then managed haphazardly unless someone is proactively leading the charge.

Companies also often overlook the problem that their rapid growth can put enormous pressure on their suppliers—in which case all the difficulties of proactive anticipation apply to the supply chain as well. A lack of quality or efficiency on the part of suppliers can lead to problems in your offerings that were not anticipated.

Finally, you need to put in place processes that anticipate and counteract competitive attack. A golden rule in strategy is that all attractive markets attract competition, and visible, rapid growth markets do so dramatically. You need to be sure that your venture team anticipates these attacks and is able to mount an effective counter-strategy.

Venturing challenges: routine-building

Even as the venture team copes with the pressures of growth, those operating the venture need to begin thinking about making it “a permanent fixture.” An emergent venture must start putting into place the processes and systems (or routines) necessary for it to become a real operating business. The more that growth challenges can be addressed by making certain activities routine or systematized, the less has to be invented on the spot and the more effectively the challenge will be met. Thus, at this point you should start to push for standardization of some activities, for the development of organized systems for customer service and production, and the installation of policies and procedures.

Standardization, not invention, begins to become important, and the infrastructure on which the later business will be built needs to start being developed.

One frequently overlooked aspect of this process is that the person with the skills to initiate a new business and launch it into the market may not be the right person to create the processes and systems to smoothly handle rapid growth. The very rule-breaking, innovative qualities that are crucial when the chief task is initiation can become liabilities when the job is to bring order to a turbulent situation. With many organizations, the reward for starting a venture is to be given the opportunity to run the business that emerges from it—unfortunately, this has often been exactly the wrong person to run the business, and often they don’t want that role anyway. If this is the case, your technology development program could lose a rare and valuable start-up manager who

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leaves in disgust or disgrace because of your lack of insight.

Technology development managers need to be sensitive to this possibility. Often, the solution is to bring in a different manager or management team to handle the challenges of growth. Alternatively, you need to spot when the time has come to introduce such skills into the management team and bring in people who have appropriate experience.

Coping with growth, therefore, often means a transition in the management skills that are most needed and may imply a transition in management. All the techniques of effective change management come into play here, as the entire organization goes through a series of often-wrenching changes in people, processes and systems.

The goal during this phase of the venturing process is no longer to create a new business but to build a proven commercial proposition into a solid new piece of the firm. Effective venture managers thus begin to focus on standardization, quality and reliability. The right people for this task are able to define a set of core key priorities and manage the details of the business.

It is then time for you to orchestrate handoff to the established organization and get on to the new opportunities in your technology development program.

Summing Up

Over ten years of observation and study of the evolving challenges facing those charged with the development of firms’ technological assets has led us to conclude that the winning firms in the technology game will be the ones that forge technology development programs focused on business-building rather than R&D.

This suggests that more traditional technology management positions will give way to a new executive responsibility which we call technology development manager.

Effectively filling this executive position is no mean task—managers charged with converting the silo-oriented R&D mentality to one of business-building face many challenges.

The challenges can be perceived in terms of nine major roles for the technology development manager, encompassing the major sets of activities (pipeline-building, market entry and takeoff) attacked at three levels of challenge (venturing, championing and heatshielding). We have outlined in some detail what each of the nine major roles entails, based on our observations of managers and companies that have succeeded in their struggles with business-building. ◀

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18. The scoring is derived from Six Sigma principles, in which the idea is to force a clear choice between alternatives; hence, the staggered scores. This scoring approach was developed by Robert C. Cooper and the members of DuPont's Knowledge Intensive University, whom we thank for permission to reproduce here.

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