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Customer/Supplier Integration into New Product Development

Bob Lutz Shares His Strongly Held Beliefs at General Motors[1]

Focus groups? Over-used and unreliable. Design? Undervalued and "corporate criteria-ed to death." Content? Not at the expense of profit or shareholder value. So says Robert Lutz, freshly anointed product czar at General Motors, in a widely circulated memo entitled "Strongly Held Beliefs."

The memo, which was leaked almost immediately to the media, created such a buzz throughout the world's biggest car company that CEO Richard Wagoner felt compelled to issue a statement saying in essence, "Go, Bob, Go." Lutz, Wagoner said, was hired to challenge the status quo and that's what his memo does.

More than a half-decade of committee-laden "brand management" looks to be taking it on the chin at General Motors as Lutz pressures the corporation to develop more exciting products in less time and at lower cost.

Lutz, who declares his motto to be "often wrong, but seldom in doubt" assailed excessive democracy and "consensus building" as counterproductive and hailed the virtues of tension and conflict in the workplace.

He certainly generated some of the latter. Reaction to the memo, predictably, varies depending on its implications for the recipient. The memo is shown below.

MEMORANDUM

From: Robert A. Lutz

Strongly Held Beliefs

1. The best corporate culture is the one that produces, over time, the best results for shareholders.

Happy, contented employees, and an environment where nobody argues or disagrees, and everyone compromises because the other person has goals, too, is usually not the culture that produces great shareholder value. A performance-driven culture is often a difficult place to work, and it certainly isn't "democratic." Democracy and excessive consensus building slow the process and result in lowest-common-denominator decisions. As Larry Bossidy, former CEO of Allied Signal, so aptly said: "Tension and conflict are necessary ingredients of a successful organization."

2. Product portfolio creation is partly disciplined planning, but partly spontaneous, inspired all-new thinking.

A good planning process can be an excellent baseline tool, a means of generating solid data. But it cannot robotically create a good future portfolio. It will generate bunts, singles, walks, and the occasional double. But triples and homeruns come from people who say, "Hey, I've got an idea!! Listen to this!" Steven Spielberg does not research in moviegoer needs segments. Needs-segment analysis can find a "small minivan" niche. It can't find a PT Cruiser, or a new BMW Mini, or an H2!

3. There are no significant unfilled "Consumer Needs" in the U.S. car and truck market (except in the commercial arena). There are "consumer turn-ons" that research alone won't find.

4. The Vehicle Line Executives (VLEs) must be the tough gatekeepers on program cost, content, and investment levels.

After (and maybe before) contract, requests for "priceable" content (it never works out that way, anyway) or "volume-improving" content can no longer be honored without offset. The VLE needs a program contingency, to be reserved for last–minute fixes or enhancements, (and maybe I need one, too). But the VLEs must evolve into often-unpopular "benevolent dictators" when it comes to protecting their cost position. It must be inviolable. Programs that miss their cost targets cannot be tolerated.

5. Much of today's content is useless in terms of triggering purchase decisions.

Most customers want a vehicle of new, fresh exciting appearance, with a rich, value-transmitting interior. They want a great powertrain, superb dynamics, and, obviously, safety and quality. But the thought that huge advances in voice recognition, or screen technology, or multi-function displays or ever-trickier consoles, or embroidered floormats, etc. will somehow override other deficiencies (or, worse yet, "averageness") is wrong. What focus

groups say they would "really like in their next car" is not reliable, because they are, in the research, not really paying for it. ("Talking car" and all-digital instrument panels received high "want" ratings in their day.) The vehicles that are succeeding today (Honda, Toyota, Audi, VW) are not highly contented, or if they are, they charge for the option packs. A "base" Camry is really base!

6. Design's Role Needs to be Greater.

As one of you said to me the other day, Design is being "corporate-criteria-ed" to death. By the time the myriad research-driven "best-in-class" package, the carryover architecture, the manufacturing wants, the non-stone chip rocker placement, the carryover sunroof module, and on and on, are loaded in, and the whole thing is given to Design with the words, "Here, wrap this for us," the ship sailing toward that dreaded destination, "Lackluster," has already left the dock.

7. Complexity-reduction is a noble goal, but it is not an overriding corporate goal.

Standardizing options for the sake of simplifying the BOM, engineering and releasing effort, pricing, dealer stocks, etc. is very worthwhile. But it can be counterproductive if it reduces vehicle margins, i.e., the net revenue loss is greater than the demonstrated savings in the enabling disciplines.

A good rule of thumb is that, in the case of an option with a significant cost, where the freestanding "take" is less than 70-75%, the incorporation as standard will cost money. If "priced for," then a large proportion of customers are being asked to pay for something they don't really want. If it's "eaten" and not priced, we are reducing margins without enhancing value to those who don't care for the option.

My experience is that options running at 25-40% should remain options (perhaps grouped into packages); options running at over 75% should be incorporated as standard. The area between 40-75% requires judgment in each individual case, and a good dialog between affected parties.

8. We all need to question things that inhibit our drive for exceptional, "turn-on" products.

Edicts and criteria do some good; they create consistency and order, and they help someone achieve a goal that he or she feels is important. But many of our criteria are internally focused and prevent us from doing high-appeal, exciting, dramatically new products. A salesman cannot say to the customer, "It takes a bit of getting used to, I admit, but did you know that it satisfies 100 percent of GM's internal criteria?"

We don't want anarchy, but we do need more of a "Who says?" attitude. The focus has to be on the customer.

9. It's better to have manufacturing lose ground in the Harbour Report, building high net-margin vehicles with many more hours, than being best in the world building low-hour vehicles that we take a loss on.

10. We need to recognize that everything is a tradeoff, that we can't maximize the performance of any one function to the detriment of overall profit maximization. The same goes for every discipline: A gorgeous vehicle that

disappoints in quality will fail. A car incorporating every conceivable new safety technology makes no contribution to safety if it becomes unaffordable to the customer or we can't afford to build it. A vehicle with a single-minded focus on "absence of things-gone-wrong" will fail miserably if it is dull, unexciting, a dog to drive, and ugly. Even if it's the best ever found by J. D. Power!

11. Remember the Bob Lutz motto: "Often wrong, but seldom in doubt."

None of us is infallible, and we all make errors. Remember baseball, where a batting average of .400 is unheard of! But pushing and arguing for what you believe to be the right course (while recognizing you just might be wrong, therefore, still willing to listen) is the key to moving forward. Errors of commission are less damaging to us than errors of omission. In our business, taking no risk is to accept the certainty of long-term failure. (Even Aztek, in this sense, is noble!)

Changes to the New Product Development Process

The reality in many markets today is that 40 percent or more of revenues come from new products introduced in the prior year. Thus, unless supply chain participants can create a continuous stream of innovative products, customers will take their business elsewhere. In the late 1980s and early 1990s, many Western organizations began re-evaluating and re-engineering their new product development processes. The combination of speed to market pressures and the need for product innovation forced many firms to experiment with new ways of bringing new products to market. For example, American automakers recognized that Japanese automakers were consistently able to design and build a new automobile in less than 30 months. Until very recently, the "Big Three" automotive manufacturers required from 48 to 60 months to accomplish the same task. Japanese automakers were consistently "leapfrogging" their American and European counterparts and in so doing, achieving a significant technological and marketing advantage in terms of quality, design, and performance. One common strategy that emerged during this time was to view new product development as more of a rugby game than a relay race, stressing the importance of getting the functional areas together early and frequently in bringing the product to market. The implications for manufacturing were significant. No longer was the manufacturing function notified after the product design was complete; instead, it would become involved throughout the process.

In the long run, competitiveness is the result of an ability to nurture and develop, at a lower cost and faster than competitors, the core competencies

that result in unanticipated, innovative products. Core competencies include a firm's collective learning, especially its ability to coordinate diverse production skills and integrate multiple streams of technology.[2] Firms must focus on those activities in which they have a learning and technological performance advantage. For example, 3M develops product lines around adhesives, while Honda considers their engine design and production a core competence.

As manufacturers focus more on their areas of competence and technical expertise, they must rely more on external suppliers to support non-core requirements. This is especially true in new product development. Firms are relying increasingly on suppliers for early design, concurrent engineering, and other product development support. To remain competitive, firms must receive competitive performance advantages from their suppliers that match or exceed the advantages provided by the suppliers of their global competitors. Firms are recognizing the strategic performance potential that collaborative relationships with suppliers can provide. They need a proactive approach to supplier integration into new product development; characterized by the formation of strategic alliances with core technology suppliers, open information sharing, co-location of supplier design personnel, and joint future technology planning. This approach must include strategies and tactics that directly promote supplier inputs into the new product development process. This practice suggests that a firm's strong commitment to internal technological development is not always necessary for competitive success. Successful technology acquisition or co-development is another means to achieve a sustainable competitive advantage. Some firms have been particularly successful borrowing innovative product and process ideas developed externally and applying them to better serve their market segments. In such cases, the borrowed technology could have been available for a long time. Among the most notable examples of this approach are seen in Japanese automotive and electronics firms that have competed very successfully in the world marketplace using many borrowed technologies. Other firms may not have adequate research and development (R&D) resources to allow much internal product or process development; such a firm must rely more heavily on external acquisition of innovative ideas to remain competitive. Thus, successfully acquiring and implementing a specific technology may well lead to a competitive advantage.

In this chapter, we review a number of important developments in new product development that have significant implications for value system creation, and present the key implementation issues involving supplier—customer integration into new product development, based on the results of a recent National Science Foundation study. Supplier development is then explored in the final section.

Supplier Integration Into New Product Development

Although there is increasing evidence that involving suppliers in the new product development cycle is important, there also is evidence that not all such efforts are successful. Moreover, successful supplier integration is dependent on a large number of variables. Supplier integration considerations include tier structure, degree of responsibility for design, specific responsibilities in the requirement setting process, timing of supplier involvement in the process, inter-company communication, intellectual property agreements, supplier membership on the project team, and alignment of organizational objectives with regard to outcomes. While the benefits of supplier integration appear to be obvious, the results of a recent study show that successful supplier integration projects have special common characteristics.[3] Specifically, successful supplier integration initiatives result in a *major change to the new product development process*. Furthermore, to be successful the new process must be formally adopted by multiple functions within the organization. The most important activities in the new development process are understanding the focal suppliers' capabilities and design expertise, conducting a technology risk assessment, and weighing the risks against the probability of success. Key questions that must be addressed are presented in the following sections and include:

1. Which suppliers should be involved?
2. Is the supplier able to meet our requirements?
3. Is the supplier's technology roadmap aligned with our technology roadmap?
4. Given the level of technical complexity, to what extent should the supplier be involved in the project?
5. When should the supplier become involved in the project?

Supplier Integration Approaches

The possible forms of supplier integration can be framed within the context of the "generic" new product development process shown in Figure 6–1.[4] The new product development process is a series of interdependent, often overlapping stages during which a new product (or process or service) is brought from the idea stage to readiness for full-scale production or service delivery. As the product concept moves through these stages, the idea is refined and evaluated for business and technical feasibility, the initial design is established, prototyping and testing are done, the design is finalized, and preparations for

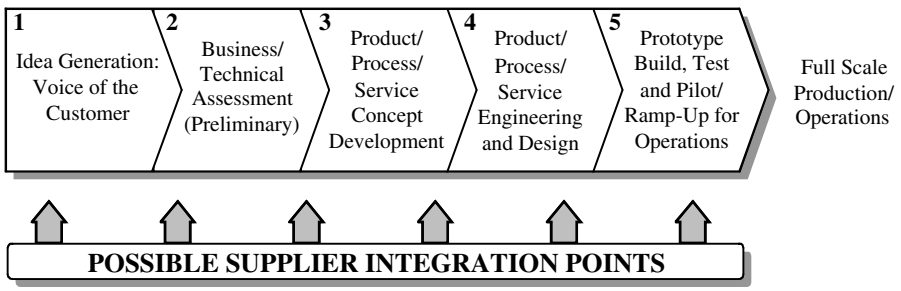

Figure 6–1 New Product Development Process

full-scale operations (tooling, layout, personnel, equipment, etc.) are completed. During this process, issues relating to cost, performance, timing, quality, and others, which result in tradeoffs and changes in the design are addressed. The design may be modified numerous times before it is finalized.

In the first stage (idea generation), designers and marketing personnel consider the need for the product, and typically tap potential customers for ideas and input on what such a product/process/service might do, how much it might cost, etc. Potential technologies also may be assessed at this point, especially if an existing supplier possesses an exciting new technology. In the second stage, the team may perform a business assessment of the product, and also identify the technical solutions to the customer's requirements. In the third stage, the product/process/service concept is effectively conceived, with performance specifications "frozen." In the case of product development, a preliminary prototype model may be created to define the concept. Next, the actual development process begins: designers from both the supplying and buying organizations create design specifications. Tools such as Quality Function Deployment (QFD) may be used to develop technical specifications that address customer requirements. They create a working prototype that enables testing and verification of existing production systems. Finally, the product enters full-scale production.

Outside suppliers provide materials and services that comprise a majority of the cost of many new products. In addition, suppliers may provide innovative product or process technologies critical to the development effort. The supplier may have better information or greater expertise regarding these technologies than the buying company design personnel. Supplier input and/or active involvement of suppliers may be sought at any point in the development process.

While the concept and design engineering phases of new product development incur a relatively small portion of the total product development costs,

these two activities often commit or "lock in" as much as 80 percent of the total cost of the product. Decisions made early in the design process have a significant impact on the resulting product quality, cycle time, and cost. As the development process continues, making design changes becomes increasingly difficult and costly (see Figure 6–2). It is crucial then, for firms to bring to bear as much product, process, and technical expertise as possible early in the development process. In addition, companies whose development plans are well aligned with those of their key suppliers can shorten overall development time.

The degree of supplier integration in new product development can range from having no supplier involvement to a "Black Box" approach, where the supplier provides its own design without the involvement of the buying organization. In between are the "White Box" and the "Gray Box" stages. A "White Box" occurs when the supplier is brought in on an ad hoc basis, and acts as a consultant to the buyer's new product development team. This is largely an informal meeting, occurring only as needed. The "Gray Box" approach is more formal: joint development activities such as joint design, prototype manufacture, and testing occurs between the buyer

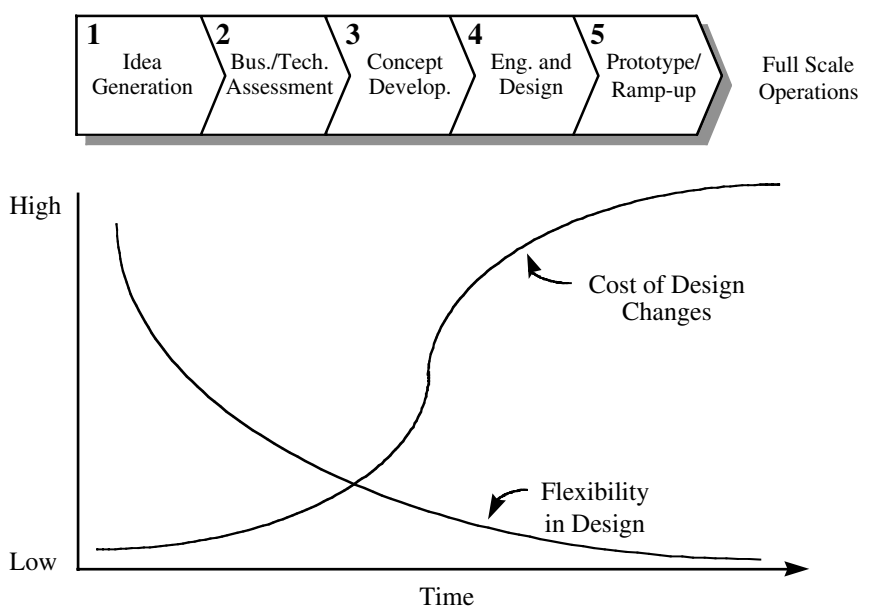

Figure 6–2 Design Flexibility and Cost of Design Changes

and supplier. In the "Black Box" approach, the supplier is formally empowered to design the component based on the buyer's performance specifications. In this type of approach, a high degree of trust typically exists between buyer and supplier, as the buyer relies on the supplier to design and manufacture an entire subassembly or module that will "fit" into their primary new product or service.

BMW's Global Integration in New Product Development[5]

BMW is initiating a project to improve the CAx collaborative processes it shares with its global suppliers. CAx refers to any type of computer-aided design (CAD), engineering, or manufacturing data used to develop and produce vehicle parts, process tools, or equipment. This data includes the following: 3-D digital models, geometric and process quality data, 2-D drawings, or product management system data. Collaborative engineering, as defined at BMW, is simply working simultaneously on synchronous CAx data with suppliers. Virtual simulation and a digital mock-up process also help shorten the development timeline and reduce material use in prototyping. These models have been developed extensively in Germany, and BMW is implementing this technology on a global basis with its key suppliers. Because co-location is not possible given the wide array of technology centers within the supply base, using digital technology will enable BMW's entire supply base to be "on the same page" throughout the new product creation and development stages, on a real-time basis, regardless of location.

Supplier Integration Into New Product Development Process Model

Based on a detailed analysis of multiple company case studies that were conducted as part of a major research project funded by the National Science Foundation,[6] a process model of supplier integration into new product development was created (Figure 6–3). This model is a compilation of supplier integration process "best practices." Additional insights into company practices at various stages of the model are also provided in this section.

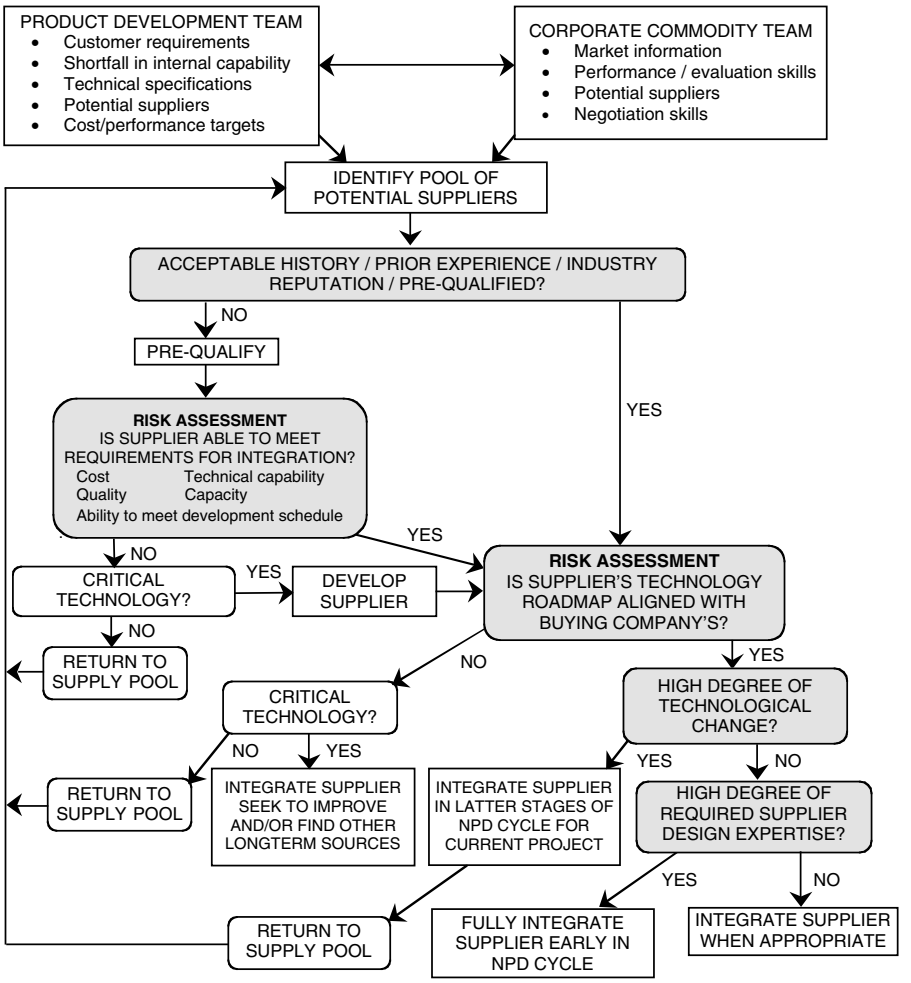

Figure 6–3 Process Model for Reaching Consensus on Suppliers to Integrate into New Product Development Project

Identifying Desired Supplier Capabilities and Potential Suppliers

All the companies that participated in this research indicated that the design and manufacturing process is being subjected to a much more thorough analysis than in the past. An important initial decision in this process involves a formal statement on the level of insourcing/outsourcing that will occur in core technology development. In order to reach consensus on difficult insourcing/

outsourcing decisions, successful organizations have developed a formal process for defining the level and types of product/process technologies to be outsourced. Whenever possible, companies are approaching the insourcing/outsourcing decision from a systems perspective, and are asking suppliers to increase their responsibility for the level of integration. This was observed across a variety of products and processes; including chemical molecules, computer components, installation and maintenance of new processes, and automobiles.

The decision-making process begins with an assessment of strategic core competencies in product and process design and manufacturing. At this level, the analysis involves decisions regarding core technologies, system integration, and return on investment for resource allocations leading to internal technology development. In general, companies trended toward outsourcing commodity-like items, and focusing internal efforts on value-added processes such as system integration. In all of the companies, this decision was made at higher levels in the organization, and involved a strategic vision regarding the organization's future markets and technology roadmap over the next ten to twenty years.

Once consensus is reached, executives formalize the insourcing/outsourcing technology strategy and communicate it to the divisions, who are then responsible for establishing current and future new product requirements. The process of cascading the decision to the next organizational decision-making level is achieved through a variety of means. One of the prevailing organizational structures used to interpret and deploy technology strategies is the advanced technology group. These groups are typically located centrally, and are tasked with identifying major new subsystem and component technologies required in new products. Another approach involves integrating suppliers into process development and start-up. Some companies use institutionalized "platform teams," responsible for new product development with suppliers on a permanent basis. Finally, other organizations employ a letter of intent that formally specifies the nature of the relationship. At this stage product development teams are typically making the decisions, guided by the executive core competence vision.

The final insourcing/outsourcing decision-making hierarchy occurs at the component level, where decisions are typically made jointly by the product development and purchasing commodity team. Purchasing is responsible at this level for identifying leading suppliers within a commodity class and sharing this information with the commodity team.

After completing this initial stage of the strategic process, teams should have identified a vision statement regarding the company's internal core competencies, established a set of requirements for success in current and future new products, and have a general idea of the technology needs within these

product groups. In addition, the company should have a general idea of the specific roles and responsibilities it requires of suppliers selected for new product development. New product/commodity teams should seek to formally specify these objectives in as much detail as possible. These objectives become the primary criteria used in supplier selection, negotiation, alignment, and relationship management.

A number of case examples illustrate this process. At NEC, a major manufacturer of fax machines in Japan, the primary metric used to drive all supplier integration projects is target cost. A target cost for a fax machine is first developed based on marketing's input, and is broken down into different categories of parts based on historical costs. This target cost is submitted to suppliers. Suppliers share their cost data with engineers, and provide information on labor, overhead, and material costs. To achieve the target cost, changes in processes and materials are discussed first, avoiding the topic of profit margins. If the supplier still cannot meet the target cost, the company initiates negotiation of profit margins based on volume considerations.

Other considerations that may influence the decision to integrate suppliers include a lack of internal design capability and the need to develop a non-core technology. For example, Intel relies extensively on its suppliers to deliver state-of-the-art process technology that it cannot develop internally. The key strategy within Intel involves holding suppliers responsible for delivering, installing, servicing, and maintaining machine tools. Suppliers are responsible for process ramp-up and equipment maintenance. While the company is also involved in supplier integration into new product development, process integration represents a unique application in a non-traditional area. Suppliers are first fully responsible for the maintenance of these machine tools; the maintenance tasks are then gradually turned over to internal people. Each supplier is responsible for a single process, which is performed identically at multiple Intel facilities around the world. Intel demands the exact replication of processes across its facilities: this principle is emphasized throughout its business strategies. The principle refers to the fact that any time a specification or task is transferred between functions or suppliers, the other party is responsible for exactly reproducing the requirements.

In another case, Dupont considered portions of molecules as building blocks in assessing supplier competence. The company's strategy was to accelerate the rate of new product development by focusing on fewer compounds annually, and to integrate suppliers who have proven capabilities and can perform multiple steps in the intermediate production process. Instead of asking suppliers to only supply basic elements, the suppliers make the intermediate molecules with the final molecules in mind. This involved showing suppliers "the big picture" (not just a small piece of the process), posing the ques-

tion more broadly, and getting the supplier to perform a greater share of the process. Supplier integration was facilitated by broader confidentiality agreements covering more issues as the supplier gained access to more pieces of the molecular puzzle. In some cases, Dupont even licensed parts of molecules from university research centers! The strategy driving this integration process was to push it increasingly higher up the compound chain, becoming more of an "assembler" of the final compound or molecule.

Supplier Risk Assessment

Once the new product commodity team has reached consensus on the key objectives for integrating suppliers, a set of specific performance measures related to customers' needs and requirements should be used to identify potential supplier capabilities and drive the subsequent selection. Cost, quality, and delivery are, of course, relevant, but evaluating suppliers for potential integration into new product development should involve criteria beyond those used to evaluate ordinary material/service suppliers. Based on the experience of the companies studied, the following elements are likely to be important factors in considering new or existing suppliers for integration:

- **Targets:** Is the supplier capable of achieving the required targets regarding cost, quality, and product performance/function (e.g., weight, size, speed, etc.)?
- **Timing:** Will the supplier be able to meet the product development schedule?
- **Ramp-up:** Will the supplier be able to increase capacity and production fast enough to meet volume production requirements?
- **Innovation and Technology:** Does the supplier have the required engineering expertise and physical facilities to develop an adequate design, manufacture it, and solve problems when they occur?
- **Training:** Do the supplier's key personnel have the required training to initiate and successfully operate required processes?

All of the above criteria must be tied into the evaluation/measurement system, in order to develop a comprehensive risk assessment that answers the following questions:

- What is the likelihood that this supplier can bring the product to market?
- How does this risk compare to other potential suppliers?
- At what point are we willing to reverse this decision if we proceed, and what are the criteria/measures for doing so?
- What is the contingency plan in the event the supplier fails to perform?

It is no longer enough that a supplier be able to design and manufacture a prototype or start-up small volume production. Because of the intense competition and short product life cycles in many industries such as computer electronics, suppliers must also be able to meet product introduction deadlines and ramp-up their production volumes very quickly. Several of the companies studied assessed these criteria through a variety of means.

A good example is provided by a new product/commodity team from a computer manufacturer and a European supplier, who was selected after ten suppliers presented their design for a new project. The commodity team evaluated all presentations. During the course of the selected supplier's presentation, the team found that it could satisfy its requirements with an "off-the-shelf" chip set from this supplier. The team also visited selected supplier facilities, and the supplier deployed a dedicated engineering team over the course of the project. The commodity team also worked in parallel with other new product/commodity teams on the product development group. A key element in the structure of the teams in this company is that it is not a 100 percent engineering-led process, even though engineering has traditionally dominated decisions. The new vision is to retain a core set of knowledge to respond to end customer needs, and develop more interfaces with suppliers to identify which technologies can meet these requirements. The company cannot afford to be shut out of a new technology, so the group must constantly transfer knowledge from a variety of sources, including customer requirements, aftermarket (where new technologies often show up first), trade shows, competitive assessments, and alliances.

For another computer manufacturer, the supplier's capacity and flexibility are critical issues, and the team examines the type of agreements the supplier has with their contract manufacturers and how they affect the supplier's ability to increase output quickly. In this case, the supplier must have to the ability to increase productive capacity in the following manner:

- 25 percent in 4 weeks
- 50 percent in 8 weeks
- 100 percent in 12 weeks

A computer peripherals manufacturer faces the problem of having a very limited number of potential suppliers of several key components worldwide. However, because of the small number of suppliers, the company has done business with most of them, and recognizes their capabilities. Supplier selection is based primarily on the supplier's capability to design and manufacture the product in large volumes to performance specifications within the required time.

At another computer company, in the first stage of the new product development process (definition and planning), material support involves selection

of technology appropriate to product requirements. Once this is complete, corporate materials can identify a potential list of suppliers. If the supplier is new to the company, the supplier will first perform a self-assessment survey. Then the new product/commodity team conducts a comprehensive assessment of the supplier's capabilities and arrives at a performance score.

When the supplier's capabilities are not at desired levels, the new product/commodity team has two options. If the technology is not critical to the product's functioning, a different supplier may be investigated. However, if limited numbers of suppliers are available and the technology is critical to the product, the company may undertake a more detailed technical assessment of the supplier in order to develop and improve the suppliers' capabilities early in the product development process.

Several companies in the study carried out detailed assessments of the supplier's technical capabilities prior to selecting them for a new product development project. In most cases, both formal and informal approaches were required to develop a reliable assessment. A typical approach would start with a standard survey augmented by informal evaluations by the buying company's engineers based on face-to-face discussions with the supplier's technical personnel.

A good example of how this decision is made involved a component supplier who made lead frames and over-molding for a semiconductor manufacturer. Although the company had the capability to manufacture these parts internally, they chose to team up with the supplier to produce them after the new product/commodity team (engineering, design, quality, marketing, and procurement) made an insourcing/outsourcing decision. The team decided to outsource because the internal process could not meet the customer's quality requirements (0-6 parts per million). The supplier was selected after the new product/commodity team reviewed the supplier's product, process, and control plans. Next, the team was expanded to include the supplier, to determine if it could meet the customer's requirements. Once the supplier's capability was established, it became a full-time member of the team.

In another case, an oil and chemical company's new product/commodity team evaluates suppliers involved early in its development efforts using a number of criteria in a "Total Cost of Ownership" model that considers:

- Reputation for meeting requirements
- Cost/availability of raw materials
- Difficulty of the process matched against the supplier's capability
- Waste generated in the supplier's process
- Number of steps required of the supplier
- Environmental compliance
- Technical competence

The choice of supplier is made by the whole team. Following the recommendation, the company audits the supplier's facilities for contamination, environmental compliance, quality, technical capability, and cost.

Assessing the Supplier's Technology Roadmap

Even after the new product/commodity team has carried out a detailed performance assessment prior to selection of a supplier, it must carry out a second type of assessment. This second assessment ensures the short-term and long-term alignment of the objectives and the technology plans of the buying company and the supplier. To obtain maximum strategic benefit from the integration of the supplier, companies must share objectives and have complementary future technology plans. This is commonly described in terms of a convergence of the partners' technology roadmaps (see Figure 6–4), which describe the performance, cost, and technology characteristics of future products each company plans to develop and introduce over some specified time horizon.

The specific approaches companies use to assess and achieve alignment of technology roadmaps with suppliers vary considerably. Regardless of the approach, sharing information is a critical element of the process. A second important element is providing some incentive or motivation for suppliers to work toward technology alignment with the buying company.

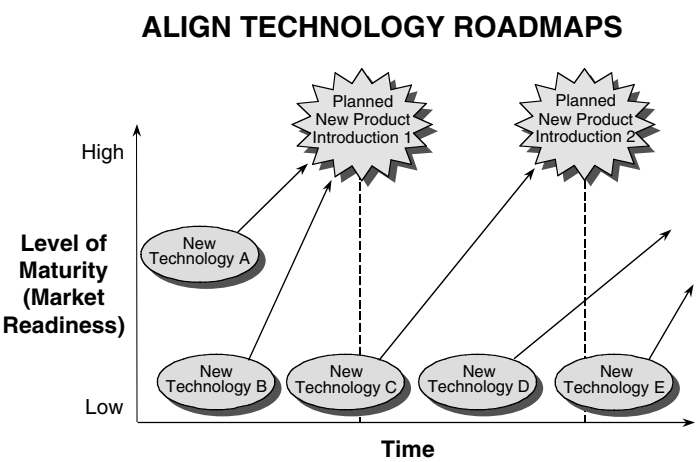

Figure 6–4 Managing Product and Technology Development

As organizations seek to improve the technological capabilities of their supply base, they will need to first build stronger relationships with suppliers, which involves sharing future product plans and alignment of technology roadmaps. In turn, suppliers may need to alter their technological plans to more closely align them with those of major customers. As this exchange of information takes place, industry standards may be influenced. This will not only require an intimate understanding of current suppliers' capabilities, but also a commitment and willingness to trust the other party.

At the same time, buying companies must maintain a competitive edge, and must be aware of potential new suppliers and technologies. Organizations may need to create separate groups responsible for advanced technology development and expertise. These groups will need to continuously monitor competitors' products, processes, and supply bases, and to suggest modifications to current sourcing strategies. In some cases, joint technology development with suppliers may yield substantive results, providing that appropriate targets can be set. Companies must conduct this activity on a global basis, scouring the world for the best suppliers. This study showed that geographical proximity was one of the least important factors influencing the choice of supplier for integration.

Many companies attempt to manage and obtain the best technologies for application by developing a "bookshelf" of current and emerging technologies and suppliers of those technologies. These companies monitor the development of new technologies and, for those that appear to have promising applications, manage their introduction in new product applications so as to balance the benefits of "first mover" status with the risks of utilizing new technology. The objective is to maintain a selection of promising and accessible technologies and suppliers on the "bookshelf," ready for the company to use in a new product application.

At one company studied, an engineer in the buying company initiated the company's most successful supplier integration project. The engineer recognized synergies between the capabilities of his company and a supplier and began talking informally with a counterpart in the supplier company. This led to a high-level meeting between executives from the two companies. At this meeting, supplier executives shared technology plans and roadmaps, and identified common research streams in a very broad category of materials. A "top four" list of projects was targeted directly to future product needs. This relationship has now solidified, with the two companies meeting periodically to share their technology roadmaps and update their project list.

A different type of technology roadmap sharing is done by one electronics company that isn't sure where needed technology developments are most likely to occur. In some cases, internal development groups will share early

information about future technology roadmaps. For instance, in one commodity, the manager has established a technology roadmap with performance curves and expected targets by date. The target area is shared with multiple suppliers. Suppliers are told that if they can't hit the target by a specified date, they won't get the business. This concept varies somewhat from conventional early involvement wisdom. Due to the volatility of this industry, the company does not have the time or the need to form alliances and go through an early involvement program. Rather, the company's strategy is to make sure the technology is available by openly sharing technology roadmaps with any qualified supplier, and to move its business when necessary to take advantage of performance at the target price.

Assessing the Rate of Technological Change

Assuming that the buying company can establish that the supplier's technology roadmap is aligned with its own, another important factor it must consider is the rate of change in product technology. The current rate of technological change is challenging many companies' capabilities, and they are seeking the help of suppliers with the development and application of critical but non-core technologies in their new products. For instance, the product life cycle of some products such as personal computers is less than three months. One computer manufacturer in the U.S. mentioned that the need to quickly bring new products to market is the single most important reason for integrating suppliers. Because of this need, this manufacturer skips the prototype stage and goes directly from development to full production!

Although supplier integration is useful for managing the quick pace of technological change, it also represents a double-edged sword. If a particular technology is changing rapidly, then involving the supplier early has potential pitfalls: the buying company may become "locked into" a particular design or technology, release the product, and discover that the technology has become obsolete or has been replaced by a technology with improved performance characteristics.

Timing of Supplier Integration

Companies should consider two major factors when deciding when to integrate the supplier into the product development process: the rate of change of the technology, and the level of supplier expertise in the given technology. Generally speaking, if the technology is undergoing a significant amount of technological change, it should be delayed in the product development cycle. On the other hand, if a supplier's design expertise is significant

and its technology experts can provide insights instrumental to crafting the new product, that supplier should be included earlier in the process (see Figure 6–5).[6]

Field studies suggest that certain types of suppliers are more likely to be integrated earlier. For instance, at a Japanese computer manufacturer, the extent of interaction between product development engineers and suppliers appears to depend on the volatility of the commodity technology. Suppliers of critical non-standard commodities are involved much earlier in the product development initiative. These suppliers have regular, face-to-face discussions with engineers. On the other hand, suppliers of non-critical, standard items are not integrated until the final stages of the development cycle, and communication appears to occur more frequently by means of information systems (i.e., CAD is used with non-critical items such as PCBs, keyboards, and chassis). In general, face-to-face discussions are quicker, and information can be exchanged more effectively. However, because suppliers are located within a day's travel to the operating divisions, co-location is often unnecessary.

At a U.S. electronics manufacturer, the supplier's level of involvement may vary. To get a good quote, the supplier must be brought in early and sit in on the customer negotiation meeting. This company typically relies on suppliers for their process technology, not their product technology: suppliers are involved in bringing in new processes that are not internal areas of expertise. Suppliers often understand the total design, and how they can influence the design, earlier than internal personnel. In this case, the functional specifications are defined, and suppliers work with the company to jointly ensure they are met.

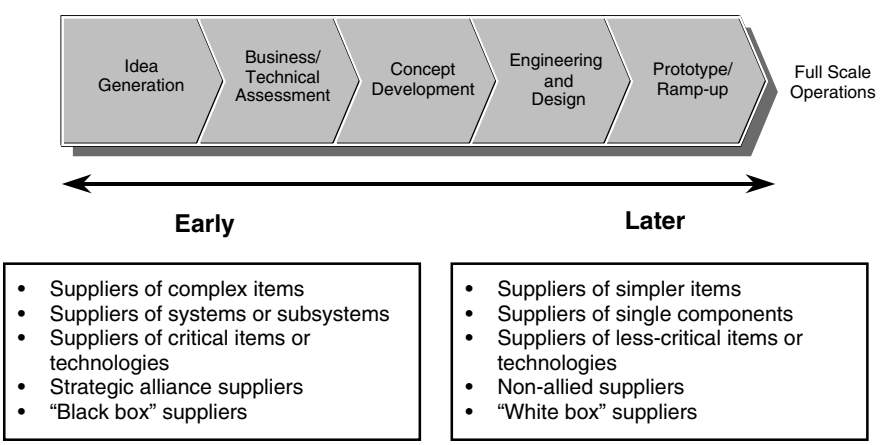

Figure 6–5 Integrate Suppliers at Different Stages

The Future of Supplier Integration

The companies in this study had a median of six years' experience integrating suppliers into new product development. They expect to increase their use of supplier integration in the future, and to involve suppliers earlier in the development process than they do now. Respondents were asked to characterize the success of the specific supplier integration effort, as well as the success of the overall development project in which the supplier was involved. On average, the respondents considered both the supplier integration effort and the overall development project to have been fairly successful.

Not surprisingly, results also indicated large variation in companies' level of satisfaction with their supplier integration efforts. In fact, only 20 percent of respondents agreed with the statement "We are currently satisfied with the results of our supplier integration efforts." More than 45 percent disagreed with the above statement. Despite these mixed results, respondents are committed to supplier integration for the future and their expectations are that supplier integration will continue to be important. This is indicated by the fact that more than 70 percent of respondents agreed "Expectations about the results to be achieved from supplier integration will increase significantly." Together, these results seem to indicate that many companies realize the importance of supplier integration, but have not yet perfected the process to successfully implement it.

Developing Suppliers' Capabilities[7]

In the early stages of new product development, a new product/commodity team may visit suppliers and find that they will have problems meeting performance expectations. It is definitely better to discover such problems *before* the product enters into the full production cycle. To deal with this issue, many companies are employing a strategy called supplier development. Leading organizations do not simply tell the supplier to improve, but are increasingly adopting a hands-on approach to improvement. This often involves working directly with the supplier to identify and resolve problems. Help may come in the form of process engineering support, financial support, or even support from within the supplier community itself. The following cases provide examples of how organizations implemented these approaches.

Process Engineering Support

One U.S. automotive company has used a group of 15-16 process specialists in supplier development for many years. These individuals specialize in areas such as castings and machining, and are typically in a "reactive" mode: they

respond to quality or delivery issues when a problem is recognized. For instance, if a supplier is experiencing persistent process problems and the normal set of contacts cannot resolve it, then the process specialists become involved. In such cases, these individuals have the requisite skill set to watch a supplier's production line, talk to the supplier's production people, and subsequently understand the problem. They then work with the supplier to determine the root cause of the problem and potential solutions. This process may require several days and repeat visits. After the problem is resolved, they move on to another supplier, and often travel all over the world "fighting fires." Until recently, nearly 90 percent of the company's supplier development efforts were reactive in nature, and the remainder proactive. One of the company's objectives is to reverse this ratio.

Financial and Facility Support

Financial distress has been a common problem in the Asia Pacific supply base within recent years. A manager from a Korean electronics firm, Samsung, noted that most Small Manufacturing Enterprises (SMEs) in Korea are deficient in manpower capability, technology, and financial resources. The latter two are the primary focus of the company's improvement efforts. The company supports financial and technology initiatives by performing facility layout projects for suppliers, as it has expertise in the area. In the financial resource area, the company is able to assist by lending money at lower interest rates than financial institutions and waiving collateral requirements. Suppliers also may initiate supplier development assistance from the company by making a formal request. The electronics firm also employs specialists who assist suppliers in improving competency in areas such as supplier management and purchasing.

Another Korean company, Lucky Goldstar, emphasizes education as a key part of its supplier development program. The company also provides collateral for supplier's improvement projects, allowing the supplier to borrow funds at reduced rates for new equipment. The firm also helps suppliers purchase raw materials, and leverage steel prices from steel manufacturers.

Hyundai has begun to improve suppliers' technology and capacity through the creation of a Supplier Industrial Complex. This facility allows suppliers to work together in supplier clusters. This five-acre complex was purchased to help suppliers develop their own facilities, rent-free. The company envisions a joint plant, with joint painting and tooling facilities, to be shared by all suppliers in the complex. Currently, this concept is limited to domestic Korean suppliers, but may be extended internationally in the future.

Supplier Associations

Many organizations also are developing supplier support systems within their supply base, in order to concurrently improve the entire supply base. One of the largest such support systems is run by Toyota with operations in the U.S., which has formed a supplier association (*kyoryoku kai)* to support its objectives through its supplier members. In effect, the objectives are linked back to the company's internal policy deployment *(hoshin)* process, which ultimately dictates the real goals. These associations facilitate supplier development, by creating peer pressure with other suppliers in the tier, essentially creating a "shame factor" for low-performing suppliers.

This company has four supplier associations: three are regional and one is made up exclusively of tooling suppliers. First-tier supplier companies and the OEM buying company lead these associations. The association's strategy board generally consists of eight suppliers, whose membership rotates annually. This group defines what is to happen within the association. The primary meetings occur about twice a year, and include the presidents of all the supplier members. Together, the strategy board and the primary meetings constitute an extension of the *hoshin* process beyond the walls of the buying company. At a lower level, the parts and commodity groups meet approximately ten times per year to discuss evolving trends, technologies and new product requirements. However, the majority of the work occurs in the process group meetings. These groups are divided into three focus teams: Cost, Quality, and a group whose topic of emphasis varies every year according to Toyota and supply base needs. Possible topics for this group include automation, environmental issues, and cycle time reduction among others. Each of these groups meets approximately ten times per year. Although supplier associations were originally instituted in Japan, companies around the world are now using them.

Summary

Companies must recognize that supplier involvement in new product development can have both positive and negative impacts on technology risk and uncertainty. Organizations need to capitalize on the positive aspects of supplier involvement recognizing:

- The supplier may have greater experience or expertise with the technology and, as a result, may have better information about where the technology can be successfully applied.
- Some (or all) of the technological risk may be taken on by the supplier.
- The buying firm may have some ability to influence the direction of the supplier's R&D efforts in order to match developing technologies with the buying firm's technology strategy.

If a closer relationship between the buying company and the supplier develops as a result of supplier involvement, the supplier may be more willing to share information about its new/emerging technologies with the buying company. The buying organization may also provide various types of supplier development assistance to help motivate this information exchange.
However, organizations also need to recognize that:

- Involvement with a supplier may tend to lock the buying company into the supplier's technologies. This makes initial selection of the supplier a more critical issue, as the buying company needs to anticipate whether the supplier will remain a technology leader.
- A supplier with an "inside track" may not have as much incentive to innovate, slowing the pace of technological advancement. The buying company must find ways to ensure it is getting the supplier's best efforts.

In the next chapter, we discuss another benefit of supplier integration that is evident: significant reductions in cost across the value system.

Endnotes

[1]Appeared in Autoweek Online on October 12, 2001.

[2]C. K. Pralahad and Gary Hamel, "The Core Competence of the Corporation," *Harvard Business Review* (May-June 1990): pp. 79–91.

[3]Robert Handfield, Gary Ragatz, Robert Monczka, and Kenneth Peterson, "Involving Suppliers in New Product Development," *California Management Review*, vol. 42, no. 1, Fall 1999, pp. 59-82.

[4]R. Monczka, R. Handfield, D. Frayer, G. Ragatz, and T. Scannell, *New Product Development: Strategies for Supplier Integration.* ASQ Press, Milwaukee, WI, 1999.

[5]Presentation made by Rob McDarris (BMW) at the Southern Automotive Manufacturing Conference & Exhibition, Palmetto Expo Center, Greenville, SC, April 8-10, 2002.

[6]R. Monczka, R. Handfield, D. Frayer, G. Ragatz, and T. Scannell, *New Product Development: Strategies for Supplier Integration.* ASQ Press, Milwaukee, WI, 1999. Figures 6–1 to 6–5 are adapted from this text.

[7]Adopted from Daniel Krause, and Robert Handfield, *Developing a World Class Supply Base*, Center for Advanced Purchasing Studies, Tempe, AZ, National Association of Purchasing Management, 1999.