

Changes to Improve New Product Development at Nortel

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Introduction and Summary

The lifeblood of any company in a capitalistic society is the development of profitable new products and/or services for existing and new customers.

[PORTE90] describes five competitive forces within a market: bargaining power of suppliers, threat of new entrants into the market, bargaining power of buyers, threat of substitute products or services, and rivalry among existing competitors. The strength of each of these forces depends on the industry structure or the underlying economic and technical characteristics of the industry. As the industry structure changes due, for example, to deregulation, technology improvements, or end consumer demand, competitors within the industry will change as new players enter the market and old players make product changes or leave the market.

The Procurement function within a company can directly contribute to the effectiveness of the new product development and market introduction. By assisting the new product team by procuring the materials and services needed, the Procurement function ensures that the company's commercial and engineering requirements are met as cost effectively as possible.

Nortel, a manufacturing company of telecommunications industry products, is operating in an environment that has changed as deregulation of the telecom industry continues to move from the United States, into Canada, Europe and throughout the world.

Until the 1980's, the telecom industry was slow to accept change due to the small number of players. Beginning with the successful challenge by MCI to provide long distance service, a host of telecom companies have sprung up nurtured by legal and regulatory decisions that have broken down the telecom market entry barriers. Europe is undergoing the same types of market changes as national telecom companies sheltered by their governments are being privatized and the regulatory market barriers are being lowered to encourage competition.

Like the airline industry, the telecom industry has become a competitive, cost conscious industry. Customers are wanting products that provide the features they need to be successful in their niche at a low cost. Feature rich products no longer count if they aren't cost effective.

In this paper, we will look at the function of procurement within the development and market introduction of a new product at Nortel. We will discuss two issues: (1) the difference between a new product development during the product innovation stage of a product lifecycle and the production innovation stage of a product lifecycle and (2) the interface between the R&D procurement function and the manufacturing procurement function.

The question we are interested in exploring is: what changes can Nortel make in the procurement function which could improve Nortel's competitiveness. We are especially interested in what measures can be implemented to improve Nortel's ability to reduce

new product development cycle time by improving the procurement function and integrating it more fully into the new product development team.

The new product development cycle time is defined as the time from when a product need is identified to the time when the product is generally available.

The term “new product” as used herein covers not only new products but also products derived from existing products through cost reduction and/or feature enhancement.

The New Product Development Environment

The New Product Development Cycle at Nortel

The new product development cycle at Nortel begins with the identification of a market need by someone. The identifier may be in one of several functional groups that have some contact with the marketplace.

The new product requirement is fed into the Business Line Management (BLM) group where it is added to the product mix being reviewed for implementation. If it is decided to implement the product, a recommendation along with a funding request form is submitted to executive level management who then approves or refuses the request. Approved requests become a product idea to be developed by the organization.

The product is designed within the engineering/design group, prototypes are tested, the design is recycled with improvements learned from the prototype, and a final design is released to manufacturing. The first standard units are manufactured and are installed at a Verification Office (VO). There the new product under goes acceptance testing followed by a soak period where the product is in-service with its performance closely monitored. Once the product completes the VO successfully, it is installed in a series of other customer sites (the ramp customers) with the number of units deliberately held in check until field performance shows the product that meets its field performance metrics such as failure rates. Once a product is successfully deployed into the ramp customers, it becomes generally available for all customers to purchase.

A new product program schedule usually encompasses the time from when the product requirements are specified in a commercial specification and a development program is started until when the product is generally available.

Differences Between Manufacturing and R&D Procurement

Nortel, since it contains an R&D component, has two flavors of procurement groups, the R&D procurement group and the manufacturing procurement group. The focus of the R&D procurement group is to support the R&D engineering group while the focus of the manufacturing procurement group is to support the manufacturing group.

The needs of R&D engineering are different from the needs of manufacturing in the areas of cost, quality, and quantity. R&D engineering is accustomed to small quantities of leading edge components which may be of variable quality due to design churn in those

components and which may be costly due to premiums paid for short lead time and/or low volumes. Manufacturing is accustomed to large quantities of known quality components with reasonable lead times.

One of the major efforts in manufacturing procurement is to have a steady supply of known quality components arriving per a known schedule. The goal is to remove as much variability as possible from the value chain. Manufacturing procurement must work with the accounting group to ensure that the accounting group is able to properly track money flows for reporting.

Nortel manufacturing procurement has a list of approved vendors categorized by product such as sheet metal assemblies. Nortel has existing commercial arrangements with the suppliers on the approved vendor list. These commercial arrangements include communication arrangements allowing the use of EDI to transfer orders and payment as well as TDI to transfer engineering documentation. The commercial arrangements also provide for product support arrangements such as repair and return as well as quality system standards.

R&D procurement working with small quantities normally provides a Request for Quote to one or more suppliers for engineering materials and services. With some products such as mechanical prototypes, the winner of the RFQ may not be the company that will actually manufacture the standard product. R&D procurement normally attempts to use the approved vendor list in order to reduce costs.

There is a tension between R&D procurement and manufacturing procurement due to these real differences in their immediate customers, product design and manufacturing respectively. It may well be that a particular component or sub-assembly needed by engineering is not provided by a supplier on the approved vendor list. A new supplier triggers actions that include both R&D and manufacturing procurement in order to ensure that the new vendor is added to the approved supplier list.

The first step is to allocate a vendor code and begin the assessment process required for a vendor to appear on the approved supplier list. The prospective supplier is visited by a Nortel auditor who reviews the supplier's manufacturing quality system.

Normally, the contracts group will work with procurement and design to draw up a commercial agreement. If the component or sub-assembly is a standard product offering of the supplier, pricing is also established. If the component or sub-assembly is an engineered product based on a Nortel design, pricing may wait until the design is complete and the first finished products are available to establish the price.

The price Nortel pays is then padded with an additional overhead charge to establish the Nortel standard cost. This standard cost contains the price the supplier charges Nortel along with a charge to cover handling, shipping, and other overhead. Marketing then uses the standard cost plus a profit margin to arrive at the list price and acceptable discounts.

Tyranny of Standard Cost

The tyranny of standard cost is how it drives organizational behavior that is against the best interest of the company. Basically, standard cost is an approximation of the real cost

required to manufacture a product at a particular point in time. Standard cost is composed of the material costs, the direct labor costs, and the indirect costs of labor and facilities which are assigned to the component, assembly, or product.

The problem standard cost poses to the organization is that it can become the real cost in the minds of its users. A product standard cost that is artificially high can cause marketing and sells to ignore a product which in reality has good margins. A product standard cost that is artificially low can encourage marketing and sells to push a product which in reality has poor or non-existent margins. An incorrect standard cost can also mean the elimination of a product with an artificially high standard cost or keeping a product with an artificially low standard cost.

[SRIKA90] provides a brief overview of the limitations of the standard cost system of cost accounting when used for making business decisions.

Standard cost is an approximate cost at a particular point in time. Changes in real direct costs aren't reflected in changes to the standard cost nor are changes in indirect costs due to volume or other environmental changes. Standard cost, since it is a local measurement, tends to influence managers to make local changes to improve standard cost of a particular product. Such local optimizations can negatively impact the global performance of the organization such as for example when procurement orders a large volume of a component to obtain an attractive price yet the organization ends up carrying a large inventory of the component incurring costs which negates the lower price.

Most organizations provide some type of accounting mechanism that provides a charge back when actual costs vary substantially from standard costs. If the actual cost is lower than the standard cost or if the actual cost is greater than the standard cost, the affected groups such as manufacturing and marketing can negotiate charges against the involved accounts so that the costs are properly recorded.

At Nortel, this accounting mechanism is called Purchase Price Variance (PPV). It is a part of the manufacturing procurement's function to work with vendors to obtain purchase price improvements.

Lifecycle Impacts to Procurement Requirements

Product Lifecycle

In [UTTER96] the author describes a theory of product lifecycle in which every product lifecycle is composed of a period of product innovation followed by an overlapping period of product production process innovation. Utterbeck provides examples from recent history of several major products and industries that demonstrate his thesis.

Basically, Utterbeck believes a new product is introduced into the marketplace after which a period of product innovation follows as other companies enter the market each attempting to gain market share through product differentiation. This period of product innovation allows the marketplace to determine the product's features.

Towards the end of the first phase of product innovation the marketplace has formed the product's major features and the second phase of production innovation begins. The major focus of production innovation is cost reduction both of the product and the product production process.

Finally, the product is superceded by a newer, more superior product or is rendered obsolete due to changes in the marketplace and customer needs.

One of the most important observations that Utterbeck makes is that companies working to reduce costs during the production innovation phase are seldom the companies that generate the new, innovative product that will replace the product they are trying to cost reduce. The new, innovative products come from companies that have little investment in the existing product that will be replaced.

Implications of the Product Lifecycle

Utterbeck's hypothesis implies that the emphasis of the product development effort will vary from an emphasis on new features or functionality to an emphasis on cost reduction depending on where in the product lifecycle the product is being developed or enhanced.

During the product innovation phase, the emphasis is on new features in order to capture and hold market share while developing brand recognition. During the product production process innovation phase, the emphasis is on cost reduction through changes in materials/components, design changes to improve manufacturability, and new interfaces to allow the product greater market penetration.

During the product innovation phase, procurement is expected to help the product development team to procure the materials and services needed for quick product development with the features that marketing is asking the product to provide.

During the product production process innovation, procurement is expected to help the product development team and manufacturing engineering team to procure materials and services needed for cheaper product production.

Utterbeck's hypothesis also implies that suppliers will be at various stages in their product lifecycles. For instance, the first personal computers used discrete components and large scale integration packages that are now available as a small number of very large scale integration packages. Suppliers such as Intel have combined what were once discrete packages reducing costs and improving performance. What was state of the art in the personal computer silicon industry three years ago is obsolete now as PC manufacturers strive to reduce costs and improve performance to maintain margins in a competitive industry.

The major implication for manufacturing procurement is that suppliers should no longer be treated as separate, black box entities. Procurement must actively interact with suppliers in order to ensure that as products move through the innovation lifecycle, procurement is not locked into obsolete components or costly commercial arrangements. See [BURT84] for additional ideas for a proactive procurement group.

Changes Needed at Nortel

In past years, the telecommunications industry was stable with few players. Most Nortel customers had "Bell shaped heads" and where the Bell companies went, so did the North American telecommunications industry. Global competition was not as intense.

In such a stable environment, Nortel could afford long product to market time, large investment in manufacturing facilities, and a "Not Invented Here" syndrome.

With the deregulation of the telecom industry, where the Bell companies are just additional players in a global marketplace, Nortel can't afford long time to market, large investment in manufacturing facilities, and above all Nortel can no longer afford a "Not Invented Here" attitude.

What can Nortel do to improve its own time to market and its own flexibility in order to prosper in the competitive telecommunications industry?

Move Risk of Change to Suppliers

One of the major improvements that Nortel can make is moving as much of the risk associated with change to suppliers and vendors. Such a movement of risk will require proactive procurement and contract groups working with Nortel suppliers closely developing a relationship similar to the relationship between the members of a Japanese *keiretsu*.

It means that Nortel must assist its suppliers with the process improvements they need to improve their products and production processes introducing cost reductions.

It means that Nortel must be continually on the lookout for new suppliers and new products to cultivate.

Reduce Investment in Hard Assets

Reducing investment in hard assets means reducing investments in equipment and inventories. With this reduction in investments in hard assets should go an increasing investment in people and the tools that people need to produce new products.

The concept is to keep the product innovation functionality within Nortel and push the production innovation into Nortel's suppliers.

Nortel people will work closely with Nortel suppliers. Nortel suppliers should also be encouraged to work with Nortel's competitors to improve the supplier's breadth of knowledge and encourage the introduction of new manufacturing processes and materials.

Such a reduction in hard assets puts an additional burden on procurement and contract administrators. It means that procurement and contract administrators will interact with suppliers in a proactive manner similar to the way marketing and sales reaches out to and interacts with customers.

Increase Usage of Outside Services

Along with the increased emphasis on investment in people comes an increased usage of services.

Training services is a service that springs readily to mind. Training of people to improve their ability to create new products is a necessity in today's competitive environment.

Support services such as facility maintenance services, information infrastructure services, logistical services, and human resources services will be necessary.

Services procurement and contract administration is different from materials procurement. It's a different marketplace and requires a different set of skills and knowledge.

Reduce Number and Types of Databases

The number of databases and computer systems used to track products and components within Nortel is over a hundred different systems not counting the various spreadsheets and other systems that individuals use to handle moving data about.

Nortel is now in the process of changing to a more centralized computer system, Baan, which will reduce the number of systems from over 100 to around 50.

Every product, component, and sub-assembly must be assigned an ordering or CPC code which uniquely identifies the part within Nortel. Higher level components also have a PEC assigned as well as the CPC code. These codes are allocated from a central Nortel agency, PACE which also performs component qualification when necessary.

Stocklists and design documents are stored in PAS/DDME. Since St. Laurent manufacturing uses its own computer system, EDAS, design documentation must be transferred from PAS/DDME into the manufacturing system EDAS. Before manufacturing procurement can procure material, the codes and stocklists must also exist in PMS with a standard cost and there must be a demand in the MRP system triggering manufacturing procurement to order the parts. The MRP is loaded from forecasts provided by the line of business marketing and forecasting group into St. Laurent manufacturing material supply.

Before Access marketing can order products, the prices and codes must be loaded into PADS, REGIS, and GENESIS (a Customer Service computer system). There are additional systems for the technical assistance and repair and return groups.

The impact of all of these different computer systems is that creating the product codes, getting the various systems updated, working up a forecast and presenting it to manufacturing, and procuring the material adds a couple of weeks and a lot of overhead to the tail end of the product introduction process.

Changes in the Nortel Organization

In the past, Nortel was divided into Northern Telecom, the manufacturing and marketing company, and Bell Northern Research, the research and development company owned by Northern Telecom. This division created natural barriers that inhibited the quick introduction of products.

The New Product Introduction group was formed to assist new products through the development process and into manufacturing when Northern Telecom and Bell Northern Research were separate companies. The NPI organization had responsibility for managing the new product introduction process but had no formal authority. The NPI organization acted as a facilitator to assist the functional groups in working together towards the goal of releasing a new product. The NPI role within Northern Telecom was defined by the definition of Bell Northern Research as a contracted for Design Agency.

Within the last two years, the two discrete companies have been consolidated into a single company, Nortel, Northern Telecom. Jean Monty, CEO of Northern Telecom, mandated this consolidation in order to turn around Northern Telecom which was losing market share to more competitive companies.

The new CEO of Nortel, John Roth, is now making further changes to break down barriers between the various lines of business within Nortel. Nortel is now providing network solutions to its customers rather than individual products. Nortel is selling services such as installation and network management as well as products such as circuit packs and remote terminals.

Nortel's new way of business is putting a greater emphasis on project management and the use of integrated teams whose members come from a variety of functional groups. The role of the New Product Introduction group and the way new products are introduced is also changing.

A Model for Integrated Teams

When a market need is identified, the need is presented along with a business case into a project office which determines if the business case is viable and appoints the basic resources and team to apply to the new product.

The team must first combine a scanning of the marketplace needs with a scanning of the new products and new capabilities emerging from suppliers to determine what new products can be generated using off the shelf parts glued together with additional engineering.

The team would be formed from the various functional groups required such as procurement, design, manufacturing, marketing, customer service, etc. and would have a project manager from the project office assigned. The team would then be responsible for moving the product from concept to product in as short a time as possible or, determine based on analysis, that the project should be cancelled.

Both R&D procurement and manufacturing procurement would work closely with the team to ensure that the necessary materials and services required for prototypes are

available and that the transition into manufacturing is smooth. Suppliers would be active partners in the team as would customers. The suppliers providing the prototypes would be the suppliers to provide the first ramp units into the market.

The first phase would be a planning phase in which the team would begin with pre-packaged planning documents that would then be modified to fit the actual needs of the product team. During this first planning phase all members of the team would help re-write the planning documents so that everyone is familiar with the plan and the activities that need to be accomplished.

As a part of the first phase, procurement and contract administration would write up a Request for Proposal with the assistance of marketing and design. The RFP would be sent out to selected suppliers. This RFP would contain both technical and commercial requirements for the new product and would serve as the commercial specification as well as the product specification agreement for suppliers as well as Nortel internal groups such as design.

The suppliers would provide a proposal in response to the RFP describing the components, sub-assemblies, and services they can supply towards the new product effort. The proposals would be reviewed by design, marketing, and procurement to select the suppliers to use in the project.

The project would continue forward with manufacturing and R&D procurement working together with design and manufacturing engineering in concert with the suppliers and customers to develop the product for initial deployment. Verification and Product Integrity would perform tests to validate the Alpha version of the product in Nortel labs. Customer labs would be given the opportunity to test the Alpha version as well in order to maintain customer exposure and to generate additional product improvements.

At this point the transition from R&D to manufacturing begins. Manufacturing procurement and supply management, being an integral part of the team, will make this transition smoother than it currently is. Any new suppliers will be handed off with commercial agreements in place.

After Product Integrity testing against regulatory is complete and the PI test suite has passed, the first units would be deployed into customer sites for a Beta test.

Once Beta tests are complete and the team is satisfied as to the quality of the new product, the product would be released for general deployment.

Summation

Nortel is making changes in its organization mandated by a need to remain a competitive player in the telecommunications marketplace. Traditionally a seller of telecom equipment, Nortel is changing to become a single source of network solutions involving equipment and services.

In order to be competitive, Nortel will need to change from an emphasis on developing its own products despite what the marketplace may already provide to an emphasis on providing network solutions built from a variety of sources. The management of this

more complex environment will require procurement and contract administrators who can work with development teams facilitating the interfaces between Nortel and its suppliers.

This more complex environment also means that manufacturing will be moving from Nortel factories into supplier factories. Nortel needs to cultivate close, supporting relationships with suppliers while at the same time driving for cost reductions and productivity improvements.

Nortel is beginning to metamorphose from the traditional telecom equipment manufacturer into a network solutions provider. The emphasis on hard assets such as manufacturing equipment is changing to an emphasis on soft assets, people and their training and experience.

This metamorphosis needs to be accompanied by a change in the procurement and contract administration role. The procurement role needs to change from adversarial, Nortel against supplier, to proactive and relationship building, Nortel with supplier.

Nortel must begin assisting its suppliers in cost reduction and manufacturing process improvements.

Suppliers must work closely with Nortel design teams in order to deliver products that are cost effective with good margins.

And Nortel must continue to make the internal organizational changes needed to allow new product teams to do their best with integration across functional groups.

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