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Planning the Unpredictable?

New Product Forecasting and Planning in the High-Tech and Electronics Industry

Planning & control solutions in leading organisations

An EyeOn white paper

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Planning the Unpredictable?

New Product Forecasting and Planning in the High-Tech and Electronics Industry

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Our special recognition goes to the members of the High-Tech and Electronics network. The white paper reflects the findings of interviews with the 25 participating companies.

Planning & control solutions in leading organisations

An EyeOn white paper

Contents

Summary and Conclusions

An accurate prediction of future customer demand is required to facilitate high quality decision making. This is especially difficult when it concerns the introduction of new products and the phasing out of 'old' products [Aertsen, 2005]. Reasons mentioned during the interviews included the reduced length of the product life cycles, the increasing number of product introductions, technological complexity in upstream companies such as equipment manufacturing and the involvement of nearly all business functions.

In response companies have deployed different practices. Key in all these practices is that they strive for the reduction of complexity and the communication of the most accurate information in an efficient and timely manner.

- NPI planning teams
- Rigorous portfolio management
- Centralised planning
- Simultaneous management of phase-ins and phaseouts
- Product coding to identify the PLC phase
- Forecasting your customer's demand
- Collaborative forecasting and planning
- Sales tracking
- Simplifying spare part planning

Responsive forecasting and planning

	Information transparancy	Speed	Efficiency
1. NPI teams	●		●
2. Manage phase-in and phaseout simultaneously	●		
3. Product coding to identify the PLC phase	●	●	●
4. Market driven	●	●	
5. Sales tracking	●	●	
6. Centralised planning		●	●
7. Simplifying spare part planning			●
8. Rigorous portfolio management			●

The practices identified contribute to achieving three key elements in the a responsive forecasting and planning process: information transparency, efficiency and speed. Information transparency is about sharing relevant information in order to reduce information distortion, both between different functions in the same organisation and between supply chain partners. Efficiency refers to the need for a process that enables the relevant operational, tactical or strategic decisions to be taken with minimum effort. The requirement for speed is related to the fact that the world is always changing, especially in the High-Tech Electronics industry. This may cause the assumptions on which yesterday's decisions were taken to be no longer valid today. It should therefore be possible to revise plans on a frequent basis using the latest information available. This can only be achieved through a planning process with a short throughput time where relevant information is disseminated to the relevant people at the moment it becomes available.

The outcome of a previous study among the participants of the High-Tech and Electronics network points out that these companies should implement responsive forecasting and planning processes to cope with the considerable demand and supply uncertainties. The best practices shown in this study clearly illustrate how responsive forecasting and planning can be put into practice to make the right product life cycle management decisions.

Introduction

Growth is one of the most undeniable company goals. For most companies in the High-Tech and Electronics industry, the introduction of new products is a primary engine for growth. With the ever increasing pace in which new products are introduced, forecasting of these introductions becomes a major challenge for the companies in the High-Tech and Electronics industry. Accurate forecasts drive functional decisions and help managers to develop strategies, identify priorities and to allocate resources. In practice as well as in theory a great deal of attention has been paid to the shape of product life cycles (PLC), but the PLC concept as such has limited practical use. What are the forecasting techniques that provide the best possible insight into future demand for new products? How can the process be designed not only to cater for forecasting new products but also for forecasting products that will be phased out? How can complex product portfolios be managed?

To address these questions, an explorative study was undertaken to describe the forecasting endeavour surrounding the introduction and phaseout of products. Information has been gathered via several structured face-to-face interviews with 25 large, multinational companies, members of the EyeOn knowledge network on forecasting and planning in the High-Tech and Electronics industry. In a second phase, the completeness and correctness of the findings have been validated in a group session. The participants mainly had their background in Supply Chain Management. Since representatives from various parts of the value chain participated, good insight into the specific issues throughout the entire industry could be achieved.

This white paper reports on the study's findings, indicating current practice and those practices that are perceived to relate to higher forecast accuracy and greater satisfaction with the forecasting of new and phased out products, so-called best practices.

Participating companies:

Acer
Apple
Arrow
ASML
ASM international
Assembleon
Avnet
Canon Europe
Dell
Ferro
Flextronics
Freescale Semiconductor
Fujitsu Siemens
KPN Mobile
Lexmark
LG.Philips Displays
MediaMotion
Navteq
Omron
Philips Consumer Electronics
Philips Semiconductors
Solectron
STMicroelectronics
Thomson
Vodafone

Why do we need forecasts?

The fundamental purpose of forecasting is to enable accurate decision making. Forecasting is estimating some future event or condition which is outside an organisation's control and provides a basis for managerial planning. Organisations forecast so that they can plan and help shape their futures. Forecasting is a crucial input for planning in almost all companies. Forecasts are major components of the business decision-making process. Earlier research has revealed that forecasting sales volumes and values in the different stages of the product life cycle is perceived to be the most compelling challenge in the High-Tech and Electronics industry [Aertsen, 2005]. Planning product introductions or new business requires a great many decisions to be made prior tothe launch. Many of these decisions depend upon the forecast of the most likely numbers of demand and demand patterns. Table 1 shows the most significant decisions according to the respondents in the various phases of the life cycle.

The respondents indicated the importance of possible decisions on a scale from 1 – 3. Key decisions made during the introduction of products are dominantly related to capacity and pricing issues, stock levels are not perceived as a key variable. However, when phasing out, decisions are commonly related to stocks and pricing. The consequences of inaccurate sales forecasts are eminent; lost sales volumes and turnover at introduction and excessive stocks at phasing out. In those parts of the value chain where margins are low a reliable product introduction forecast can make the difference between generating a small profit and suffering a severe loss.

In the next section the forecast challenge surrounding the introduction and phaseout of products is elaborated on.

Decisions during phase-in	Decisions during phaseout
1. Pricing	1. Stocks
2. Capacity (Quantities)	2. Pricing
3. Sales channels	3. Sales channels
4. Accounts	4. Accounts
5. Supply chain set-up	5. Capacity (Quantities)
6. In / outsourcing	6. Supply chain set-up
7. Personnel	7. Personnel
8. Stocks	8. In / outsourcing

Figure 1. Key decisions related to phase-in and phaseout in order of importance

The forecasting challenge

The classical product life cycle has four stages; the development and phase-in of the product with the initial introduction and a period of rapid growth in sales, followed by a maturity period in which sales level off, a phaseout period in which sales drop off and the end-of-life period in which already phased out products are still supported. Conceptually the length of a life cycle is defined as the time between introduction and withdrawal from the market place. The length of the product life cycle depends on the aggregation level. Product technology life cycles are longer than product model life cycles; product model life cycles are usually longer than product life cycles (also see the example in Figure 2).

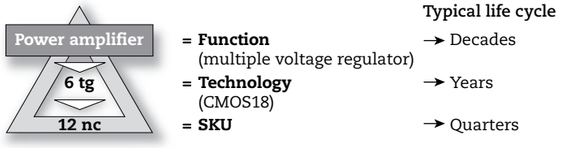

Figure 2. Product life cycles depend on aggregation level (Source: Philips Semiconductors website)

Conventional wisdom holds that product life cycles are getting shorter over time. This perception is especially evident in technologically dynamic industries such as the High-Tech and Electronics industry. The feasibility of achieving accurate forecasts is party correlated to the level of novelty of the products and the markets. Introducing radically new technological products in completely new markets is an important but treacherous task. Whereas engineering changes in the design of an existing product for an existing market or customer group are less complex to forecast [Kahn, 2002]. For the respondents in our survey the majority of introductions are those with new or existing products (component substitutions) in existing markets.

Typically, companies operating upstream in the value chain such as equipment manufacturers introduce a limited number of totally new products; they are closely associated with product reengineering to incorporate new technology and or process simplification in their existing product range. Very often a primary driver is the quest for ever lower production costs for both the equipment manufacturer and their customers. Downstream companies like OEM manufacturers are confronted with the introduction of replacement products in their existing markets A certain product range is renewed with new products with better features. The new products are frequently successors with more or enhanced features. For example, with every new mobile phone more features such as FM radio, MP3 players or cameras are added. Component manufacturers such as the semiconductor companies and the TV tube manufacturers equally introduce existing products (engineering changes) and new products in their existing markets.

Life cycles of upstream companies are often relatively long; the average length of the product life cycle is expressed in years. The introduction of new products is characterized by the technological complexity of the products where a well- managed handover from R&D into the manufacturing environment is crucial; this is expressed in a relatively low successful time-to-market rate of 50%. On the marketing front engineering changes would typically present the company with increased opportunities for new orders especially if the product offers enhanced features, enhanced performance or a lower price. On the manufacturing front the new products may cause schedule changes and inventory fluctuations. With the concept of modularity (re-use of certain building blocks in new products) companies try to limit these negative effects. Since the number of phase-ins and phaseouts is relatively limited, forecasting and planning of future demand is frequently executed by the project team responsible for the newly designed product. The principal KPI (key Performance Indicator) is the adherence to the project milestones.

The product life cycles of downstream companies such as OEM manufacturers and Telecom operators are characterized by short product life cycles (ranging from 3 months to 1 year) and the introduction of new products in existing markets. A main challenge is the forecast around the transition moment where the

	Upstream	Downstream
Type of introductions	Existing products in existing markets (engineering changes)	New / replacement products in existing markets
Life cycle	Typically years	Typically months
Complexity	Technological	Transition of successor / predecessor applications
Portfolio	Limited number of basic versions	Large number of basic versions
Nr. of phase- in / out	Limited (dozens)	Large (hundreds)
Time to market success	Average 50% range from 20% – 80%	Average 75% range from 50 – 85%
KPI	Timing, milestones	Forecast accuracy, stock turnover, sell through and chain speed
Process set-up	Forecast generated in project team	Integrated in regular S&OP process
Content of plan	Scenario planning	Limited use scenarios
Key business driver	Roadmaps	Portfolio management

Table 1. Differences upstream / downstream companies as outcome of interviews

forecast of the demand for the successor has to be aligned with the demand for the predecessor. Since the number of introductions is large and portfolio management is a key value driver for downstream companies, forecasting and planning is often integrated in the normal sales and operations planning process. If this process is not managed correctly the launch window can be missed or stock can become obsolete. Key performance indicators are more operational in nature and include forecast accuracy, stock turnover, sell-through and chain speed.

Although many departments contribute to the forecasting process, the management of the product life cycle is the core responsibility of the marketing department (Table 2).

	Involvement phase-in	Primary responsible for new product forecast	Involvement phaseout	Primary responsible for phaseout
Marketing	84%	47%	49%	21%
Sales	74%	16%	45%	21%
Top Management	26%	53%	11%	21%
Customer	5%	0%	0%	0%
Engineering	11%	5%	0%	0%
SCM	42%	5%	74%	37%
Operations	16%	16%	11%	4%

Table 2. Organisational set-up of forecasting phasing in / phasing out volumes and values

As expected, the level of participation of the sales department is also high. Top management plays an important role in the forecasting and planning of new products. This can be explained by the large financial impact of new products introduced by the equipment manufacturers where, generally, the number of introductions is limited by nature. Although the sales department is heavily involved in the generation of the forecast (83%), only in 17% of the cases are they named as the primary responsible for the forecast of new products.

At phasing out the responsibility for generating the forecast is transferred from marketing to supply chain management and also the involvement of the sales and marketing department is reduced. In only 49% and 45% of the companies do Marketing and Sales yield input in the phaseout plan. By many respondents this is explained by the fact that developing and phasing in of products is a 'sexy' activity compared to the phasing out of these products. The indicators used to express the success of the phaseout process are the obsolete stocks, which is a KPI typically measured and reported in the SCM area. The limited involvement of the marketing and sales department in the phaseout of the products was mentioned by many participants as one of the areas for improvement.

The difference in involvement in the two phases is also reflected in the use of statistical forecasting techniques. A large part of the literature on forecasting and planning product life cycles focuses on the use of sophisticated statistical forecasting techniques [McBruney et al., 2002]. However, the results from this study suggest that the use of statistical techniques is relatively limited (see Table 3).
In those cases where statistical forecasting techniques were mentioned it very often concerned relatively simple techniques such as seasonal patterns and moving averages.

In the phaseout stage statistical forecasting techniques are more commonly used.
The explanation for the limited use in the phasing in stage can e.g. be found in the imperfect historical data. Phasing in is often directed by the marketing department where judgemental forecasting based on qualitative factors is preferred. Phasing out is managed

Phase-in		Phaseout	
yes	no	yes	no
21%	79%	56%	44%

Table 3. Use of statistical forecasting techniques

by the supply chain management department with a larger comfort in numbers and statistical forecasting techniques.

More than 68% of companies use MS Excel and MS Project as important tools for forecasting and planning product introductions and phaseout of the aged products. 3 companies have installed specific tools to indicate the current life cycle stage of the product. E.g. code x for newly introduced products, code y for mature products, etc. The code refers to a specific forecasting and planning process that has to be applied per stage. One of the distributors involved has implemented a system to manage the component portfolio of its customers. This enables the distributor to propose alternative products when a component of a certain supplier is phased-out. Functionality that was missing included simulation possibilities, the integration between project planning and material planning / Bill of Material (BOM) development and reporting.

In summary, an accurate prediction of future customer demand is required to facilitate high quality decision making. This is especially difficult when it concerns the introduction of new products and the phasing out of 'old' products. Reasons mentioned during the interviews are:

- Reduced length of the product life cycles in general.
- Number of introductions has increased over the last few years.
- Technological complexity in upstream companies like equipment manufacturing makes time-to-market challenging.
- Downstream companies have to manage the introduction of new products and the phasing out of old products simultaneously.
- Large financial impact of missed introductions or excessive end of life stocks
- The input into the process has to be supplied by nearly all business functions
- Massive attention can be obtained for phasing in since this is seen as the main life-line for the company. However, phasing out receives limited attention.
- Historical information, when available, cannot be extrapolated.
- No system support besides home grown excel based systems are available.

Companies in the High-Tech and Electronics industry are implementing different practices to improve the quality and effectiveness of their forecasting and planning processes with respect to phasing in and out of products. In the next section a number of these practices are described.

Best Practices

Many of the solutions that organizations have implemented to improve their forecasting process fall into the realm of what are often called best practices. In general, a practice is a tactic or method chosen to perform to meet a specific objective. The main objective served in this area is an improved forecast accuracy to enable high-quality decision making. These practices can be related to the organisational set-up ('cross-functional forecasting team'), process ('the tracking and communication of actual demand after introduction') or system ('product coding to identify the PLC phase'). In this section these practices are presented. Available literature on the subject is primarily focused on specific forecasting techniques, often using advanced statistical methodologies [Kahn, 2002]. In this study we have examined managerial practices and are thereby providing benchmark information.

The results of the study were obtained via interviews with the network participants and a group session. Via interviews with the participating companies best practices have been identified. In a group session the practices have been checked for completeness and placed in perspective making a distinction between the core principle, processes and techniques.

Solutions that were perceived to be best practice were:

- New product introduction (NPI) planning teams
- Rigorous portfolio management
- Centralised planning
- Simultaneous management of phase-ins and phaseouts
- Product coding to identify the PLC phase
- Forecasting your customer's demand
- Collaborative forecasting and planning
- Sales tracking
- Simplifying spare part planning

The participants stressed that centralised planning is the key operating principle to achieve reliable forecasts during the phase-in and phaseout phase of the product life cycle. Centralised planning will lead to a process with a high level of efficiency and speed. By strongly centralising the planning for new products one of the OEM manufactures has ruled out the risk of creating information distortion among all the entities involved. The decision on the introduction numbers is managed by a small central team and they only deploy the plan to the operating units when the fulfilment period (in this case 3 months) is hit. By planning on an aggregate level with sufficient volumes the company is able to apply statistical forecasting techniques as well.

Centralised forecasting for new products is also found in supply networks where a bottleneck capacity limits the output of the total chain. The forecast for the entire chain can be determined centrally by a supply chain manager (one or a group of companies) that determines the boundaries for all parties involved.

This centralisation can be supported via two key processes: (1) forecasting product introductions via new product introduction (NPI) teams and (2) by applying rigorous portfolio management.

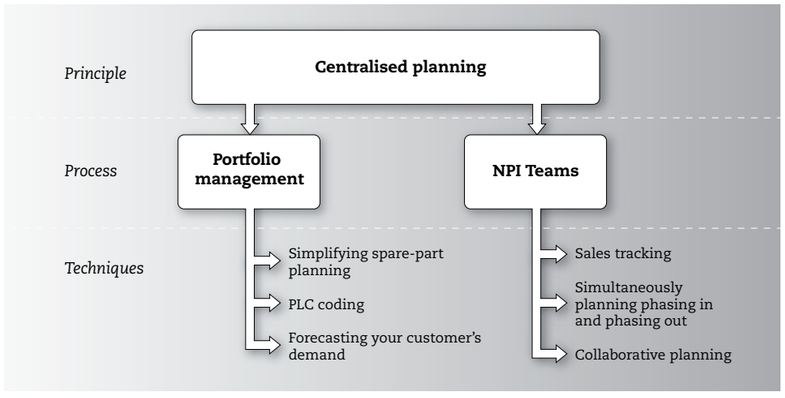

Figure 3. Best practices clustering

NPI teams

Cross-functional project groups or teams are the method of choice by which high-technology organizations forecast new products. Cross-functional groups consist of members from different functional areas, such as various research disciplines, engineering, supply chain management, operation, or marketing. The cross-functional make-up provides the advantages of multiple sources of communication, information and perspectives, contacts outside the project group, inclusion of downstream concerns in upstream design, a clearer line of sight to the customer, and speed-to-market that is critical for success in globally competitive, high-technology markets.

Overall, a key success factor mentioned by many of the respondents is the cross-functional alignment of forecasts and plans between the departments involved in the introduction and phaseout of the products. In 84% of all cases 2 or more departments are involved in forecasting introduction volumes, in more than 50% of the cases 3 departments (Sales, Marketing and Supply Chain management / Operations) are involved. In those cases where only one department was involved in the generation of the forecast of new products the level of satisfaction with the process is low.

Number of departments	Phase-in	Phaseout
1	14%	25%
2	18%	
3	58%	38%
4	6%	19%
5	4%	6%
No forecast		13%

Table 5. Number of departments involved

The picture is more scattered when products are taken out of the market. In 25% of the cases only 1 department is involved in forecast generation. The satisfaction with the process as indicated by these companies is low.

Although the concept of cross-functional planning has been known for several years implementation is perceived to be difficult. The companies participating in the research have applied several tactics to be certain that the collaboration actually takes place:

- A contract is made between Marketing & Sales, Supply Chain Management and Operations on the launch quantities and these are related to the bonus scheme.
- Profit and Loss responsibility is assigned to a specific product group. If not all functions are co-operating this will harm the profit and loss directly by creating obsolete stock or missing out on sales.
- In those cases where the development and introduction of new products is vital for the existence of the company the targets related should be integrated in the business balance score card of ALL functions involved in the process.
- Short planning cycles can only be established when a strict planning calendar is prepared for all activities. Personal compliance to this schedule is measured and reported for every staff member related to personal remuneration. An important element of this strict scheduling is the installation of an alignment meeting involving all disciplines involved required to make the relevant decisions and to deploy required corrective actions. Every activity is strictly scheduled in the Plan-Do-Check-Act (PDCA) cycle.

These teams can also be used for the benefit of forecasting the phaseout of the 'old' products.

Within this process three supportive techniques were determined:
A. Sales tracking
B. Simultaneously planning phasing in and phasing out
C. Collaborative planning

A. Sales tracking

Demand for new products is inherently difficult to predict. Since forecasts often turn out to be wrong, it is important not only to prepare for product introductions by developing the most accurate forecasts possible, but also to create mechanisms that rapidly synchronize production with end-customer demand. Despite good forecasting efforts including intensive market research, account plans and

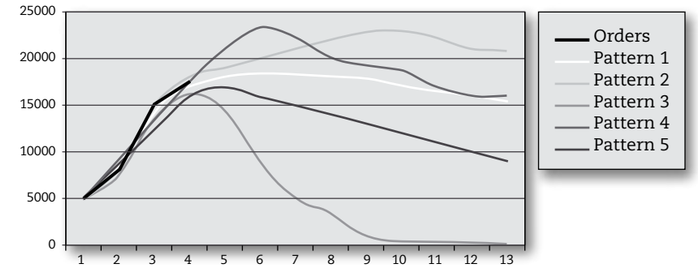

Figure 4. Matching orders on known sales pattern

promotion campaigns, new products have a relatively high failure rate. Research in the consumer goods industry shows that 43% of the true new products, 51% of the line extensions, and 77% of me-too products are 'dead' or 'almost dead' within a relatively short time after their introduction [Kahn, 2002]. Consequently, it is not only important to prepare accurate forecasts in advance, but also create mechanisms that enable companies to react to demand realized as quickly and efficiently as possible.

An important mechanism to enable OEM responsiveness is increased demand visibility of sales to consumers (sales through) by using point-of-sales data. Only a limited number of days after the selling period has started is it possible to adapt the first forecast of the total sales by combining different facts from earlier products and by extracting the basic laws and fixed relations from previous product introductions. An example of this shown is in figure 4. It shows the sales patterns of previously introduced products, by matching the actual orders of the newly introduced product against the patterns a reliable estimation of futures sales can be made using the first weeks of actual sales.

B. Simultaneously planning phasing in and phasing out

The perfect product launch manages the development and support of complex products and services throughout the entire life cycle, from product design to manufacturing to end-of life service. Short product life cycles and price erosion result in high risks regarding stock depreciations and obsolescence.
At the end of a product life cycle this can turn the profit earned during the earlier phases into a loss. So, a successful simultaneous planning of the phasing in and phasing out of products is crucial. The example in Figure 5 shows the approach to managing both processes in coherence as implemented by Motorola. The pre-defined transition period is 5 months, 60 days for pre-introduction and 90 days for the start-up and phaseout. The project is managed by world wide product transition teams with participation from Engineering, Production, Marketing & Sales and Finance. Their

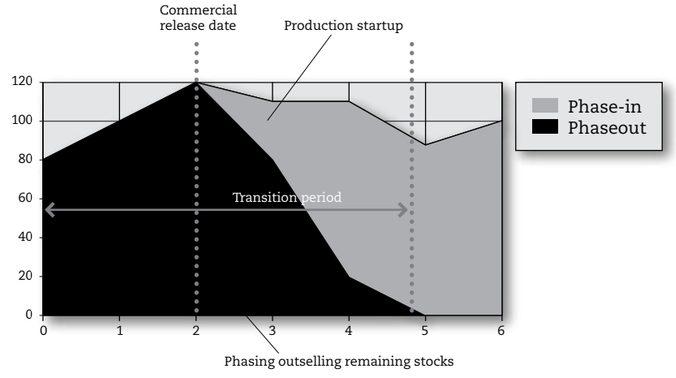

Figure 5. Transition model Motorola

key responsibility is to manage the transition period:

- Meet the introduction date
- Availability during introduction
- Production meets demand
- Interfere in demand planning / sales (demand shaping)
- No end of life stocks
- Profitable phasing out
- Report to top-management

C. Collaborative planning

The demand from the final customer is the force that drives the activities in the supply chain. Each of the links in the supply chain operates in reaction to actual or anticipated demand from the consumer at the end of the chain. The level of accuracy and efficiency with which this demand is communicated up and down the chain is directly connected to inventory and customer service levels.

To be able to benefit from the technological know-how of their suppliers and the market knowledge and requirement of their customers, manufacturing companies give suppliers increasing responsibilities with regard to the design, development and engineering of components and engage in design projects with customers.

The involvement of suppliers and customers in the forecasting and planning process is relatively high in upstream companies and especially during the introduction and phase-in of new products. The level of involvement of external parties in the supply chain decreases with firms operating downstream. In the event of a phaseout an end-of life notification is communicated to customers and suppliers and in those cases where this potentially creates a problem, alternative solutions are proposed.

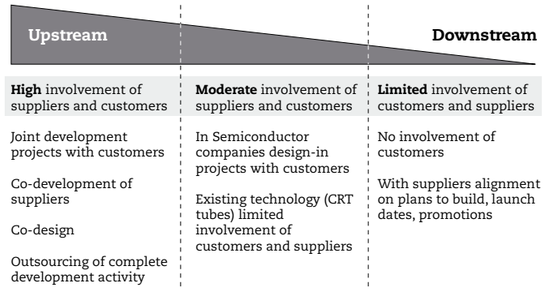

Figure 6. Involvement of customers and suppliers in phase-in of new products

Rigorous portfolio management

Portfolio management is a dynamic decision process, whereby a business's list of active products (and customers) is constantly monitored and revised. In this process products are evaluated on their contributions. This evaluation can be based on parameters like financial, customer demands (sole supplier, to complete product offering, etc.) and contribution to strategy.

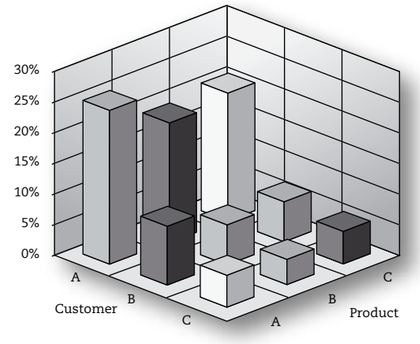

Figure 7. Example portfolio analysis

One of the participating companies has introduced a portfolio management process. They were confronted with products with very limited sales volumes, where no direct successor / predecessor relationship existed. A process has been created where Supply Chain Management has the authority to manage the product portfolio with Marketing and Sales aggressively.

For this company the level of obsolete stock has been reduced significantly without hampering sales.

Within this process three supportive techniques were determined:
A. Simplify spare part planning
B. PLC coding
C. Forecast your customer's demand

A. Simplify spare part planning

Service demand and end-of-life demand is hard to predict. Equipment manufacturers in the research stressed the post manufacturing issues in life-cycle engineering design.

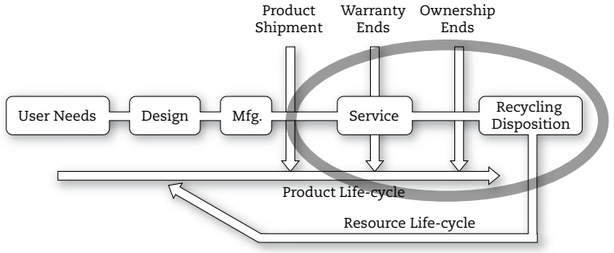

Figure 8. service and end-of-life demand

Whereas design for manufacture has drawn significant industry interest, issues such as serviceability have not attracted as much attention. The challenge in serviceability and recycling is to deal with the uncertainty in service needs and recycling strategy that is acceptable when the product life is over. Serviceability and reliability significantly impacts the overall product competitiveness. A design without thorough consideration for serviceability could lead to an unexpected increase in servicing and warranty cost and customer dissatisfaction. Many of the equipment manufacturers are following the strategy to develop generic modules that can be easily replaced as much as possible.

OEM manufacturers have chosen a similar strategy. Instead of repairing the products requiring service part stocks with all the problems associated they offer the customer (often the final consumer) a replacement product at a low cost. In view of the high level of technological renewal, the new product has more features, which makes the consumer willing to replace an old product for a new one. This relieves the OEM of maintaining large stocks of spare parts.

B. Product coding to identify the PLC phase

In the ERP and planning system of a number of the participating companies codes are attached to the products indicating the different stages of the product life cycle.

Exhibit 1	Exhibit 2
PLC 0 – PLC 8 (product introduction pending) (Removed from active portfolio)	10 = NRE (new release) 20 = 24 = 30 = 50 = Last time Buy 60 = EOL (end – life)

Figure 9. Product codes used

In exhibit 2, as shown in Figure 9, stage 10 is related to a new product introduction, when a product has this flag no forecasts are required. Production is only started based on initial firm orders. The same holds in phase 50; the last-time-buy stage, in this stage no forecasts are provided and production plans are only based on fixed orders. Since both companies are large internationally operating semiconductor firms, the coding also serves as communication to all the different organisations. By applying this approach a process is implemented where the forecasting problem is transferred into an ordering problem.

A disadvantage mentioned of this approach is the sensitivity to mastering data maintenance. Both companies have a large product range (thousands of devices), if the codes are not correctly updated this will lead to redundant work in all organisations.

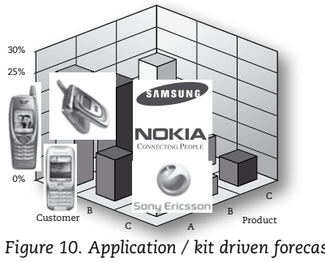

Figure 10. Application / kit driven forecasting

C. Forecast demand of your customer's customers

If one gets further down the value chain the relation towards the view of the real consumer demand when introducing new products for a consumer product is lost. Typically the "real product demand (e.g. demand for mobile phone type XYZ, PC type ABC, TV 123) is translated by the manufacturer into dependent demand for the individual components. The demand for these components is handed over to the parties further down the chain. Leading component suppliers are moving away from planning individual components to planning finished products and derive their components demand via a bill-of-material from the finished products demand. In those cases where a supplier delivers more components to the manufacturing site it enables them to deliver complete kits or sets of components, this is especially relevant when phasing in new products or phasing out products. Not managing the individual components in relation to each other leads to a shortage or obsolete stock for an individual component.

An additional advantage is that the value or volume forecast can be compared with the market demand to determine market shares to validate the quality of the forecast especially during a phase-in of a new product. Often market research figures are available for the end-market demand but not for the demand for the individual components.

Based on the best practices as shown in this section general conclusions can be drawn, these conclusions will be subject of the next section.

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