

# Early Supply Chain Integration into the Product Development Process



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# 1. Introduction

The Product Development Process (PDP) has become over the last decades a very critical issue in a world where technological evolutions drive a major part of economic growth and success.

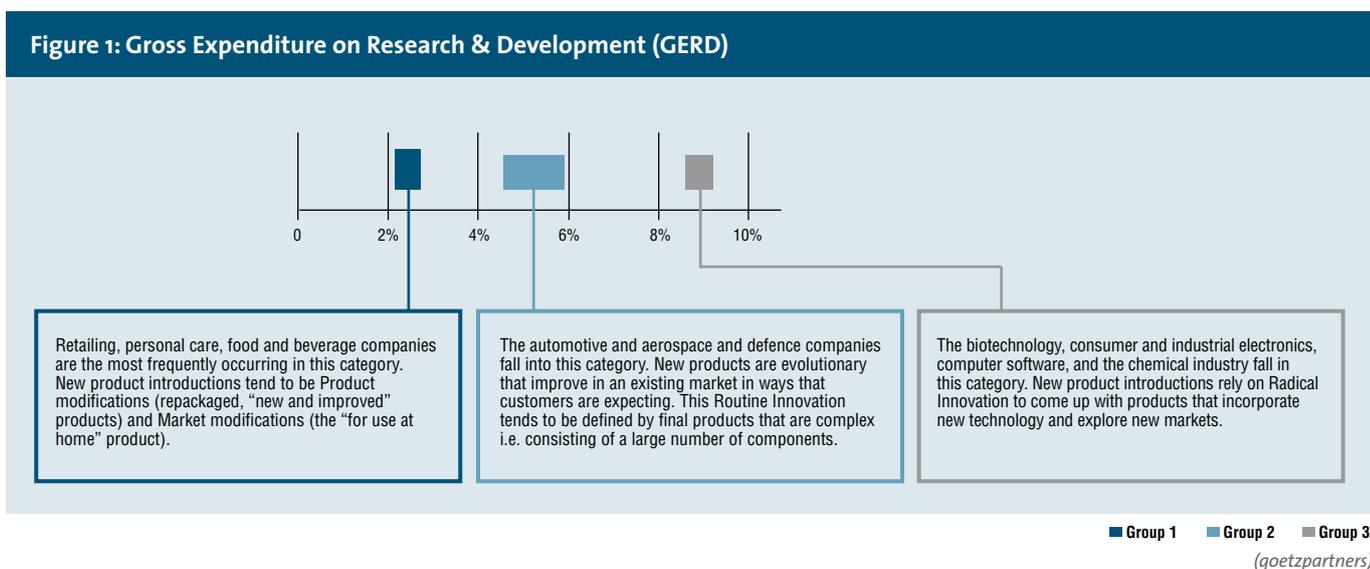
The scope of the PDP encompasses the delivery of high quality, cost-effective products incorporating the shortest time from concept to market. While many R&D projects never result in a commercial product, once on the market, new product failure rates range from 50% ( Sivadas and Dwyer, 2000) to as high as 95% (Berggren and Nacher, 2001). For every seven new product ideas, about four enter development, one and a half are launched, and only one succeeds (Booz, Allen & Hamilton, 1982). These trends have prompted a great deal of research on how to optimize the new product development process.

Many authors suggest that cross-functional teams should be utilized early in the PDP in order to speed up the process and also increase success rates. (Carmel, 1995; Gupta & Wilemon, 1990; Mabert, Muth & Schmenner, 1992). The use of cross-functional product development, reduces costs and time-to-market, enhances idea generation and minimizes miscommunication, which leads to a better fit between product attributes and customer requirements. Our experience in consulting has shown us that cross-functional collaboration, as it is implemented in most businesses today, is crucial to new product success. However, it has also shown us that the application of the concept is very different depending on the industry sector and can lead to additional costs, longer time to market and duplication of efforts if a “one size fits all” approach is chosen.

The objective of this survey that was conducted in September 2012 is to analyse the cross-functional collaboration between R&D and Supply Chain departments focusing on the exact timing of involvement of the Supply Chain side in the Product Development Process (PDP). Subsequently, we will develop a model demonstrating what timing and type of involvement will lead to the most efficient results depending on the industry.

### 1.1 Methodology

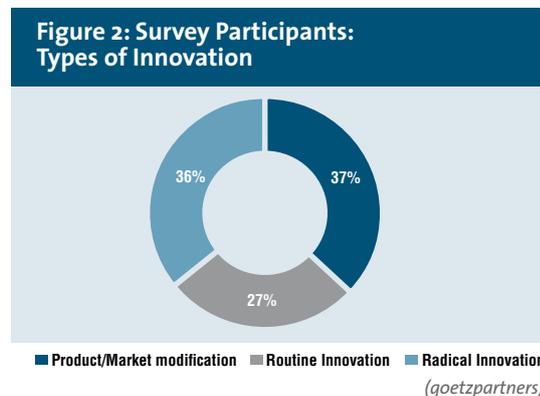
As the Product Development Process traditionally starts in the R&D department we looked at the Gross Expenditure on Research & Development (GERD), comparing the company’s yearly income with the total expenditure on Research & Development. We find that our survey participants, fall into 3 distinct groups (Figure 1):

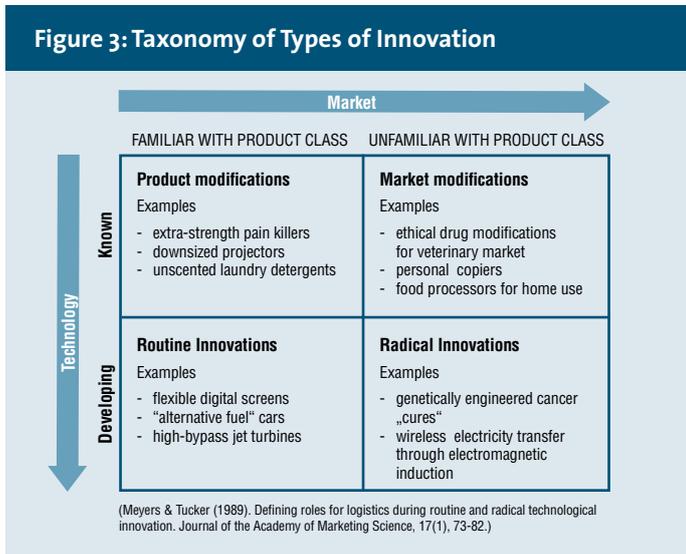


Our survey participants are evenly distributed among the 3 groups as shown in figure 2, resulting in balanced results.

Meyers and Tucker (1989) developed a classification system based on the process of developing and introducing a new product or service and our 3 clusters correspond with the 3 categories of innovation:

- 1. Product/market modification** denotes those new products or services for which the technology is well known and developed but the users are unfamiliar with the product. These constitute cases similar to the existing but “new and improved” situation of many consumer packaged and industrial goods. Due to the similarity of product and market modification supplier integration we combined the two. A good example for this type of innovation would be Black & Decker who were the first to modify long-lasting, expensive power tools which were designed for everyday use by professionals. Replacing internal components such as the heavy duty motor, gears and seals with cheaper ones resulted in a product that was aimed at the occasional use, DIY market.





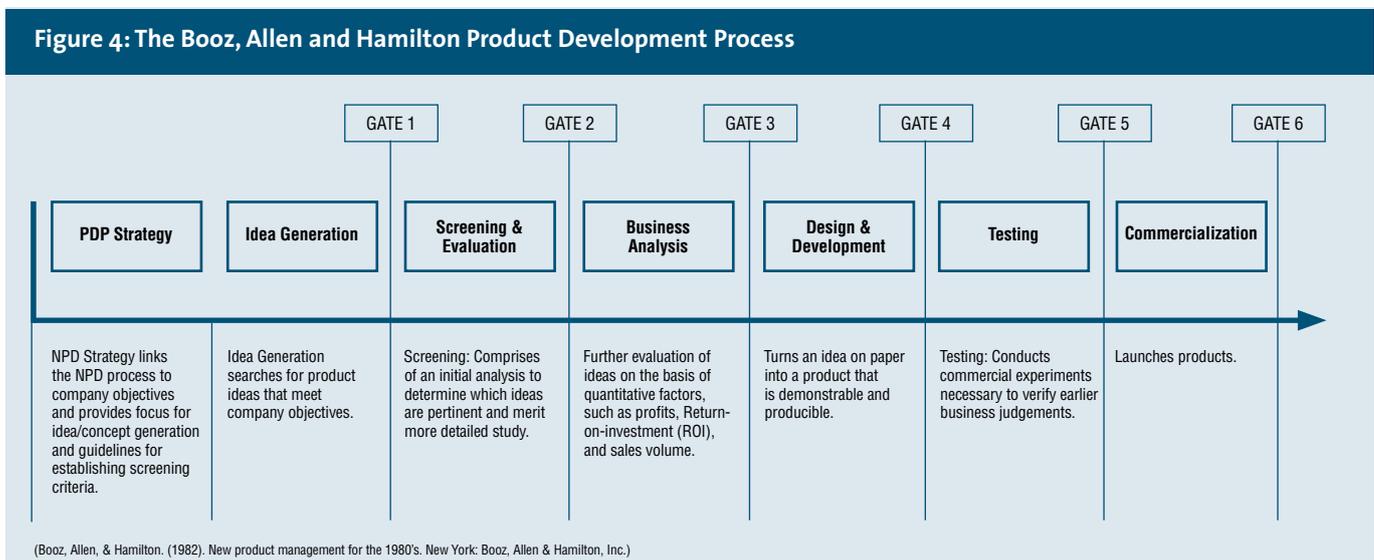
- Routine Innovation** is found where the market is familiar with the product class but the technology is new. In this group new product introductions are most often driven by customer demands. A typical product in this category would be a new generation BMW, which incorporates new technology that the customer is expecting due to the gradual development of technology.
- Radical Innovation** is defined as the process of developing and introducing a new product or service which is based upon new technology and is aimed at a market that is unfamiliar with the product class; Apples iPad is a good example for this category.

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1.2 The Product Development Process (PDP)

As the main focus of our research is the exact moment of involvement of the Supply Chain departments in the Product Development Process we need to examine its different stages.

Many researchers have tried to develop a model that captures the relevant stages of the Product Development Process (Ulrich & Eppinger, 2011; Wind, 2001; Cooper, 2001; Crawford, 1987). Over the years, several detailed PDP models have been developed, the best known of which is the model by Booz, Allen and Hamilton (1982), also known as the BAH model, which underlines most other PDP systems that have been put forward. It is based on extensive surveys, in depth interviews, and case studies and, as such, appears to be a fairly good representation of prevailing practices in industry.



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## 2. Product/Market modification

This section, Hall (1991) described it as “the three Rs” (repackaged, repositioned, recycled), represents the simplest and most general and least “new” of the three types of innovation. Products are often designed to replace existing products providing similar benefits and performance but at lower cost to the business. It appears that in companies in this category, where R&D has very low budget responsibility, involving the Supply Chain departments as a controlling body is widely established.

### 2.1 New Product Strategy

Lynn and Akgün (2001) suggest that, for this type of innovation, a clear vision is important but is likely already in place since incremental innovations are generally expansions or modifications to current product offerings. Incremental innovations provide project teams with explicit goals up front since the team is typically improving on a specific aspect of the product’s performance.

As this vision is part of the PDP Strategy, the Idea Generation and Idea Screening phases tend to be very short and involvement of the Supply Chain superfluous. However involvement of the Supply Chain in Product Strategy can lead to significant cost reductions. A good example for the vision in Product Modification is a food manufacturer who involved the Supply Chain departments in the modification of the packaging of one of his products achieved significant cost reductions. By improving the design on the packaging, the supplier was able to reduce the number of colours used to print the packaging from 6 to 4, reducing the cost of packaging by 20% and increase sales. The cost advantage was equally divided between the supplier and the food manufacturer, leading to better cost-efficiencies, better supplier relations and also higher sales.

All of our participants, in this group of incremental innovation, involve their Supply Chain departments in the New Product Strategy, the very first step of the Product Development Process.

### 2.2 Design Development

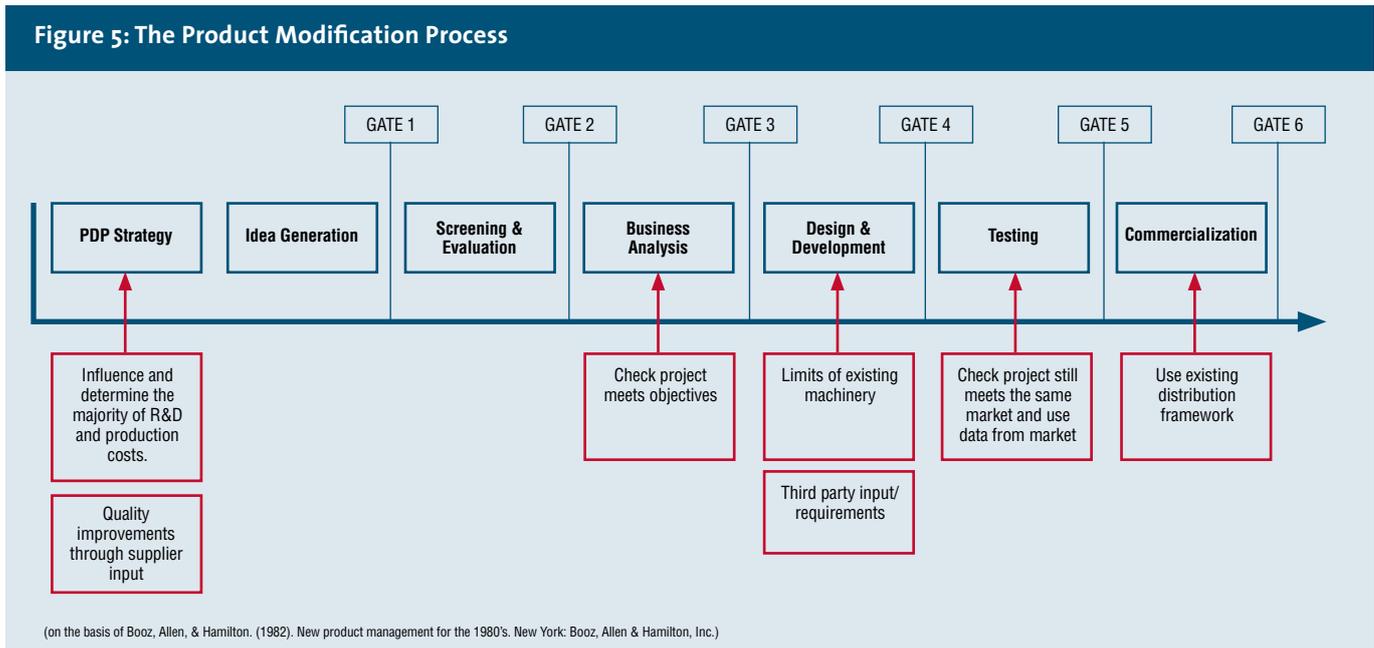
We observed that often in Product/Market modification the product needs to be able to be produced using existing machinery as the purchase of costly new machinery cannot be financially justified by the small change to the product. In one beverage company the objective was to modify its bottles to comply with a government regulation which stated that bottles had to be returnable and reusable. The design had to incorporate

these changes, use the existing distribution network and machinery and have the same dimensions as the previous product so it could be used in the same way as the previous product by the retailer. The product was limited by what the existing machinery could produce. To be more cost effective, avoid rework and save time the Supply Chain should state these design limits in the Design Development phase of the process.

### 2.3 Commercialization

The responsibility of the distribution in the Commercialization phase of the process is to ensure the modified product can use the distribution framework of the product it replaces. Speed to market is a critical success factor and it appears modifying the product within the framework set by the existing product is the best way to ensure the project has short-time to market and meets cost objectives.

### 2.4 The Product Modification Process



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## 3. Routine Innovation

The automotive and aerospace sectors are the most prominent in this sector and a good example for Routine Innovation as most products are evolutionary products that improve in an existing market in ways that customers are expecting. This market distinguishes itself from product modification as new technology is involved but it is also noteworthy that products in this category tend to be more complex, i.e. consisting of a large number of individual components. Overall we observed that due to the bigger budget responsibility of R&D, the regular frequency of new product development and the complexity of the final product, the cooperation between the Supply Chain departments and R&D lasts almost throughout the entire Product Development Process. This illustrates the difference between Product Modification, where the input was only in some stages and mostly controlling or advising, and Routine Innovation where the departments work together towards one objective. As Madhavan & Grover (1998) put it: A cross functional PDP team is a product development vehicle that works using the knowledge that is embedded in its members and their interactions as a team. The Product Development Process must be viewed as an enterprise-wide process rather than one owned by one function such as R&D or marketing.

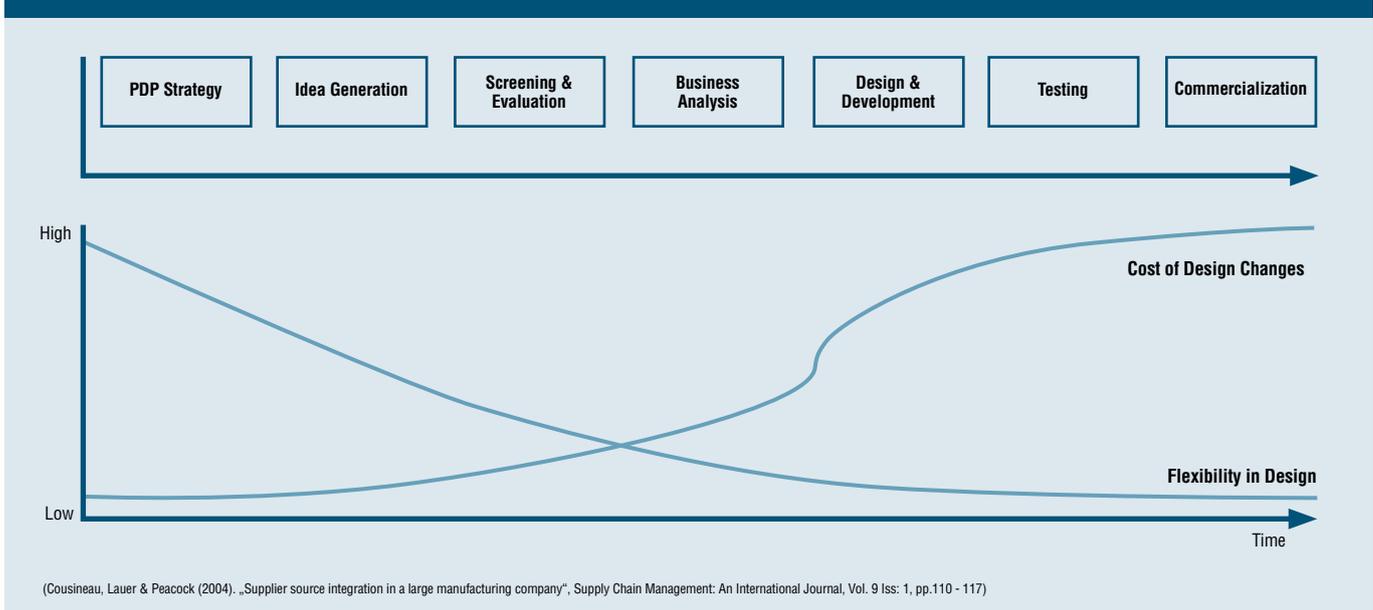
### 3.1 Strategy

Norman and Verganti (2012) defined this category of innovation as Market-pull innovation that starts from an analysis of user needs and then develops products to satisfy them. This puts R&D at the heart of PDP and all of our surveyed companies in this category either “agree” or “strongly agree” that R&D is involved in the strategy development of the company and consequently in Product Development.

One Head of Development of a major automobile manufacturer whom we interviewed confirmed this: “The Supply Chain input is to assess the capability to source, manufacture and deliver new products or services. The Supply Chain manager sits on the PDP strategy committee.”

Cousineau, Lauer & Peacock, (2004) looked at General Motors’ PDP focusing on supplier integration and developed the model below. It demonstrates once more the importance of early initial supplier integration in Routine Innovation when the cost of design changes is still low and design flexibility high.

**Figure 6: Cost of Design Changes and Design Flexibility in Product Development**



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We found Logistics to be engaged in both formal and informal advising roles throughout the product development process. Logistics provided advice about downstream customer requirements and product lifecycle cost control, resulting in better customer focus, cost savings and clearer budget overview.

Kong & Allan (2007) suggest that quality improvements are another opportunity using Rane Brake Linings (RBL) as an example. RBL operates in the automotive component industry with revenues of over \$131 million. Their customers today include Ford India, General Motors India, Australia Railways and Tata Motors. In 1999 however, the company did not operate at the same levels of efficiency. With a defect rate of 16,000 ppm and a process rejection rate of 2.1% the company was quickly losing ground in this highly competitive global market. In order to regain their competitive edge, RBL looked specifically at quality, but also Supply Chain process improvements that would enable the entire Supply Chain to perform more effectively. By 2003, the defect rate had decreased to 1,750 ppm and employee suggestions on process improvements increased from 228 to 7,500.

### 3.2 Idea Generation

In the Idea Generation phase, we also noted that Supply Chain departments had developed a commitment to facilitate problem identification and problem solution from its roles as advisor and liaison. Due to the continuous development of new generations of products particularly in the automotive sector, data capture, analysis and feedback for the quick solution of anticipated and unanticipated problems, are roles of the Supply Chain departments and show the cross-functional collaboration along the entire PDP.

### 3.3 Idea Screening & Business Analysis

The objective of the Idea Screening Phase is to evaluate ideas to determine which ideas are worthy of the next phase, Business analysis, a screening phase where quantitative methods are applied to further evaluate ideas. Meyers and Tucker (1989) point out that a new product development team is focused on its products and may not have knowledge of the experiences of other product teams and that the Supply Chain departments' knowledge, cumulative data, attention to process and experience are valued by the new product development teams. To avoid rework, which reduces costs and time-to-market, this information is best provided during these early stages.

### 3.4 Design Development

When we asked what the key objectives of involving Supply Chain accountability in the Product Development Process were, one sourcing strategy manager of a major aerospace and Defence Corporation said the following: "The key is not only to have the right product at the right time at the right place and at the right time, the early involvement to find the best cost/quality feedback from the supplier/Supply Chain to optimize the product is just as essential as an early established operational Supply Chain."

This notes the importance of liaison between R&D and logistics. Mentzer (2001) mentions an anecdote about an automobile manufacturer, who spent 5 years developing a sports utility vehicle but did not communicate the new vehicle specifications to the logistics group until the vehicles were ready to be delivered. Unfortunately, the changed dimensions of the new sports utility vehicles meant the rail cars typically used could carry only racks of two vehicles whereas in the past they had carried three. This dramatically increased the cost of shipment per vehicle and increased the delivery time – which could have been avoided with logistics involvement in the Design Development Phase. Along with checking specifications like dimensions another input in this phase would be to check if previous machinery and tools can be used to manufacture the product. Although this is a condition in Product modification, in Routine Innovation this is merely a possibility to reduce costs.

A positive example for Supply Chain involvement, which led to sharing of innovation, is the cooperation between the BMW Group and ZF Lenksysteme GmbH. The Zahnradfabrik Friedrichshafen (ZF) was founded in 1915 by the Luftschiffbau Zeppelin GmbH to develop gears and gearboxes for Zeppelin airships, planes, motorboats and cars. In 1999 ZF founded ZF Lenksysteme (ZFLS) in cooperation with the Robert Bosch GmbH to develop steering systems and components. ZFLS steering systems have been used by BMW for many years and are used in nearly the entire range of BMW cars. When ZFLS developed their Servoelectric electric power

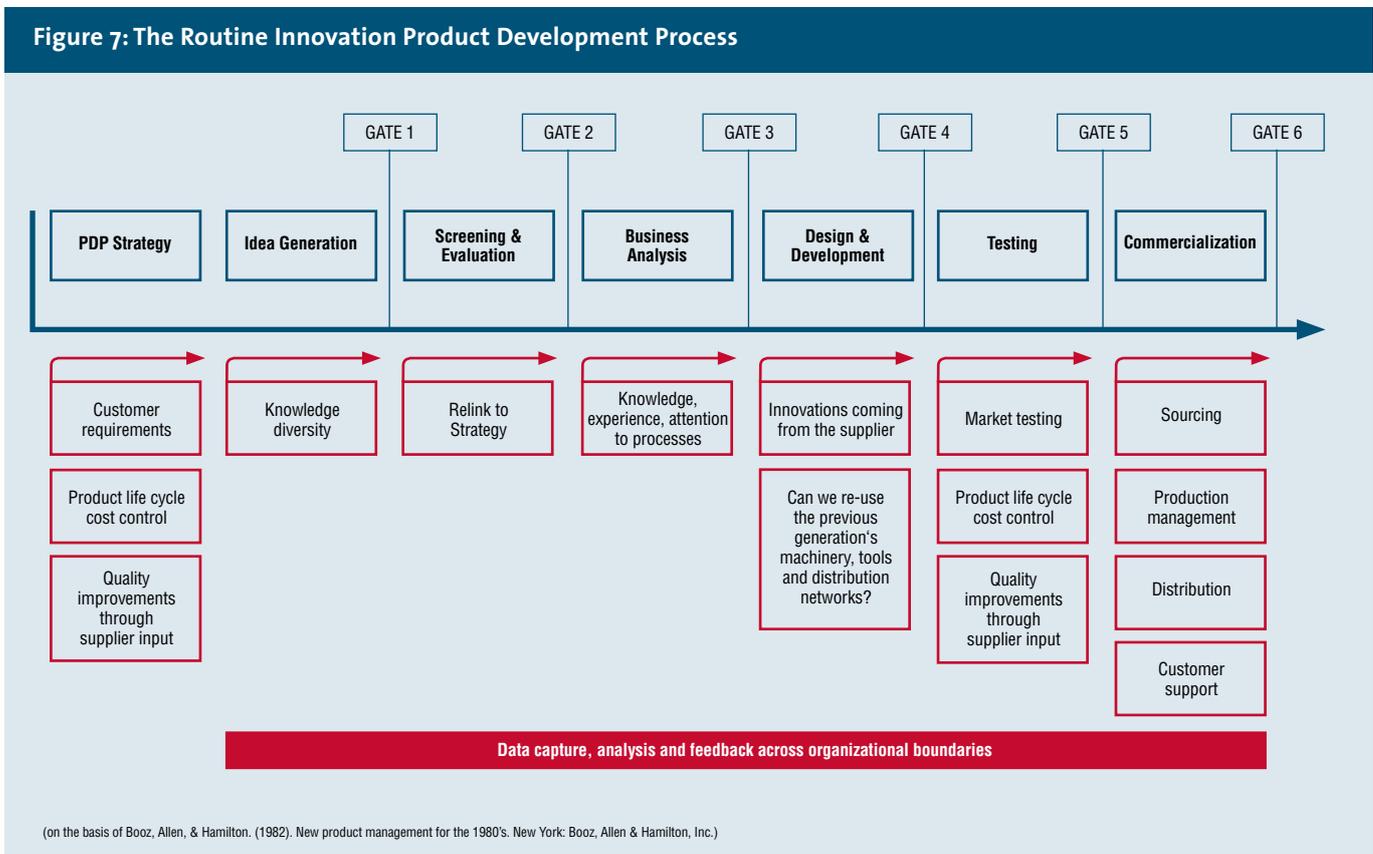
steering system, which saves around 0.3 l of fuel per 100 kilometres compared to conventional hydraulic power steering systems, BMW worked together with ZFLS to implement the system in the new 3 and 5 series. This shows that innovation coming from the Supply Chain side can be achieved through involvement in the Product Development Process, particularly the Design Development Phase.

This sharing of innovations significantly reduces the R&D costs, in an area where the final product consists of many individual complex components. It is therefore advisable to involve the Supply Chain in the product development stage as a liaison between suppliers and R&D.

### 3.5 Commercialization

When it comes to launching a Routine Innovation, evolutionary product, customer support, distribution and production management are tasks that the Supply Chain departments fulfil in a very cost-effective manner.

### 3.6 The Routine Innovation Product Development Process



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## 4. Radical Innovation

Norman and Verganti (2012) described this process as Technology-pull innovation as the final product due to its' new technology, will create a new market.

In some firms R&D has moved beyond a preoccupation with processes. The goal is no longer to develop and produce high-quality products at the right time but also to use scientific information to explore new markets. These firms are under pressure to maintain a constant flow of new products, and R&D is a major strategic tool for the firm (Mentzer, 2001). According to Schilling & Hill (1998) in industries such as biotechnology, consumer and industrial electronics and computer software companies often depend on products introduced within the last 5 years for more than 50% of their annual sales. These sectors are also the most frequently occurring in this category.

In Radical Innovation new product introductions can often be described as disruptive. Christensen (1997) defines disruptive innovation as an innovation that creates a new market by applying a different set of values, which ultimately (and unexpectedly) overtakes an existing market. Christensen (1997) uses the disk drive industry as an example looking at the development from 14 inch diameter disks to diameters of 8, 5.25 and 3.5 inches and then from 2.5 to 1.8 inches. The floppy disc market had unusually large changes in market share over the past 50 years. One of the key findings of Christensen's work is that disruptive technological innovations eventually grow to dominate the market (Markides, 2006). More modern examples can be found in the audio format market from gramophone records over Compact Cassettes, Compact Discs to MP3 files. Naturally some were more disruptive than others; Sony's MiniDisc never had the same success as 8- and 4-track tapes but it shows the general speed of development in Radical Innovation and the possible competitive advantage it offers.

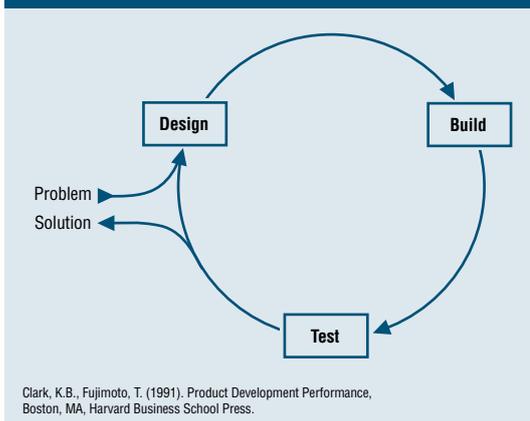
### 4.1 Strategy

As most attempts at radical innovation fail, (i.e. don't make it to the start of production) (Sandberg, 2011) -Larry Keeley, President of the Doblin Group estimates that 96% of radical ideas fail (Bloomberg Business Week, 2005) - involving the Supply Chain department at a too early stage in the PDP can lead to inefficiencies as time is spent on projects that will not create revenue.

Only 40% of our participants involve their Supply Chain departments in the New Product Strategy, the rest of the surveyed companies only "sometimes" involve it.

Norman and Verganti (2012) found that every radical innovation they investigated was done without design research, without careful analysis of a person's or a society's needs. Two examples of "technology first, needs last", radical products, that were rejected by marketing are Chester Carlson's invention of the Xerographic copier that was turned down by multiple companies but that today is known as the Xerox copier and HP's development of the electronic calculator which was rejected by the marketing experts at HP but was only built because William Hewlett, one of the founders of HP, wanted one for himself. It is therefore important not to overvalue the voice of the customer (VOC) as human-centred design has many weaknesses in Radical Innovation mainly because the customer does not know the technology and therefore cannot envision the product that is about to be created. (Norman and Verganti, 2012).

Figure 8: The Design-Build-Test Cycle



Clark, K.B., Fujimoto, T. (1991). Product Development Performance, Boston, MA, Harvard Business School Press.

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#### 4.2 The learning cycle

Clark and Fujimoto (2001) use the "Design-Build-Test Cycle" to demonstrate the learning and reconfiguration within product development. It is a problem-solving cycle, a "problem" being a gap between intended and realized product attributes. To close such a gap organizations apply a problem-solving or design-build-test cycle. (figure 8)

Solving problems in product development is both a learning and reconfiguration process. No matter how much an individual may know about a given problem, there are always aspects of a new product that must be understood and adapted before an effective design can be developed. Except for trivial problems, developers are unlikely to come up with a complete design in a single iteration. Instead, developers go through several iterations, learning a little more about the problem and alternative solutions each time before committing to a final design and detailed specifications. Each iteration or "learning cycle" consists of three phases. Holland, Gaston & Gomes (2000) even suggest that experimentation and risk-taking in radical innovation should be encouraged and failure treated as a learning opportunity.

The main use for this cycle is in the early stages of product development, also called the "fuzzy front end". The stages of the cycle correspond with the fuzzy front end in Radical Innovation: Idea Generation (Design), Screening (Build), Analysis (Test). As radical innovation teams often find themselves in uncharted territory, this cycle will repeat several times before the project attributes are realized and the team moves on stage 4 of the Product Development Process (Business Analysis). To avoid wasting resources it would be advisable to involve the Supply Chain departments in stage 4, when the project is out of the very early stages of development and a clearer image of the final product has established itself.

### 4.3 Design & Development

By creating liaison between the development team and purchasing time is reduced as communication occurs more frequently. To improve the process this information flow starts at the beginning of the Design stage. The inherent problem here is as Sophie Bechu, Vice President of Worldwide Engineering and Integrated Supply Chain for IBM explains: “the designers often focus on performance and functionality, while the buyers focus on cost, supply and technology availability.” In an effort to reduce the effects of having multiple interests, she adds that involvement from the beginning of the design cycle is essential to minimize delays in getting prototype hardware. The specific task of the Supply Chain departments is to steer the focus of the design on supply, cost and technology availability aspects. According to Burgelman (1985) and Stein and Kanter (1980) due to the large budget responsibility the product development teams in radical innovation tend to be very autonomous making it difficult for an established logistics function to have input during product development. Becchu states that the involvement in the design stage reduces turnaround time and ultimately improves the product’s time-to-market and leads to a more cost efficient product.

Most radical innovations take considerable time to become accepted (Norman and Verganti, 2012). For example, one of today’s radical innovations is Apple’s development of multi-touch interfaces and their associated gestures to control hand-held devices. Apple however did not invent either multi-touch interfaces or gestural control, multi-touch systems have been in computer design laboratories for over 20 years and gestures also have a long history. Although Apple’s ideas were not radical to the scientific community, they did come as a radical, major shift in the world of products and how people interact with them.

Lashinsky (2012) describes the strong collaboration between Apple and its’ supplier in the PDP. Once a product begins production, two responsible people are enlisted to bring it to fruition: The engineering program manager (EPM) and the global supply manager (GSM). The former has absolute control of the product process and is so powerful that it is referred to as “the EPM mafia”. Both of these positions are held by executives that spend most of their time in China overseeing the production process. The GSM takes the beta device back to Cupertino, California for examination and comments and then flies back to China to oversee the next iteration of the product. This overcomes the old problem of a supplier whose samples don’t fulfil the manufacturers expectations and leads to a supplier who is integrated in the production and development and can therefore produce the product to a much higher standard. This shows the importance of supplier integration in the Design and Development phase.

#### 4.4 Market Testing

The purpose of this phase is to conduct commercial experiments necessary to verify earlier business judgements. According to Lashinsky (2012), Apple occasionally pays a factory worker in China to hand off a prototype to a blogger or journalist. This commercial experiment often results in a media hype preparing the new market for the launch of the product; a free market test that is only possible in radical innovation. This shows the use of a supplier to advertise the product before it is even launched and establish the products market.

In 2010 when Apple launched the iPad it was criticized for not having a USB-Port or a camera, its small storage space, and the lack of flash support, however the iPad did turn out to be a commercial success, as it revolutionised the tablet PC market and accounted for 75% of the market share by the end of 2010 (Cellan-Jones, 2011). This success was naturally due to Apple's previous high-quality products, the extremely loyal customer base, a substantial advertising campaign and a number of powerful partners to launch the product such as AT&T, Google, Yahoo and Disney. While the first two points are brand linked, the third a matter of budget, the fourth is an option that is becoming more and more adopted in radical innovation. Well established partners make the product appear more relatable to the new market. Involving the marketing department in the testing phase of product development to find partners and understand the product will result in a more successful product launch.

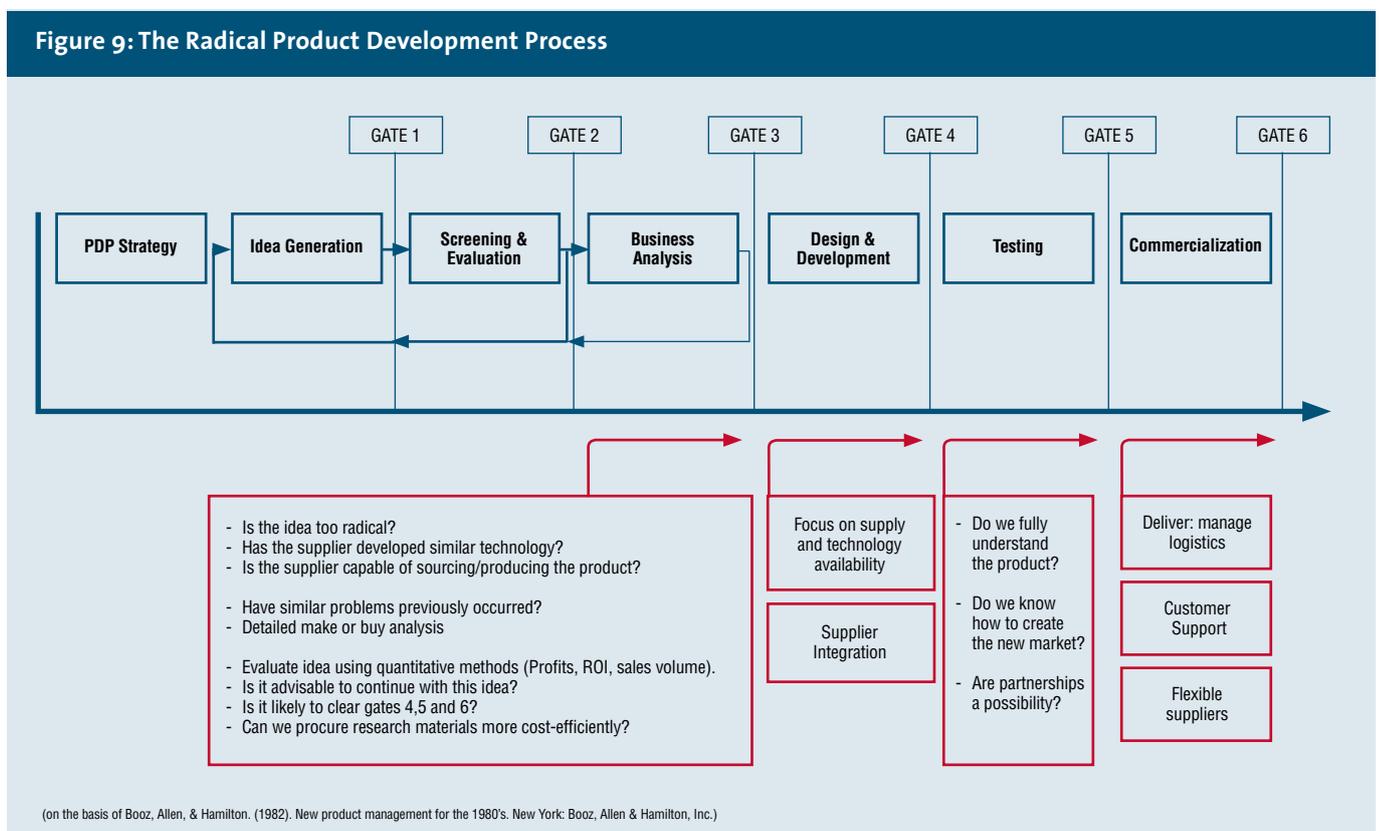
#### 4.5 Commercialization

The role of the Supply Chain in the product launch stage is of significant importance as one additional and crucial task is added to the list of tasks: As the demand for radical innovation products is unpredictable, scalability of production becomes very important. In mid-2000 IBM revealed its laptop computer product line, the venerable ThinkPad, releasing the T20 and A20 models. After losing \$800 million in 1998 and \$ 571 million in 1999, the IBM PC division used a conservative forecast of the sales of the new machines and kicked off a major ad campaign in conjunction with the release, However, to the delight of the IBM marketing department and to the horror of its operations department, the new ThinkPads became an instant hit with consumers. Sales soared, leading immediately to product shortages. In mid-July, customers seeking 79 of the 108 ThinkPad configurations faced back orders of well over a month. The problem had no quick fix because component suppliers could not ramp up their production of DVD and CD-RW components. IBM lost a substantial amount of sales to competitors, as would-be buyers were turned away by the publicity regarding the shortages. Being able to scale down production is equally important as items that were geared to sell in much higher numbers may have to be sold at dis-

count, robbing the manufacturer of its profit margin and may even force him to sell at a loss. False forecasting is the main cause of these problems and scalability of production the best way to minimize risk in radical product development. Choosing flexible suppliers, who can respond to fluctuations in demand quickly and efficiently, is therefore the key to a successful commercialization of a product. This ability to handle complexity is a key benefit of cross-functional teams in radical product development.

Logistics is traditionally just asked to distribute the finished product (Mentzer, 2001), but it can provide customers with the nurturing service and warranty support a new product needs to ensure commercial success, especially with radical innovation products (Meyers & Tucker, 1989), and when individual product life cycle times are short, logistics processes can make critical contributions to the time it takes a firm to bring a new product to market (La Londe & Powers, 1993) making customer support, managing logistics and choosing flexible suppliers main tasks in radical Product Development thus creating strong customer focus.

#### 4.6 The Radical Product Development Process



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## 5. Summary

Prior research has indicated that the integration of the Supply Chain departments into the Product Development Process (PDP) can provide substantial improvements in cost efficiency, time-to-market, supplier relations and quality and facilitate the smooth launch of new products.

The most common limitation of existing studies is the lack of differentiation between different industry sectors. Using the same model for a food manufacturer, modifying existing products and a consumer electronics manufacturer, relying on a constant stream of highly innovative products, cannot lead to the same efficiency improvements due to entirely different processes.

We differentiate between industry sectors to be able to find out exactly when the Supply Chain departments are to be involved and what precise task is to be given to them. We divided our survey participants into 3 clusters, finding numerous patterns in their replies which were used to develop our supplier integration models.

Our results show 3 very different types of supplier integration:

- Product modification in which retailing, personal care, food and beverage companies are the most common. We found the role of the Supply Chain functions to be often controlling in nature. As the modified products tend to use existing machinery, distribution networks and market research ensuring that they can still be used is one of the main roles of the Supply Chain departments in Product Modification. Early initial Supply Chain involvement led to cost reductions, better supplier relations, higher sales, avoidance of rework and time-to-market reductions.
- In Routine Innovation, where automotive, aeronautical and defence companies tend to be the most prominent, products tend to be evolutionary and complex i.e. consisting of a large number of components. We found that full collaboration between R&D and Supply Chain functions for the entire length of the Product Development Process was the best way to achieve quality improvements, a better budget overview, customer focus, avoidance of rework and reduce time-to-market and costs.
- Radical Innovation includes consumer and industrial electronics, computer software, biotechnology companies. Radical Innovation products are the “doing what we did not do before” products that can completely take away the market share of existing products. Our research suggests that the Supply Chain functions tend to be involved

from the middle of the Product Development Process onwards due to the uncertainties of design linked with radical innovation and due to the cost efficiency improvements, shorter time-to-market and a more effective development and product launch can be achieved through advisory input.

It remains that the involvement of the Supply Chain departments is crucial to new product success but for optimum efficiencies but the success factor is not that it is applied but how it is applied.

One of our respondents, a global sourcing manager of a major chemical company put it very well.

“We involve our Supply Chain functions to ensure that the end to end process of new products can be managed efficiently and effectively. The way this concept is implemented varies with every type of new product we develop.”

## 6. References

Berggren, Eric, & Nacher, Thomas. (2001). "Introducing new products can be hazardous to your company: Use the right new-solutions delivery tools." *The Academy of Management Executive* 15(3): 92-101.

Bloomberg Business Week. (2005), August 1. Get creative: How to build effective companies. Bloomberg Business Week. Available at: [http://www.businessweek.com/magazine/content/05\\_31/b3945401.htm](http://www.businessweek.com/magazine/content/05_31/b3945401.htm)

Booz, Allen, & Hamilton. (1982). *New product management for the 1980's*. New York: Booz, Allen & Hamilton, Inc.

Burgelman, R. A. (1985). "Managing the New Venture Division: Research Findings and Implications for Strategic Management." *Strategic Management Journal* 6:1,38-54.

Carmel, Erran. (1995). Cycle time in packaged software firms. *Journal of Product Innovation Management*, 12(1), 1-14.

Cellan-Jones, R. (2011). iPad 2 launched by Apple's Steve Jobs. BBC News online. 2.3.2011. available at: <http://www.bbc.com/news/technology-12620077>.

Christensen, C.M. (1997). *The Innovator's Dilemma: When New Technologies Cause Great Firms to Fail*. Boston, MA, Harvard Business School Press.

Clark, K.B., Fujimoto, T. (1991). *Product Development Performance*, Boston, MA, Harvard Business School Press.

Cooper, R. (2001). *Winning at new products: Accelerating the process from idea to launch* (3rd Ed.). Boston, MA: Perseus Publishing.

Cousineau, M., Lauer T.W., Peacock E. (2004). „Supplier source integration in a large manufacturing company“, *Supply Chain Management: An International Journal*, Vol. 9 Iss: 1, pp.110 - 117

Crawford, C. (1987). *New product management*. (2nd Ed.) Illinois: Richard D. Irwin. Chicago, IL: Richard D. Irwin.

Gupta, Ashok K., & Wilemon, David L. (1990). Accelerating the development of technology-based new products. *California Management Review*, 32(Winter), 24-44

Holland, S., Gaston, K., Gomes, J. (2000). Critical success factors for cross-functional teamwork in new product development. *International Journal of Management Reviews*, 3, 231-259.

La Londe, Bernard J & Powers Richard F. (1993). Disintegration and Re-Integration: Logistics in the Twenty-First Century. *International Journal of Logistics Management*, 4, 1-12.

Lashinsky, A. (2012). *Inside Apple: How America's Most Admired – and Secretive – Company Really Works*. New York, NY: Business Plus.

Lynn, Gary S. and Akgün, Ali E. (2001). "Project Visioning: Its Components and Impact on New Products. *The Journal of Product Innovation Management*, 18:274-387.

Mabert, Vincent A., Muth, John F., & Schmenner, Roger W. (1992). Collapsing new product development times: Six case studies. *Journal of Product Innovation Management*, 9, 200-212

Markides, C. (2006). "Disruptive Innovation: In Need of Better Theory. *The Journal of Product Innovation Management*, 23:19-25.

Mentzer, John T. (2001). *Supply Chain Management*. Thousand Oaks, CA: Sage Publications.

Meyers, Patricia W., & Tucker, Frances G. (1989). Defining roles for logistics during routine and radical technological innovation. *Journal of the Academy of Marketing Science*, 17(1), 73-82.

Norman, Donald A., & Verganti, Roberto. (2012). Incremental and Radical Innovation: Design Research versus Technology and Meaning Change. Presented at Designing Pleasurable Products and Interfaces conference in Milan, 2012.

Sandberg, Birgitta. (2011). *Managing and Marketing Radical Innovations*. New York: Routledge.

Schilling, Melisaa A., & Hill, Charles W.L. (1998). Managing the new product development process: Strategic imperatives. *Academy of Management Executive*, 12(3),67-81.

Sheffi, Yossi. (2007). *The resilient enterprise: overcoming vulnerability for competitive advantage*. Cambridge, MA: The MIT Press

Sivadas, Eugene, Dwyer, F Robert. (2000). „An examination of organizational factors influencing new product success in internal and alliance-based processes." *Journal of Marketing* 64(1) 31-50

Stein, Barry A. & Kanter Rosabeth M. (1980). "Building the Parallel Organization: Creating Mechanisms for Permanent Quality of Work Life." *Journal of Applied Behavioral Science* 16:317-388.

Ulrich, K.T. & Eppinger, S.D. (2011). *Product Design and Development*. New York: McGraw-Hill

Wind, Y. (1982). *Product policy: Concepts, methods, and strategy*. Reading, MA: Addison-Wesley.

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# About goetzpartners

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By its very nature, this study does not take account of the circumstances of individual cases. It can therefore not replace individual specialist consulting or in-depth third-party research.

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