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Strategic marketing planning in turbulent environments: The case of PromoCast™

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If you make change your enemy, you will always be at war.

This article illustrates an approach to strategic marketing planning in times of rapid change. The process begins with an extensive situation analysis that pays particular attention to environmental change coming from political, behavioural, economic, sociological, and technological sources. These environmental forces are looked at from the points of view of the company, the business ecosystem, and the infrastructure. The factors identified in the situation analysis are woven into the economic webs surrounding the new product. The webs are mapped into Bayesian networks. This involves a combination of knowledge engineering and specification of focussed research projects. The Bayesian nature of the planning document enables planners to update information as events unfold and to run scenarios that simulate the impact that changes in assumptions underlying the web have on the prospects for the new product. The method is developed around the planning for PromoCast™, a statistical forecast used to support promotion planning in the grocery industry.

Introduction

Even in times of turbulent change, we must act strategically and plan responsibly. We cannot rely on plans that are outdated as soon as they are written. Our planning documents must be dynamic – updateable as events unfold and new uncertainties arise. Such motivations drove the development of the methods for strategic marketing planning presented in Cooper (2000).

The premise of that effort is that strategy arises from a comprehensive statement of the critical issues facing an endeavour. A strategy is a solution to a set of problems. If the problems are not posed comprehensively, the strategy is likely to be incomplete. To articulate the sources of problems and opportunities, we should look broadly at the political, behavioural, economic, sociological, and technological environment surrounding our endeavours. Just as telephoto lenses, portrait lenses, and wide-angle lenses bring different parts of a scene into focus, we should look at these environmental forces from the points of view of the company, the industry or business

ecosystem, and the larger infrastructure. The combination of the five environmental forces and three points of view create the 15 cells in a “critical issues grid”. We use this grid to help maintain the comprehensiveness of our focus and organize the topics of our strategic conversations. We replay a strategic conversation that relates to the development of a statistical forecast used by retailers as an aid in planning promotions for frequently promoted consumer goods. The detailed summary of the conversations in each cell of the critical issues grid is designed to help illustrate the breadth and depth that such conversations should embrace.

Cooper's approach (2000) continues by weaving the stakeholders and factors identified in the situation analysis into the economic webs surrounding the new product. The webs are then mapped into Bayesian networks (Pearl 1986), using third-party software designed to facilitate this process and free for applications of up to 200 nodes, far larger than the scale illustrated here <see www.hugin.dk for details>. A Bayesian network is an

interconnected set of conditional likelihoods. For example, given the trend towards category management, how likely is it that store managers will insist on better forecasts of promotion events; and given an insistence on better forecasts, how likely is it that grocery chains will improve their computer infrastructure. Answering such questions involves a combination of knowledge engineering and specification of focussed research projects. After the entire network is mapped out, the Bayesian nature of the planning document enables planners to update information as events unfold and to simulate the impact that changes in assumptions underlying the web have on the prospects for the new product. This approach to marketing planning provides a dynamic alternative to a static planning document, which is outdated before it is read.

This article illustrates these methods in the context of a new service developed by Efficient Market Services, Inc. (EMS) to support promotion planning in retail environments (Cooper, *et al.* 2000). Much of it relates strategic conversations focussed on the critical issues facing EMS during the development of PromoCast. From the record of these conversations, over 60 issues (nodes) are highlighted that affect the viability of PromoCast. These issues are mapped into a network of relations concerning retailer and manufacturer demand for such services, EMS's ability to supply the services, and competitive threats. Each link in the network represents a conditional relation, such as: "If a sales forecast comes from a trusted third party, how likely is it that this will lead to a decrease in the conflict between manufacturers and retailers over the terms of a trade deal?" By transforming the issues into this form, we gain not only an opportunity to quantify the forces underlying plans, but also a natural way to update our planning framework as events and relations change. The resulting Bayesian network allows us to develop scenarios representing alternate futures and simulate the impact of uncertain events on the ultimate likelihood of success of our ventures.

Critical issues facing EMS

In this case, the conversation was between the first two authors, both of whom were familiar with the general issues of efficient consumer response (ECR) and the particular issues facing EMS. The first author had consulted for several years with EMS, led the development of

the statistical model behind PromoCast, and taught about ECR in MBA classes. The second author had worked at EMS in the years preceding his entry into the MBA program at the Anderson School.

The following sections use numbered "nodes" which correspond with the nodes in the Bayesian network depicted in Figures 1 to 6. The beginning and the end of the material relating to each node is indicated in the text to illustrate how the readers might take the text of their strategic conversations and draw a Bayesian network for their own cases.

Efficient consumer response

The ECR objective for the consumer packaged goods industry is to provide the right product, at the right price, in the right store, in the right amounts. ECR programs focus on changing the industry supply chain to become a responsive, customer-driven process that fills demand quickly and efficiently. The component initiatives of ECR are efficient promotions, assortment, pricing, new product introduction, and product replenishment. The key to ECR is making the consumer the centre of decision-making activity. Point-of-sale (POS) data collection technology changes the direction of product flow from a "push process" to a "pull process". ECR bases supply chain flow decisions on the preferences of consumers. The pull process of the supply chain provides feedback on consumer sales so that only demanded goods are stocked, transported, and even manufactured in the precise quantities desired. For the first time, vendors have accurate information about consumer demand.

A Food Marketing Institute study estimated that \$30–60 billion in efficiencies could be obtained through better store-level execution. Sales are increased through eliminating the supply of products and sales conditions. The industry capitalizes on formerly lost sales opportunities due to poor information and assumptions. Costs decrease from the reduction in unnecessary inventory and lost sales from out-of-stocks. Precise inventory requirement information reduces inventory, transportation, and labour costs with less handling. [Node 1] Eventually, a portion of the savings is passed along to the consumer in the form of lower product prices. Consumers also benefit because the manner in which consumer packaged

goods are supplied matches their demand characteristics for the market. [Node 1 end]

Introduction to PromoCast

PromoCast is a promotion event forecasting system for consumer packaged goods sold by the grocery industry. The product uses a statistical model and historical POS other promotional dimensions to generate an advance forecast of promoted volume by retail store event. An accurate and reliable forecast enables manufacturers and retailers to predict product and resource needs for critical deal events and to reduce inventories and product out-of-stocks, two traditionally opposing objectives. Furthermore, customer service improves by supplying products and promotions desired by consumers.

The founders of EMS believed that the consumer packaged goods industry could only capitalize on the opportunities offered by ECR by the development of an underlying information-technology infrastructure. ECR implementation requires that retail sales and merchandising information be accurate, timely, complete, and accessible.

The basic building blocks of the infrastructure are store-level detail, daily data, all item and category access, and complete promotional condition reporting including price reductions, in-store displays, and feature ads. EMS collects information at the fundamental level by establishing a direct connection to each store's electronic point-of-sale system through an in-store processor. By pulling data directly from the store, the system bypasses the retailer centralized processing system that creates many systematic errors. The resulting information is transmitted back to EMS headquarters, where the sales volume data are combined with audited display and feature ad information and forecasted baseline sales demand and are processed into easily utilized reporting units

Political: Company issues

EMS was founded in an entrepreneurial environment on the principle that ECR was the emerging force of the consumer packaged goods industry. [Node 2] Many employees had left established companies and so had a high commitment to the concept and enjoyed the non-bureaucratic environment presented by the founding members. Also, a sense of personal stake in the success of the company was emphasized, including an employee stock option plan.

[Node 2 end] Employees believed that the concept of ECR would result in high demand for their services and large returns on their personal investment.

[Node 3] A previous incarnation of the PromoCast, known as OfferNet, was a more comprehensive approach towards the entire promotion process. It went beyond generating product sales forecasts from promotions, by aiding in negotiating the optimal deal strategy and reconciling product billings. [Node 3 end] [Node 8] EMS partnered with IBM to develop a network infrastructure where the information could be created and transmitted. Part of the agreement involved IBM supplying product funding in return for certain rights to the product itself. Following a dispute over the direction of the product, IBM withheld the right of EMS to develop OfferNet in its form. The EMS product team was forced to scrap their existing plans. [Node 8 end]

EMS decided to continue to pursue the promotional forecasting concept through a revised product version called PromoCast. The strategy was to limit the product to the forecast while still emphasizing the importance of the entire process. Having the right forecast is meaningless if you do not know where to put it. It was difficult for EMS to give up OfferNet because they had invested a lot of time, money, and most importantly belief in its success. OfferNet correlated closely with the ideals of EMS and ECR's vision. It was even harder because they were actually successful in developing the product. They had not failed in their goal to produce a superior method of promoting products but had the product development terminated for political reasons. The new version of the product, PromoCast, is a scaled-back version of OfferNet. Some may believe that PromoCast is an inferior version because many believed that OfferNet was the right product. [Node 64] The success of PromoCast requires the recommitment of key personnel, as well as the company as a whole, to the importance and viability of product success. The product has not only implications on EMS's bottom line, but serves as a bellwether for the company's direction. Internal forces and commitment to vision need to be addressed to maximize the likelihood of success by PromoCast and provide momentum for EMS's overall business plan. [Node 64 end]

Political: Industry issues

[Node 4] The likelihood that PromoCast will become a successful product is largely affected by the context of the industry in which EMS operates and the political forces within it. The scanner-based, retail sales data tracking industry is dominated by two firms, Nielsen Marketing Research, a division of A.C. Nielsen, and Information Resources, Inc. (IRI). These companies share the U.S. market nearly equally, while Nielsen possesses a much greater share of international business. Nielsen maintained nearly a 70% share of international business totaling \$1.4 billion in 1996, while IRI reported \$406 million in revenues. IRI experienced tremendous growth early on but began reporting significant losses. [Node 4 end]

[Node 9] The relationship between these two dominant firms and the ability to sustain competitors provides the contextual framework for the emergence of EMS and the viability of PromoCast. Nielsen has been affected by legal issues, and IRI filed a \$1 billion lawsuit in 1996 alleging anti-competitive practices by Nielsen including predatory pricing and exclusivity contracts. In 1987, IRI agreed to be purchased by Nielsen; however, the U.S. Federal Trade Commission did not permit the merger, claiming Nielsen would act as a monopolist. This raises an interesting issue of whether there is enough demand in the industry to sustain multiple firms. Both companies have been forced to reduce pricing to levels sometimes below costs. Due to the high costs and limited clientele, Nielsen and IRI have waged a hostile battle for market share with IRI losing and struggling to remain profitable. [Node 9 end]

[Node 6] Economic theory suggests that in a highly competitive environment where all firms' prices are roughly equal to their long-run average total cost, the number of firms that can be sustained can be determined using the concept of minimum efficient scale. [Node 6 end] This is the output level for a firm with the minimum average cost. For Nielsen, if this level of output is at or above the full market demand for their information, there is only room for one firm in the industry. If Nielsen's level of information output at minimum efficient scale falls short of the industry demand, there is room for competition.

[Node 7] EMS entered the market with full knowledge of the competitive environment in the industry. The expectation of the company's founders was that another arena for supplying information was emerging. [Node 7 end] [Node 5] The prospect of ECR introduced the potential need for retail sales data with a more tactical nature. For the retail industry to respond to consumer demand in an execution-oriented manner, the supply chain required operations-ready data at the store, item, and daily level. Their assumption was that EMS could be sustained in the market by expanding the demand for industry services. [Node 5 end]

Political: Infrastructure issues

[Node 10] PromoCast plays a role in improving the way that manufacturers and retailers communicate about optimal product promotion decisions. [Node 10 end] The product's forecast provides a basis for ordering and resource allocation. PromoCast also enables manufacturer brand managers to approach retail category managers with a more informed promotional plan. Access to consumer reaction to different deal scenarios allows both parties to accurately determine consumer demand with respect to pricing. [Node 11] The emergence of category management, managing entire categories as business units, allows retailers to set a pricing strategy with multiple manufacturers. The potential implication is that this type of pricing decision can be considered potential collusion. [Node 11 end].

To be considered collusion, the promotional decision must be made in a monopolistic or oligopolistic manner. A collusive agreement involves a mutual agreement by all parties to reduce output and increase prices. By doing so, the industry increases profits on product sales by gaining a portion of consumer surplus, the difference between what a consumer is willing to pay and the actual market equilibrium price. The ability to charge prices higher than the optimal market price requires that competition that could provide services for a lower price does not exist.

It seems possible that the role of a category manager as manager of relationships between their retail chain and all manufacturers in a given category could encourage price fixing. This would involve a reduction in promotional activity and an increase in regular prices. However,

collusion activity also requires that other retail outlets do not exist for lower prices to be offered. If the grocery industry organized with consumer packaged goods companies to fix prices, consumers could still obtain these products through a number of outlets, including convenience stores and mass merchandisers.

The current and short-term future of PromoCast involves providing promotional forecasts accounting for only a small percentage of grocery retail volume. Even if they could co-operate with all manufacturers, grocery chains in major metropolitan markets could not set prices above competitive levels because other grocery chains would price their goods below their inflated price. This is evidenced by the behaviour of consumer package goods manufacturers. If all firms agreed, they could reduce promotions targeted towards short-term high volume and increase regular prices. However, the competitive nature of the industry creates an incentive for firms to break this agreement by offering a lower price and capitalize on high potential sales.

The role of PromoCast as a third-party forecast reduces the implications of potential collusion as long as retailers and manufacturers focus on maximizing promotion performance and employing the forecast for lower cost operations. Armed with expected sales demand, vendors can plan manufacturing cycles and distribution requirements while retailers can plan stocking needs.

Behavioural: Company–industry issues

[Node 12] Typically, manufacturer representatives obtain internal information regarding their product line's historical promotional performance. [Node 12 end] [Node 13] Independently, the retail category manager tracks promotional success, usually at the retail chain market level. For example, the retailer may have a list of past promotions conducted by each brand or other promotional item grouping. [Node 13 end] [Node 14] This does not necessarily guarantee that all contracted displays were built or built correctly. Corresponding to each promotion merchandising mix, the retailer will track unit volume and/or dollar sales and possibly calculated profit. [Node 14 end] [Node 15] The volume information is generated using total sales across the chain for the entire promotional week.

Under these conditions, an important relationship dynamic between the manufacturer and retailer representatives concerns the struggle over amount of product ordered. Since neither party could historically accurately predict product stocking needs, they independently attempt to create their own forecasts and to convince the other party that their forecast is more accurate. [Node 15 end] [Node 16] Underlying this process is the motivation of the manufacturer to sell-in as much product as possible. Given that most purchase transactions occur when the product is delivered, it is in the manufacturer's best interest to ensure that as much product is in the stores and available to consumers. The costs of inventory, including physical space, handling, theft, and breakage and the responsibility for product turnover is placed on the retailer. [Node 16 end] [Node 17] For this reason, the retailer attempts to reduce their inventory costs by ordering conservatively while trying to avoid missing sales. Much time is spent trying to sell each other on the merit of their promotion and sales projections. [Node 17 end] [Node 18] An environment of mistrust exists in which the retailer makes sure that the manufacturer is not overselling them on the promotion. [Node 18 end] [Node 19] In fact, when product deliveries occur in the store, most store managers may refuse orders if they believe that stocking requirements are unrealistic and sales expectations are inflated. [Node 19 end] [Node 20] The cost of moving product multiple times and across stores can be enormous. [Node 20 end]

[Node 21] PromoCast changes this relationship by providing a third-party, accurate forecast of promotional sales under numerous merchandising mixes. Access to accurate volume expectations improves ordering decisions for both parties. The process transforms into a state of mutual trust. The retailer can accept the neutral PromoCast order as a fair and accurate forecast of sales. As a result, the category manager can make informed decisions about inventory requirements. [Node 21 end] Belief in the integrity of the order [Node 22] reduces the likelihood that orders will be refused at the store's point-of-delivery. Manufacturers reduce logistics costs of transporting product that may not actually be sold to their customer. This cost saving is partially passed on to the retailer and the consumer. [Node 22 end] Furthermore, by instilling confidence in order quantities, the retail cat-

egory manager has fewer inventory issues. Without knowledge of sales volume levels, they must balance the carrying costs of over-ordering with out-of-stock lost sales costs from under-ordering. The tendency is to over-order to avoid out-of-stocks because of its short- and long-term effects on consumer sales. [Node 23] An accurate sales forecast allows retailers to reduce inventory while reducing the danger of out-of-stocks and enables them to manage their warehouse and store inventory better. [Node 23 end]

Since both parties are aware of the sales potential of various promotional mixes, [Node 25] the brand manager has supportive evidence and can show the merit of the proposed promotion and analyze its impact on the retailer's profits. [Node 25 end] [Node 26] And the role of the brand manager as trying to sell unrealistic volumes and sub-optimal deals is reduced. [Node 26 end] [Node 27] Both parties can avoid debating over volumes and focus decision making on optimal promotional mixes. [Node 27 end] [Node 28] The brand manager can capitalize on store-level promotional information, targeting stores to maximize payback from limited resources. Execution in critical stores can generate strong sales by reallocating time and money. For instance, they should ensure that promotional displays are actually built in the 20 stores in a chain market that respond best to that display and/or the largest stores. [Node 28 end]

Behavioural: Infrastructure issues

[Node 24] ECR is a new way of operating the grocery. The EMS vision is based on the belief that ECR is and will continue to be a priority industry initiative. [Node 24 end] The product focusses on one key ECR initiative — efficient promotions. Grocery retailers seek to maximize the profitability of product promotions by determining their effectiveness and formulating a category management plan. PromoCast forecasts promotions at the store level based on the actual in-store deal conditions. [Node 29] Product order needs are determined by aggregating to the chain market level and product is allocated according to individual store requirements. [Node 29 end] Since ECR is the underlying concept behind EMS and PromoCast, we must consider the long-term health of the ECR vision to predict the future outcomes of the product launch.

A critical ingredient for ECR's success is the accepted usage of electronic data. The amount of information employed by ECR programs is massive, and the retail opportunities require immediate action. Tactic-based sales efforts present a [Node 30] hit-or-miss scenario in which only those that can identify and act on opportunities quickly and effectively flourish or even survive. As a result, automatic processes are developed to manage data and facilitate decision making. All parties involved in ECR-based transactions must trust the integrity of the data and operating systems used and be comfortable with the immense role that data play. Retailers and manufacturers are unable to thoroughly manually examine the information for execution enhancement.

The process of using information must be viewed as a competitive advantage, not an intrusion into their business. [Node 30 end] Although all retail and manufacturer representatives have used information as a business management tool, those too slow to implement it are struggling to keep up. The grocery industry's workforce is becoming more accustomed to the information age. If ECR will be successful, [Node 31] they need to train key personnel, on how to use information and be more at ease with its role in their business. Furthermore, manufacturers and retailers need to extend their ECR view of category management as a partnership to include information usage and systems. Leveraging information requires accepting automated decision processes. [Node 31 end] Information transmissions such as EDI are used to facilitate rapid communication of massive content, and EMS must consider how PromoCast is dependent on all parties' trust of electronic commerce.

Economic: Company issues

In attempting to determine an appropriate price for the PromoCast product, EMS must overcome an issue facing many producers of radically new products. No precedent exists, so information about past product sales performance and cost structures do not apply to the new market system. Typically, a profit-maximizing producer can set price-output decisions based on market factors, including demand, costs, and competitive behaviour. Since EMS has limited access to any of these conditions, they have not been able to pinpoint an optimal pricing strategy for products without an established market structure.

[Node 32] A number of factors compose EMS's difficulty in measuring their costs. The direct costs consist of the expense from retrieving stored "raw" data, processing the data into a usable format, generating reporting output, and delivering the end-product to the customer. The process of data collection through delivery is more difficult for EMS to determine than other data processing houses that employ mainframes and operators. EMS does not have a systematic method of measuring precise processing costs. This product information input, stored in the historical deal performance databases, consists of sales volume per promotion by store, item UPC, price level, display type, and feature ad type. These information dimensions are the basic building blocks of promotional reporting, the backbone of EMS's infrastructure, and the source of their competitive advantage. Deal history information is used along with other current market conditions to generate the promotion forecast. The costs incurred from collecting this informational infrastructure are tremendous. EMS invests millions to ensure accurate sales reporting from each store's POS system, to audit display information in each store weekly, and to code each feature ad. However, these costs are difficult to apply directly to PromoCast because they cannot be altered by the decision to produce any level of sales quantity. As a result, they should not be factored into their pricing decision. [Node 32 end]

[Node 33] EMS has found problems measuring demand for their products, because the marketplace in which they operate is informal and rapidly changing. The creation of new products aimed at maximizing tactical, store-level decision making is a new generation of information. Although the goal of ECR-related information products is to capitalize on sales and efficiency opportunities from better in-store execution, experience with proven return on investment is limited. Even if a customer benefits from the use of tactical data, payback is intangible because it is difficult and costly to measure the direct correlation between the usage of the information versus other market factors. As a result, it is difficult for customers to determine their own value for the product. [Node 33 end] EMS is seeking a pilot retail partner to test PromoCast with, partially in an effort to prove value. Without limited access to cost and demand information about [Node 34] PromoCast, EMS has attempted to discover an optimal pricing policy by

testing the market's reaction to different price levels and structures. The strategy that EMS has used to determine a customer's willingness to pay is charging a portion of the customer's benefit from usage. Since the marketplace for information services, particularly radically new ones, is informal and the market power of customers varies, it is difficult to create a uniform pricing policy. On the other hand, effective price discrimination, charging legally based on a customer's willingness to pay, is equally difficult to manage. Initially, EMS proposed a small charge per forecast, per item, per store. An important pricing issue they discovered was that their customers set their budget for information expenditures on an annual basis. Uncertainty about the annual aggregate charge of PromoCast created reluctance on the part of customers to commit. A second plan involved charging a fixed fee per picture feature ad. Forecasts would be generated for each store covered by the ad. Therefore, a feature representing five separate items, brands or package sizes, would be charged the same as an ad for two items. It seems that this scheme may have caused problems with matching price to value since some ads generate more sales than do others. Furthermore, customers reported that the price was too high for them to commit. The current pricing plan involves charging a flat fee per store per month for all forecasts if transmitted electronically and higher fixed fee for manual transmission. A possible problem may occur if the retail customer requests excessive forecasting given the fixed price. Furthermore, allocation of the price to specific product promotions would be difficult for the retailer. It has yet to be determined the willingness of customers to pay this price. Also, once the return on investment from the PromoCast service has been established, EMS will once again need to determine consumer value. In fact, the lack of an pre-existing market system for this product will require EMS to constantly re-evaluate market demand and their pricing decisions. [Node 34 end]

Economic: Industry issues

In measuring the long-term viability of PromoCast, we should consider the economic implications of how the scanner-based information industry might respond to its introduction. [Node 35] EMS faces competition from such companies as Nielsen and IRI, [Node 35 end] [Node 36] which have considerably greater market share, resources, and market presence. [Node 36 end] EMS

approaches the market with a vision that focusses on tactical data usage. The information infrastructure that has been built to support their business approach [Node 37] provides EMS with a competitive advantage of data accuracy for the stores in which they operate. [Node 37 end] Therefore, the desire and ability of their competition to imitate PromoCast in the marketplace should be examined. If the ability to duplicate does not exist in the short term, we should consider the vision of their competitors and their ability to provide a comparable product in the long term.

PromoCast's strength lies in its ability to provide an accurate promotional sales forecast at the store level. By combining historical sales volume with each item's display and feature composition by store and promotional week, forecasts can be generated for any time frame, for any aggregation of stores, and for any price and merchandising mix. The reaction of consumers to different promotions varies by these components; therefore, knowledge of individual store sales expectations is more accurate than trying to forecast aggregate units. The ability of EMS's competition to combat PromoCast depends on their ability to provide similar information under their current infrastructure or redesign their vision. Currently, Nielsen and IRI have considerably more retail stores than EMS, providing them with a competitive advantage. However, to capitalize on their greater market coverage, they must be able to provide an accurate promotional sales forecast in those stores. [Node 38] Both competitors still project sales for store group based on a sample subset of stores rather than for all stores. Both companies have attempted to develop all store information, as a complement to the more strategic information services. IRI has introduced the InfoScan product in about 10,000 stores to capture market interest in store-level data. The Nielsen venture into census data partially involved a three-year agreement with EMS to sell their daily, store-level data as part of Nielsen's product line. [Node 38 end] [Node 39] Neither company has a store-level history for all their chains, and the accuracy of the forecast suffers.

Competitors must also develop a historical database of display and feature information by store, item, and promotional week. Since promotional merchandising make-

up for each item varies between stores and over time, a store-level promotional forecast requires a detailed history of merchandising conditions for these data units. Even if a promotion were agreed upon to be implemented uniformly across a group of stores, actual execution would most likely vary. [Node 39 end] Nielsen and IRI both only collect information for a sample of stores. Their current stance is that the cost of census reporting outweighs the benefits of reduced error. However, to compete with PromoCast, they will need to forecast promoted sales based on actual market conditions. Basing promotional performance evaluation on assumed sales and merchandising conditions distorts valuable insights.

The long-term vision of EMS's will affect their ability to imitate PromoCast. If Nielsen or IRI invest in these concepts and commit to developing their infrastructure, they will be able to compete with the order accuracy of PromoCast while providing much greater market coverage. Their commitment to realizing the vision of ECR and shifting from a strict strategic strategy to include tactical strategies will decide their long-term ability to imitate PromoCast.

Economic: Infrastructure issues

PromoCast was conceived and designed to fill a market need using the larger vision of ECR as its base system. The development of an information infrastructure was necessary because ECR requires accurate, timely, complete, and accessible knowledge of consumer demand. ECR programs focus on changing the industry supply chain to become a responsive, customer-driven process that fills demand quickly and efficiently. [Node 40] The key to ECR is making the consumer the centre of decision-making activity. POS data collection technology changes the direction of product flow from a "push process" to a "pull process". Traditionally, goods are moved from the manufacturing plant to the manufacturing warehouse, on to the retailer warehouse, and finally to the retail stores based on inventory flow requirements and past ordering practices. [Node 40 end] [Node 42] ECR bases supply chain flow decisions on the preferences of consumers. The pull process of the supply chain provides feedback on consumer sales so that only demanded goods are stocked, transported, and even manufactured in the precise quantities desired and on the proper schedule. For the first time, vendors have accurate informa-

tion about consumer demand on which to base cost-effective production decisions. [Node 42 end]

The benefits of ECR are numerous, shared, and measurable. These Food Marketing Institute reported that up to \$30–60 billion could be gained through ECR practices. Manufacturers, distributors, and retailers share many benefits. Sales are increased and the industry can capitalize on formerly lost sales opportunities due to assumptions. Costs decrease primarily from the reduction in unnecessary inventory and lost sales from out-of-stocks. Precise inventory requirement information reduces inventory, transportation with less handling, and labour costs. Eventually, a portion of the savings is passed along to the consumer in the form of lower product prices. Consumers also benefit because the manner in which consumer packaged goods are supplied matches their demand characteristics for the market. Goods are provided with greater freshness, quality, availability, and assortment, all at a lower price. In response to this gain in utility, consumers show loyalty to their suppliers.

Social: Company issues

The vision of the company is that the grocery industry requires detailed information about consumers' purchasing behaviour to market their products with an emphasis on consumer demand. The grocery industry can then distribute, promote, merchandise, and price their products based on demand from merchandising information to support decision making individually by item for each store and day. [Node 41] Since pricing could change every day, it is important to track sales daily to be able to make inferences about the relationship between specific prices and sales. [Node 41 end]

The grocery industry no longer wants to make generalizations about the consumers but wants to know how individual consumers react to their merchandising tactics. [Node 43] As a result, grocery retailers and product manufacturers seek information at the consumer level. At the same time, customer loyalty programs have emerged as a strategy by retailers to create a stronger customer base. The programs involve offering special discounts on products to customers who sign up for a club-type card. While registering, customers are asked to provide personal information that can later be used to make inferences about the relations of

demographics to purchase behaviour. The intent is to offer customers an incentive to buy products specifically at their retail chain and to convince them that they are receiving a special deal. This perception of exclusivity is even conveyed in the program card's names, for example, Preferred Shopper's Card. As a result, the same products are offered to customers at different prices on the same day in the same store. [Node 43 end]

The special prices offered by a [Node 44] customer loyalty program acts as a new form of product promotion and are becoming an increasingly popular tool for retailers. These programs will affect the introduction of PromoCast in two major ways. First, the data collection process that EMS employs involves collecting the price that each product unit is charged at the checkout register. Since frequent shopper discounts are listed as separate line items in the system and on the receipt at point of purchase, specific discounts cannot be applied to specific sales units. For example, when someone purchases a cereal and receives a frequent shopper discount, it lists the discount as separate transaction. Discounts possess an item code similar to a UPC. Retailer systems have a reference file that links this discount back to the UPC which receive the discount. Since retailer POS systems report these transactions separately, an inaccurate sales price is recorded. EMS must figure out how to report the true sales price.

However, even if this change were possible, the ability to predict sales from such promotions would be difficult because they would need to be linked only to sales in which the consumer bought using the card and perceived the discount applying to a specific product. For example, if a discount is offered on the first two cases of assorted brands of carbonated beverages and someone buys three cases, all three beverage units are charged the regular price and two separate transactions are generated to record the discount. It is not possible to determine which products received the discount. It is misleading because it is unclear which products the consumer perceived to be on discount. [Node 44 end]

[Node 45] A second way that customer loyalty programs will affect the introduction of PromoCast is the impact on the product's forecast generation and the file structure

of the historical data used to generate the forecast. Promotional sales forecasts are created for each price point, as well as other merchandising and contextual factors. If an entire promotion or an extra discount is offered only to certain consumers, product sales forecasts need to account for this new promotional factor. Sales volume should be allocated to only products bought at each specific price. Therefore, the promotional history database needs to be expanded to include customer loyalty discounted sales separately from other sales. Retailers and manufacturers will need to access information about the historical redemption of card discounts for each product and store. [Node 45 end]

Social: Industry issues

PromoCast generates promotional forecasts for the 4000+ grocery stores that are serviced by EMS. During the 1980s and '90s, mass merchandisers formed, based on the philosophy of low-cost, high-volume production, which moved most operations towards this and away from the traditional "mom and pop" store. [Node 46] Mass merchandisers have a competitive advantage in their ability to purchase products in greater quantities and sell them rapidly. [Node 46 end]

This shift in consumer purchase behaviour affects grocery promotional decision making and the development of PromoCast. Currently there are a lot of out-of-stocks, and sales volumes are often underestimated. Furthermore, despite additional display space, stores have limited stocking capacity even for [Node 47] promoted goods, and restocking is often lax. Product out-of-stocks create a situation in which consumers want a product, but cannot purchase it. [Node 47 end] The retailer may have actually lured them to the store with that specific promotion, and the customers can react by buying an alternate brand or looking for the product in another store. With PromoCast's better forecasting, this can be prevented.

The shift to mass merchandisers should also affect PromoCast's product planning. The expected demand for a particular promotion in a grocery chain will be reduced if customers increasingly find purchasing their goods from mass merchandisers more attractive. As mass merchandisers invade a territory, the historical sales period

might need to be shortened from its current 2.5-year span toward the minimum span of one year to better reflect sales expectations. Moreover, the existence of simultaneous promotions at mass merchandisers will affect grocery deal volume and [Node 48] PromoCast may need to include competitive retailer behaviour. [Node 48 end]

The changing role of women in the workplace, and thus their schedules, is causing pressure on the grocery industry to arrange their operating hours around the changing schedules of their customers. [Node 49] Grocery retailers have reacted by expanded their shopping hours and offering services reducing the dependence on in-person shopping, [Node 49 end] such as [Node 50] on-line shopping and delivery. PromoCast must consider how these changes affect the accuracy of its promotional forecast and the demand for its services. [Node 50 end]

Social: Infrastructure issues

PromoCast provides information about the purchasing behaviour of retail grocery consumers. Buying decisions are influenced by the type and the attractiveness of a promotion. [Node 51] The evolving demographic makeup of the consumer population is changing. Historical information about consumer purchasing decisions are representative of the customer population at that time. Attachment to particular products and response to different promotion types are correlated with age, sex, race, income, and family size of the purchaser. If these characteristics evolve within our consumer base, so must our inferences about their purchase behaviour. The aging of the baby boomer generation is creating a powerful shift in the population demographic composition, and this affects consumer packaged goods; a large increase in the 50-59 age group and a large decrease in the 40-49 age group are taking place. Thus, past sales information is becoming rapidly obsolete. As the population matures, their purchasing decisions will reflect their new lives. For instance, children of baby boomers have now moved out of the house, and baby boomers are becoming grandparents.

To determine the effect the aging of the population will have on PromoCast, one important consideration is the demographic effect on store traffic. [Node 51 end] Traditionally, consumers spend an average of 2.2 hours

weekly (source: FMI) at a local grocery store. New services are becoming available that allow grocery customers to purchase products from home over the Internet. [Node 52] The combination of the availability of home shopping and the aging of the population will significantly reduce store traffic. Furthermore, traditional promotional activity, which is based on the assumption of in-person interaction between the purchaser and the point-of-sale, will need to be re-evaluated. [Node 52 end]

When shopping with their computer, consumers still have access to information about promotions. However, they can immediately purchase these goods, which feature ads as an advance notice of. More significantly, the visual effect of the point-of-purchase is eliminated unless the on-line provider uses a form of interactive display, for example, a graphical banner. When consumers purchase groceries in the store, displays create an excitement about the product, which is eliminated with on-line shopping. Display location is critical to the success of a promotion because it needs to be apparent to consumers who normally don't purchase this product or have just forgotten to purchase it. Historical information proves that more visible product displays generate stronger sales. Product vendor representatives often pay for valuable display space. Large, eye-catching displays not only serve as deal information providers and extra stocking location, but also create a perception of vitality. Consumers perceive the product deal to be attractive to others and do not want to be left out. The absence of displays during on-line purchasing reduces the electric atmosphere from a deal. The features of the promotion become more prominent since the consumer reduces decision making mostly to price and their personal value for the product. Retailers and manufacturers can address this effect by creating elaborate on-line displays, such as video commercials. Promotion forecasting methodology must respond to this evolution in the social environment in which grocery products are marketed.

Technological: Company issues

The technological architecture that composes PromoCast has three main function components: 1) PromoCast Extract, the process for creating the parameters and data support tables for the PromoCast Engine to use; 2) PromoCast Engine, the forecast model that

receives the client's promotional information inputs and creates a forecast; and 3) PromoCast Interface, the communication process for receiving "order" requests for promotion forecasts and sending completed forecasts back to the client in an agreed-upon format.

[Node 53] Technological issues that are critical to PromoCast's success include the quality of historical promotion input data, [Node 53 end] [Node 54] the accuracy of the promotion forecast, [Node 54 end] and the [Node 55] ability to exchange important information with clients. [Node 55 end] PromoCast requires the ability to complete these tasks effectively and cost efficiently at varying levels of scale.

EMS creates forecast algorithms from sales data by each individual deal event. Using datamining techniques, they can identify many systematic errors and reduce them by about ten percent (Cooper & Giuffrida 2000). For instance, while overall errors are unbiased, there might be a tendency to underforecast a major promotion for Folger's or overforecast a promotion for a store private label brand. Detecting and correcting such patterns are a good use of datamining.

There needs to be efficient communication between EMS and clients. First, the client must inform EMS of their promotional conditions. [Node 57] EMS must link this order entry process with their other systems, such as billing, to ensure proper tracking. Most importantly, a completed forecast needs to be communicated to the client in a manner that fits into their promotion planning systems. [Node 57 end] [Node 60] A common delivery format, such as an EDI transmission, must be used to ensure acceptance and reduce customization costs. [Node 60 end]

[Node 59] The forecast's delivery medium will optimally be through a direct TCP/IP network link to each retail store. The retailer should accept the forecast into their computer-aided ordering system to be combined with non-deal volume forecasts. The PromoCast forecast server can physically exist anywhere, including the retailer's headquarters. For retail clients that cannot be connected directly, EMS is planning to develop both off-line and an ad hoc forecasting services. [Node 59 end] [Node 60] While information would become more actionable

through faster delivery, information usage will be beyond the control of EMS. EMS must ensure that their forecasting knowledge competitive advantage and client information are secure. [Node 60 end]

Technological: Industry issues

The larger vision of PromoCast's promotion forecasting ability is to place the forecast within the consumer packaged goods industry's overall supply chain process and execute their operations based on consumer demand. The supply chain information flow direction shift is the objective of ECR. The PromoCast forecast provides information to all parties involved to maximize each one's total net benefits. Consumer packaged goods vendors and grocery retailers must seek to reduce inefficiencies and costs.

[Node 61] The key to an integrative relationship in the grocery industry is to communicate information throughout the supply chain as if one's suppliers and customers were an extension of one's business. However, inter-company communication is difficult. [Node 61 end] The separate companies of the grocery industry use a standardized version of electronic data interchange (EDI) to communicate business transactions and processes. EDI is able to promote efficient communication and integration.

The emergence of consumer POS data enables retailers to inform parties in the supply chain about product needs. Similarly, PromoCast forecasts communicate deal product requirements to suppliers and drive planning and execution. The aggregate sales for the chain market can prepare the retail and manufacturer distributors as well as the vendors. [Node 62] EDI replaces old systems with instant order creation, entry, and reconciliation processes. ECR presents information opportunities with a short timeframe on which to capitalize. Particularly valuable in the grocery industry where margins are so slim, companies can use EDI technology to communicate and seize on profit possibilities. [Node 62 end]

EMS should help retailers integrate forecasts into their supply chain management so that the retailers will be able to transmit information back through the supply chain quickly to the distributors and manufacturers.

Technological infrastructure Issues

Supply chain processes in general are changing from a vendor-driven to a consumer-driven orientation. The growing availability of consumer behaviour information and the ability to communicate knowledge quickly and efficiently has positioned markets to change their production, logistics, and sales processes.

The lead supplier in supply chain software applications is Systems, Applications, and Products in Data Processing (SAP). SAP produces client/server solutions that redesign workflow to be more integrative. They provide quality, usable, real-time information about business activity to employees, suppliers, distributors, and customers. SAP creates a partnership among supply chain firms across a virtual private network. They help product flow move in the opposite direction of information and cash flow, as well as reducing cycle time and costs. Only products and services that are demanded by customers are manufactured, stocked, shipped, and offered.

Industries can structure their operations around changing customer needs through new access to customer information. Since information flows back from retail to production, consumer information is the critical starting point. EMS has positioned itself as the information supplier to the new model of supply chain management. EMS must monitor the direction that supply chain management systems firms such as SAP are headed. The vision of integrated supply decision making must influence the direction of PromoCast.

The emergence of inter-company co-operation forces firms to rely on each other. [Node 63] The degree of trust between partners must be high for integrative supply to be realized. Trust includes honest, accurate, and reliable communication, all of which apply to PromoCast. [Node 63 end] Supply partners depend on consistent access to product need information. If the information transmission cannot be counted on, due to either user or system error, the system breaks down. Production decisions cannot be based on partial information. Also, supply chain firms need to trust each other to view their relationship as a long-term partnership. Gone are the days when manufacturers tried to send in

abundant product in hopes of higher than reasonably expected sales. Finally, the information must be viewed as consistently accurate. If history proves a high error rate, inventory levels cannot be reduced and supply chain personnel will override order expectations.

Making the network

After articulating the critical issues, one must map them into a Bayesian network to grasp the supporting and resisting forces involved and their relationship with each other. The nodes are neither random disconnected events nor all interconnected. The strategic conversation should help in forming the framework that connects the nodes. Nodes should be organized into content groups or slightly larger issues; these groups should form their own issue clusters. This organization of nodes should continue until all nodes eventually branch into a final node, typically representing the overall objective of the project. The construction of the multi-level network can proceed top down, combining individual issues to create larger nodes, or bottom up, using a logical strategic framework within which one can place individual nodes. Node names should be created by simplifying issues into a clear, concise node phrases, such as "store traffic change". In addition, the organization of the network may allow one to re-examine potential nodes and consider adding or modifying them based on the framework used for the network.

For example, a final node could be named "probability of PromoCast viability" with all nodes feeding into it and determining its outcomes and probabilities. In this case, the product planner would be able to determine the likelihood of different levels of success or adoption. The first set of branches is an aggregation of individual issues and most directly influences the final node. For the PromoCast case, they could relate to the firm's ability to supply the product, the retailer and manufacturer demand level, and their competitive threat, as shown in Figure 1. The retailer and manufacturer demand level is influenced by industry trends (Figure 2), customer costs and benefits (Figure 3), and their ability to integrate PromoCast into their ongoing operations (Figure 4). Figure 5 elaborates the factors influencing EMS's ability to supply PromoCast, while Figure 6 describes the competitive threats. Reading these figures gives both a feel for

how the issues (indicated in brackets) either increase or decrease the viability of PromoCast. What follows is a reading of the influence structure that takes us that first step toward quantifying the impact of these forces.

Try reading the descriptions below while following the relevant paths in the appropriate figures. This should help you describe your own planning networks to other managers without requiring them to read the whole strategic conversation.

Manufacturer: Retailer demand

One factor that will determine the likelihood of success of PromoCast is customer demand. For this product, the key customers are the grocery retailer and the consumer-packaged goods retailer. The main determinants of their demand are: 1) the direction of the industry as a whole and whether PromoCast fits that direction; 2) their costs and benefits derived by PromoCast; and 3) their ability to integrate PromoCast into their existing systems.

Industry trends

Industry trends are more likely to improve customer demand when: 1) the future of ECR [61] is promising and 2) consumer trends are positive. Consumer trends threaten PromoCast when 1) store traffic changes [52] and 2) buying patterns change [49]. First, buying patterns are likely to change if customer loyalty programs become powerful [44]. Second, store traffic will change when 1) customer demographics change [51]; 2) on-line shopping becomes powerful [50]; and 3) more customers switch to mass merchandisers [46].

Customer costs/benefits

Improvements in the cost-benefit trade-off result from: 1) improvements in the retailer/manufacturer relationship; 2) the perception of that PromoCast is a value-added service; and 3) whether the customer seeks new features [43b].

The retailer-manufacturer relationship improves when PromoCast results in: 1) fewer order refusals [19]; 2) less time debating orders [27]; 3) improved trust between parties [21]; and 4) retailers and manufacturers have less conflict of interest in ordering [11]. Ordering conflict of interest results from the retailer's motivation to lower in-store inventory [17] and the manufacturer's motivation to

Figure 1

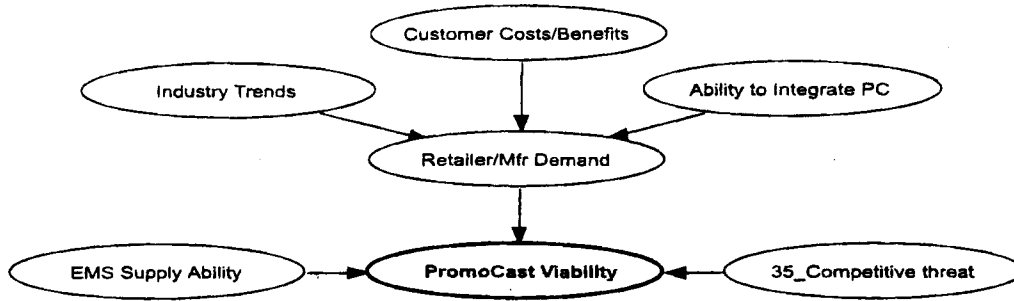


Figure 2

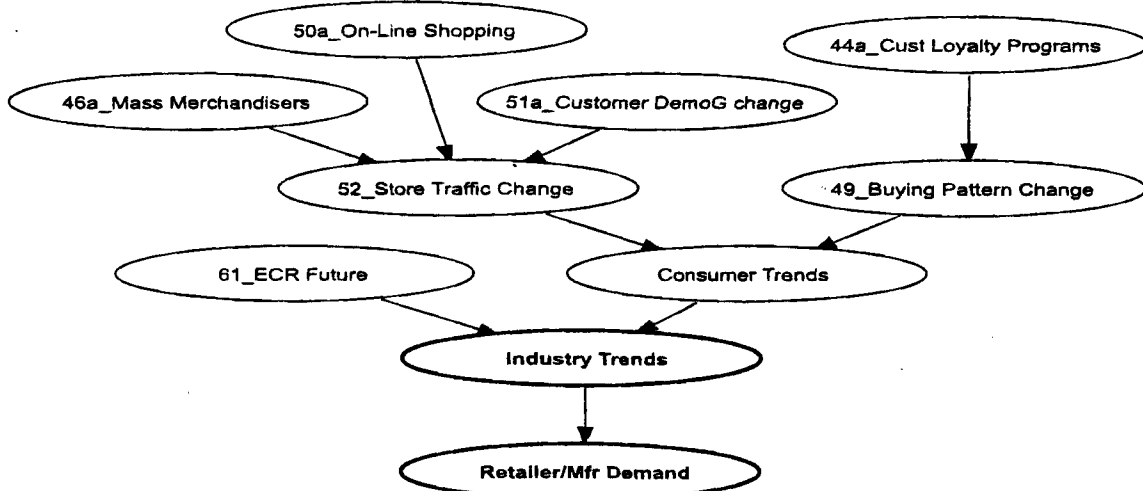


Figure 3

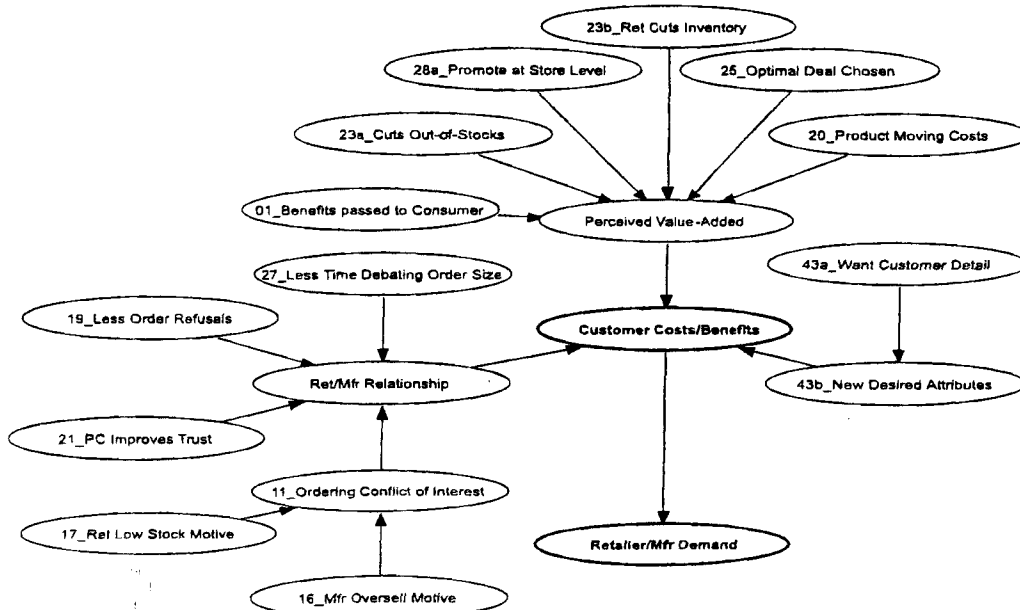


Figure 4

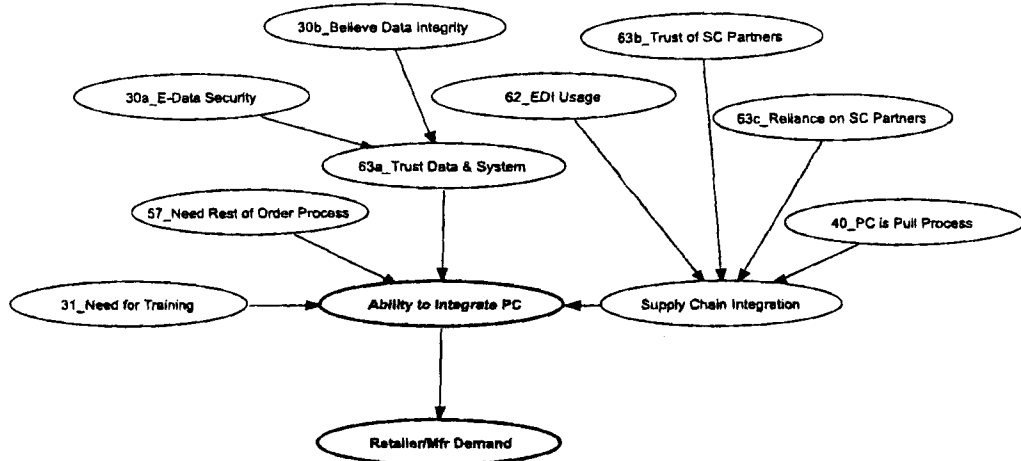


Figure 5

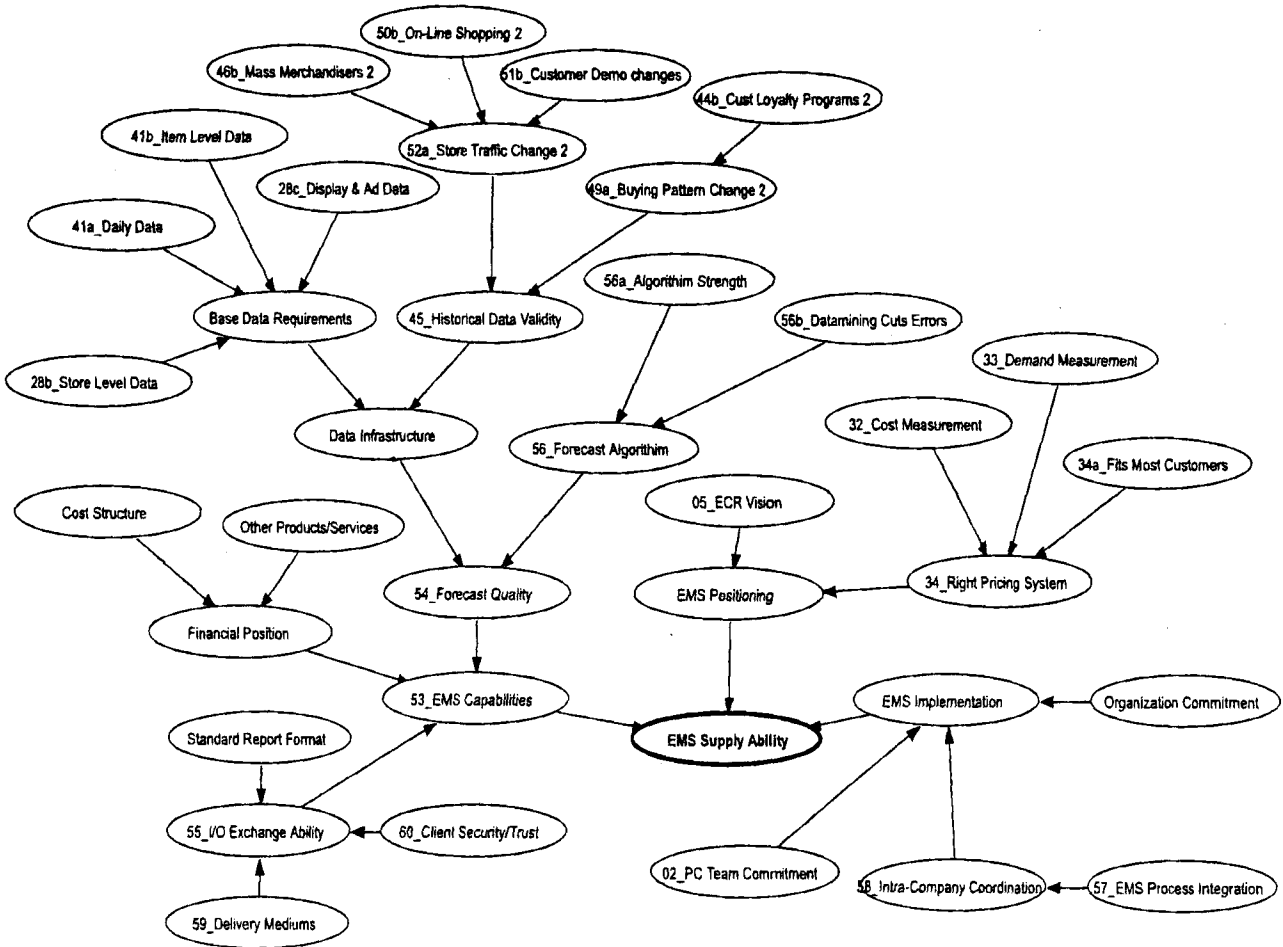
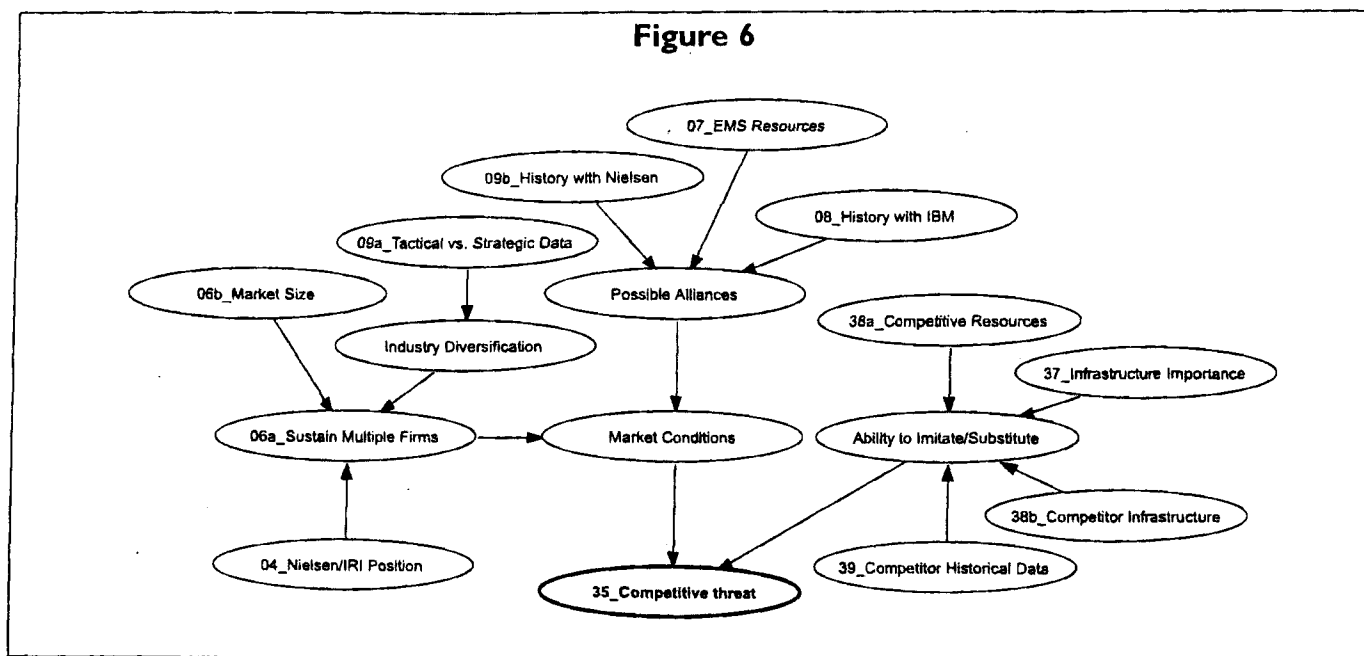


Figure 6



stock as much as possible to maximize sales potential [16].

PromoCast is perceived to add value when 1) the benefits of the service can be passed on to the consumer [1]; 2) out-of-stocks are reduced [23]; 3) promotions can be implemented at the store-level [28]; 4) retail inventory can be reduced [23]; 5) an optimal deal can be chosen [25]; and 6) product transportation costs are reduced [20].

The customer seeks new features when more detail than data by item, by store, by promotion is desired by the retailer or manufacturer [43a]. For instance, customers may demand data with transaction-level detail.

Integrating PromoCast into systems

Customers are less likely to integrate PromoCast into their systems when 1) training is needed [31]; 2) trust of PromoCast data and the system are low [63]; 3) customers want and need a fully integrated promotion planning system (no longer part of the product) [57]; and 4) they can integrate it into their supply chain processes. Customer trust levels improve with 1) proof of security when dealing with electronic data [30a] and 2) a perception of data integrity [30b]. Supply chain integration is more likely to occur when 1) EDI can be used [62]; 2) supply chain partner trust is high [63]; 3) reliance on supply chain partners is high [63]; and 4) PromoCast

facilitates a product pull process [40].

EMS ability to supply

Another main factor that will determine the likelihood of success of PromoCast is the ability of EMS, the designer and owner of the product, to supply PromoCast and its supporting services effectively and efficiently. The main determinants of their ability to supply are the company's 1) capabilities [53], 2) positioning, and 3) implementation.

EMS capabilities

EMS will be more capable of supply the PromoCast service if 1) their financial position is strong; 2) the product's forecast quality is solid [54]; and 3) they are able to easily exchange PromoCast input and output with customers [55].

First, their financial position is strong if 1. other products and services provide a solid stream of revenue and 2. their cost structure consists of lower fixed costs.

Second, the PromoCast forecast will be more accurate given they have 1) the right infrastructure and 2) the optimal forecast algorithm [56]. They have the right infrastructure given 1) they have the base data requirements, which are daily data [41a], store-level data [28b], item-level data [41b], and feature and display information [28c]; and 2) their historical data validity is high [45], which is decreased when the store traffic changes

[52] and the customer buying patterns change. As discussed earlier, buying patterns are likely to change if customer loyalty programs become powerful [44] and store traffic will change when 1) customer demographics change [51]; 2) on-line shopping becomes powerful [46]; and 3) more customers switch to mass merchandisers [46]. The forecast that drives PromoCast is optimal when 1) the original forecast is reliable [56a] and 2) datamining can reduce errors in the original forecast [56b].

Third, exchange of input and output between EMS and customers [55] is simplified when 1) desirable delivery mediums are provided [59]; 2) The reporting format is standardized; and 3) security and trust issues by the client are managed well [60].

EMS positioning

The likelihood of EMS supplying the right product also depends on their positioning. The positioning by EMS is improved if 1) PromoCast fits the ECR vision [5] and 2) EMS offers the right pricing [34]. The appropriateness of their pricing improves when 1) they fully understand their costs and cost structure [32]; 2) they can accurately measure demand for PromoCast [33]; and 3) their pricing can be uniform to fit the majority of their customers [34].

EMS implementation

Implementation of the product and support plan will also be a chief determinant of their ability to supply PromoCast. Implementation improves with strong commitment by the PromoCast product team [2], organizational commitment [64], and inter-departmental coordination [58], which in turn depends on their level of process integration [57].

Competitive threat

A final factor that will determine the likelihood of success of PromoCast is the threat posed by competitors

[35]. Competition for PromoCast increases when 1) market conditions encourage increased competition and 2) competitors have a strong ability to imitate or substitute for PromoCast.

Market conditions

Market conditions decrease the competitive threat toward PromoCast when 1) the industry can support many firms [6] and 2) EMS can make alliances with firms to improve their product and service offering. First, the industry can support many firms when 1) the market is large; 2) competitors such as IRI and Nielsen are positioned closer to EMS [4]; and 3) diversification within the industry is high, which depends on whether tactical and strategic data form distinct and separate market niches [9]. Second, EMS will be more likely to forge alliances if 1) their history with the Nielsen partnership is viewed positively [9]; 2) their history with the IBM partnership is viewed positively [8]; and 3) they lack the necessary resources to keep pace with demand for PromoCast [7].

Ability to imitate or substitute

The ability of competition to either imitate or substitute for PromoCast increases if 1) the competition has the necessary resources [38a]; 2) the importance of the EMS model infrastructure is reduced [37]; 3) the competition has or can acquire the necessary infrastructure [38b]; and 4) the competition possesses valid historical data [39].

Quantifying the network

Once the network is constructed, you need to start filling in the numbers. Each arrow in the network represents a conditional relation specifying how the possible states of the parent node (source of the arrow) affect the child node (destination of the arrow). Only the direct parents affect the child node, but there will be as many conditional probabilities as combination of all states in the direct parent nodes times the number of states in the

Table I

35_Compétitive threat EMS Supply Ability Retailer/Mfr Demand	Strong Competitive Threat				Weak Competitive Threat			
	Can Supply		Cannot Supply		Can Supply		Cannot Supply	
	Want PC	Don't want	Want PC	Don't want	Want PC	Don't want	Want PC	Don't want
PC Success	0.7	0.2	0.3	0	1	0.5	0.6	0.1
PC Failure	0.3	0.8	0.7	1	0	0.5	0.4	0.9

Table 2
Probabilities under default conditions for nodes in Figure 2

	<u>Yes</u>	<u>No</u>
Customer loyalty programs become powerful	70	30
Mass Merchandisers - More customers shift to	40	60
Buying patterns change	49	51
On-line shopping become powerful	60	40
Customer demographics change	90	10
Store traffic changes	76	24
ECR Future good	80	20
Customer trends change	69	31
Industry trends are positive	66	34
Ret/Mfr relationship improves	46	54

Table 3
Probabilities under default conditions for nodes in Figure 3

	<u>Yes</u>	<u>No</u>
Benefits passed to consumers	100	0
Ordering conflict of interest	100	0
Mfr has overall motive	100	0
Retailer has low inventory motive	100	0
Less order refusals	70	30
Producing moving costs - less	70	30
PC improves CM/BM trust	50	50
Cuts out-of-stocks - OOS reduced	90	10
Ret cuts inventory	80	20
Chooses optimal deal	90	10
Less time debating order size	20	80
Promote at store level	100	0
Ret want customer detail	60	40
New desired attributes	66	34
Customer costs/benefits	60	40
Perceived value added	82	18
Ret/Mfr relationship improves	46	54
Retailer/Mfr demand - want pc	47	53

child node. For example, Table 1 shows the conditional probabilities for the final node (PromoCast viability). It is directly affected by competitive threat (strong or weak), EMS ability to supply PromoCast (can supply or cannot supply), and retailer/manufacturer demand (retailers/manufacturers want PromoCast or retailers/manufacturers do not want). Thus, we need $2 \leftrightarrow 2 \leftrightarrow 2 \leftrightarrow 2 = 16$ conditional probabilities for this

Table 4
Probabilities under default conditions for nodes in Figure 4

	<u>Yes</u>	<u>No</u>
E-Data security	47	53
Believe data integrity	60	40
Need for training - can train	90	10
PC is pull process	100	0
Need rest of order process	100	0
Use EDI	90	10
Trust data system	47	53
Trust supply chain partners	60	40
Needs supply chain partners	100	0
Able to integrate PC	54	46
Ret/Mfr want PC	47	53
Can integrate supply chain	77	23

table. We ask, "What is the probability of PromoCast's success if there is a strong competitive threat, but EMS can supply PromoCast and the retailers/manufacturers want it. In this case the estimate is 0.7. Fifteen other conditional probabilities fill out this table. These must be supplied by the planning team for this table and the table behind every other child node in the network. These estimates can be rough at first, and then refined through research or growth in expertise.

While the concepts involved in each node are useful in mapping our understanding of the planning context, the states within each node carry the practical meaning — what events must be monitored, what exact research questions must be researched, and what expert knowledge must be found. In Table 2, for example, the states on 46a mass merchandisers indicate that planners must monitor the customer shifts away from grocery retailers towards mass merchandisers. Increasing customer shifts should alter the conditional probabilities for each state. Thus, the states listed in these table are important indications of exactly what monitors need to be established.

After the entire network of nodes has the conditional probabilities filled in, we can compile the network to see the marginal probabilities under the default assumptions. (The complete set of tables and final network are available on the Project Action Web site: <<http://164.67.164.88/>

Table 5
Probabilities under default conditions for nodes in Figure 5

	<u>Yes</u>	<u>No</u>	
Good team commitment	70	30	
Fits ECR Vision	90	10	
Have store-level data	100	0	
Have display/ad data	100	0	
Can measure costs	30	70	
Can measure demand	50	50	
Right pricing system	46	54	
Uniform pricing fits most customers	50	50	
Have daily data	100	0	
Have item level data	100	0	
Customer loyalty programs become powerful	70	30	
Valid historical data validity	31	69	
Mass merchandisers - more customers shift to	40	60	
Buying patterns change	49	51	
On-line shopping becomes powerful	60	40	
Customer demographic changes	90	10	
Store traffic changes	76	24	
EMS possess capabilities	54	46	
Optimal forecast	67	33	
I/O can exchange data	67	33	
Optimal forecast algorithm	80	20	
Right algorithm strength	90	10	
Datamining significantly reduces errors	80	20	
Good internal EMS process integration	60	40	
Good internal intra-company coordination	52	48	
Provide desired delivery mediums	60	40	
Client/security trust - control security issues	90	10	
Have base data requirements	100	0	
High fixed cost structure	100	0	
Have right data infrastructure	62	38	
Good EMS implementation	43	57	
Right EMS positioning	60	40	
Can supply EMS ability	43	57	
Strong organization commitment	50	50	
Other products/services - solid revenue stream	60	40	
Standardize reporting format	70	30	
Financial position	Strong 36	Medium 30	Weak 34

Table 6
Probabilities under default conditions for nodes in Figure 6

	<u>Yes</u>	<u>No</u>	
Nielson/IRI position - Direct threat	60	40	
Can sustain multiple firms	61	39	
EMS - already have resources	30	70	
Positive history with IBM	10	90	
Tactical vs. strategic data - no direct competition	100	0	
Positive history with Nielsen	20	80	
Strong competitive threat	49	51	
Infrastructure importance - critical	90	10	
Have competitive resources	80	20	
Have competitor infrastructure	30	70	
Have historical competitive data	10	90	
Can imitate/substitute	37	63	
High industry diversification	70	30	
Good market conditions	55	45	
Alliance possibility	48	52	
Market size	Large 30	Medium 60	Small 10

Table 7
Elasticity for 20 top nodes on PromoCast viability

<u>Node name</u>	<u>Elasticity</u>
Ret/Mfr demand	0.53
53 EMS capabilities	0.45
EMS supply ability	0.38
Customer costs/benefits	0.37
Perceived value added	0.34
35 competitive threat	0.30
Ability to integrate PC	0.21
23b Ret cuts inventory	0.15
Supply chain integration	0.14
54 forecast quality	0.14
Market conditions	0.13
31 need for training	0.12
EMS implementation	0.11
EMS positioning	0.09
56 forecast algorithm	0.09
23a cuts out of stocks	0.09
06a sustain multiple firms	0.07
Data infrastructure	0.07
63a trust data and system	0.07
Ability to imitate/substitute	0.07

research_projects.htm#PromoCast Case>. The network is constructed using HuginLite 5.3, available at no charge from <<http://www.Hugin.dk>>. Tables 2–6 have the compiled probabilities that correspond to the networks presented in Figures 2–6 respectively.

Scenario and sensitivity analysis

The final step in the planning process attempts to understand how the likelihood of success changes with the inevitable changes in the internal and external environment; there are two basic approaches to this. The first is scenario analysis (Schwartz 1996). This approach does not try to forecast the future; rather it tries to look at a range of possible futures, seeking to understand how plans hold up (qualitatively) to a variety of possibilities. Once the network is established, however, a very quantitative version of scenario analysis is possible. All key events that trigger different scenarios should already be in the network. To assess the impact of different scenarios, we simply need to change the likelihood in the compiled node list (Tables 2–6) and propagate that change through the network. (The “Summ Propagate” tool in Hugin Lite does this for any combination of scenario events.) For example, under default conditions, the network asserts that PromoCast has a 39% chance of success. If competitors increase their ability to imitate or provide a substitute for PromoCast, the network reassesses the success likelihood down to 35%.

The second approach involves sensitivity analysis. We use elasticity measures to reflect sensitivity. The basic question is what percentage change in a destination nodes occurs with a percentage in an source node. For the example above, the elasticity is 0.07, just high enough to make the top 20 list in Table 7. This table shows the 20 nodes that most affect our criterion “PromoCast viability”. Note that the most impact comes from the aggregate nodes such as “retailer/manufacture demand” or “53 EMS capabilities”. We could look into the sensitivity of these nodes in turn. The process becomes simpler, in that only parent nodes can have non-zero elasticity with child nodes. The arrows in the network are meaningful. You must be able to follow the arrow points from a source node to a destination node for there to be any elasticity.

Conclusion

While a story needs a beginning, a middle, and an end, a process requires just a place to start and a way to take the next step. We start the planning process by trying to understand the forces that have an impact on the viability of PromoCast — staying divergent enough to consider the political, behavioural, economic, sociological, and technological environments from the points of view of the company, the business ecosystem, and the broader infrastructure. We continue by distilling the critical issues into a visual network of over 60 nodes. Asking simple questions about the conditional likelihood of outcomes under different assumptions, we quantify a Bayesian network. The network allows us to simulate different scenarios representing possible futures, and assess the sensitivity of any nodes to changes in the antecedent conditions.

We know that our understanding at any point is partial and uncertain. Some of the numbers in the network are very subjective guesses. Others reflect more expert judgment on industry trends and technological capabilities. But at any point we have a comprehensive set of rather specific, researchable questions. Thus, we know what are the next steps to take to increase our certainty in the network. We have a place to begin and a way to take the next step.

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