RC21820 (98178) 7 August 2000 **Electronic Commerce**

Research Report

Distribution Channels in Insurance

Pasumarti V. Kamesam
IBM T. J. Watson Research Center
P. O. Box 218
Yorktown Heights, NY 10598

Avi Giloni, Sridhar Seshadri
Operations Management Department
Leonard N. Stern School of Business
New York University
40, W 4th Street, New York, NY 10012

Distribution Channels in Insurance

Abstract

This paper describes the changes and forces that are making insurance firms rethink their distribution strategies. A set of questions related to distribution that are uppermost in the minds of executives in this industry are presented along with a literature survey of the models that can be used to answer some of these questions. Based on the survey, a normative framework for determining the mix and the intensity of channels is proposed. Qualitative and quantitative analysis based on the proposed framework is presented along with empirical data to demonstrate the usefulness of the framework. The paper concludes with an agenda for further research.

Key Words: Financial Services, Insurance, Channel Design, Mathematical Programming

Distribution Channels in Insurance

1. Introduction

Insurance firms are faced with a wide range of challenges such as how to decide the mix of products and services to offer to their customers, how to distribute their products and how to improve the efficiency of their operations (Wilcox[1996]). Several developments over the last few years, such as globalization and mergers between financial services companies and insurance companies as well as the emergence of electronic commerce have compounded some of these challenges. Specifically, firms have to decide (i) which products and services are to be provided at what prices and to which segment of customers, (ii) which channels are to be utilized to reach the various customer segments, for example, should one channel be used exclusively or should the channel strategy include a mix of different channels, (iii) how to optimally allocate resources to the various channels for serving different customer segments, and (iv) how to achieve operational efficiency and effectiveness, in particular, determine the most effective use of information technology? We define this collection of decisions to be the integrated distribution channel design problem.

A recent study (IBM/Economist 1996) shows that nearly 60% of the insurance executives surveyed are not confident that their current channel strategies address the evolving needs of their customers. While this may be dismissed as an "opinion" of managers, it is hard to refute the fact that insurance firms have not been able to deliver products and services to nearly 38% of US households who are currently either uninsured or under insured (Flur and Lowie, *Business Week* 1998).

Not withstanding the uniform concern of insurance managers about their channel strategy, both the distribution channel design problem and its solution differ from firm to firm. The firms in this industry range widely in size, whether size is measured in terms of total employees, total assets, or annual premiums. Yet, each firm has to choose a channel structure to deliver its products and services as well as to perform many other functions that are described in Section 5. While it follows that the customer segments that a firm wishes to target should determine the firm's distribution channel design, it is not quite clear how to exactly model and solve this problem. We therefore address the modeling aspects of this problem and propose an integrated approach to channel design in this paper. Our approach is normative, so that the questions that are the uppermost in the minds of managers as listed at the end of this section can be answered. In Section 4 we establish some theoretical properties of the solution to the channel design problem, and we apply these properties in Section 5 to explain the co-existense of exclusive and independent agency firms in the property casualty sector of this industry.

We place emphasis on distribution because, nearly, 67% of the operating costs of an insurance firm in the property casualty (P/C) markets are related to distribution channel operations (Berger, Cummins and Weiss [1995], Cook and Cummins [1996]), and a similar proportion of the operating costs is attributed to distribution channel operations in the life insurance market. It is further estimated that over 40% of distribution costs are related to agent commissions (Insurance Advisory Board [1998]). In addition, a recent survey (Tillinghat-Tower Perrin, 1997) shows that nearly a third of the discretionary spending in the life insurance industry is spent on distribution channel development.

Distribution operations in this industry can be classified in terms of the (customer) service functions performed, such as, providing product information, claims processing, and the provision of account summaries. Insurance firms have a multiplicity of choices with regard to which channel to use to provide these service functions to their customers. Some of the familiar channels used by insurance firms are: The use of independent agency firms, the use of exclusive agency firms, direct sales, call centers, mail order systems, bundling with financial products, selling through affinity groups, and the use of an electronic marketplace such as the Internet (IBM/Economist [1996]). In Table 1 we show the current mix of channels deployed by firms in this industry. This data indicates that firms use multiple distribution channels.

Multiple distribution channels are advocated in theory since a multi-channel strategy enables the firm to reach and serve many different types of customer segments that have different preferences as well as geographical locations (Kennickell and Kwast [1997]). Bowersox and Cooper [1992] suggest that "while few services may *require* only one method of contact, the extent of such situations is actually limited," and that searching for alternative contact methods might yield significant rewards. As an example, they cite USAA's success in its strategy of relying both on the telephone and mail to communicate with its customers. Besides adding to effectiveness, a firm chooses to use multiple channels so that less expensive routes of distribution are used to reach those customers who either prefer such a route or are unwilling to spend more for personalized service.

Multiple distribution channels might not be appropriate for all firms, e.g., smaller firms that depend on targeting niche markets are often observed to use very few but specialized channels to serve their customers. For example, it is well documented that high-end customers within the banking industry are willing to spend more money for services performed by personnel as opposed to automated service (Soteriou and Zenios [1997], Roth and Jackson [1995], and Heskett et al [1994]). Such customers could be targeted by small firms. Thus, the determination of the mix and the intensity of channels to be deployed to meet the strategic and operational objectives of a firm is central to the channel design problem. This paper provides an approach to formulate and solve this problem. In addition, the paper is aimed at providing answers to some of the key strategic questions on the minds of executives in this industry. These questions were elicited during informal contact over the last two years and are listed below.

- How can an insurance company effectively segment customers and provide the right level of support and service based on the segmentation ?
- How can an insurance company nurture emerging channels (such as direct sales, Internet) without alienating the existing (agents) channels ?
- How can an insurance company create an information and technology based culture to build efficient and customer segment based services ?
- How can an insurance company harness technology to decrease the costs of distribution ?
- The cross selling concept is leading to mergers and acquisitions (M&A). How real are the possibilities of cross-selling? What forms are they likely to take? Should every firm adopt an M&A strategy ?

This paper provides a framework for addressing the above questions. The rest of this paper is organized as follows. In Section 2, we highlight some of the major factors of change that are likely to affect this industry. In this section we also present the new technologies that are becoming available and how they are related to the channel design decision. In Section 3, we summarize some of the competitive priorities that have a significant impact on the channel design problem. In Section 4, we review the literature on models for the channel design problem and in Section 5 examine the scope for applying these models in the context of insurance. In Section 6, we identify opportunities for developing appropriate models for decision support.

2. Factors Hastening Change in the Distribution of Insurance Products and Services

Over the past two decades, there has been a significant change in the demand for products and services offered by insurance firms. In the early eighties, insurance companies offered whole life, term and annuity products to mass market mostly through agents (independent or exclusive). Competitive advantage in this set up was derived through maintaining and enhancing customer-agent relationship. While this strategy might have sufficed to survive and even to be profitable in an expanding market for insurance products, such a strategy is quite inadequate nowadays -- because over the last decade consumer demand for life and health protection as well as cash value insurance has leveled off. For life insurance industry, investment business has grown dramatically, while cash value business has remained flat[1].

Despite this change in demand, in many insurance firms the current channel structure is either a legacy of the past, or is evolving very slowly and cautiously. A recent survey (IBM/Economist [1996]), see Table 1, reported managerial perceptions regarding the future of different distribution channels in this industry. Based on this survey, it is somewhat surprising to find that the executives surveyed do not anticipate more dramatic changes in the channel structure five years from now. The table also shows that today's insurance companies can deploy a number of alternative channels. The new channels (any means other than the use of agents can be considered to be new) are viable options. In other industry contexts, such as banking and investment, the use of these alternative channels has led to lower costs, lower front end commission costs, and in some instances created opportunities to cross-sell products.

---

[1] From 1985 to 1995, investment business had an annual growth rate of 18% higher than cash value life, whereas the life and health protection business declined (Tillinghat-Tower Perrin, 1997).

Channel	Year 1,995[2] (%)	Projected 2,000[2] (%)
Independent agents	51	42
Tied or captive agents	32	27
Direct Telephone	6	11
Internet	1	6
Bundled Products	1	3
Other	10	11

Table 1: Mix of Channels Used by the Insurance Industry

There are forces other than changing demand patterns and the availability of alternate channels that are likely to force insurance firms to rethink their distribution strategies. The most important of these forces are: changing customer preferences, advances in technology, and government deregulation that has led to the emergence of new players especially banks (Shelton [1995], IBM/Economist [1996], Kan [1997], Rometty and Morrison [1996], and Morrison and Yellin [1996]). These forces are described below.

2.1 Customer Preferences

As described at the beginning of this section, changing customers preferences have changed the nature of demand for insurance products. Apart from this macro-economic phenomenon, it is important to note that a customer's preferences for different aspects of the product or service offered by an insurance firm determine their value. This in turn impacts which channel should be used to perform different service functions, such as, claim settlement, advising customers about insurance needs, and responding to customer inquiries. Some customers might greatly value the saving in time provided by an independent agency firm in performing these services on behalf of the customer. Others might either be more price conscious or might value these services much less and consequently prefer to use an exclusive agent or a direct sales channel (like the telephone or the Internet). Moreover, customer preferences should not be expected to remain unchanged given the rapid developments taking place in information and communication technology (see Section 2.2). (Sixty six percent of the respondents to the IBM/Economist

[2] IBM/Economist 1996

survey say that changing customer preferences will become an important or the most important single factor influencing the global market place for insurance.)

The problem for an insurance firm is to map the set of preferences or change in the set of preferences with regard to *service functions* into a channel design. In Section 4, we describe a modeling framework in which a value can be attached to performing a service function by any given channel. Such a map of value to service functions can then be used to determine which channel(s) should perform what function.

Customer preferences also have a lot to do with answering an important question in the channel design problem, namely, whether or not a single channel should be used to serve a specific market. In the P/C industry, this question has been studied in the context of why independent agency firms coexist with exclusive agents and/or direct agents. (An exclusive agency firm specializes in the products of a single firm whereas direct agents are employees of the firm and therefore only sell that firm's policies. Independent agency firms generally carry insurance products from several different firms.) Independent agents have higher expenses when compared to direct agents of firms or firms' electronic channels. Even though the number of independent agents declined by approximately 14% over 1987 to 1992 (Cook and Cummins [1996]), they still play an important role in the property casualty market. Independent agents continue to have the upper hand in US sales of life/health insurance (Standard and Poors 1998 Life/Health Insurance Outlook). Studies in the last three decades have repeatedly questioned why independent agents have not become relics of the past? In Section 5, we examine this question using our modeling framework.

2.2 Technology

Investments in information technology (IT) have been quite significant in this industry. It is not clear whether this investment has resulted in commensurate increase in productivity or increase in value to customers. For example, Garner [1991] reports that insurers in the P/C market spent 12 billion dollars per annum on IT and application systems in the 1980's without being able to reduce their operating expense ratios. Not withstanding the controversy regarding the productivity of information technology investments, when compared to yesteryears, the potential for leveraging IT to enhance value to customers and to reduce costs is undiminished (or is even greater) today. In the context of this paper, it will become obvious that the emerging technologies can revolutionize distribution channels in the near future. Therefore, we describe how the leaders in the industry are investing in some of the promising technologies to improve their distribution efficiency. Insurance firms are hopeful that these technologies, once fully deployed can fundamentally change customer relationship management and customer interaction experiences.

Data Warehousing and Data Mining for segmentation and relationship marketing: The information systems that are currently in use are policy centric (silos). Financial services firms are attempting to create a customer view, so that from a single system the full profile of a customer is available. Secondly, today there exist a number of sources for obtaining reasonably accurate *demographic* data about customers and prospects. Marketing data warehouses are being created from the multiple policy and claims systems that a firm has and are being combined with external demographic databases. These combined warehouses are then mined to create customer segments. An important motivation for these investments is to create the ability to cross sell to existing customers. In Section 5, we describe an application that links the creation of such segments to the design of the distribution channels.

Call Center Technologies: Technologically sophisticated call centers are important not only to create a direct sales channel, but also to efficiently serve existing customers, Pinedo, Seshadri, and Shanthikumar [1999]. It is possible today to use speech recognition and natural language understanding technologies to serve customers more efficiently. Sophisticated systems are being used to identify an incoming customer, pull all associated records instantaneously and then route the call to an appropriate customer service representative. Depending on customer preferences, it has also become possible to selectively provide different levels of service for the same service function.

Internet, WWW and Portals : Of all technologies, the Internet has had the most profound effect on channel design. Besides used to provide online product information, collect information about prospects, and accept online applications, the Internet is also being used to process invoices, settle claims, and follow up sales contacts. Web based collaboration technologies are available today that can connect a customer directly from a web page to a call center operator so that both can view the same web pages, navigate collaboratively and converse at the same time.

Architecture and Systems to support multi-channel access : Choosing a multi-channel strategy necessitates providing customer data, policy information, claims and other data to multiple access points. Whether an agent calls a call center for help or a customer tries to access his account via the Internet, the financial services company should be able to use the same back end systems and databases to service customer needs. For example, see the recent interview of the CEO of Liberty Mutual, in which he emphasizes the need to synchronize sales and service delivery in a channel neutral fashion (National Underwriter 1999).

Policy Issuance Systems : Policy issuance, especially in life insurance, continues to be a slow process. This is a problem, especially for the direct and Internet based channels. Firms are investing in systems so that they can issue a policy in a few days rather than a few weeks.

The above sample of technologies suggests that the effective use of IT in distribution channels might hold the key to operationalizing a firm’s strategy in the insurance sector. However, without a framework for determining how these technologies will mesh with the service functions demanded by customers, it is quite difficult to predict what mix of current and future technologies will yield the maximal advantage to firms.

2.3 Product Design

Which channels should be used to determine the preferences of a firm's customers is a central one in today’s channel design problem (IBM/Economist [1996]). It has become even more important to obtain information about product preferences since customer demographics have changed and will continue to change with the aging of baby boomers who have insurance requirements yet to be determined (NY Times, 1998, Monday, June 8, “Life Insurance Loses Ground as Investment Options Grow”). Traditionally, insurance firms have relied upon agents to collect and update the information related to customer needs. This might have to change if insurance firms wish to become better informed about their customers (IBM/Economist [1996]). Several leading insurance firms are becoming proactive in this regard, and are making large investments in the development of marketing data warehouses.

There is some interest in *mass customizing* products in this industry so that off-the-shelf products can be rapidly modified to suit individual customer or household requirements. However, the regulations in the US do not allow for a great deal of flexibility in creating such product offerings. Products designed this way are more likely to first arrive in Europe, where the regulatory environment is less restrictive. Bundling of insurance products with other products (e.g.: with automobiles or with airline tickets) is also likely to increase in the future.

2.4 Deregulation and Bancassure

The deregulation of the insurance industry (or according to some actually re-regulation) is taking place simultaneously with the mergers of banks and insurers (White [1997], Kan [1997], S&P 1998 Life/Health Insurance Outlook)[3]. This is creating a new type of player known as the bancassure. Bancassurance is a French term for the selling of insurance through banks. Kan [1997] in his talk on the changing global environment of financial services said, “we want to offer a full range of banking, investment and insurance products and services to both the personal and corporate clients through the distribution channel of their choice.” The bancassurance phenomenon first took place in the UK with the enactment of the Financial Services Act (FSA) in the 1980’s. The insurance industry in the UK was transformed to such an extent that it is predicted that by the year 2000, the top six players will be bancassures claiming close to 60% of the financial services market (Laing [1994]) as compared with the existing concentration of 35-40% of the business in the hands of the 15 largest firms.

It is plausible that bancassurance will be a reality in the US in the near future simply because the middle market (of over 37 million households) in the US is either not insured or underinsured and because independent agents currently focus only on affluent customers (Flur and Lowie, *Business Week* 1998). Current mega-mergers in the US such as the Citibank/Traveller's merger (Business Week, April 27, 1998, “$1,000,000,000,000 Banks.”) also indicate that bancassurance is not unrealistic to expect within the US. Although less than one percent of life insurance sales in the US are currently made through banks, it is estimated that by the year 2000 up to 25% of life insurance policies will be sold through banks.

---

[3] Lawmakers reached “an agreement early Friday to overhaul the financial system, repealing Depression-era laws that have restricted the banking, securities and insurance industries from expanding into one another's businesses.” *New York Times,* October 23, 1999.

Deregulation also presents opportunities to many firms operating within local markets to expand and diversify. However, benefits accrued from such expansion need not last for long. For example, Direct Line, which took advantage of the Financial Services Act in the UK to offer auto insurance over the telephone, has hit upon hard times as other companies have followed suit with similar distribution strategies (Direct Line Starts to Feel Growing Pains, 2/4/96 Financial Times). In fact, from what has occurred in the UK as an aftershock of the Financial Security Act comes the recognition that there are different methods to compete in the insurance industry depending on a firm's current position and strengths. In the 1980's, the FSA created a strong movement away from business being conducted by financial advisors to direct sales. Despite this, financial advisors and independent agents have managed to prevail within the high-end of the market. For example, as observed by Laing [1994], firms that began this era of change with high-end clients flourished by offering improved service.

3. Channel Design Objectives

During the past decade, there has been an ever increasing interest in studying different aspects of the insurance industry. Several studies have focused upon efficiency (see Berger, Cummins, and Weiss [1995] and Cummins and Zi [1997] for a review). We discuss the findings of these studies with regard to cost efficiency first and then discuss the service strategy options that are available to an insurance firm. The implications for channel design are then described.

Berger, Cummins and Weiss' study was based on a sample of 472 insurers in the P/C industry, with data for the years 1981-90. They found that the average cost efficiency of firms employing direct writers was 63.9% as opposed to only 54.8% for firms that use independent agents. However, they also found that the firms that employ independent agents managed to recover most or even all this extra cost in revenues. They observe that, "These findings are consistent with the *product quality hypothesis*, i.e., the notion that measured cost inefficiencies primarily reflect unobserved differences in product quality, rather than true efficiency, even among firms using the <u>same</u> insurance distribution system."

Cummins and Zi [1997] used several techniques for measuring efficiency in the life insurance industry. Their sample comprised of data from 1988-1992, which was drawn from 445 life insurers whose combined assets represented over 90% of the industry's. As per their estimates the cost efficiency level in the life insurance industry is approximately 60%. They also found that firms with less than $300 million of assets exhibited increasing returns to scale whereas those with assets in excess of $1 billion showed decreasing returns to scale. Meador, Ryan, and Schellhorn [1997] studied diversified versus focused firms in the life insurance industry. They concluded that there are scope economies to be obtained in this industry; and therefore developing a proper mix of products and services should also be a concern. (The opinions expressed in the S&P's outlook for 1998 for the life/health industry support these findings.) These studies suggest that reducing costs and selecting the product mix should be primary concerns. However, if the additional costs are perceived as higher quality then firms need appropriate methodology to distinguish between true inefficiency and value adding activity. Therefore, the channel design problem needs to consider service quality as well.

It also appears that firms have several choices regarding competitive strategy in this industry. We describe three such strategies that seem to fit the pattern observed in the way most firms operate. One method for competing is to adopt an overall cost leadership strategy. Specifically for insurance firms a low cost strategy means finding ways to operate efficiently both in the back and the front offices (Prasad and Harker [1997]). Since distribution costs are such a large component of operating costs, focusing on controlling the cost of distribution is unavoidable for such firms. A low cost strategy translates into seeking out low-cost customers and standardization of policies that are most often requested by these customers. In addition, business in certain market segments can be conducted through a low cost network such as the phone or Internet channels with a reduced personal element in distribution (Watkins [1995] and Wilcox [1996]). Examples of firms that have attained success using a low cost strategy with one or more of these refinements include Direct Line in the UK and GEICO in the US (Insurance Advisory Board [1998]).

A second strategy is one that relies upon product and firm differentiation. In order to achieve differentiation, both the tangible and the intangible parts of the insurance package could be emphasized through the creative use of agent and promotional activities. Generally large insurance firms are the ones to implement this strategy, at least as a part of their marketing effort; yet not all firms can pursue this strategy. Many customers have some apprehensions when it comes to insurance. Some fear that hidden clauses detrimental to the customers' well being might exist in a policy while others fear that potential claims may not be processed satisfactorily. A trusting relationship or a good reputation can remove such apprehensions. Several writers have emphasized that it is essential that the firm's relationship with the customer does not end with the sale of the policy. Moreover, if firms that pursue such a strategy wish to reduce their reliance on independent agents, but also wish to maintain the levels of customized service, then attention must be given to the training and the development of customer care personnel. Furthermore, without the added tension between the firm and the independent agent, the quality of service can be maintained only at the cost of higher controls.

A third strategy is to focus on a specific market segment and to follow the "niche market" approach. In this case, the service that is provided by the firm closely conforms to the preferences of customers within a specific market segment. The firm attempts to gain as great a share as is possible of that particular segment. A large number of small insurance firms pursue this strategy.

In summary, low cost, personalized service, differentiation, and niche marketing are seemingly different options that are available for a firm to adopt in this market. The forces shaping the market needs might result in a collapse of these options into mass-customized services (Gilmore and Pine [1997]). The mass customization option might be difficult to implement without first acquiring a strong brand image. In this regard, the general public is uninformed when it comes to the insurance industry, whether it is information concerning firms or information specific to products and policies. (It has been noticed that the offering of insurers of their products on the Internet has raised the level of knowledge within the market segment that uses the Internet and thus increased the level of competition (Insurance Advisory Board [1998]). Therefore, brand image might be the most important distinguishing criteria between competing firms offering similar products over the Internet.) Secondly mass-customization can take different forms, for example, a firm can choose to offer standard products but carefully customize the servicing of claims to fit the needs of the customers. Or, the pool of customers might be partitioned into a segment of customers who are offered additional information about services and products and another segment of customers who are offered standard services. The choices are endless.

How can the channel design problem be structured so that it can address the needs of firms that pursue such different strategies? Donnelly and Guiltinan [1986] gave a caveat when selecting channels of distribution of services, namely, that the difficulties are less with the differences between products and services and more with failing to clearly distinguish between the production and the distribution of services. This caveat seems even more apt for an industry like insurance. Thus even though two firms in this industry may use different strategies for reaching customers and have different products and performance standards, their distribution channels will be required to perform a similar spectrum of service functions. It is by identifying and classifying these functions that a common approach to channel design can be crafted. From the discussion of strategies, we can identify (but not yet classify) these functions quite clearly: The service functions range from providing product information to gathering information with regard to customer preferences, from selling a product to supporting claim processing, and from creating a brand identity to delivering standardized services. In the next section, we develop a framework for modeling distribution channels for insurance that is centered around two themes: how to classify the functions that are required to be performed by distribution and how to combine the functional needs into the design of a distribution system.

4. Models for Distribution Channel Design

In this section, we review some of the models that are available for channel design. Four different types of models have been proposed in the literature, namely, behavioral models, economic models, managerial models, and conceptual models. We elaborate upon the managerial models because these models are best suited for formulating and solving the integrated channel design problem.

Behavioral Models

Behavioral models generally focus on the sociological behavior of channel members, covering for example, notions of power, conflict, and satisfaction in channel dyads (Rosenberg and Stern 1971, Hunt and Nevin 1974, Lusch 1976, Etgar 1978). Behavioral models are descriptive as opposed to being normative. For example, models that explain the coexistence of independent agents and exclusive agents (based on hypotheses, such as product quality, effect on future sales, and negotiating power of independent agents with insurance firms) have been proposed and tested by Mayers and Smith [1981], Kim, Mayers, and Smith [1994], Crosby and Stephens [1987], Crosby, Evans, and Cowles [1990], Posey and Yavas [1995], and Venezia, Galai, and Shapira [1999].

Economic Models

Extensive work has been done on developing economic models of distribution systems. These models focus on an entire industry rather than on a single firm. For example, the classical assumptions of a competitive market structure have been used to predict the equilibrium number of channel intermediaries by Balderston [1958], Baligh and Richartz [1967], and Naert [1970]. More recent work has been carried out within a game theoretic framework in which some of the classical assumptions are relaxed (e.g., the use of contracting theory by Zusman and Etgar [1981], the use of quantity discounts to coordinate the channel system by Jeuland and Shugan [1983], the role of implicit understandings in achieving greater profits for all channel members by Shugan [1983] and product differentiation and its relationship to vertical integration by McGuire and Staelin [1983] and Coughlan [1985]).

Managerial/Normative Models

As opposed to economic models, normative models aim to provide guidance to decision-makers within a firm. These models, when suitably modified, are the most appropriate ones for addressing the channel design problem for insurance. Three models are reviewed in this subsection. Their relevance to solving the distribution channel design problem is discussed at the end of this subsection.

<u>The Market Share (MS) Model (Rangan [1987])</u>

Rangan's framework is an outgrowth of earlier work by Aspinwall [1962], Bucklin [1966], and Lilien and Kotler [1983]. In this modeling framework a (channel) function is a specialized task that must be performed by the firm and its marketing intermediaries in the process of selling, distributing, and providing after sales support for its products to customers. Therefore, describing the channel functions is an essential step in the problem formulation. A list of channel functions along with a brief description is given in Table 2. The classification of these functions is based on earlier research by Aspinwall [1962], Bucklin [1966] and McCammon and Little [1965].

A channel is considered to be a medium by which the function can be performed. An intermediary or channel level is a specific person or area that actually performs the function through a particular channel. For example, consider the *function* of providing potential customers the price and specifications of available product(s). This function can be performed by several *channels*, such as face-to-face meetings between the customer and an employee, via telephone, or by use of the Internet. Consider the telephone channel. The person who speaks to a client over the phone could be a salesperson, a technical support employee, or a telemarketer. These are examples of *levels*. Thus, "salespersons who answer potential customers' questions over the phone concerning the price and specifications of the firm's product(s)," is an example of a function (providing price and specifications of available products) that is performed through a channel (inbound telephone calls) by a specific level or intermediary (salespersons).

Rangan chose three sections of the channel design problem upon which to focus, namely, how to determine the distribution structure (i.e., what are the channels and intermediaries?), the distribution intensity (how much of each type of intermediary to deploy in each channel?), and the distribution management (the service levels to be provided to the customer). The market is partitioned into segments that represent a subset of potential customers. The market share in each of the market segments is then represented as a function of the firm's strategy as well as the channel intensity. A firm's strategy is comprised of both channel as well as non-channel strategies. A channel strategy is a mapping of the available channels to the market segments. For example, managers might decide that each market segment will be served by only one channel. A non-channel strategy is a combination of the price strategy and the (perfect) prediction of the reaction of the competition in each market segment. We now describe the model itself. There are P market segments (indexed by p), K channel strategies (indexed by k), and Q non-channel strategies (indexed by q) in the model. Let T be the planning horizon indexed by $t=1,...,T$. Let

n be the number of channel functions indexed by $i=1,...,n$.

k_i be the number of levels for channel i indexed by $j=1,.... k_i$.

The key assumptions in this model are that:

- The current period's market share is influenced by four factors: channel effort, nonchannel effort (price), cumulative effect of the past effort (channel and nonchannel), and competition's expected strategy.
- The individual channel functions are assumed to be independent, and thus the aggregate effect of channel efforts can be determined by the sum of the components effects.
- In order to simplify the model, a concave response function is used to determine the firm's market share as a function of channel efforts.

The market share, m_{pt}^{qk} at time t for market segment p under channel strategy k and non-channel strategy q is given by

$$m_{pt}^{qk} = (\mu_{pt})^{(\phi^{v_{pt}})(\gamma^{w_{pt}})}\left(1 - \exp\left(-\alpha_{pt} - \Sigma_{i=1}^{n} \Sigma_{j=1}^{h_i} \beta_{pij} x_{pijt}^{qk}\right)\right) \qquad (1)$$

where α_{pt} is an estimated parameter which is used to model goodwill;

β_{pij} is an estimated parameter that describes the effects of channel functions performed;

x_{pijt}^{qk} is the amount of channel function i performed by intermediary j and is greater than or equal to zero;

μ_{pt} is the estimated maximum achievable market share that can be achieved (by channel effort alone);

ϕ, and γ are estimated parameters describing price strategies and competition respectively;

v_{pt} is a managerial estimate of price strategy; and

w_{pt} is a managerial estimate of competition.

In this model, goodwill is expressed as

$$\rho_{pt} = (\mu_{pt})(1 - \exp(-\alpha_{pt}));$$

i.e., ρ_{pt} represents the cumulative effect of the past effort (channel and nonchannel). The impact of channel effort for this period is captured by modifying ρ_{pt} to

$$\mu_{pt}\left(1-\exp\left(-\alpha_{pt}-\Sigma_{i=1}^{n}\Sigma_{j=1}^{h_i}\beta_{pij}x_{pijt}^{qk}\right)\right).$$

In order to include the other two factors, nonchannel effort and competition, two more parameters are included, namely, ϕ and γ. The effects of these factors are captured by representing the maximum achievable market share through channel effort, nonchannel effort, and reaction by competition as $(\mu_t)^{(\phi^{v_t})(\gamma^{w_t})}$. Thus, v_t is a scale factor which measures change in nonchannel strategy, i.e., price. This factor is determined by the manager(s) of the appropriate area of the firm. By convention, aggressive moves by the firm are described by negative values in v_t. Similarly, w_t is a scale factor that measures change from the competition's current strategy. Aggressive moves are described by negative values of w_t.

Let Z_{pt} be the market size of segment *p* at time *t*. Then the sales response is given by

$$\Sigma_{p=1}^{P} m_{pt}^{qk} Z_{pt}. \tag{2}$$

Let the cost of providing the *ith* channel function at the *jth* level for segment *p* at time *t*, using the *qth* channel and the *kth* non-channel strategy be C_{pijt}^{qk}, the gross margin on sales dollars be G_{pt}^{qk}, the fixed cost be FC^{qk}, and the company's cost of capital be *r*. Then the objective is to maximize the discounted profit given by

$$\max \Sigma_{t=1}^{T}\Sigma_{p=1}^{P} m_{pt}^{qk} Z_{pt} G_{pt}^{qk}/(1+r)^{t-1} - \Sigma_{t=1}^{T}\Sigma_{p=1}^{P}\Sigma_{i=1}^{n}\Sigma_{j=1}^{h_i} C_{pijt}^{qk} x_{pijt}^{qk}/(1+r)^{t-1} - \Sigma_{t=1}^{T}\Sigma_{p=1}^{P} FC^{qk}/(1+r)^{t-1} \quad . \tag{3}$$

Resource and managerial constraints can be added to this model. This model provides a convenient starting point for solving the channel design problem. However, there are three limitations to this model. First, only the channel and non-channel strategies specified by the managers are compared. Thus, there are possible combinations of channels which are not checked for optimality, even though they might be more profitable than the selected combinations. In more complex scenarios, the strategies can be cumbersome to enumerate. Second, many of the model's parameters are based on managerial estimates and are therefore difficult to verify. Third, correlation between channel functions can not be captured because the market share is expressed as a multiplicative function. Significant work is required to change from a multiplicative model to an alternate framework that permits inter channel correlation or the cannibalization of sales.

Modeling Inter-Channel Correlation (Corstjens and Doyle [1979])

In the Corstjens and Doyle model, sales is a function of the number of intermediaries and the price. This model, here forward denoted as the CD model, can be used to determine the optimal number of intermediaries and the optimal prices for the different channels. Let

K = the number of potential channels.

α_i = weight for channel *i*.

p_i = the price for an average outlet (level) in channel *i*.

β_i = the direct elasticity with respect to p_i.

N_i = the number of outlets chosen in channel *i*.

ε_i = the economies or diseconomies from increasing N_i.

δ_{ij} = the cross price elasticity between channels *i* and *j* which represents channel cannibalization.

Q_i = the demand served by channel *i*.

Then, Corstjens and Doyle equate the demand served by channel *i*,

$$Q_i(N_i) = \alpha_i (p_i)^{\beta_i} (N_i)^{\varepsilon_i} \prod_{\substack{j=1 \\ j \neq i}}^{K} (p_j)^{\delta_{ij}} .$$

The cost of using N_i outlets of channel i to serve Q_i units of demand, denoted as $C_i(N_i)$ is given by

$$C_i(N_i) = \omega_i (Q_i)^{\nu_i} (N_i)^{\tau_i}$$

where,

ω_i = weight for channel *i*.

ν_i = factor denoting any economies of scale in the cost function (e.g.: $\nu_i < 1$ signifies that the average cost decreases with Q).

τ_i represents the economy resulting from increasing the number of outlets (levels) in channel i.

Four types of constraints have been proposed by Corstjens and Doyle, namely, capacity, control, system inflexibility, and price range constraints as shown below. The model is then

$$Max \sum_{i=1}^{K} (p_i Q_i(N_i) - C_i(N_i))$$

subject to:

Capacity: $\Sigma_{i=1}^{K} Q_i(N_i) \leq Q^*$

Control : $Q_i(N_i) \leq zQ^*$

System inflexibility : $N_i^L \le N_i \le N_i^U$

Price Range: $p_i^L \le p_i \le p_i^U$

where Q^* is the total production capacity bound, z is some discretionary input taking value in $[0, 1]$, and N_i^L, N_i^U, p_i^L, and p_i^U are lower and upper bounds on the number of outlets as well as the price. The CD model is different from the MS model in several ways. In contrast to the MS model, the CD model allows interaction among the channels as well as cannibalization. However, the CD model has some limitations: (i) The CD model assumes a demand function that is independent of the marketing strategy whereas the MS model is based on the assumption that different marketing strategies will attract different types of customers (via their preferences). (ii) In the CD model the demand is aggregate in nature whereas the MS model estimates the demand in each market segment as a function of the channel intensities and other factors. (iii) Competition is not considered within the CD model. (iv) All intermediaries within each channel are assumed to be identical (iv) The model is restricted to a single product or service.

Modeling Switching Behavior of Retailers

Rangan and Jaikumar (1991) present a model in which retailers have the option of either purchasing products from a wholesaler or directly from the producer. We present a generalized version of their model. In this model, a manufacturer produces Z products and supplies them either to wholesalers or directly to retailers. There are J wholesalers and I retailers. Retailer i has the option to purchase all products either from a given wholesaler j_i or to purchase all products directly from the manufacturer. The list price for product z is P_z. The manufacturer offers wholesalers a trade discount D_z for product z $=1,2,...,Z$. The decision variables in this model are the rebates, R_z, that the manufacturer offers to the retailers for products $1,..,Z$. (The same rebate is offered to all retailers.) Each retailer evaluates whether it is economical to purchase from the manufacturer or the wholesaler. There is a cost to the retailer of switching from one to the other. These costs of switching are listed below. Retailer i purchases $V_{izm}((1-R_z)P_z)$ of product z if purchasing from the manufacturer, otherwise retailer i purchases a given amount V_{izw} from wholesaler j_i. Furthermore, the revenue that retailer *i* receives for product *z* is assumed to be a function of the price $(1-R_z)P_z$ (P_z if purchasing from the wholesaler) as well as the price of competing products. Let

$P_z =$ manufacturer's list price selling product *z*.

$K_z =$ manufacturer's cost of manufacturing product *z*.

$D_z =$ wholesaler's trade discount for product *z*.

$R_z =$ rebate (percentage of list price) offered to retailers by the manufacturer for product *z*.

$V_{izw} =$ quantity purchased by retailer of product *z* from a wholesaler.

$V_{izm}((1-R_z)P_z) =$ quantity purchased by retailer of product *z* from the manufacturer.

$C_{izj_i} =$ manufacturer's marketing and sales' costs per unit for selling product *z* to retailer *i* through wholesaler j_i.

$C_{izm} =$ manufacturer's marketing and sales' costs per unit for selling product *z* to retailer *i* directly.

$\omega_{izm} =$ operating cost per unit for retailer *i* of purchasing product *z* from the manufacturer.

$\omega_{izw} =$ operating cost per unit for retailer *i* of purchasing product *z* from a wholesaler.

$\rho_{iz}(P_z) =$ revenue for retailer *i* for product *z* purchased at price P_z.

$T_{imw} = F_{imw} - F_{iwm}$ =cost to retailer *i* to switch from manufacturer to a wholesaler.

$T_{iwm} = F_{iwm} - F_{imw}$ =cost to retailer *i* to switch from a wholesaler to the manufacturer.

The manufacturer's profit from retailer *i* is

$$\pi_{ij_i} = \sum_{z=1}^{Z} V_{izw} \times \left(P_z - Kz - D_z - C_{ijz}\right) \text{ if retailer } i \text{ purchases from wholesaler } j_i \text{ and is}$$

$$\pi_{im} = \sum_{z=1}^{Z} V_{izm}((1-R_z)P_z) \times (P_z(1-R_z) - K_z - C_{imz}) \text{ if retailer } i \text{ purchases from the manufacturer.}$$

Let $k_i = 1$ if retailer *i* currently purchases from the manufacturer and zero otherwise. Let $e_i = 1$ if, upon obtaining the rebate, retailer *i* purchases from the manufacturer and zero otherwise. The manufacturer has to decide how much of a rebate should be given for each product to the retailers keeping in mind that the retailers maximize their own profit. Therefore, the manufacturer's profit maximization problem can be stated as follows:

$$\max \sum_{i=1}^{I} \pi_{ij_i}(1-e_i) + \pi_{im}(e_i)$$

subject to:

$$\sum_{z=1}^{Z} \rho_{iz}(P_z - R_z) - \rho_{iz}(P_z) - \omega_{izm} V_{izm}(R_z) + \omega_{izw} V_i$$
$$+F_{imw}(k_i - e_i) - F_{iwm}(e_i - k_i) + s_i = 0 \quad for\ i = 1 \ldots I$$

$$e_i s_i \leq 0 \text{ for } i = 1 \ldots I$$

$$e_i, k_i \in \{0, 1\} \text{ for } i = 1 \ldots I,\ 0 \leq R_z \leq 1, \text{ and } s_i \text{ unrestricted.}$$

This problem has both non-linear constraints as well as a non-linear objective function. In addition there are *2I* integer variables in the formulation. Therefore, the problem is very difficult to solve. However, if we assume that the manufacturer gives the same rebate, say *R*, for all products then we can solve the simplified problem as follows. We observe that after obtaining the rebate the retailer has the option to buy the same quantities and sell at the same price before receiving the rebate, therefore the profit for each retailer is increasing in *R*. Moreover, for each retailer, there is a value of $R \in [0, 1]$ such that for rebates lower than this value it is economical to purchase from the wholesaler. Similarly, there is a value of *R*, such that for rebates higher than this value it is economical to purchase from the manufacturer. Thus, there are 2*I* values of $R \in [0, 1]$ where purchasing policies will be switched. Therefore, the optimal rebate will belong to this set of *2I* values.

Discussion of Managerial/Normative Models

The MS model is applied to the distribution channel design problem in Section 5. The CD model provides a method for incorporating cross price elasticity between different channels. This aspect could be very useful when the pricing decision has to be made in conjunction with the channel intensity decision. The third model captures switching behavior and is therefore relevant when the firm expects customers and/or agents to switch channels due to differential pricing (e.g., from purchasing from an agent to purchasing directly using the Internet).

Table 2: Eight Channel Functions

Function	**Definition**

Product Information	Customers seeking information usually for complex products.
Product Customization	Products need to be adjusted to meet the customer’s requirements.
Product Quality Assurance	The emphasis on product integrity and reliability placed by customers due to the customer’s operational needs.
Lot Size	The customer’s monetary spending for the product. Products with high unit values and those which are used extensively represent significant financial decisions.
Assortment	The customer may require a wide range of products.
Availability	The customer requires the immediate availability of products from the firm.
After Sales Service	Installation, repair, maintenance, and warranty of the product are required by the customer.
Logistics	The transportation, storage, and supply of the product to the customer.

Conceptual Models for the Design of Services

Many authors have argued that services are inherently more difficult to design and model due to the greater importance of customer/company interaction and the greater emphasis on intangibles found in services. As a consequence, a different approach to designing service systems has been advocated. We briefly describe two such approaches.

Chase and Bowen [1988] focus on the integration of operations and human resource management. They propose a service design matrix in which the tradeoff is between production efficiency and sales opportunity. They suggest that processes that have low production efficiency should be used where there are high sales opportunities. Chase and Bowen remark upon the fact that the customer is often a member of the service system and in some ways should be considered to be an employee of the firm. Just as the employees of the firm have to be trained, the customers too will need clear cut instructions how to participate in the service system. They also mention that although back-office operations are not essentially part of the service system, they should be dealt with appropriately in order to increase the firm's efficiency.

Bailey and Harker [1995] focus on the separation/integration issue of the back office with the service network. They describe a framework for designing large service networks. They classify functions based on the effect on the customer into three categories: direct impact functions, first order functions, and second order functions. Direct impact functions can be considered as those functions performed by the front office. First order impact functions are those functions that strongly and quickly affect customer service levels without direct customer contact, for example, the ways a firm deals with a power outage. Chase and Bowen suggest it is within first order functions that a separation of the back office from the system is most detrimental to the corporation. Second order impact functions are the elements of the firm's operating system which have only indirect affect on customer service levels. Bailey and Harker however conclude that "the separation and isolation of non-customer contact functions does not promote more efficient operations than can be achieved by maintaining those functions as an integrated part of the network."

5. Application to Insurance

In this section, we apply the MS model to analyze the distribution system of an insurance firm. We first describe the channel functions for insurance and qualitatively assess the viability of performing these functions using emerging technologies and alternate channels. Then, we derive certain useful structural properties of the model and apply these properties to the P/C sector. The structural properties derived by us are new and are helpful in answering some of the questions raised in Section 1.

5.1 Channel Functions for an Insurance Firm

In Table 3, the eight functions described in Table 2 have been redefined with regard to the insurance industry. For example, the need to determine product preferences for different types of customers is an "important and necessary" function. The function of logistics does not appear to carry over to insurance. The preference of a customer for talking to agents instead of using the Internet could be due to the value of intangibles attributed to this service by the customer. The table also indicates whether a direct agent or an indirect agent or an entirely new media will generally be preferred for performing the function. Many successful uses of new media in this industry are based on the factors favoring the use of alternative channels as shown in Table 3. The predictions made in this table with regard to the preference for independent agents are examined in Section 5.3.

The dimensions of service quality could be included in this list of functions. The measurement of service can be performed by designing an appropriate questionnaire using available tools (see Soteriou and Zenios [1997] for an application of this methodology to retail banking).

TABLE 3: Eight Channel Functions Applied to Insurance

Function	**Application to Insurance**	**Factors Favoring the use of Direct or Exclusive Agents**	**Factors Favoring the use of Independent Agents**	**Factors Favoring the use of Alternative Channels**
Product Information	Policies, Prices, Comparisons	Centralization of Sources for Policies	Comparisons between different firms easier	Convenience, 24 Hour Service, Automated Service
Product Customization	Match Customer Preferences	Has greater knowledge of product	Has greater knowledge of customer	
Product Quality Assurance	Claim Processing Time, Conversant with policy details	Firms can standardize processes and have greater control over them.	Has greater leverage with firms.	
Lot Size	Group Policies, Extra-High Protection	Centralization of Sources for Policies		Corporation Wide and Affinity Group Sales
Assortment	Multiple Policy Needs	Discounts for multiple Policy holders	Can search for the best deal for each policy	
Availability	Speed	Direct Agent is connected to firm	Has greater leverage, i.e., can move business elsewhere	Very low transaction time.
After Sales Service	Claims Processing, Change (Renewal) of Policy	Direct Agent is connected to firm	Has greater leverage. Easier to anticipate and meet customer's changing needs over time	
Logistics	Customer Receives Policy and Updates	.		Automation increases efficiency and speed.

5.2 Some Theoretical Properties

Proposition 1: The objective function shown in equation (3), is a joint concave function in the x_{pijt}^{qk} 's.

Proof: We show this for a simplified version of the objective function. Let r=0, T=1, P=1, Z=1, G=1, and let h_i =1 for all i. Then the objective function can be expressed as

$$\max K(1-\exp(-\alpha-\Sigma_{i=1}^{n}\beta_i x_i))-\Sigma_{i=1}^{n}C_i x_i$$

The Hessian matrix of this function is

$$\begin{pmatrix} \beta_1^2 & \beta_1\beta_2 & & \beta_1\beta_{n-1} & \beta_1\beta_n \\ & \beta_2^2 & & & \\ & & & & \\ & & & & \\ & & & & \beta_n^2 \end{pmatrix} * -K\exp(-a - \Sigma_{i=1}^n \beta_i x_i)$$

Let X be a standard normal random variable. Let $Y_i = \sqrt{\beta_i}\, X$. Then $E(Y_i Y_j) = \beta_i \beta_j$. Thus

$$\begin{pmatrix} \beta_1^2 & \beta_1\beta_2 & & \beta_1\beta_{n-1} & \beta_1\beta_n \\ & \beta_2^2 & & & \\ & & & & \\ & & & & \\ & & & & \beta_n^2 \end{pmatrix}$$

is a covariance matrix which is by definition positive semi-definite.

Therefore, the Hessian matrix is just a covariance matrix that is multiplied by the constant $-K\exp(-a - \Sigma_{i=1}^n \beta_i x_i)$ and thus is negative semi-definite. This implies that the objective function is jointly concave in x_{pijt}^{qk}'s even in the general case, since the only changes are the inclusion of additional indices for channel levels, multiple time periods, and multiple strategies.

Remark: The propositions that follow although based on the MS model, will hold if the objective function is jointly concave in the decision variables, namely, the x_{pijt}^{qk}'s.

Proposition 2: Assume that there are no constraints in MS model. Then in the profit maximizing solution to (3), for a given non-channel strategy *q* and a channel strategy *k* in each segment *p*, for each time *t*, for each $x_{pijt}^{qk} > 0$ in the optimal solution, the marginal revenue from increasing x_{pijt}^{qk} is equal to its marginal cost. For all $x_{pijt}^{qk} = 0$ in the optimal solution, the marginal revenue is strictly less than the marginal cost.

Proof: Again we use the simplified form of the objective function. We know that the objective function is jointly concave in the x_i and the direction of optimization is maximization. Consider the gradient at the optimal solution, namely

$$\begin{matrix} K(\beta_1 \exp(-\alpha - \Sigma_{i=1}^{n} \beta_i x_i^*)) - C_1 \\ K(\beta_2 \exp(-\alpha - \Sigma_{i=1}^{n} \beta_i x_i^*)) - C_2 \\ \dots \\ K(\beta_{n-1} \exp(-\alpha - \Sigma_{i=1}^{n} \beta_i x_i^*)) - C_{n-1} \\ K(\beta_n \exp(-\alpha - \Sigma_{i=1}^{n} \beta_i x_i^*)) - C_n \end{matrix}.$$

Since we are restricting the channel functions, x_i's to be greater than or equal to zero, if the gradient with respect to x_i in the optimal solution were negative, then the optimal value of x_i should equal zero (because the marginal revenue $K(\beta_i \exp(-\alpha - \Sigma_{i=1}^{n} \beta_i x_i^*))$is strictly smaller than the marginal cost C_i at the optimal solution). On the other hand, if x_i were greater than zero in the optimal solution then the marginal cost should be equal to the marginal revenue.

5.3 An Application to the P/C Sector of the Insurance Industry

As described previously in Section 2, Berger, Cummins and Weiss [1995] examined the coexistence of exclusive agency firms and direct agents with independent agency firms in the P/C industry. (This reference will be denoted as BCW.) Researchers have established that independent agencies have higher costs than exclusive ones and thus they perhaps should not coexist with exclusive agency firms and direct agents. Two different hypotheses have been advanced to explain their coexistence. The product quality hypothesis explains the coexistence by arguing that independent agency firms provide more service and thus able to generate higher revenues in return. Such revenues offset their higher costs. On the other hand, the market imperfection hypothesis suggests that the coexistence is based on external factors causing an imperfect market such as price regulation, slow diffusion of information or search costs. Unlike the product quality hypothesis, the market imperfection hypothesis suggests that the two different types of agents provide the same level of service. BCW conclude that the cost inefficiency of independent agency firms is greater than that of exclusive agency firms. (Cost efficiency is defined as ratio of the lowest achievable cost to produce a given output to the actual cost of producing the same output.) However, they show that even though the independent agency firms also have lower profit efficiency, the difference between exclusive and independent agency firms is much smaller. (Profit efficiency is defined as the ratio of actual profits to potential profits. BCW also go on to show that the difference in profit efficiency is not statistically significant.) Thus, they find evidence that the product quality hypothesis is more likely to be correct and conclude that the extra costs incurred by independent agency firms are a result of the higher service levels provided to their customers; who in turn pay more for the additional service.

We now show that not only are the conclusions of BCW predicted by the models discussed in this section, but also that there are at least two market segments of customers: a segment in which customers prefer lower price and another in which customers prefer higher service levels. Therefore, the P/C market can and actually should be segmented based on customer preferences. Consider the data shown in Table 4. The percentage of Net Premiums Written (NPW) by exclusive agency firms are shown for five lines of P/C insurance for the years 1991 to 1995. We observe that for each line, the variation of this percentage is relatively small from year to year and in some cases the changes are not even monotone. More important, there is a tremendous difference between personal lines of insurance and those that are at least somewhat commercial. The three personal lines Private Passenger Auto Liability, Private Passenger Automobile and Homeowners Multiple Peril have percentages that range from 58% to 69%. On the other hand, the two commercial lines, Fire and Commercial Auto Liability have percentages that range from 20% to 37%. This indicates that the characteristics of each line or product might make it more suitable for one type of distribution channel over another. This is in agreement with the use of channel functions to determine optimal channel configurations. The functions described in Table 3 can be used to provide an explanation of the independent agency firms' dominance in commercial auto liability as opposed to personal liability. For example, the lot size function effect itself could produce this effect. As shown in Table 3, independent agency firms should have an advantage when the average policy sold for a particular line is large and expensive.

Fire					
	1991	1992	1993	1994	1995
NPW	35.70%	36.77%	38.37%	36.90%	36.72%
NPE	35.26%	36.70%	37.61%	36.60%	37.05%
Commercial Auto Liability					
	1991	1992	1993	1994	1995
NPW	21.15%	21.36%	21.68%	20.66%	20.19%
NPE	20.96%	21.17%	21.58%	20.56%	20.15%
Private Passenger Auto Liability					
	1991	1992	1993	1994	1995
NPW	68.72%	68.78%	68.34%	68.40%	68.53%
NPE	68.72%	68.92%	68.50%	68.51%	68.67%
Private Passenger Automobile					
	1991	1992	1993	1994	1995
NPW	69.02%	69.36%	69.17%	69.00%	68.53%
NPE	68.93%	69.42%	69.39%	69.13%	68.72%
Homeowners Multiple Peril					
	1991	1992	1993	1994	1995
NPW	58.24%	61.82%	63.33%	63.62%	64.00%
NPE	57.21%	60.24%	62.43%	63.19%	63.78%

Table 4: Percentage of Net Premiums Written (NPW)
and Net Premium Earned (NPE) by Direct Writers

(Source: A.M. Best Company, *Best's Aggregates and Averages*, 1996 Edition (Oldwick, NJ))

Fig. 1 shows that the variation shown in Table 4 is not only amongst different lines, but there is also variation from state to state within any line. The lines shown in this figure are fire, homeowners multiple peril and private passenger auto physical damage. The data (drawn from A.M. Best tapes) contains the percentage of Net Premiums Written by exclusive agency firms for each of the separate lines, for each of the 50 US States along with the District of Columbia and the US for the years 1995 - 1997. Fig. 1 shows the data for only one year. (The variation from year to year is minimal. The points are connected with line segments in order to highlight the variation from state to state as well as from line to line.) We next show that the variation could be attributed to various demographic factors and not just due to randomness.

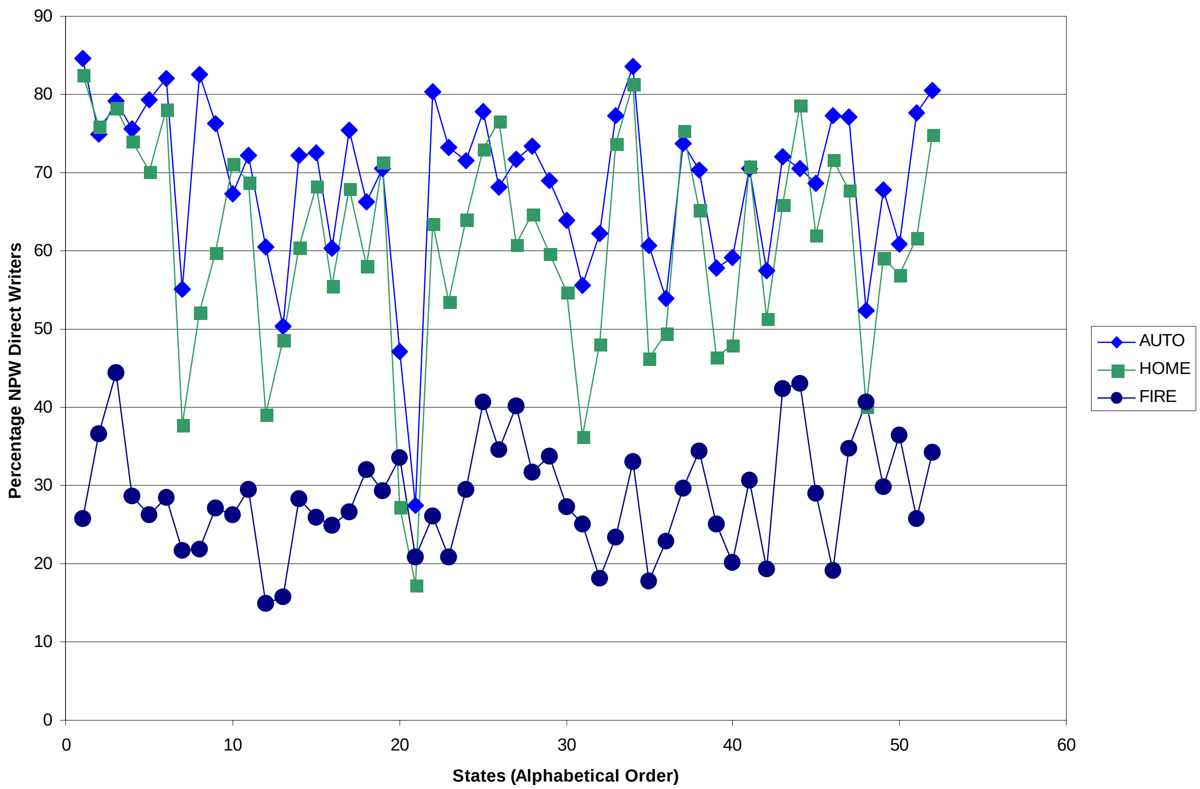

Figure 1: State to State Variation in Net Premiums Written by Direct Agency Firms

We examined the correlation of the percentage of direct agency NPW with several demographic variables, such as, household income, population density, unemployment level, percentage of population living in a metropolitan area, and industrial concentration. The Pearsons Correlation Coefficient**s** between *per capita income* and each of the percentages of direct agency NPW in fire, auto, and home insurance respectively are -.37, -.26, and -.499. All three are statistically significant at levels .01, .1, and .001 respectively. The Pearsons Correlation Coefficient between auto and the *unemployment rate* is .305 and is statistically significant at level .05. Furthermore, the Pearsons Correlation Coefficient between fire insurance percentage and the percent of a state's *population living in a metropolitan area* is -.31 and is statistically significant at level .05. (Note that in all these cases, the tests were two-sided, in other words the alternative hypothesis was that the correlation was $\neq 0$.) Thus, these demographic variables explain a significant proportion of the variation in NPW amongst states. The variables used in this analysis figure in the MS model in one way or another: either as customer preference (customers with high income prefer personalized service whereas unemployed persons prefer direct writers due to low cost), or as a factor that influences the performance of one or more of the channel functions (such as concentration of population in metropolitan area permits independent agents to reach customers more efficiently thereby offsets higher distribution costs due to personalized service). Further analysis of these variables will be presented in future work along with models to predict the variations from one segment to another.

Now we show that the MS model can be used to support the claim that there are two or more market segments. Before we state the proposition, we draw attention to an important fact that is highlighted in the BCW study: Most insurance firms use either only exclusive agents or only independent agents. Firms that use a combination of the two are in the minority. The 472 property-liability insurers studied by Berger, Cummins, and Weiss, represent almost 90% of industry assets over the period between 1981-1990. Only 26 of those firms switched from one distribution system to the other during the 10 year study and only 53 had systems which were either a combination of both direct and indirect agents or just simply indeterminable.

Proposition 3: The coexistence of two types of distribution systems with different cost structures and the decision of most firms to use either one or the other type of distribution system together indicate that there are at least two (distinct) market segments for P/C insurance products: One in which customers prefer to deal directly with an insurance firm's agent (possibly one in which price is the primary factor) and the second whose customers prefer to deal with independent agents (possibly a segment in which service quality is very important as well).

Proof: Assume that there is only one market segment that is served by both types of firms. Then, Proposition 2 suggests that if two "pure" channel strategies, such as the exclusive use of direct agents and the exclusive use of independent agents, are both optimal with respect to the same market, then the use of a combination of the strategies will yield higher profit if the objective function is strictly concave. Although the objective function is not necessarily strictly concave, in any event, *any* combination of exclusive agents and independent agents should be optimal. It is therefore surprising to find that the majority of firms use either one or the other type of agents. Thus the assumption of a single market segment must be incorrect. Moreover, the data in Table 4 and also shown in Fig. 1 indicate that the different lines and different states have very different ratios of Net Premiums Written through exclusive agency firms. This variation in the data is moreover correlated with the demographics of the states. If the preferences of customers are (relatively) homogenous then such variation can not be explained based on rational behavior by firms. It therefore follows that demographic factors that account for customer preferences (and other factors such as state regulations) as well as the variations in the service requirements across lines of insurance must be influencing the decisions of firms to concentrate on different customer segments.

Based on the analysis presented above, it is more reasonable to expect that firms that attempt to reach multiple market segments find it difficult to focus their strategies. In other words, such firms must not only be able to provide the extra service to a segment of its customers but also to maintain a reputation as a provider of high quality service. Achieving these dual objectives is more of a problem for firms that try to sell in (both) multiple market segments since it is already known that they provide no frills service to other customers for a (significantly) lower price. Therefore, we hypothesize that signaling better quality or better price, and preventing customers that prefer personalized service from buying the low cost product is a much more severe problem for insurers than it is for a seller of industrial products.

In BCW's analysis, the data on *all* states and *all* lines was pooled together for examining the product quality hypothesis. The pooled data was used to construct non-parametric estimates of cost and profit efficiency. As we have shown, the disaggregated data is so heterogeneous that analysis based on aggregate data can not be easily used for answering many of the questions posed by executives in this industry and summarized in Section 1. In contrast to the BCW approach, our analysis is based on a qualitative discussion of service functions and the use of a normative framework to examine the state wise and line wise data. We have shown that there is strong evidence that there is more than one market segment for the same insurance product. Our work additionally sets forth a normative framework for determining the optimal channel mix and intensity.

6. Conclusions and Directions for Future Research

The insurance industry is undergoing a tremendous change brought about by several factors described in this paper. Many changes that have taken place in Europe are yet to arrive within the US. The changes will impact how firms in this industry decide to distribute their products and serve their customers. There are almost no guidelines available to insurance firms make these decisions. In view of this, we surveyed the literature and presented a framework that can be used to answer many of the questions that are the uppermost in the minds of executives in this industry. Some empirical data was presented with regard to the validation of the framework and verifying the consistency of the framework. Both the qualitative and the quantitative analysis presented in this paper suggest that the framework is potentially useful to managers. Further empirical and theoretical work related to the topics listed below is necessary in order to design a tool for use by managers.

- Model cross-elasticities as discussed in Section 4 under managerial/normative models
- Determine useful market segments along the lines of analysis presented above
- Determine the cost for each channel-function combination
- Estimate costs and benefits (with respect to channel functions) of new technologies
- Develop an optimizer to solve for channel intensities
- Determine the implications of the design for process and information system.

In particular, the market segmentation ideas discussed in Section 5 need to be developed further. Once we can parsimoniously describe how to create the market segments, the questions of describing the key service functions and capturing the preferences of customers within these segments with regard to these functions can be taken up for further study.

References

A.M. Best Company, *Best's Aggregates and Averages*, 1996 Edition (Oldwick, NJ).

Anderson, Erin, Day, G.S. and Rangan, V.K., "Strategic channel design ," *Sloan Management Review* **38**, 4, Summer 1997, pp. 59-69.

Aspinwall, L., "The Characteristics of Goods Theory," *Managerial Marketing: Perspectives and Viewpoints*, Lazer, W. and Kelley, E.J., (eds), Homewood, Ill.:Richard D. Irwin, 1962, pp. 633-643.

Anonymous, "Banks caught in distribution dilemma ," *Financial Technology International Bulletin* **14**, 6, Feb. 1997, pp. 7-9.

Bailey, A.B., and Harker, P.T., "Organizational Structure in Large Service Networks: The Hazards of a Back Office Strategy," Discussion Paper #56, The Wharton School of the University of Pennsylvania, PA, 1995.

Balderston, F.E., "Communication Networks in Intermediate Markets," *Management Science*, **4**,1, 1958, pp. 154 - 171.

Baligh, H.H. and Richatz, L.E., *Vertical Market Structures*, Boston, Allyn and Bacon, 1967.

Bellhouse, A.E. and Hutchison, G.M., "A model for the analysis of distribution channels," *Marketing Intelligence & Planning*, **11**, 11, 1993, pp. 22-27.

Berger, A.N., Cummins, J.D., and Weiss, M.A., "The Coexistence of Multiple Distribution Systems for Financial Services: The Case of Property-Liability Insurance," *Journal of Business*, **70**, 4, 1997, pp. 515-546.

Bowersox, D.J. and Cooper, M.B., *Strategic Marketing Channel Management*, McGraw-Hill, New York, 1992.

Bucklin, L.P., *A Theory of Distribution Channel Structure*, IBER Special Publications, California, 1966, pp. 7-16.

Chase, R.B. and Bowen, D.E., "Integrating Operations and Human Resource Management in the Service Sector," in *Strategy, Organization Design, and Human Resource Management*, edited by Snow, C.C., Greenwich, CT, JAI Press, 1988.

Cook, D.O. and Cummins, J.D. "Productivity and Efficiency in Insurance: An Overview of the Issues," paper 96-57, *Wharton Financial Institutions Center*, The Wharton School, University of Pennsylvania, PA.

Coughlan, A. T., "Competition and Cooperation in Marketing Channel Choice: Theory and Application," *Marketing Science*, **4**, 2, 1985, pp. 110-129.

Corstjens, M. and Doyle, P. “Channel Optimization in Complex Marketing Systems,” *Management Science*, **25**, 10, 1979, pp. 1014-1025.

Crosby, L.A., Evans, K.R., and Cowles, D., “Relationship Quality in Services Selling,” *Journal of Marketing*, **54**, 1990, pp. 68 -81.

Crosby, L.A. and Stephens, N., “Effects of Relationship Marketing on Satisfaction, Retention, and Prices in the Life Insurance Industry,” *Journal of Marketing Research*, **24**, 1987, pp. 404-411.

Cummins, J.D. and Zi, H., “Measuring Cost Efficiency in the U.S. Life Insurance Industry: Econometric and Mathematical Programming Approaches,” paper 97-03, *Wharton Financial Institutions Center*, The Wharton School, University of Pennsylvania, PA.

Donnelly, J.H. and Guiltinan, J.P., “Selecting Channels of Distribution for Services,” in *Handbook of Modern Marketing*, ed. V. P. Buell, McGraw-Hill, New York, 1986.

Etgar, M., "Interchannel Conflict and the use of Power," J. *Marketing Res*., **15**, 2, 1978, pp. 273-274 **.**

Garner, M., “Revamping your Information Systems,” *Best’s Review (P/C)* , **92**, 4, 1991, pp. 70-74.

Gilmore, J.H. and Pine, B.J., “The four faces of mass customization,” *Harvard Business Review*, Jan.-Feb. 1997, pp. 91 -101.

Heskett, James L; Jones, Thomas O; Loveman, Gary W; Sasser, W Earl Jr; Schlesinger, Leonard A; *Harvard Business Review*; Boston; **72**, 2, Mar/Apr 1994, pp. 164-174.

Hunt, S. D. and Nevin, J.R., "Power in a Channel of Distribution: Sources and Consequences," *J. Marketing Res*., **11**, 2, 1974, pp. 186-191.

IBM/Economist, *Global Insurance to the 21st Century*, (The Economist Intelligence Unit, and IBM Insurance Solutions) 1996.

Insurance Advisory Board, *CEO Briefing: A Call to Arms, The Mandate for Distribution Innovation in the Shrinking Life Insurance Market*, Insurance Advisory Board, The Watergate, 600 New Hampshire Ave., N.W., Washington, D.C. 20037, 1998.

Jeuland, A.P. and Shugan, S.M., “Managing Channel Profits,” *Marketing Science*, **2**, 3, 1983, pp. 239-272.

Kan, Rinnooy, “The Changing Global Environment of Financial Services,” talk given at the “Creating Value in Financial Services,” seminar, Stern School of Business, March 7th 1997, New York. in *Creating Value in Financial Services*, eds. Melnick, E., Nayyar, P., Pinedo, M., and Seshadri, S, Kluwer Academic Press, Hingham, MA, 1999.

Kennickell, A.B. and Kwast, M.L., "Who Uses Electronic Banking? Results from the 1995 Survey of Consumer Finances," *Proceedings of the 33rd Annual Conference on Bank Structure and Competition* (Federal Reserve Bank of Chicago, May), 1997, pp. 56-75.

Kim, W.J.; Mayers, D.; and Smith, C. W., Jr., “On the choice of insurance distribution systems”, *Journal of Risk and Insurance*, **62**, June 1996, pp. 207-28.

Laing, A.W., “Distribution of Life Assurance and Investment Products: The Scottish Mutual Life Assurance Industry,” *Journal of Bank Marketing*, **12**, 4, 1994, pp. 25-31.

“Liberty focuses on Acquisition Channels”, *National Underwriter Property & Casualty/Financial Services Edition*, August 2, 1999.

Lilien,G.L. and Kotler,P., *Marketing decision making : a model-building approach*, Harper and Row, New York, 1983.

Lusch, R.F., “Sources of Power: Their Impact on Intrachannel Conflict,” *Journal of Marketing Research*, **13**, 4, 1976, pp. 382-390.

Mayers, D., and Smith, C.W., Jr., “Contractual provisions, organizational structure, and conflict control in insurance markets”, *Journal of Business*, **54**, July 1981, pp. 407-34.

McCammon, B.C. and Little, R.W., “Marketing Channels: Analytical Systems and Approaches,” *Science in Marketing*, Schwartz, G. (ed.), New York: Wiley, 1965, pp. 321-385.

McGuire, T.W. and Staelin, R., “An Industry Equilibrium Analysis of Downstream Vertical Integration,” *Marketing Science*, **2**, 2, 1983, pp. 161-191.

Meador, J.W., Ryan, H.E., and Schellhorn, C.D., “Product Focus versus Diversification: Estimates of X-Efficiency for the US Life Insurance Industry,” paper 97-16, *Wharton Financial Institutions Center*, The Wharton School, University of Pennsylvania, PA.

Morrison, A.B. and Yellin, Daniel, “The Virtual Insurance Company,” *Insurance and Technology*, **21**, 8, 1996, pp. a1-a4.

Naert, P.A., “Mathematical Models of Vertical Market Structures,” Ph.D. Dissertation, Cornell University, 1970.

Pinedo, M., Seshadri, S., and Shanthikumar, J. G., “Call Centers in Financial Services: Strategies, Technologies, and Operations,” in *Creating Value in Financial Services*, eds. Melnick, E., Nayyar, P., Pinedo, M., and Seshadri, S, Kluwer Academic Press, Hingham, MA, 1999.

Posey, L.L., and Yavas, A., “A Search Model of Marketing Systems in Property Liability Insurance,” *Journal of Risk and Insurance*, **62** , 4, 1995, pp. 666-689.

Prasad, B. and Harker, P.T. “Examining the contribution of information technology toward productivity and profitability in U.S. retail banking,” paper 97-09, *Wharton Financial Institutions Center*, The Wharton School, University of Pennsylvania, PA.

Rangan, V.K., “The Channel Design Decision: A Model and an Application,” *Marketing Science*, **6**, 2, 1987, pp. 156-174.

Rangan, V. K., and Jaikumar, R., “Integrating Distribution Strategy and Tactics: A Model and an Application,” *Management Science*, **37**, 11, 1991, p. 1377-1389.

Rangan, V.K., Zoltners, A.A., and Becker, R.J., “The Channel Intermediary Selection Decision: A Model and an Application ,” *Management Science*, **32**, 9, Sep. 1986, pp. 1114-1122.

Rosenberg, L. J. and Stern, L. W., "Conflict Measurement in the Distribution Channel," *J. Marketing Res*., **8**, 4, 1971, pp. 437-442.

Roth, A. V. and Jackson, W. E., "Strategic Determinants of Service Quality and Performance: Evidence from the Banking Industry," *Management Science*, **41**, 1995, pp. 1720-1733.

Shelton, David, “Distribution Strategy in the Life and Pensions Market,” *International Journal of Bank Marketing*, **13**, 4, 1995, pp. 41-44.

Shugan, S.M., “Implicit Understandings in Channels of Distribution” *Management Science*, **31**, 4, Apr. 1985, pp. 435-460.

Soteriou, Andreas and Zenios, S.A., “Efficiency, Profitability and Quality of Banking Services,” paper 97-28, *Wharton Financial Institutions Center*, The Wharton School, University of Pennsylvania, PA.

Standard and Poor’s, “1998 Life/Health Insurance Outlook,” from S&P WebSite, 1998.

Tillinghast-Tower Perrin / Wharton Financial Institutions Center, “Strategic Choices, Firm Efficiency and competitiveness in the U.S. Life Insurance Industry”, Wharton Financial Institutions center, University of Pennsylvania, Philadelphia, PA.

Venezia, Itzhak, Galai, Dan, and Shapira, Zur, “Exclusive vs. Independent Agents: A Separating Equilibrium Approach,” J. of Economic Behavior in Organization (in press), 1999.

Watkins, Peter, “Get Ready for the Virtual Insurance Company,” National Underwriter, **99**, 23, Jun. 5, 1995, pp. 41-44.

White, L.J., “Technological Change, Financial Innovation, and Financial Regulation: The Challenges for Public Policy,” paper 97-33, *Wharton Financial Institutions Center*, The Wharton School, University of Pennsylvania, PA.

Wilcox, Joe, “Reinventing Insurance for the Internet,” *Life Association News*, **91**, 7, July 1996, pp. 106-115.

Zusman, P. and Etgar, M. "Marketing Channel as an Equilibrium Set of Contracts," *Management Science*, **27**, 3, 1981, pp. 284-302.