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Essays on the Influence of Social Networks on the Marketing Distribution Channel and New Product Diffusion

by

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Dedication

To my wife Hui Xu.

ABSTRACT

The first essay studies the channel relationship between the reseller and the manufacturer based on a social network theory framework. We propose a conceptual model that approaches this topic from a relational embeddedness perspective. Our analysis shows how the reseller can strategically develop relational ties with a manufacturer that transform the latter's common marketing mix into unique resources that enhance the reseller's own profit.

Results from a large scale survey of beer resellers in a local Chinese market suggest that in a channel setting, social norms (e.g. communication effectiveness and conflict resolution) and social relations influence the reseller's access to the manufacturer's valuable resources. Furthermore, we find that over embeddedness affects the reseller's profit in a non-linear manner. That is, a reseller's effort to develop a relationship with a particular manufacturer may generate information that lacks freshness, objectivity or usefulness, thereby diminishing the reseller's profitability.

Theory of social contagion states that individual's adoption of new product depends on the adoption of his immediate neighbors in a social network in addition to the influence from other sources. This research models the dynamic diffusion process of new drug in a social network of physicians. We simulated the information transmission process in a social network, where each network entity repetitively influences the probability of connected entity's new product adoption. The simulation approach integrates two seemingly contradictive

concepts of cohesion and structural equivalence into a single modeling framework. Besides, it incorporates a coefficient that describes an individual entity's efficiency of information transmission. On the one extreme it assumes that information transmits to only one of the network neighbors and on the other extreme it assumes that information transmits to all of the network neighbors.

We revisited Medical Innovation data and empirically find an optimum point for each of the four cities in this data set, using a discrete time hazard model. The four cities demonstrate different patterns of information transmission. Managerially, we suggest different ways of pinpointing initial adopters in different types of social networks.

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Chapter 1: General Introduction

The 21st century is a century of network and networking. The economic development and more intensive competition call for the specialization of various functions in a society. At the same time, these social functions become more interdependent on other's specialized work to achieve better competitive advantages. It is the social network that links those social functions and conveys information and resources between network entities (Padolny 2001). In marketing field, the market competition propels a firm to concentrate on its own competitive advantage. Some of the functions of sales, promotion, production, purchasing, research and development could be outsourced to more specialized firms. Thus, the firm needs networking with others to get resources to supplement its own needs.

Similarly, the word of mouth network could be an important product information transmission media (Frenzen and Nakamoto 1993). In consumer research domain, perceived risks in product consumption often hamper new product trial use. At that moment, consumer could refer to their close friends to get reliable product information. And this consumer could also be a source of reliable information for other people's consultation after the trial use.

Strategic network theory, originally developed in sociology, explains how social relations can shape the economic behavior and performance. Social embeddedness is the foundation of this theory (Grannovetter 1985). Embeddedness refers to the process by which social relations shape economic action. According to Uzzi (1996), the concept of embeddedness can be classified as two main constructs: relational and structural. Relational embeddedness addresses the question of not only whom one knows, but also how well one knows them. Nahapiet and Ghoshal (1998) defined relational embeddedness as “the personal relationships people have developed with each other through a history of interactions.” This is a quality of tie measure. And the quality of tie generally determines the quality of resources (Gulati 1999).

Theory of weak ties by Grannovetter (1973) suggests that a confined set of relations constrains the inflow of fresh information. Compared with a strong tie, a weak tie is more efficient and effective in transmitting fresh information. In other words, a strong tie with the manufacturer, on the other hand, may prevent a reseller from accessing fresh, objective, and complete information to make economically informed decisions. Thus, the information obtained under this scenario may be redundant, subjective, and less helpful in decision making.

The literature in structural embeddedness discusses how the network structure and the position of the network entity influence the organization or individual behavior. The structure of a network could influence the process of new product diffusion. For example, the centrality of an entity in a network determines the timing of new product adoption (Coleman, Katz and Menzel 1957). In a word, the social embeddedness and the structure of network determine individual organization or person’s behavior.

My two essays contribute to the understanding of the influence of social embeddedness on the sales agent. The first essay is talking about the reseller in a marketing channel. It applies structural equation modeling approach to model the effect of how dyadic relationship between reseller and manufacturer influences the quality of marketing resources and subsequently the reseller's profit. It has also shown that over-embeddedness does not bring additional profits to resellers. This essay enriches the channel relationship literature in that it fills in the theoretical gap of how behavioral process variables influence firm's profit and justifies the economical value of relationship building. In addition, this essay also contributes to strategic management in general by showing relational mechanisms of governance is an alternative to the market power and hierarchy**.** My first thesis also contributes to the strategic marketing literature by showing that relationship building is a type of sustainable competitive advantage. Moreover, our analysis also expands and enhances our understanding of a firm's domain of controllable resources within a channel setting. That is, a reseller may implicitly or explicitly adopt the resources of other channel members to strategically increase its profits. In social network theory, our analysis confirms the information redundancy of a strong tie and has similar findings with Uzzi's (1996) work. As a whole, the contribution of our thesis covers all the major trends of marketing theory development in 21st century as outlined by Vargo and Lusch (2004).

The second essay is on the new drug information diffusion in a medical doctor's social network. The medical doctor is a special agent of drug manufacturer prescribing medicine to the patients or the end user. My second essay simulates the information diffusion process in a medical doctor's network. The social contagion theory basically states that people may copy what their peers did(e.g. Festinger, Schachter and Back 1950).Yet the social contagion theory does not explain consumer's information acquisition behavior to reduce consumption risks. Social cognitive theory (e.g. Bandura 1977) instead states that human being is able to learn from other's experiences. If a medical doctor wishes to prescribe a new drug, he may observe the consequences of the prescription of other doctors that he is able to access. Moreover, he could discuss, argue and even debate about the effects and side effects of a new drug with other doctors who had experiences of using the new product before him. The information he gets from his peers can reduce the potential risks of a new drug. My modeling approach dynamically simulates the new drug information diffusion process from original adopters to each later adopter via social ties. More importantly, our approach simulates the diffusion process upon various efficiency coefficients of network entity's diffusion. We use a series of discrete-time hazard models to look for an efficiency coefficient that could best fit the doctor's new drug adoption date empirically. With this efficiency coefficient, managers could judge whether the network hubs (those with lots of social ties) are more important than non-hubs in the new product diffusion process within social network as described by Goldenberg et al (2009).

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Chapter 2: Essay 1: The Profit Impact of the Reseller's Relational Embeddedness in Channel Relationships: A Social Network Framework

2.1 Introduction

With the emergence of the network economy and new trends in market competition, firms have become more interdependent on each other. Firm boundaries and activities are increasingly blurred by interweaved networks. The process by which firms embedded in a relationship network survive and grow within a network economy is a key theme of the 21st century (Achrol 1997, Achrol and Kotler 1999). Within the network domain, research on strategic channel relationships has considerable promise. This setting may afford new insights into cooperative and competitive behaviors of independent business units (e.g., manufacturers and resellers) that have to function within the challenges and opportunities presented by their network (i.e., the distribution channel).

Academic research on channels reflects two main paradigms: microeconomic and behavioral (Stern and Reve 1980). The former models manufacturer and distributor behaviors using a profit-maximization approach (e.g. Jeuland and Shugan 1983). Although this approach has the advantage of focusing on firm-level profits, it treats channel units as black boxes (Nelson 1991) and each transaction as discrete. In other words, it neglects the social interaction process critical to building a relational tie within a channel setting (Heide 1994). In contrast, the behavioral paradigm showcases the mechanisms that channel members may use to influence others' behavior during contract negotiation (e.g. Frazier, Rody and Raymond 1991), marketing mix implementation (e.g. Bergen, Dutta, Shantanu and Orville 1992) and customer service (e.g. Anderson and Narus 1990). Such studies usually consider intermediate performance process-related constructs like channel member satisfaction (e.g. Ruekert and Churchill 1984), compliance (Frazier, Rody and Raymond 1991), trust and commitment (Morgan and Hunt 1994), but seldom address a key performance outcome such as firm-level profits. Additionally, they are preoccupied with the manufacturer's perspective (Siguaw, Simpson and Baker 1998 offer a rare exception by considering the reseller's or distributor's perspective.)

The impact of channel network relationships on reseller profits remains largely unexplored (Frazier 1999). Our research fills this knowledge gap. Adopting the social network theory perspective, we argue that, depending on the quality of manufacturer-reseller relationship, a reseller has improved access to transaction-, product- and promotional resources of the manufacturer to enhance its own profits.

Social network theory specifies that a firm's relationship network is a unique, inimitable resource that has a long-term impact on its profits (Gulati 1999). Firms are especially likely to benefit from network relationships that bring valuable resources and/or augment their status (Kogut 2000). In channel settings, the task of attracting and managing network resources qualifies as a strategic capability likely to enhance long-term profits of downstream firms. Our research shows that the reseller may strategically build a quality relational tie with a manufacturer. That is, a given reseller, by nurturing its relationship with the manufacturer, can transform the initially common resources (i.e., those made available by the manufacturer to all its resellers) into unique resources that enhances its own profits.

Nevertheless, social network theory also suggests that relationships are not necessarily beneficial to network members if they are (a) too close, and (b) involve a dominant network partner. Granovetter (1973) describes the importance of a weak tie (as opposed to a strong relationship tie) in that it can more effectively transfer fresh information at a lower cost. From a reseller's perspective, emphasizing a close relationship (strong tie) with a dominant manufacturer may not be effective, or even detrimental. For example, consider the choice problem confronting retailers when manufacturers introduce new products. Under the circumstances, retailers have to decide which products to carry, guided by constraints they face such as limited shelf space. Kaufman, Jayachandran and Rose (2006) provide evidence that relationship embeddedness may lead to economically sub-optimal choices. They show that strong retailer-manufacturer relationships may inhibit the retailer's ability to make informed economic choices. More specifically, when a manufacturer fails to offer a clear competitive advantage in the new product (i.e., when its attractiveness is modest), the likelihood that the retailer will accept the new product is increased by approximately 33% when the retailer-manufacturer relationship is strong as opposed to weak. Interestingly, the authors report another insight when the research focus changes from the business-to-business to the person-to-person relationship domain. That is, the likelihood of the retailer accepting the new product increased as high as 60% under strong buyer-salesperson relationships, when compared to weak buyer-salesperson relationships.

Overall, it appears safe to state that strong reseller-manufacturer relationships impose more hidden economic costs than weak relationships. Furthermore, it is reasonable to assert that such costs are exacerbated in the case of a reseller who cultivates a strong relationship with a single manufacturer, because economically detrimental outcomes are less likely when the reseller is engaged with multiple manufacturers. Strong ties appear to have both advantages and disadvantages (Capaldo 2007). Moreover, as Granovetter implies, weak ties may help resellers to garner fresher and more objective information about the manufacturer; a strong tie with the manufacturer, on the other hand, may prevent a reseller from accessing fresh, objective, and complete information to make economically informed decisions. In other words, the information obtained under the latter scenario may be redundant, subjective, and less helpful in decision making.

Our research contributes to the literature in marketing strategy and channel areas as follows. First, it expands our understanding of a firm's domain of controllable resources. For example, a reseller may implicitly or explicitly adopt/transform the resources of other channel members to strategically increase its profits. Notably, this possibility is not accommodated by theories in the management literature (e.g., the resource-based-view of firms - see Barney 1991, dynamic capability theory – see Amit and Schoemaker 1993), or the marketing literature (e.g., resource advantage theory - see Hunt and Morgan 1996, firm's capability theory - see Day 1994). Second, it links behavioral process variables to firm-level profits. More specifically, it explores behaviors of firms within a network to explain some of the variance in firm-level profits. Our results suggest it is appropriate for a reseller to tailor its relationship management effort devoted to a manufacturer based on that manufacturer's market power. Finally, our study showcases the reseller's perspective, which is somewhat unusual in the channel literature. This allows insights into relationship building with sellers, as opposed to the common theme of relationship building with buyers that is often advanced in the relationship marketing literature (Harrison 2004; Izguierdo and Cillan 2003).

This manuscript is organized as follows: we first present a brief literature review of the manufacturer-reseller relationship, followed by a discussion of social network theory, with an emphasis on relational embeddedness, and contrast it with the channel literature that focuses just on relationship building. We then develop a conceptual framework and offer related hypotheses. This is followed by a description of our empirical research results. We conclude with managerial implications.

2.2 Literature Review

2.2.1 Manufacturer - Reseller Relationship

The microeconomic approach has been applied to study independent and discrete transactions without the consideration of social networks and relational ties (i.e., it does not consider transaction history). This stream of research assumes simple relationships among channel members where the manufacturer is responsible for production and sells the product to the reseller. The price and product quality are usually determined by maximizing the manufacturer's and the reseller's profits in a game theory context. Using this approach, it is difficult to study relational transactions with complex manufacturer and reseller relationships embedded in a social network.

In sharp contrast, recent research demonstrates that transactions are inevitably embedded in social network contexts, and that such networks influence transactions

(Uzzi and Lancaster 2004). Contrary to the assumptions made by the microeconomic approach, it is clear that firms do reach decisions based on their previous experiences. This reaffirms the view that transactions among firms possess a relational character. When logically extended to channel settings, this suggests that channel members build relationships based on historical and social contexts. With increased communication and mutual understanding, the reseller and the manufacturer are likely to develop shared norms or standards (Dwyer, Schurr and Oh 1987; Vazquez, Iglesias and Alvarez-Gonzalez 2005) in both strategic planning and routine transactions. Under the circumstances, a reseller may alert a market-oriented manufacturer to changes in consumer and competitor actions, and expect a suitable reciprocal adjustment in the manufacturer's marketing mix that is likely to benefit the reseller. Similarly, the manufacturer may use relational exchanges with the reseller to signal impending changes that may affect the latter's financial performance (Simpson, Siguaw and Baker 2001). Indeed, a reseller's market orientation may positively influence the supplier's market orientation, and the latter construct may increase the reseller's dependence on the supplier as well as the retailer's economic satisfaction with the supplier (Chung, Jin and Sternquist 2007). Nevertheless, key research questions with resource and performance implications for the reseller await study within the manufacturer-reseller relationship context.

Another main theme in channel research is governance. Governance refers to "the initiation, termination and ongoing relationship maintenance between a set of parties" (Heide 1994). Governance may influence the nature and distribution of institutionalized capacity within a channel network, in order to influence and reach decisions with regard to a particular locality. The choice of governance structure may range from integration to joint venture, alliance, or franchising. Each choice is justifiable under different economic circumstances. Furthermore, the basis to implement, maintain or terminate a given governance structure may include transaction cost (Williamson 1985, Rindfleisch and Heide 1997), perception of environmental uncertainty, and/or acquisition of production factors (Heide 1994). For example, studies show that vertical integration could reduce the manufacturer's transaction cost and discourage the reseller's "opportunism" in uncertain markets. From the reseller's perspective, the form of governance may be less important because reseller performance is often related to their ability to coordinate and collaborate with manufacturers in order to obtain critical resources (Jap 1999). In the next section, we briefly review the traditional resource-based view in strategic management and its potential application to a distribution channel.

2.2.2 Resource-Based View and Sustainable Competitive Advantage

The resource-based view (Barney 1991) maintains that a firm's heterogeneity in strategic resources determines its profits. These resources allow firms to produce more effectively (in terms of product quality) and more efficiently (in terms of cost) when compared to competitors. Strategic resources include operational resources that are sustainable across time periods and non-duplicable by other firms. Firms controlling such resources are likely to generate long-term superior profits over competing firms. However, a limitation of studies that empirically test the resource-based view is that they unrealistically restrict the resource domain within a firm's internal boundary.

When a firm's capability is a sustainable competitive advantage, it has the potential to generate superior profits (Day 1994). Note that capability is embedded inside the firm's development process over time. Capabilities are different from physical assets. That is, the former are intangible, sustainable and inimitable resources. Day's notion of capability inspired studies on market orientation (e.g. Jaworski and Kohli 1999) that showcase the use of dynamic market intelligence to satisfy customers. However, it is important to acknowledge that a firm's control of resources may extend beyond its boundary. The resources needed to develop its competitive advantage may not be available internally. For example, resellers who seek to sell products but who do not possess the physical resources needed for production operations, may rely on their inter-organizational coordination capabilities to acquire superior resources that allow access to finished products without actually owning production resources. In a similar vein, resellers that cultivate more effective communications with the manufacturer may access actionable and timely information that improves their market performance (Simpson et al 2001). Both the reseller and the manufacturer can benefit from changes in the latter's marketing mix that are tailored to the specific environment where the reseller is located. The next section discusses strategic network theory that was originally developed in sociology, and its application in strategic management.

2.2.3 Social Network Theory

The research tradition in network and social embeddedness stems from economic sociology and organization research. Scholars in this line of research argue against the validity of the assumption that economic activities and markets are not influenced by social structures. Instead, network and organizational theorists emphasize the impact of social relational ties on economic exchanges. According to this view, such exchanges are inevitably embedded in, and affected by, the structure and quality of social network ties (Granovetter 1985). Networks are viewed as pipes conveying resources (e.g. information, technologies, etc., Podolny 2001).

More recent applications of network and social embeddedness theories into strategic management studies echo the emergence of the network economy (e.g. Achrol and Kotler 1999). Strategic network theorists maintain that networks and social relationships provide the means to access resources that are external to a firm. Additionally, they remain valuable and inimitable resources that contribute to the firm's capabilities and performance (McEvily and Zaheer 1999; Gulati, Nohria and Zaheer 2000; Zaheer and Bell 2005). A network's structural and relational characteristics, such as location within the network, membership, strength and quality of ties, norms and culture cultivated within the network, can all be resources (Nariu and Ueda 2004). These characteristics are developed usually on a long-term basis. Once developed, they become sustainable and cannot be duplicated by competitors. Therefore, we assert that a firm's relational embeddedness is an enduring source of competitive advantage (Moran 2005).

Relational embeddedness addresses the question of not only the entities one knows, but how well one knows them. Based on Granovetter's (1985) work, Nahapiet and Ghoshal (1998) defined relational embeddedness as "the personal relationships people have developed with each other through a history of interactions." In support of this view, we argue that the quality of channel relationships is very important, especially with regard to resources that a given firm may obtain from other network members. Our study draws insights from strategic network research, and improves our understanding of marketing management within distribution channels. In our view, the idiosyncratic quality of relational ties developed between a manufacturer and a specific reseller explains the bulk of the heterogeneity in resources allocated across resellers by that focal manufacturer. However, a reseller, who is over-embedded in a relationship with a manufacturer, does not necessarily get better financial profit. Over-embeddedness is defined as a multi-lateral relationship status in which network entity's cost of maintaining the relationships overpasses the benefits of the relationships. Particularly in the channel management area, the reseller needs information about the management philosophy, macro level market competition, transshipment reporting and control policy, channel stuffing, product return policy and etc. These types of information are controlled by various functional departments within the manufacturer's domain. Reseller could better manage its own sales if it has valid touch points in all of these functional departments. Therefore, when the number of touch points increases from none to a critical number, the reseller may benefit from the information provided by those touch points. Nevertheless, when the number of touch points increases further after the critical number, there will be additional touch points from same functional departments of the manufacturer. Those new touch points may provide redundant information, which does not bring additional economic benefits to the reseller. Additionally, they are more likely to be interconnected with the existing touch points. And hence the density of the ego network[1] of the reseller may increase

[1] The density of the ego network refers to the ratio of the number of actual ties to the number of all possible ties linking network entities, all of which are connected to the focal network entity.

along the increase of the number of touch points after the critical point. On the other hand, reseller may invest considerable amount of time, efforts and financial costs to maintain various relationships within the manufacturer's domain. The more touch points in a single manufacturer's domain, the more costs will be spent to maintain these relationships. Altogether, we maintain that (before) after a critical point, the marginal net effect of number of touch points in the manufacturer's domain may (increase) decrease.

In Table 2-1, we briefly illustrate the main concepts of the theories introduced above and their relations to social network theory. We next will develop our conceptual model of relational embeddedness in manufacturer and reseller relationships and state related hypotheses.

2.3 Conceptual Model and Hypotheses

We propose the conceptual model in Figure 2-1. The model begins with *relational embeddedness* variables that convey the quality of the ties that bind a reseller with the focal manufacturer. As suggested by Gulati (1999), both the network entity and the network relationships established by that entity are inimitable and non-substitutable resources. In this study, we use communication effectiveness[2], conflict resolution and strategic promotion as variables that capture the strategic elements of the relationship between a reseller and manufacturer in a typical channel setting (these variables are described later). A reseller can strengthen relational ties with the manufacturer based on its relationship-building capability. The reseller's relationship management process with

[2]The definition of each construct used in the model is provided in Appendix B, for the convenience of presenting hypotheses.

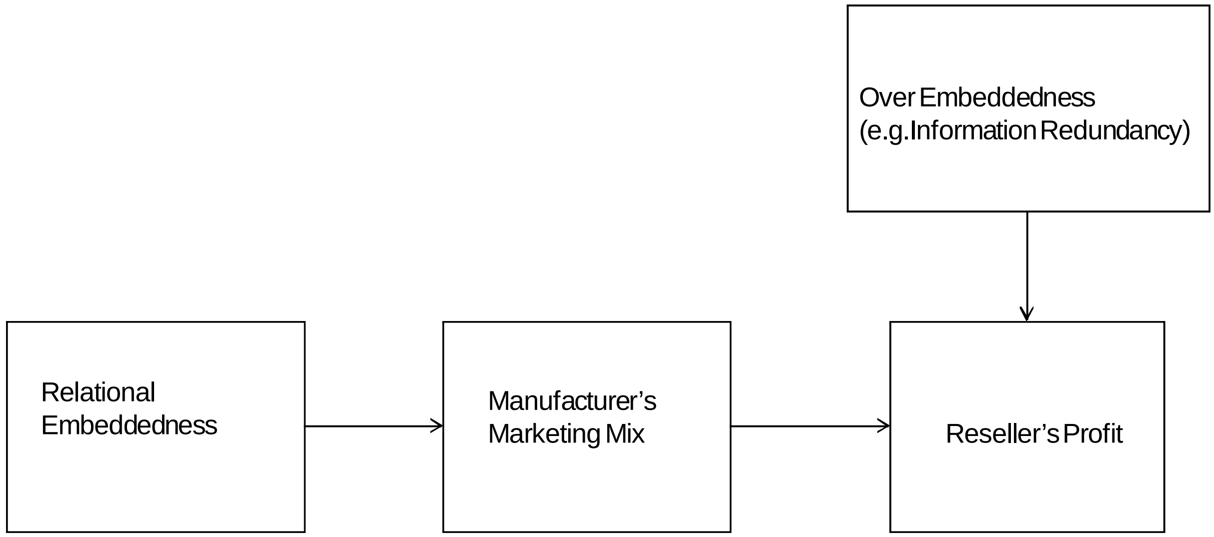
the manufacturer is similar to the latter's efforts to use its own market orientation to cultivate relationships with the reseller (Siguaw et al. 1998). Broadly defined, marketing orientation represents a firm-level capability to coordinate, monitor and accommodate to the changing competitive environment and customer needs, by actively gathering and using market intelligence (Narver and Slater 1990).

The conceptual model first underscores the importance of *relational embeddedness*. That is, the quality of relational ties influences the nature of resources that a network member (e.g., reseller) may receive from another network member, such as the manufacturer (Gulati 1999). A central tenet of the model is that the development of a manufacturer-reseller relationship, as seen from the reseller's perspective, elevates its purely economic and discrete transactions with the manufacturer by adding a significant relational and long-term orientation. Stated differently, as relational embeddedness for a specific reseller increases, the manufacturer's resources that are usually common to all resellers may be transformed into unique resources that are especially beneficial to that reseller. From a manufacturer's perspective, personnel, physical assets, technology know-how, capabilities and organizational processes all constitute the resources that can enhance the manufacturer's productivity. We maintain that resellers can access these resources through building a relationship with the manufacturer. If the reseller builds a strong relationship with the manufacturer, this relationship may be leveraged to tailor the latter's marketing mix to enhance its own efficiency and effectiveness. Relying on manufacturer's productivity, a tailor made marketing mix results in superior resources

Table 2-1 Theories Explaining Channel Member Relationship and Profit and Their Relationship to Social Network Theory

Theory	Resource Based View; Resource Advantage Theory	Firm's Capability	Channel Relationship Management
Representative articles	Barney 1991; Hunt and Morgan 1994	Amit and Schoemaker 1993; Day 1994	Morgan and Hunt 1994
Main Concept	Firm's key resources must be valuable, rare,inimitable and non-substituable. In a dynamic business environment, firms possessing the key resources could be strategically more efficient and effective than competitors.	Intangibility differentiates firm's capability from other resources. Firm's capability is a type of sustainable competitive advantage. Firm could only demonstrate its capability after acquiring resources. Firm's capabilities could be seperated into outsi	The trust and commitment are key constructs in channel member relationship management. Satisfaction and cooperation are the consequences of relationship building.
Limitations of Theory	The reasoning of RBV is self-circulating (Priem and Butler, 2001a, p31). RBV does not indicate where the key resources come from.	Firm cannot demonstrate its capability of influencing the configuration of resources beyond its own domain.	It neglects that profit is an ultimate objective of firms.
Relation to Social Network Theory	Firm's social network ties fulfill the conditions of key resources.	Firms could get resources from other network members through the social network tie (Podolny 2001)	Channel member relationship management is equivalent with building and maintaining social network ties

Figure 2-1 Research Framework



to the resellers. The model also suggests that as such resources become more valuable, the reseller's profits increase. Such resources may include variables such as product-fit, effective promotion and an efficient transaction process.

Finally, *over-embeddedness (information redundancy)* influences the reseller's profit in a non-linear way. The marginally decreasing informational benefits and increasing cost in maintaining various social ties with a particular manufacturer lead to an inverted U-shaped relationship between the density of the reseller-manufacturer relationship and the reseller's profits. When the density is low, the reseller can improve profitability by improving its relationship (increasing the relationship intensity) with the manufacturer. Beyond a certain threshold level, however, the reseller may gain little from additional relationship efforts.

2.3.1 Relational Embeddedness Variables

2.3.1.1 Communication

Two-way communication between channel members facilitates information exchange and can deepen the mutual understanding between the reseller and the manufacturer by building social norms (Frazier and Rody 1991; Heide and John 1992; Brown, Dev and Lee 2000) and lowering transaction costs (Cannon and Homburg 2001). Communication efficiency is the outcome of close and enduring inter-organizational ties (Macneil 1980). Channel members, with similar social norms and mental models of business tend to have a mutually-shared understanding that results in improved transaction efficiency. For example, if a reseller's supply chain system is tightly coupled with a manufacturer's physical distribution system, it is possible to have a more efficient information flow between them. The reseller will benefit from accurate stocking, efficient product replenishment and bar coding services, that in turn yield cost savings due to improved transaction efficiency (Iglesias and Gonzalez 2005). By contrast, if communication is dysfunctional, channel members are likely to process transactions less efficiently. In international trade contexts, for example, channel transactions are often delayed due to language and culture barriers. Therefore:

H_1: From a reseller's perspective, the higher the communication effectiveness, the higher the level of manufacturer's transaction efficiency.

2.3.1.2 Conflict

Channel conflicts exist if inconsistent objectives characterize the relationship between manufacturer and the reseller (Dwyer, Schurr and Oh 1987). For example, conflicts may arise if the manufacturer's objective is to maximize its profit in all markets as a whole and the reseller's objective is to maximize its profit in a local market. The international marketing strategy literature (Cavusgil, Zou and Naidu 1993; Jain 1989) suggests that heterogeneity (homogeneity) across different countries calls for marketing program adaptation (standardization). Following the same rationale, political, economical and cultural differences (similarity) across different sales regions call for customized (uniform) marketing mix implementation. However, economy-of-scale considerations may persuade the manufacturer to adopt a standardized product across markets (Levitt 1983). Manufacturers may even want resellers to assume the responsibility for marketing such products in local markets. In contrast, resellers may prefer an adapted product that uniquely fulfills expectations of local markets, thereby reducing marketing costs. Conflicts may arise if a manufacturer provides less customization/localization than that desired by the reseller. Reducing these conflicts (e.g. via technical support) is likely to improve resellers' perceptions of the 'fit' of the manufacturer's product for local markets. We therefore propose:

H_2: From a reseller's point of view, conflict resolution is positively related to manufacturer's product fit.

Conflicts may also arise at an operational level. For example, if the reseller's inventory turnover window does not match the manufacturer's credit extension period, the reseller's financial capital turnover rate may be adversely impacted. This may restrict the reseller's ability to repurchase goods, thereby engendering perceptions that the manufacturer does not provide adequate financial resources to assure transaction efficiency. In contrast, if the manufacturer and the reseller do not have implicit or explicit conflicts, their transactions are likely to be smooth and efficient. In sum, we propose:

H_3: From a reseller's perspective, conflict resolution is positively related to the manufacturer's transaction efficiency.

2.3.1.3 Strategic Promotion

Manufacturers tend to initiate strategic promotion programs in response to market competition. Although the objective of such programs is to better adapt both the product and related promotional strategy to changes in the marketplace (Cavusgil and Zou 1994), strategic promotion may also be designed to be more responsive to another manufacturer's competitive behavior rather than to resellers' preferences. Effective strategic promotion must accommodate the reseller's perspective. That is, a reseller will benefit if the manufacturer provides promotional support that is tailored to the local market served by the reseller (Cavusgil, Zou and Naidu 1993). Therefore, we hypothesize:

H_4: From a reseller's perspective, effective strategic promotion is positively related to the manufacturer's product fit .

H_5: From a reseller's perspective, effective strategic promotion is positively related to the manufacturer's promotion effectiveness.

2.3.2 Operational and Marketing Resources

2.3.2.1 Transaction Efficiency

The manufacturer's transaction efficiency depends on the manufacturer's transaction facilitating capability, including facets such as document processing, relationship with customers, suppliers and resellers, and the quality of its physical distribution system and transportation management (Morash, Droge and Vickery 1996; Rinehart, Cooper, and Wageneim 1989). Efficient order fulfillment capability at the manufacturer's end ensures that the right product arrive at the right place at the right time, thereby affording the predictability and flexibility that resellers need to manage their sales. This approach allows a reseller to effectively manage product inventory, while retaining the ability to rapidly respond to short-term market opportunities to serve end consumers. In contrast, manufacturer-induced channel bottlenecks (including transportation delays) may force resellers to forego such market opportunities. Based on this argument, we propose:

H_6: From a reseller's perspective, manufacturer's transaction efficiency influences reseller's profits.

2.3.2.2 Product Fit

Fitting product characteristics to local consumer needs and wants is a common practice in marketing. Consumers' needs and wants may change rapidly due to environmental and competitive factors. In this dynamic environment, the reseller expects the manufacturer to adapt to these market changes and provide the right products in a timely and efficient manner. If product delivery is delayed in a market where conditions rapidly change, this may result in products that are unsuitable for a specific market served by a reseller. ,

H_7: From a reseller's perspective, manufacturer's transaction efficiency influences the level of manufacturer's product fit.

Product adaptation can exploit different consumer needs across segments to achieve long term profitability (Cavusgil and Zou 1994). Therefore, the reseller serving niche markets prefers products that are adapted to local market conditions. Such products tend to increase sales volume and profits for the reseller.

H_8: From a reseller's perspective, the manufacturer's product fit positively influences the level of reseller's profitability.

2.3.2.3 Promotion Effectiveness

The reseller may benefit from a manufacturer's promotions in several respects. First, promotions tend to stimulate a temporary increase in demand. For example, manufacturers often use promotional gifts as incentives to increase sales. Second, the reseller may, in theory, redeem the economic value of such gifts (in separate transactions with a third party) if their residual market value exceeded the expected profits from incremental sales attributable to the promotional activity. Note that reselling promotional gifts is a common practice among channel members who are the focus of this study . Therefore, we propose the following:

H_9: From a reseller's perspective, manufacturer's promotion effectiveness, , positively influences reseller's profits.

2.3.3 Over-Embeddedness

The discussion above states that resellers can significantly benefit from building a strong relationship with a manufacturer, who can provide them with unique adaptive marketing and operational resources suitable to local market conditions.

As stated before, in addition to the exploratory market development with the manufacturer, the reseller needs information about manufacturer's management to manage their sales readily. Resellers can get useful information from more social interaction with the manufacturer when the reseller ego network density is low. The information may be redundant when the reseller ego network density is high.

The ego network density of a given reseller in the reseller-manufacturer relationship is measured by the attention devoted to that reseller by top management in the manufacturer firm. Such top management attention encourages timely and effective responses directed at the reseller by the manufacturer firm. It is also likely to generate new and more result-oriented touch points in the reseller-manufacturer relationship. From a benefit perspective, we expect a marginally decreasing information benefit when the ego network density between a reseller and the manufacturer increases. If the density is low, it is desirable to increase the number of useful touch points such that the reseller better understands the manufacturer's management information.

From a cost perspective, establishing more touch points with a single manufacturer requires more resources to build and maintain various relationships. Given this, it is reasonable to expect that, after a critical relationship intensity level is reached, a reseller's investment in developing a closer relationship with manufacturer exceeds the benefit afforded by a stronger tie with the manufacturer.

H_{10}: From a reseller's perspective, the influence of manufacturer's top management attention has an inverted U-shaped relationship on reseller's profits.

2.4 Data

Data were obtained from a commercial market research firm, which conducted a reseller satisfaction study for a foreign beer manufacturer operating in China. The beer manufacturer owned two brewing plants and four brands at the time of this study. Three brands were targeted at low end markets, and the fourth was aimed at the high-end market. The manufacturer worked with thousands of resellers to market their products, and ranked in the second tier of beer manufacturers in terms of market share. A focus group was initially conducted with 12 resellers who were asked to list factors influencing their relationship development with the manufacturer. The items most frequently mentioned were related to communication efficiency, conflict resolution, strategic promotion, product fit, promotional effectiveness and transaction efficiency. Guided by these results, a questionnaire was prepared to measure reseller satisfaction with the six areas identified above. The survey included 27 satisfaction scales to measure these areas. A five-point Likert scale was used with response options ranging from "very dissatisfied" to "very satisfied." All questions were rotated to avoid possible order effects.

To administer the questionnaire, the research firm conducted a personal interview of resellers drawn from 23 Chinese cities. They used a proportional sampling scheme whereby the proportion of sampled resellers in a given city was based on the actual number of resellers for the manufacturer in that city. A total of 376 usable questionnaires were available for data analysis.[3]

All scales measuring manufacturer-reseller relations, reseller's perceptions of quality of marketing mix and reseller's profit are satisfaction ratings, which are the most commonly used ratings in market research. In addition, satisfaction with channel relationships is the foundation for cooperation within distribution networks (Dwyer,

[3]We were not able to obtain the response rate from the company that administered the survey.

Schurr and Oh 1987). Satisfaction ratings are especially suitable to measure reseller's perceptions of relational embeddedness variables (Spekman 1996, p.12), resource variables, and profits. For most variables measured, the reseller's satisfaction rating reflected the difference of what manufacturer offered and what the local reseller desired in different markets. Finally, the reseller's satisfaction with their profits is used as an estimate of profitability because most resellers were private companies that did not disclose profits publicly.

2.5 Results

2.5.1 Measurement Model

We followed Anderson and Gerbing's (1988) two steps approach, and first develop a measurement model using LISREL (Maximum Likelihood), followed by the estimation of the structural model shown in Figure 2- 2 (with both straight and dotted lines). To develop a reliable and valid measurement model, we conducted a confirmatory factor analysis on the original 27 items used to measure the seven constructs (The 27 original items are listed in Appendix A). We used the Lagrange multiplier/Wald test to determine which items to include, and deleted items that loaded incorrectly or that had a high error covariance with other items (Netemeyer, Bearden and Sharma 2003, Ch. 7). After sequential deletion of 9 items, we obtained a measurement model, which has 18 items loaded on the 7 constructs. The reseller's perceived profit construct is measured by a single item. The error variance of the item measuring this construct is fixed at 0.2 level for model identification purpose[4]. The

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[4] Actually, the χ^2 statistics does not change when the error variance changes from 0 to 1.

included items and their standardized factor loadings are provided in Appendix B. All factor loadings are significant at 0.01 level. Table 2-2 (column 1) reports the goodness of fit statistics for the measurement model. The statistics shows that the model provides an acceptable fit (RMSEA=0.031) using the criteria suggested by Hu and Bentler (1999).

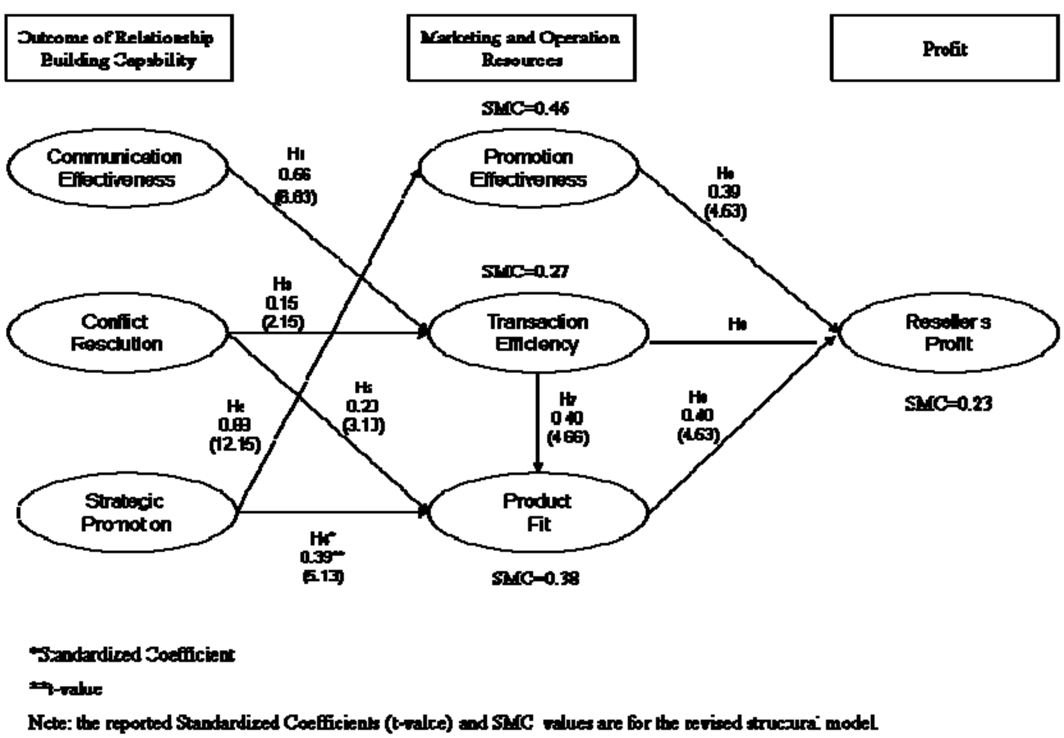
Table 2-2 Measurement Model and Structural Model Statistics Testing Relational Embeddedness

Measurement Model (18 items/7 constructs) Goodness of Fit	Original Conceptual Model Goodness of Fit	Revised Conceptual Model Goodness of Fit	Difference between Measurement Model and Revised Conceptual Model
χ^2 = 156.12 df=115 (P = 0.004)	χ^2 = 165.81 df=124 (P = 0.007)	χ^2 = 170.89 df=125 (P = 0.004)	$P(14.77_{(10)}) = 0.14$
RMSEA = 0.031	RMSEA = 0.030	RMSEA = 0.031	
GFI = 0.96	GFI = 0.95	GFI = 0.95	
CFI=0.98	CFI=0.98	CFI=0.98	
Standardized RMR = 0.035	Standardized RMR = 0.036	Standardized RMR = 0.036	
Sample Size = 376	Sample Size = 376	Sample Size = 376	

2.5.2 Structural Model

The original conceptual model achieved a similar acceptable level of fit (χ^2 =165.81, df =124, p = 0.007, RMSEA=0.030, other fit indices could be found in Table 2-2, column 2) to that of the measurement model (Table 2-2, column 1) using the 18 items on 7 constructs (Difference of χ^2 = 9.69, Difference of df =9, p = 0.38). All hypotheses except H_6 (transaction efficiency -> profit, not significant at 0.05 level) are supported by the data. The result for H_6 merits further scrutiny. It suggests that the manufacturer's transaction efficiency has only an indirect effect on reseller's profit. One consideration is that the reseller benefits from the right products arriving at the right place at the right time, relying on manufacturer's efficiency (H_7 and H_8). However, other considerations may undermine the premise that the manufacturer's efficiency improves a reseller's profits. If the manufacturer continuously delivers the product to the reseller regardless of its 'fit' to the end consumer, the reseller's inventory is likely to increase, and as a result, its profits may decrease. Given this equivocal finding, we deleted this path (H_6: transaction efficiency -> profit) and retested the structural model. The fit of the revised structural model (χ^2 =170.89, df =125, p = 0.004, RMSEA=0.031, other fit indices could be found in Table 2-2, column 3) is not statistically significantly different from the measurement model (Difference of χ^2 = 14.77, Difference of df =10, p = 0.14). The Squared Multiple Correlation (SMC) of each endogenous variable in the revised model is shown in Figure 2-2 (without the dotted line).

Figure 2-2 Relational Embeddedness Model Results Based on Structural Equation Model Estimation



2.5.3 Testing the Effect of Over Embeddedness

Our conceptual model provided in Figure 2-1 hypothesized that attention from manufacturer's top management has a negative quadratic effect on profits, resulting in an inverted U-shaped relationship (H_{10}). Recent advances in the methodology of structural equation modeling by Marsh, Wen and Hau (2004) suggest an unconstrained approach in testing the interaction effect. This approach results in a better estimation result than the constrained approach (i.e. Algina and Moulder 2001; Kenny and Judd 1984). We firstly incorporate the "attention from manufacturer's top management" construct into the previously acceptable measurement model. The new measurement model with 19 items on 8 constructs[5] also fits the data closely (RMSEA=0.030, χ^2 =173.42, df =126, p = 0.003, RMSEA=0.030, other fit indices could be found in Table 2-3, column 1). Moreover, we test the structural model with the effect of linear term of top management attention on the reseller's profit. This structural model fits the data closely (χ^2 =181.71, df =139, p = 0.003, RMSEA=0.030, other fit indices could be found in table 2-3, column 2) and achieves similar model fit as the measurement model (Difference of χ^2 = 8.29, difference of df =13, p = 0.82). We then follow the approach suggested by Marsh et al (2004) and test the conceptual model including the quadratic effect.[6] The quadratic model also provides an acceptable fit level (χ^2 =198.75, df =153, p = 0.007, RMSEA=0.028, other fit indices could be found in Table 2-3, column 3). The result shows that H_{10} (the quadratic term of top management attention is negatively related to the reseller's profit) is supported (β = -0.12, t = -1.98). The parameter

7 The error variance of top management attention is set to 0.20.

8 The quadratic term of top management attention derives from the square of the mean-centered variable of top management attention.

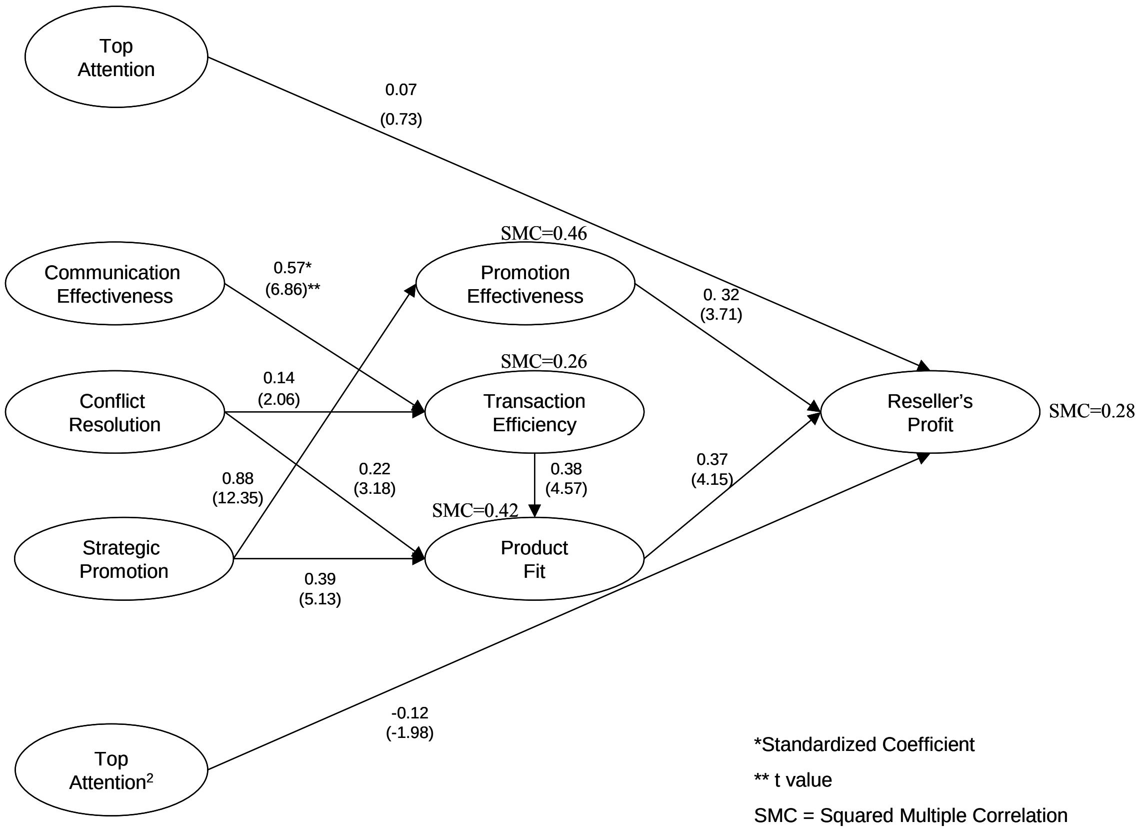
estimates for the whole conceptual model are shown in Figure 2-3. The coefficients of the relational embeddedness part of the whole conceptual model are similar to those if they are estimated without incorporating the over-embeddedness part.

We also test the alternative path from profit to the top management attention because reseller's poor performance might influence the manufacturer's profit level and arouses the attention of manufacturer's top management. This alternative explanation again is not supported by our data. Details of my data analysis, which fails to support this alternative explanation, are shown in Appendix C. Conceptually, most resellers in our dataset are small in size and the manufacturer has business relationships with thousands of similar resellers. Therefore, the profit level of individual small reseller might not be strong enough to get the top management attention of the manufacturer.

Table 2-3 Measurement Model and Structural Model Statistics Testing Whole Conceptual Model

Measurement Model (19 items/8 constructs) Goodness of Fit	Structural Model Goodness of Fit (including only the effect of linear term of top attention on reseller's profit)	Structural Model Goodness of Fit (including the effect of both linear term and quadratic term of top attention on reseller's profit)	Difference between measurement model and conceptual model in the second column
Chi-square 173.42 df=126 (P = 0.0033)	Chi-square 181.71 df=139 (P = 0.0033)	Chi-square 198.75 df=153 (P = 0.0073)	$P(8.29_{(13)}) = 0.82$
RMSEA = 0.030	RMSEA = 0.031	RMSEA = 0.028	
GFI = 0.95	GFI = 0.95	GFI = 0.95	
CFI=0.98	CFI=0.98	CFI=0.98	
Standardized RMR = 0.034	Standardized RMR = 0.036	Standardized RMR = 0.035	
Sample Size = 376	Sample Size = 376	Sample Size = 376	

Figure 2-3 Whole Conceptual Model Results Based on Structural Equation Model Estimation



Finally, we test the robustness of the effect of inverted U shaped relationship between manufacturer's top management attention and reseller's profit. Finn (2005, 2006) found that the level of error variances that represent various sources of variance (e.g. in this study, raters and/or levels of product in focus) might influence the estimation of parameters of a model. We set the error variance of top management attention from 0 to 1 with an interval of 0.1. The t value of the path from the quadratic term of this construct to the reseller's profit is between -1.70 and -3.07 when the error variance is between 0 and 0.70. When error variance is more than 0.80, the models do not converge. These results demonstrate that the inverted U shaped relationship is robust when the error variance is not too large.

2.5.4 Discussion of Results

The results in Figure 2-2 show that we find support for all hypotheses, except for H_6. H_1-H_5 mainly discusses how relationship building can enhance the quality of manufacturer's marketing and operational resources from a reseller's perspective. Nahapiet and Ghoshal (1998) state that network ties are key resources that can provide access to the manufacturer's marketing and operational resources. Our research identifies different types of resources; more importantly, it underscores the links between relationship-building variables on the one hand, and marketing and operational resources on the other, using a social network perspective. Results from our empirical study confirm that social norms (e.g. communication effectiveness and conflict resolution) and social relations influence the reseller's access to manufacturer's valuable resources. These resources are in particular important to small resellers who typically find it difficult to adapt effectively to market conditions on their own.

H_6-H_9 mainly discuss how the manufacturer's resources are used to enhance the reseller's profits. In contrast to the resource-based view that suggests that a firm's own resources contribute to its own profits, our empirical analyses show that the firm can also profit from strategic use of another firm's resources. Overall, our work extends the range of resources beyond the definitions used in both the resource-based view (Barney 1991) and in resource-advantage theory (Hunt and Morgan 1996). It also expands Day's (1994) definition of capability by adding inter-organization capability as a sustainable competitive advantage.

The resource based view (Barney 1991) states that resources controlled by a firm tend to generate profit for the firm. These resources include physical assets, information, knowledge，capabilities etc. Amit and Schoemaker (1993) further distinguishes between two different types of resources: resource and capability. The former refers to tradable and non firm specific items and the latter refers to firm-specific assets. Moreover, the literature in firm's capability suggests that firm's capability functions after the firm take possession of the resources (Makadok 2001). This is true, in particular, to the manufacturing firm, which demonstrates its capability of production out of the raw material purchased from its suppliers. Our research, in contrast, showcases from a reseller's perspective that reseller could demonstrate its capability of influencing and changing the strategic resources from manufacturer before these resources come into the possession of the reseller. Therefore, our research extends the domain of resources that could be controlled by firm's capability.

Our study, consistent with the previous literature, demonstrates the power of relations in the marketing channel. The study by Kaufman et al (2006) found that both inter-organizational and inter-personal relationships influence the reseller's choices of new products. This finding implies that the relations with the resellers may benefit manufacturer. Gu, Hung and Tse's (2008) study, from an interpersonal relationship perspective, demonstrates the influence of the "Guanxi," or meaningful favors dispensed or received by a firm's senior management in business transactions on a firm's performance in the channel setting. Our research, uniquely from a reseller's perspective, underscores the influence of inter-organizational relationships with the manufacturer on the reseller's profit.

Our study shows that firm's relationship may be considered a form of social capital (Coleman 1998) that generates profit. Moreover, a firm's relationship-building effort within a social network requires time to fully evolve, but it is often structured such that it is difficult to copy by other resellers. Resellers can also leverage existing relationships by adapting manufacturer's resources into heterogeneous and valuable resources, which can generate superior profit. Therefore, relationship management capability is a sustainable competitive advantage.

Our hypotheses related to over embeddedness (H_{10}) suggest that over-embeddedness with one particular manufacturer may lead to inefficient use of information. We find an inverted U-shaped relationship between top management attention and profitability suggesting that both too little and too much attention by top management can lead to lower profitability. When a reseller becomes too deeply embedded with a particular manufacturer, the amount of new information from alternative suppliers is reduced. The reseller may not be willing to invest the time and effort needed to acquire the information about other manufacturer's strategic behavior. Thus, it could be difficult for a reseller to form a comprehensive insight of the competitive marketplace.

2.6 Managerial Implication

Resellers may obtain a competitive advantage through inter-firm coordination. With limited physical resources in hand, resellers' competitive advantage might be the social relations. Uzzi (1999) interprets a firm's social network as social capital, and our research further substantiates this concept in the channel setting and emphasizes that the reseller should invest the time and effort needed to build an effective relationship with the manufacturer. Resellers who cultivate an effective relationship with a manufacturer are likely to access superior marketing resources from the manufacturer. Therefore, it is not wise for resellers to take the manufacturer's marketing mix offerings as granted.

Our research helps identify reseller's objectives of relationship building with manufacturer. Our analysis shows that reseller's good communication with manufacturer and conflict resolution with manufacturer lead to higher efficiency in order fulfillment and physical transportation (H_1 and H_3). Hence, the resellers should communicate effectively with the manufacturer to streamline the transaction process with a manufacturer. Our analysis also shows that reseller's conflict resolution with manufacturer leads to better product fit to the reseller's market (H_2). This suggests that the reseller should resolve the conflict with manufacturer by informing the manufacturer of changes in the consumer profile, market condition and competitors' strategies (Simpson et al 2001). In this way, the reseller could adapt manufacturer's marketing resources to the conditions of a reseller's local market conditions. Moreover, our analysis shows that a smooth order fulfillment and logistics process ensures in-time delivery of the right product to the reseller at right time (H_7). Thus, the reseller can be more competitive in a dynamic market place. Besides, our analysis demonstrates that manufacturer's strategy in promotion influences its promotion effectiveness (H_5) and product fit in the reseller's market (H_4). These results suggest that resellers could benefit from manufacturer's tailored promotion program to the end consumers. Finally, the reseller should integrate and synchronize the manufacturer's various resources for synergetic use. For example, during a manufacturer's promotional period, the reseller should ensure the in-time supply of the right goods to their place of business.

The mechanism of relational transaction within the channel differs from the arm's length transaction between manufacturer and non-relational resellers. The selfish channel members as assumed in the arm's length transactions do not care for other's interest. They safeguard the information as a competitive advantage when negotiating the trade terms with other channel members. However, our research showcases that channel relations facilitate the market information exchange and transaction efficiency between manufacturer and reseller. In particular, relational resellers could alert the manufacturers about the changing needs and wants of local consumers and other manufacturer's competitive strategies. Thus, manufacturers could design new products and appropriate promotional campaigns to meet these changes. In return, manufacturers could inform the relational resellers the launch of impending new product and promotional campaigns. Depending on the information exchange, both manufacturer and relational resellers benefit from the relational transaction.

Establishing a close relationship with a manufacturer may bring resources to a reseller, but constraining oneself within the relationship network to a single manufacturer does not necessarily enhance the reseller's profitability. While it is important to build a strong relationship tie with a manufacturer, a relationship that is too deeply embedded may result in the reseller forgoing alternative opportunities. In the domain of channel member relationships, the reseller should prioritize the management of relationships with a manufacturer who has more power than other manufacturers (Frazier and Rody 1991). Importantly, a reseller should keep an eye on multiple manufacturers, so it is not prudent to ignore the existence of other manufacturers. If the reseller constrains its relationship building with one specific manufacturer, a key downside is the likelihood of being dominated by that manufacturer. Conversely, weak ties could be strategic as well. As Choi and Kim (2008) observe, it may be beneficial for a reseller (buyer) to maintain a relationship with a poorly performing manufacturer (supplier) because the latter may serve as a pipeline to reach other firms with key resources.

To build a long term profitable business relationship with the reseller, a manufacturer will need to provide quality (marketing) resources. These resources should be adapted to local market conditions. By building a relationship with a high degree of structural embededness the manufacturer may increase reseller loyalty and reduce their price sensitivity.

2.7 Limitations and Future Research

The current research studies social network theory's application in marketing channel, which has several limitations. Therefore, in this section, we will discuss some of the limitation and provide directions for future research.

There are limitations with regard to the measurement of some of the constructs in this paper. To measure the over-embeddedness construct in the network, we used reseller's perceptions, which may not be able to accurately capture the true value of information redundancy. Moreover, we only obtained data from a single manufacturer, which ignores the influences of the relationships between resellers and other manufacturers. Additionally, there is some evidence that the influence on performance of structural- and relational-embeddedness factors depends on the industry context (Rowley, Behrens and Krackhardt 2000). Future research could investigate multiple industries and/or markets to provide additional insights.

All measurement items of the constructs are satisfaction ratings by resellers. The satisfaction rating is useful in evaluation the relationship quality since satisfaction is a foundation of relationship. However, the satisfaction rating of resources by resellers might be different from end consumer's perception of resource quality. For example, although end consumer's opinions regarding product quality may largely shape resellers' perception of product fit to the local end consumer's preference (because reseller's revenue mainly comes from the end consumers), differences may persist. . Unfortunately, we cannot differentiate the variance of the resellers' own perception from the reseller's product fit satisfaction rating. Similarly, the reseller's satisfaction rating of manufacturer's promotional gifts might differ from the end consumer's perception of promotion effectiveness. Future research should address the measurement of product quality by collecting the data from end consumers in different regions.

Besides, the resources that the manufacturer possesses are not limited to those identified by our research. Most notable is the reseller price discrimination (This practice is forbidden in the United States since the enactment of The Federal Robinson-Patman Act in 1936, but still has some exemptions), which reflects the profit that the manufacturer would like to share with the reseller. The profit margin could be partially determined by the relationship between the manufacturer and the reseller. Future research should consider the influence of relationship on reseller price discrimination.

Our measures of relationship quality, relationship intensity and resource quality are adapted from a secondary data source, which may not be consistent with standard measures used by other researchers. The item elimination process might result in a model that might be specified randomly. Ideally, there needs a validation data set. However, the sample size does not allow us to do the model validation by LISREL. The reader should bear in mind the constructs used when generalizing our results.

A close channel relationship embodies trust and commitment achieved by effective communication and conflict resolution (Morgan and Hunt 1994). Bearing these two concepts in mind, channel members would more likely cooperate with each other. Practically, channel members with mutual trust and commitment supply more appropriate resources and information to each other and compete against the rivals in other supply chain more efficiently. Therefore, the trust and commitment may mediate relationship building variables and the resources variables. Future research should consider the possible mediating effect of trust and commitment on the marketing resources.

We used cross sectional data which did not allow to test the causal relation between the constructs in this study. In addition, we only focused on reseller's social embeddedness, future research may want to focus on manufacturer's social embeddedness.

Our study was limited by the data, which were obtained from a commercial marketing research company. Future research is needed, gathering specific data for the task at hand. An ideal data set should include several matrices of manufacturer by reseller data over time for a specific market. The sales matrix records the sales volume from various manufacturers to various resellers. The same structure applies to the reseller's and manufacturer's profit. The relationship matrices record a series relationship evaluation variables by reseller on the manufacturer and vice versa. The marketing mix quality matrices adopt the end consumer's evaluation of each manufacturer's marketing mix quality in different sales region managed by each reseller. With these datasets, researchers are able to test (1) whether the reseller (manufacturer) profit margin is dependent on the brand market share, manufacturer power (reseller share), the reseller power (manufacturer share), the product quality, the relationship intensity and the relative relationship intensity compared with other manufacturers (resellers) ; (2) whether the product quality is dependent on the relationship; (3) whether the relationship is dependent on the brand market share, manufacturer power and reseller power. (4) whether the reseller (manufacturer) power is dependent on the relationship. Through these analyses, researchers could determine the influence of manufacturer-reseller relationship on reseller's and manufacturer's profitability precisely.

Finally, although we emphasize the importance of a firm's inter-organization coordination capability as a sustainable competitive advantage for the reseller, we do not directly measure this construct and only measure the outcome of a firm's relationship building capability. Future research should be conducted in this direction to understand more about the contribution of a firm's capability to profit.

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Chapter 3: Essay 2: Modeling the Information Diffusion Process in a Physician Network

Social contagion theory states that people may duplicate the behavior of others. An individual's adoption of a new product depends on the adoption by those accessible others, in addition to influence from other sources (e.g. advertising). This research simulates the dynamic diffusion process of a new drug in a social network of physicians. The model addresses the information flow, where each connected network entity (physician) repetitively influences the focal entity's (focal physician's) new product adoption, and the simulation approach integrates the two seemingly contradictory concepts of cohesion and structural equivalence into a single modeling framework. Additionally, this study incorporates a coefficient that describes an individual entity's efficiency of information transmission. With this efficiency coefficient, managers could assess whether the network hubs (those with a lot of social ties) are more important than those non-hubs (those with only a few social ties) in the new product diffusion process within a social network.

The model presented here is based on data collected by Coleman, Katz, and Menzel (1957), who in the 1950s interviewed physicians in four cities on the use of a new drug 17 months after its introduction. The research question of that study was, "What were the social processes which intervened between the initial trials of the drug by a few local innovators and its final use by the whole medical community?" In particular, the study examined "the effectiveness of interpersonal relations at each stage of the diffusion process" (Coleman et al. 1957, p. 253). The full report of the study, *Medical Innovation* (Coleman et al. 1966), has provided the basis for numerous examinations of the spread of innovation and especially for attempts to model the process.

This research revisits the Medical Innovation data and empirically finds an optimal coefficient of efficiency of information transmission, using a series of discrete time hazard models for each city in the dataset. The results show that at the optimum point, the social influence has different effect on the timing of the adoption of a new medicine in each city.

3.1 Introduction to Chapter 3

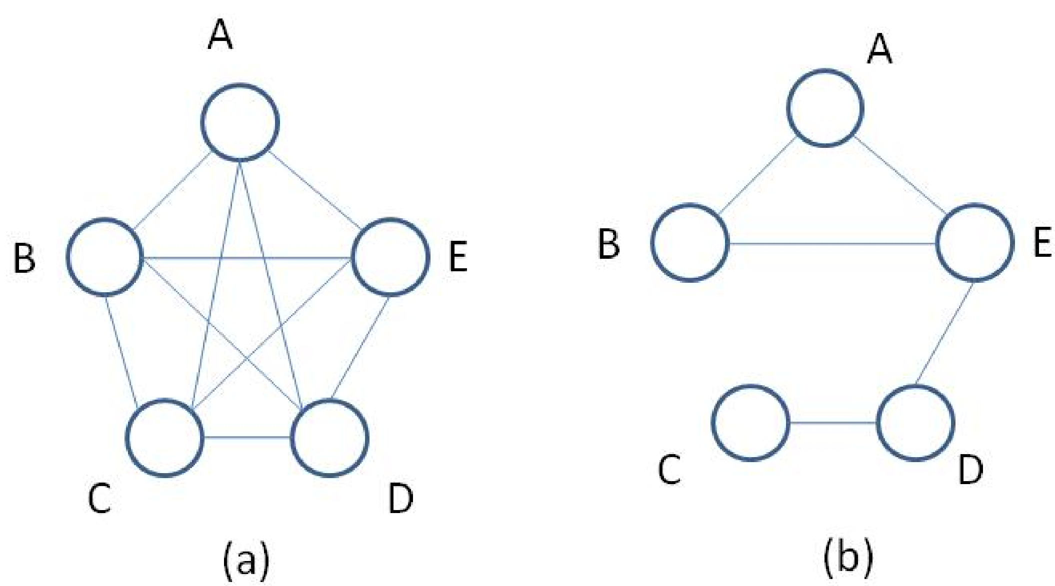
Consumer communities and discussion groups give consumers access to others' experiences using new products. Consumers who draw on this information may more confidently adopt a new product since lower perceived risks result from sharing opinions with other community members. Hence, community norms, or community member's attitudes toward a new product may play an important role in consumers' new product adoption (Godes and Mayzline 2004, 2009; Hill, Provost, and Volinsky 2006).

Social network research takes a unique perspective in studying both individual consumers' and organizational consumers' adoption of a new product or concept within a social community, in which the consumers are inter-connected by network ties. Generally, this stream of research uses individual's social network position to explain the timing of new product adoption (Becker 1970; Burt 1987; Coleman et al. 1957; Van den Bulte and Lilien 2001; Westphal, Gulati and Shortell 1997). However, this stream of research has been criticized as lacking a theoretical foundation (e.g., Salancik 1995). Specifically, it does not explain how network members follow the behavior of other network members.

Within the marketing domain, the Bass model (1969) and its extensions have remained the traditional approach to predicting the rate of new product diffusion. This stream of research assumes that product information (e.g., product characteristics and consumption risks) and adoption rate are publicly available at any time (Details are available in the next paragraph). This assumption is reasonable for a new product with a low consumption risk, such as chocolate, and is also reasonable when consumers can easily access new product information (e.g., through *Consumer Reports*). However, for some high-risk products the best sources of information are reliable adopters whom the potential customer knows well. For example, if a female consumer is considering a new cosmetic surgery but is concerned about possible side effects and risks, she may consult her intimate friends who have had the surgery and who know about its features and risks of the surgery. Under this scenario, the information obtained from close friends becomes an important reference for her decision making. In cases such as this example, information takes time to disseminate through the social network, as its spread depends on more members adopting the innovation.

In the Bass model, the number of consumers who have already adopted the innovation influence the rate of adoption, with the implicit assumption that *all* adopters influence the non-adopters. The result is the scenario shown in Figure 3-1a, where every community member is connected to each of the others. This model makes the strong assumption that all product information is immediately available to every member of this community. In contrast, the model in this study assumes that each consumer is connected to only a few other consumers (Figure 3-1b), and the adoption behavior of network entities positioned far away from the focal entity does not influence the focal entity's decision making immediately. For example, in Figure 3-1a, the adoption of a new product by entity D can directly and immediately influence all other entities. In contrast, in Figure 3-1b, the influence of the adoption by entity D must first pass through entity E before it affects entities A and B,

Figure 3-1 Fully Inter-connected Community vs. Partially Inter-connected Community



The present research contributes to the existing literature in three ways. (1) Theoretically, our research confirms that the new product information progressively disseminates from original adopters to the rest entities in a social network (2) Practically, our research simulates the product information dissemination process within a social network. And in particular, the simulation introduces an average social influence dissemination efficiency coefficient. With this coefficient, we could detect whether those entities with large number of direct neighbors would block the dissemination process rather than facilitate the dissemination process as recorded in Goldenberg et al’ s (2009) study. More specifically, if the average dissemination efficiency is low, those locally central entities might have no time to convince a large number of network neighbours within a unit time period, thus creating dissemination jams. If the average dissemination efficiency is high, the dissemination process could be a lot more efficient, taking advantage of the large number of network resources held by those locally central entities.

The next section presents the literature related to new product diffusion in the social network. Following that review, the discussion introduces the theory related to social norm formation in a community and proposes the modeling approach described here. The final section presents and discusses the research results, acknowledges limitations, and offers opportunities for future research.

3.2 Literature Review

Table 3-1 lists key findings/contributions, measure/proxy of social network influence, statistical methods, description of dataset and limitations of major research of social network in marketing and sociology field and the additional features of the present study’s modeling approach.

The seminal paper by Coleman et al. (1957) introduces the social network approach to the literature of new product diffusion. This investigation, which is the first to incorporate sociometric data to explain the adoption of innovations, indicates that new product diffusion in a social network "represents a snowball process in which those who have introduced pass on the innovation to their colleagues" (p.262). The snowball process represents a social contagion effect by which innovation is transmitted through social network ties. The social contagion paradigm assumes that the innovation non-adopter can be influenced by neighboring adopters through discussion and communication. Thus, network entities with more direct social contacts in the social network are more likely to acquire information about the new product's pros and cons earlier than entities with fewer direct social contacts. Methodologically, the research simply classifies respondents into three groups according to the number of times each respondent was identified as a friend by other members in the same community. The number of times a respondent was acknowledged as a friend increased the likelihood of early adoption of an innovation. In social network modeling terms, the degree of each network entity (Degree denotes the number of immediate neighbors in a network) influences the timing of adoption. The adoption of a new medicine, tetracycline by doctors who are inter-connected by social network ties in four small towns serves as an example to demonstrate the innovation diffusion. (Detailed description of the data will be presented in a later section).

However, the research by Coleman et al. (1957) has several limitations. (1) The researchers assume that early adopters will always transmit information about the innovation to their immediate network neighbors, and that once people receive the information about the innovation, they will adopt the product. However, possession of information is neither a sufficient nor a necessary condition for the adoption of an innovation (Becker 1970). In particular, social pressure exerts great influence on consumers' new product adoption (Bass 1969; Cialdini and Trost 1998, p169; Festinger 1954). (2) The degree of network entity represents only the local centrality in the network, and neglects the position of each mini-community or ego network in the whole network structure. Intuitively, the greater the number of information channels, the earlier the network members will receive information. However, the position of sub-communities also plays an important role. For example, a community leader living in a remote community location could conceivably have more friends than a person living in a big city. However, because his community is distant from the modern world, he may have limited access to information about high-tech products and he may be slower to adopt new technology than the person living in the city with only a few friends. (3) The Coleman et al. study concludes that network centrality facilitates early adoption, implying that the adoption of an innovation diffuses from the most central entity outward to the most peripheral entity. However, this pattern does not necessarily occur, since the pattern of diffusion depends on the fit between the innovation and the existing social norms in a community.

Table 3-1 Selected Research on the network approach to Innovation Adoption

Authors	**Key Findings and Contributions**	**Measure/Proxy of Social Network Influence**	**Modeling Approach /Statistical Method**	**Data**	**Limitations**
Coleman Kats and Menzel 1957	Social contagion effect; first social network study	Count of Ties	ANOVA	Medical Innovation	Static measure of social network effect; Neglect the effect of mass media; Ambiguous theory
Becker 1970	Differentiation of the origins of high and low adoptive potential product	Count of Ties	Correlation	Measles Immunizations and Diabetes Screening	Static measure of social network effect; Neglect the effect of mass media
Burt 1987	Social contagion through structural equivalence rather than through social cohesion affects the date of new drug adoption.	Structural Equivalence	Regression	Medical Innovation	Static measure of social network effect; Neglect the effect of mass media
Westphal, Gulati and Shortell 1997	Differentiation of the motivations of early and late adopters	Count of Ties	Cochrane-Orcutt Regression	TQM Adoption	Static measure of social network effect; Neglect the effect of mass media
Van den Bulte and Lilien 2001	When advertising in mass media takes effect on the time of adoption, the effects of both social cohesion and structural equivalence disappear	Structural Equivalence	Discrete Time Hazard Model	Medical Innovation	Only accounts for the interpersonal influence of one time period

Table 3-1 Selected Research on the network approach to Innovation Adoption (Continued)

Authors	Key Findings and Contributions	Measure/Proxy of Social Network Influence	Modeling Approach /Statistical Method	Data	Limitations
Bell and Song 2007	Exposure to proximate others influences new product trial	Geographic Proximity	Discrete Time Hazard Model	Grocery Panel	Variance of geographic proximity cannot fully represent the variance of social influences between regions.
Godes and Mayzlin 2009	Influence of word of mouth by less loyal consumers on the sales of new product, dynamic measure of WOM.	Number of Reports filed to relational entities in the network	Aggregate Model Regressions	Restaurant Chain	Only accounts for the interpersonal influence of one time period
Goldenberg, Han, Lehmann and Hong 2009	Innovative hubs have influences on speed of diffusion and follower hubs have influence on market size, Dynamic simulation of social influence	In-degree and out-degree, Simulation	Regression	The adoption of homepage building items by members of Cyworld (a social network website)	Treating the social influence between each pair of network relations as symmetric
Manchanta, Xie and Youn 2008	Both detailing and social contagion influence are incorporated into the modeling of new drug adoption	Geographic Proximity	Discrete Time Hazard Model	New Drug Adoption in Manhattan and Indianapolis	Variance of geographic proximity cannot fully represent the variance of social influences between network entities.
This Study	Combination of the effect of interpersonal and mass media channel; Dynamic Approach; Network transmission efficiency; Asymmetric influence between network entities	Simulation	Discrete Time Hazard Model	Medical Innovation	Taking the most original adopters as granted. Only dealing with bilateral relations.

Becker's (1970) research addresses the issue of the fit between the innovation and community norm (limitation (3) in the previous paragraph). Conceptually, Becker differentiates high adoptive-potential innovation from low adoptive-potential innovations. He finds that the correlation between centrality and time of adoption is higher for high adoptive-potential innovations than for low adoptive-potential innovations. This finding implies that the resistance to or acceptance of the innovation depends on existing social norms of the community. When the group norms favor the innovation (providing high adoptive potential), people in the center of a community are more likely to be early adopters, although they are not necessarily innovative (Goldenberg, Han, Lehmann and Hong 2009). They are motivated to keep their central positions and lead the trend of innovation in the community, as otherwise their central positions in the community may be taken over by other innovators. If an innovation is not in accordance with group norms (and therefore has low adoptive potential), individuals who are more peripheral to the group are more likely to adopt the innovation earlier than those at the center, because those on the periphery face less pressure from the group. From a practical perspective, however, outsiders may have difficulty judging whether an innovation fits the social norms, especially before the majority of group members adopt an innovation

Freeman (1977) introduces the concept of global centrality, which measures the sum of geodesic distance to all entities in a network. This approach overcomes limitation (2), local centrality, in the work by Coleman et al. Conceptually, this modeling approach implies that social contagion occurs if direct communication takes place between network neighbors. The shorter the sum of communication paths to all other network entities, the earlier the product information can be accessible. Yet this modeling approach is still subject to limitation (3) of Coleman et al.'s work. In calculations of the sum of the geodesic distance, this approach treats each network entity as identical. This treatment is in contrast to the reality that geodesic distance to the original adopters is more important than that to the non-original adopters.

Burt's (1987) structural equivalence modeling approach advances social network theory in three respects. First, his modeling approach overcomes the disadvantage of local centrality (limitation (2) of Coleman et al.) And second, it enriches theoretical foundation of the sociometric approach (limitation (1) in Coleman et al.). It proposes a new way of social contagion by competition, which is in contrast to the way through social coherence through proximate others in a network. Conceptually, structural equivalence refers to the similarity of a network entity's position within a social structure. An individual may mimic the behavior of a structurally equivalent position with another individual, aiming to keep a competitive position in a network. In fact, his study demonstrates that structural equivalence rather than social coherence affects the doctor's new drug adoption date in the network community. Thirdly, Burt's modeling approach calculates the network position of each entity in relation to all other entities in the same network. However, the choice of a particular behavior depends on whether the entities sense the importance of competition among the structurally equivalent entities (Bothner 2003). For example, distributors of the same manufacturer have similar social relations with both the structurally equivalent entities and the market information channel. In particular, first-tier dealers might know their competitors and their business activities. When new products are produced by the manufacturer, all first-tier dealers get to know the product information through similar patterns of relations. According to Burt's structural equivalence hypothesis, dealers in the first tier feel the pressure of competition from other dealers in the same tier. They will compete for the dealership of the new product to gain market share and avoid a challenge to their positions in the distribution channel. However, third- or fourth-tier dealers may not know the management of other dealers within their tier, and will not feel competitive pressure from their structurally equivalent competitors. Therefore, entities far from original adopters may not be influenced by their structurally equivalent entities. This example showcases the lack of social influence from structurally equivalent entities that remain distant from original adopters within a social network. My research, instead, demonstrates that structurally equivalent entities share similar routes to information access, which leads to similarly strong social norms among such entities and drives them toward adoption within a similar timeframe.

Van den Bulte and Lilien (2001) reanalyze the data collected by Coleman et al. to study the effect of structural equivalence on the timing of innovation adoption while controlling for the effect of advertising over time. They do not find an effect of social contagion (either through structural equivalence or social cohesion) on the time of adoption, but do find that advertising generates an impact on the timing of adoption, a result that is surprising. While the mass media are effective at creating consumer awareness for new products, interpersonal channels within a social network are more capable of persuading entities to adopt an innovation (Rogers 1995; Gosling, Westbrook and Braithwaite 2003). Through interpersonal channels of communication, early adopters can share detailed personal experiences with non-adopters, reducing non-adopters' consumption risks.

Several other researchers in the sociology and management fields have studied the adoption of innovations in a social network domain. Marsden and Podolny (1990) use event history analysis to study the timing of adoptions and conclude that the social network does not influence the timing of adoptions. Valente (1993, 1996) uses a threshold model that underscores the effectiveness of both interpersonal channels and mass media in the adoption of an innovation. Finally, Westphal, Gulati and Shortell (1997) study total quality management (TQM) adoption by hospitals, and find that early adopters of TQM tend to concentrate on the efficiency and effectiveness of TQM while late adopters are more likely to follow social norms created by the early adopters rather than focusing on the utility value of TQM. All of these studies, however, treat social network influence as a static value over time..

Recent marketing research in the social network area advances the theory of new product diffusion and adoption. Notably, Van den Bulte and Joshi (2007) analytically model the new product diffusion by a mixture of influential adopters and imitators. In an empirical analysis, they reaffirm social influence in new drug diffusion at an aggregate level. Additionally, Godes and Mayzlin (2009) demonstrate that word of mouth by less loyal consumers expand the market size. Bell and Song (2007) and Manchanda et al. (2009) use a geographic proximity measure to infer the influence of social interaction on new drug adoption. The contribution and limitations of these studies are described in Table 3-1.

Study by Goldenberg et al. (2009) demonstrates that early innovative adopters with many direct social network ties expedite the new product adoption process, while the followers (imitators) with many direct social network ties increase the market size. They use a revised agent based model to capture the social contagion effect within a network. Their model assumes that each network neighbor has same level of influence on the focal network entity. This assumption might be valid when information transmission does not consume too much effort. For example, the hubs in an online community, as depicted in their study, could publish their decoration items on their own homepages and their network neighbors could access the item information conveniently without exhausting the hubs' time and effort. Thus, the non-adopter's probability of receiving the new product information from different network neighbors could be similar. However, when the product involves some risks like the new drug, discussion about the effect and side effect of the new drug might be necessary. It takes time and effort (better in a one-to-one setting) for a focal doctor to transmit the information out to other doctors in his ego network. Assuming that individual's time and efforts are limited, the network entities with more social ties might have less time and effort to convince each of their network neighbors than entities with less social ties. Therefore, the information received from doctors with different number of social ties could be different.

3.3 Theory of Social Norm Formation

The adoption of innovations involves risks associated with the perceived uncertainty of product efficacy. To reduce this uncertainty, consumers seek product information, for example from their peers. Following Becker (1970), “information” in the present study refers to “important data concerning cost, problems, political risks, likelihood of opposition from interest groups, efficacy of the innovation when initiated, and so forth.” This type of information can be obtained from previous adopters of the innovation. Sherif (1936) confirms that interpersonal interactions can resolve uncertainty and conflict by exchanging mutual attitudes and opinions. Through interpersonal information exchange, focal consumers can enhance their understanding of an innovation, discuss its cost and benefits, and debate its product features with earlier adopters. Such information exchange only occurs between people who share considerable relationship intensity.

Social pressure is also an important factor in the adoption of an innovation. Festinger (1954) states that people weigh and integrate the attitudes of others. Potential innovation adopters can get product information from all neighbors in a social network. When more and more people around a focal entity adopt a new product, a consistent view toward the innovation emerges (Friedkin 2001). This consistent view represents the community’s social norm that pushes non-adopters to follow in the adopters’ footsteps.

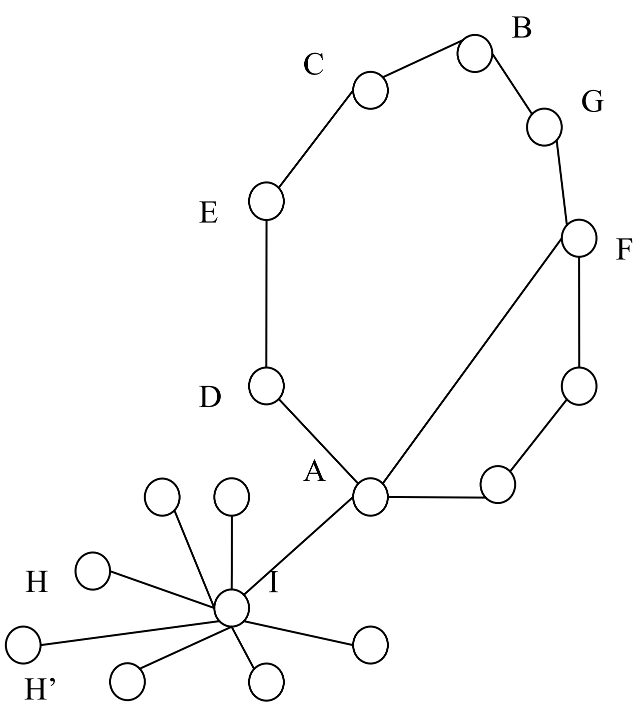
Bass (1969) posited that the ratio of non-adopters to adopters in the whole community influences the adoption of an innovation, and that the social pressure for adoption increases with an increase in the number of adopters within the market. The present study proposes that an individual's adoption of higher risk innovations is predominately influenced by the social norms of her network neighbors, rather than by norms of entities far removed. The focal entity has to wait until she gets reliable information from her network neighbors, who get innovation information from *their* network neighbors, and so on. Therefore, time elapses while the information is being transmitted from the original adopters through the social network to the focal entity within a social network. When the focal entity is influenced, she then influences other non-adopters around her. This influencing process creates social norm formation chains.

3.4 Modeling Approach

Forming social norms takes time. The process depends on the distance of the individual entity in a social network system (the focal entity in the social community) from the original adopters, the total number of entities, and the efficiency with which each network entity receives information from the original adopters. The present modeling and simulation approach extends previous research by incorporating a time-dependent social network influence value for each individual entity. This approach can simulate the diffusion process in a network over time. In addition, the approach integrates conceptual and modeling ideas from previous research.

Before we move on to the formal theoretical approach, we would like to demonstrate an example will illustrate how a social network transmits key information. Consider a social network consisting of 17 entities, with the network structure as shown in Figure 3-2. In this small social network, entity A is the original adopter. On the basis of geodesic distance, entities B and C are three units away from the original adopter A, while entity H is only two units away from entity A.

Figure 3-2 Demonstration Example – Network Structure



The network entity could transmit the information about an innovation to its neighbors in two extreme ways. One extreme way is to inform only one network neighbor in one unit time periodIn this way, the information transmission efficiency tends to be very low.. . The probability of information transmission from adopter *i* to its neighbor *j* under this setting is represented as:

$$p_{ik} = \frac{1}{D_i},$$

where *i* is an original adopter who has D_i network neighbors.

To represent the influence of a non-original adopter, the probability of influence from adopter *j* to his network neighbor *k* is similarly defined as:[7]

$$p_{jk} = \frac{1}{D_j - 1},$$

because the informed entity would not transmit the information back to its informant.

The other extreme way is to influence all network neighbors in one unit time period. In this way, the information transmission effieicny tends to be very high. The probability of information transmission from adopter *j* to its neighbor *k* in this way is is always:

$$p_{jk} = 1.$$

implying that information is transmitted to all neighbors. The network information transmission efficiency tends to be between these two extreme ways. We will find an efficiency coefficient that best fit the empirical data.

Table 3-2 and Table 3-3 demonstrate the probability that B, C, H and I are influenced by network neighbors at the end of time periods 1, 2 and 3 when only one of the entities in an ego network is influenced in a unit time period and when all of the entities in an ego network are influenced in a unit time period.

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[7] The information applies to all possible network neighbors except the one who transfers the information to this particular entity. Hence, this mechanism is not purely random walk.

Table 3-2 Demonstrative Example - Information Transmission Probability When Only One Entity in an Ego Network is Influenced in a Unit Time Period

Entity/Network Influence Probability	Period 1	Period 2	Period 2 Accumulative	Period 3	Period 3 Accumulative
B	0	0	0	0.125	0.125
C	0	0	0	0.25	0.25
H	0	0.036	0.036	0.026	0.062
I	0.25	0.188	0.437	0.141	0.578

Table 3-3 Demonstrative Example - Information Transmission Probability When All of Entities in an Ego Network are Influenced in a Unit Time Period

Entity/Network Influence Probability	Period 1	Period 2	Period 2 Accumulative	Period 3	Period 3 Accumulative
B	0	0	0	1	1
C	0	0	0	1	1
H	0	1	1	0	1
I	1	0	1	0	1

In period 0, only entity A adopts the new product. In period 1, entity I has only a 25% chance of being influenced by entity A, assuming only one network entity close to A is influenced, and has a 100% chance of being influenced assuming all of the entities in an ego network could be influenced in this time period. In period 2, the cumulative probability of entity I being influenced by a neighboring entity is $1-(1-\frac{1}{4})^2 = 0.437$ when only one entity in an ego network could be influenced in this time period. Entity H and its structural equivalent entities are dependent on I to diffuse the product information. Since the degree (number of network neighbors) of I is 8, the accumulative probability of H and its structural equivalent entities is equal to $\frac{0.25}{8-1} = 0.036$ (assuming only one of the entities in an ego network is influenced in a unit time period). By contrast, assuming a geodesic distance measure, H and its structural equivalent entities are influenced with certainty. In period 3, entity B and entity C have a small probability of being influenced when only one of the entities in an ego network is influenced in a unit time period. The cumulative probability of entity B is equal to $\frac{1}{4}x\frac{1}{2}x1 = 0.125$ and the cumulative probability of entity C is equal to $\frac{1}{4}x1x1 = 0.25$. The cumulative probability of H and its structural equivalent entities in period 3 is dependent on I's cumulative probability in period 2 and is equal to $\frac{0.437}{8-1} = 0.062$ when only one of the entities in an ego network is influenced in a unit time period. The cumulative probability of entity I is equal to $1-(1-\frac{1}{4})^3 = 0.578$. In contrast, when a geodesic distance measure is assumed, B, C, H and I adopt the new product with certainty. The process will continue until the probability of every entity being influenced is almost 100%.

Notably, the probability of H' being influenced by I is always the same as H over time because H' and H are structurally equivalent. H and H' have a similar route to access product information no matter what form the information transmission takes.

This example shows that, when network entity's information transmission efficiency is very low, the geodesic distance between entities does not necessarily determine the speed of information transmission. Entities B and C are exactly the same geodesic distance away from A, but the cumulative probability of adoption for B is less than that of C in the third period. Moreover, although H (and H's structural equivalent entities) is geodesically closer to the original adopter A than either B or C, the third period adoption probability of H is lower than that of B or C. These results show that the entire network structure, rather than just the geodesic distance and the degree (the local centrality measure), may exert an important influence on an individual entity's timing of new product adoption.

3.4.1 Formal Model

The information transmission efficiency coefficient δ is set to lie between 0 and 1 When $\delta = 0$, the network entity only transmits information to one of its network neighbors and when $\delta = 1$, the information is transmitted to all of its network neighbors. A higher δ indicates a higher percentage of network neighbors that will be influenced at any particular time period.

The influence of the original adopter *i* on its network neighbor *k* at time *t* is formally represented as

$$p_{jkt} = \frac{1}{D_j} + \delta(1 - \frac{1}{D_j}) \qquad \text{………………………………..(1),}$$

where, $0 \le \delta \le 1$.

The influence of non-original adopter *j* on its network neighbor *k* at time *t is* formally represented as

$$p_{jkt} = P_{j(T-1)} * [\frac{1}{D_j - 1} + \delta(1 - \frac{1}{D_j - 1})] \qquad \text{……………...(1'),}$$

where, $0 \le \delta \le 1$. This equation captures the lagged effect of social influence from one entity to its network neighbor. Moreover, this equation demonstrates asymmetric relations between network entities as proposed by Nair, Manchanda, and Bhatia (2008). Entities with larger number of direct ties exert less influence to each of their direct ties due to their limited time and effort.

We assume that a particular network entity would distribute the information to at least one entity within its ego network in a unit time period. In other words, we did not incorporate one of the ego network entities into the normalization of focal network entity's effort of influence distribution. We consider that the importance of each member within ego network is different. This heterogeneity of importance in our dataset would be more serious since we symmetrize the network by imposing the missing values in the relational matrix of network entities. Our treatment of the partial normalization actually puts more weight on one of the ego network entities assuming that each network entity has at least one very intimate friend/discussion partner in the social network and all other ego network entities are of same importance (In the dataset, the lowest degree of the network entity is one). This method could reduce the importance heterogeneity of the network entity and is conceptually closer to the reality than full normalization treatment, which assumes that each entity in the ego network is of same importance.

The cumulative influence of adopter *j* on its network neighbor *k* by time *T* is represented as

$$p_{jkT} = 1 - \prod_{t} (1 - p_{jkt}) \cdots\cdots\cdots\cdots\cdots\cdots (2).$$

The cumulative influence received by *k* from all of its network neighbors by time *T* is represented as

$$P_{kT} = 1 - \prod_{j} \prod_{0}^{T} (1 - p_{jkt}) \text{.............................}(3).$$

3.5 Data

The data used to develop the model in this study were collected by Coleman et al. (1957). We got this dataset from Prof. Christophe Van den Bulte, who got this data set from Professor Richard Burt. The data, which have been used a number of times to test different theories and modeling approaches, represent the diffusion of a new medicine, tetracycline, in four Midwestern cities in United States. The data set describes the friendship, advice and discussion networks of family physicians. The other variables in this data set describe the doctor's professional age, number of journals read, salesman's effort and the date of each doctor's first prescription of Tetracycline from local pharmacist's record. Five entities in city 1 and six entities in city 2 adopted the new drug in month 1. In city 3, the first two entities adopted the new drug in month 2. In city 4, the first two entities adopted the new drug in month 3. We use these entities as the original adopters disseminating influence to other entities in each network.

We use all the doctors to construct four social networks corresponding to four cities in the *Medical Innovation* dataset. We combine discussion and friendship network as into one social network for each city since friendship and discussion involve bilateral communication. The advice network in the same data set was abandoned since giving advice is a type of unilateral communication[8]. We

[8] Our algorithm can only deal with bilateral relations. Moreover, the discussion and friendship ties cover more than two thirds of the advice ties in the four networks. Finally, the rate of the misspecification of network ties due to the abandonment of the advice network would be around 1% of all possible ties in the four networks.

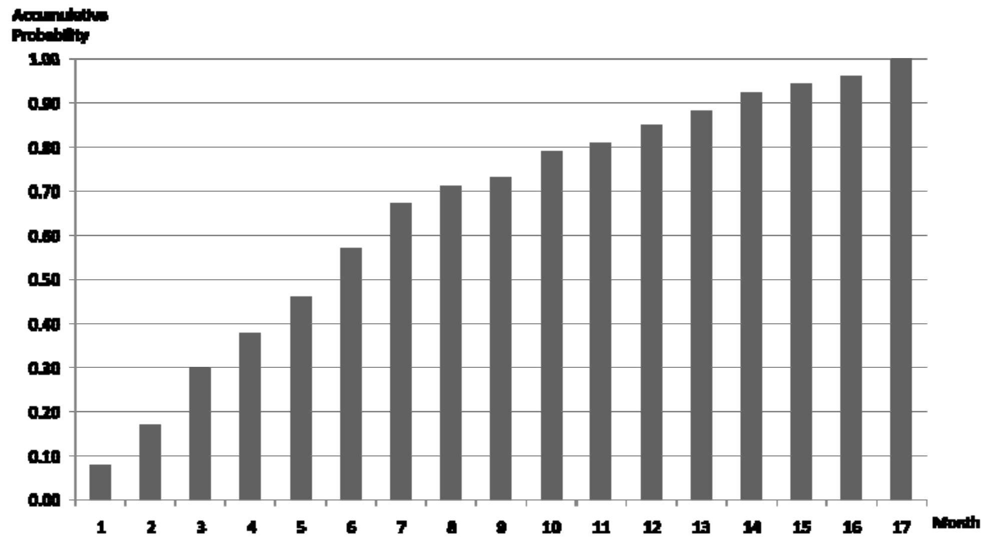
symmetrized the combined network data by imputing the missing values in the symmetric positions of the entity relational matrix. For example, if A cites B as a friend or discussion partner but B does not cite A as a friend or discussion partner, we assume A and B have mutual relations. Thus, we can simulate the information dissemination process in the four symmetric social networks (the details of the simulation are shown in section 2.6). Yet there are quite a few missing values of the doctor's new drug adoption date. Therefore, in the statistical analysis, we exclude those observations with missing values. Table 3-4 shows the number of original adopters, the number of entries in the original *Medical Innovation dataset*, the number of entities used in statistical analysis, and the person-time periods in each city. The difference between the number of entries in the original dataset and the number of entries for simulation comes from three sources: (1) the number of original adopters; (2) doctors who are cited by other doctors as friends or discussion partners, but not recorded in the original dataset; (3) doctors who are recorded in the dataset, but not either cited by other doctors or citing others as friends or discussion partners. We made similar adjustment for the entries for statistical analysis.

Table 3-4 Descriptions of Medical Innovation Data

	Number of Original Adopters	Number of Entries in the Medical Innovation	Number of Entities for Simulation	Number of Entries of Valid Adoption Date	Number of Entities for Statistical Analysis
City 1	5	117	112	62	57
City 2	6	50	49	24	17
City 3	2 (in mth 2)	44	46	21	18
City 4	2 (in mth 3)	35	35	18	16
Total	15	246	242	125	108

To provide an overview of the time of new drug adoption, Figure 3-3 summarizes the cumulative adoption rate in city 1 (it is the largest sized social network in the dataset) over time. The average time to adoption from the drug's introduction in this community is 6.79 months, with a standard deviation of 4.57 months.

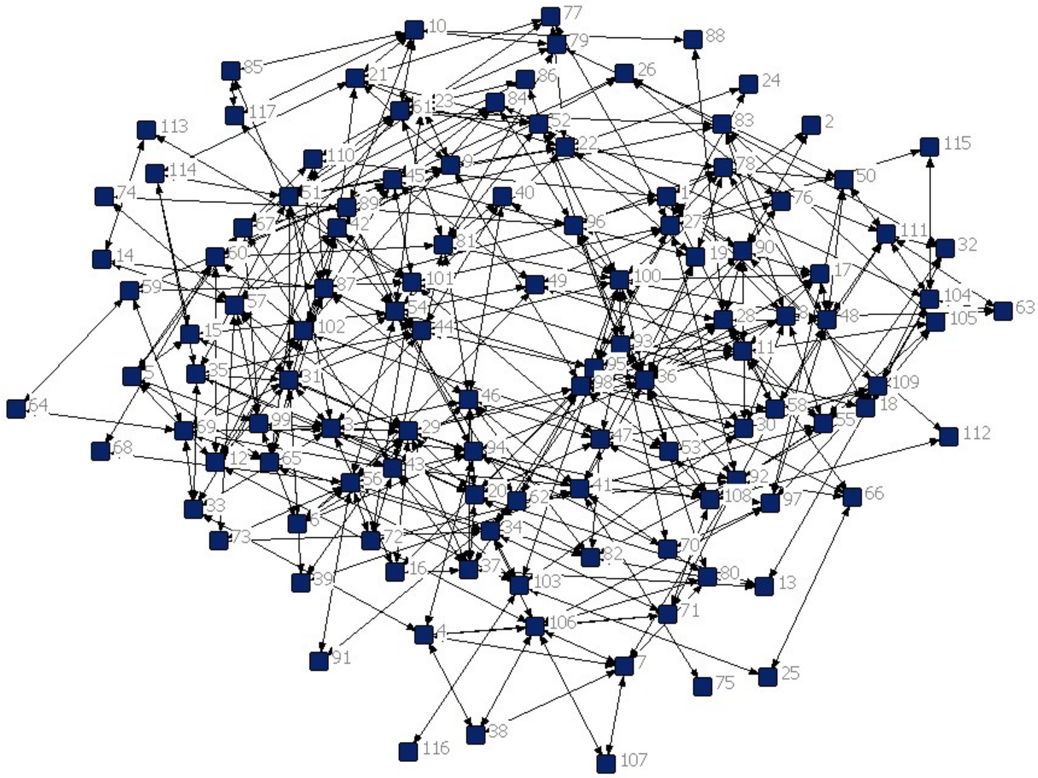
Figure 3-3 Accumulative Adoption Rate of New Medicine Over Time in City 1



Month	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Accumulative Probability	0.08	0.17	0.30	0.38	0.46	0.57	0.67	0.71	0.73	0.79	0.81	0.85	0.88	0.92	0.94	0.96	1.00

Figure 3-4 shows the overall picture of the friendship plus discussion network among the physicians in city 1. In this network, the average degree (number of direct ties of each entity) is 6.22 with a standard deviation of 1.73, and the average closeness (the sum of geodesic distance to all other entities) is 338.51 with a standard deviation of 5.97.

Figure 3-4 The Overall Picture of The Social Network of Physicians in City 1



3.6 Methods

C program language was used to calculate the influence value of each network entity in each time period on the basis of the formula and the social network structure in four cities described earlier. The network structure is assumed to be constant across time. We set the unit of time period as a single calendar month (We test the empirical fitness level using two month and half month as a unit of time period. Data using either of them fits worse than the data using a single month as the unit time period). The simulation for each network in the four cities continues until each network entity’s influence value is more than 99.99%

A discrete time hazard model is used to study the impact of social network influence on the time of adoption of the medicine, while controlling for other variables such as the physician's professional age, number of journals read, and scientific orientation as well as drug manufacturer advertising data at each time period. The discrete time hazard model is a type of survival analysis that specializes in studying the influence of historical events on a time-related dependent variable. A discrete time hazard model is used rather than a continuous time mode because it can more efficiently incorporate time-varying exploratory variables (Allison 1982; Brown 1975). Particularly, this study employs two time-varying independent variables: social influence, which is computed by a simulation process, and the amount of advertising. This method is consistent with other social network studies (e.g. Van den Bulte and Lilien 2001; Bell and Song 2007; Manchanda, Xie and Youn 2008). Therefore, the discrete time hazard model is the best option for modeling the impact of social influence and the amount of advertising on the timing of new drug adoption by doctors. The hazard function of the rate of adoption of doctor *j* at time *t* is represented as follows:

$$prob(y_{kt}=1 \mid y_{k(t-1)}=0) = F(\beta_0 + \beta_1 lederle_t + \beta_2 Other_t + \beta_3 * net_{kt}^{\delta} + \beta_4 * \log(journ)_k$$
$$+ \beta_5 * profage_k + \beta_6 * profage_k^2 + \beta_7 * sci_k) \qquad (4)$$

3.6.1 Variable and Equation Specification

Dependent variable y_{kt} represents whether entity *k* adopts the innovation at time *t*.

F is a cumulative distribution function, representing the probability of adopting the innovation.

β_0 is the constant net_{kt} represents the social influence from network neighbors to network entity *j* at time *t*. This value is calculated according to equation 3.

δ is the diffusion efficiency coefficient.

$Lederle_t$ and $Other_t$ represent the influence of advertising by leading Tetracycline manufacturer Lederle and by other Tetracycline manufacturers at time *t* on every doctor. The amount of advertising varies over time but is assumed to be the same across all entities. This data was orginaly collected by Van den Bulte and Lilien (2001) and was provided by professor Christophe Van den Bulte. The data of advertising (the number of pages of tetracycline advertising by all pharmaceutical companies) comes from an examination of each monthly issue of *Modern Medicine, Medical Economics* and *GP*, from November 1953 to April 1955. Following Van den Bulte and Lilien (2001), the coefficient of lagged effects of advertising α is set at 75% for the following months, as 75% is shown to lead to the highest model fit after using a grid search.

$$Lederle_t = \sum_{t=0}^{T} adv_t * \alpha^{(T-t)} \quad \text{.....................(5)}$$

$$Other_t = \sum_{t=0}^{T} adv_t * \alpha^{(T-t)} \quad \text{.....................(6)}$$

$\log(journ)_j$ represents the natural logarithm of the number of journals each doctor reads and demonstrates the doctor's access to professional knowledge from public media. We take the natural logarithm in order to normalize the distribution of the variable.

$profage_k$ represents the number of years that each network entity (doctor) has been practicing medicine, which may influence the rate at which the doctor prescribes medicines – for example, senior doctors may be more conservative in prescribing new medicines than junior doctors.

$profage_k^2$ represents the quadratic term of the number of years in practicing medicine. This variable controls the effect that doctors with only a few experiences or close to the end of professional career development might be more conservative or aggressive in adopting new drug.

sci_k is a dummy variable, represents whether the doctor is science-oriented or patient-oriented. This measure is obtained through a survey. Possibly doctors with a scientific orientation would be more likely to explore the effect of a new drug than their peers.

3.7 Results

Table 3-5 reports the result of a simulation of social influence transmission in all four cities. The more efficiently each network entity transmits the social influence within this network structure, the fewer time periods elapse before every network entity is influenced. For example, in city 1, if $\delta = 0$, which means the social influence is transmitted randomly, 57 time periods occur as the information travels to every entity in the network, yielding 57 rows of influence values. Each row contains 112 influence values (one value for each non-original physician). If $\delta = 1$, only three time periods occur as information travels to each entity in the network, producing only three rows of influence values.

Table 3-5 Number of Periods by Simulation of Social Influence Transmission

δ	0	10	20	30	40	50	60	70	80	90	100
City 1	57	37	27	21	17	14	12	10	8	7	3
City 2	73	42	29	22	17	14	12	10	9	7	4
City 3	58	38	28	22	18	15	13	12	10	9	6
City 4	82	45	31	23	18	15	13	11	9	8	4

The influence values from 2^{nd} month to the month of adoption for each non original doctor were taken as observations for the network influence variable in equation. If the time period for adoption predicted by simulation is longer than actual time period, we impute the missing network influence values with 1. Totally there are 101 sets of values for different δ values from 0 to 1 with an interval of 0.01. Each set of values has same number of values for each doctor in each month. We replicate same procedure for each city in the *Medical Innovation* dataset. All four cities show similar patterns of data structure.

To estimate the hazard model in equation 4, a grid search is conducted to determine the value of the diffusion efficiency coefficient δ that best fit the observed data. Table 3-6 reports the BIC values of the estimation of equation (4) for each δ from 0 to 1, with an interval of 0.1, for each city. We will begin with the discussion of the results of city 4 since the best fit δ is neither 0 nor 1 and the network influence is positive.

Table 3-6 BIC Values of Equation 4 for Each City under Different Information Transmission Efficiency Coefficient

δ	city1	city 2	city 3	city 4
0	146.52	107.77	123.28	97.69
10	150.60	111.65	123.15	95.55
20	150.04	112.85	122.81	93.40
30	150.52	111.74	122.31	93.82
40	150.81	113.11	121.76	94.25
50	151.00	112.80	121.31	95.45
60	150.78	112.42	121.02	96.36
70	150.63	112.03	120.80	96.92
80	150.60	111.68	120.97	97.18
90	150.65	111.39	121.48	97.25
100	151.03	112.66	122.93	98.24

Our result shows that in city 4, the best fit dissemination efficiency coefficient is 0.20. Literally, it means that if the focal doctor has adopted the new drug in month t, he would influence one of his social ties plus 20% of the rest network ties of a focal doctor in the next month. For example, the average number of social ties in city 4 is 6.216, averagely about 1+20%*(6.216-1)=2 people in a doctor's ego network are influenced in one time period, given the focal doctor has adopted the drug in the previous time period. If we assume that every doctor would spend same amount of time and effort influencing another doctor, then doctors with more than 2 social ties cannot influence all of their social ties, thus blocking the dissemination process. In contrast, entities with only a few social ties could efficiently send out information to most of their social ties in a short time period. And these influenced ties could send out their information to other entities in the next time period. Actually, entities with only a few ties act as important channels in the dissemination process.

Table 3-7 shows the estimation results of equation (4) with the best fit δ=0.20 in city 4. The social network influence accelerates the adoption process in city 4 as what the social norm theory predicts (p<0.05). Advertising by the leading Tetracycline manufacturer Lederle does not contribute to the timing of the adoption of this new drug. Yet the advertising by other manufacturers contributes positively to the timing of the adoption of this new drug (p<0.01). In addition, doctors reading more professional journals would more likely adopt the new medicine later than doctors reading less journals (*p*<0.05). Moreover, the doctor's professional age does not contribute to the timing of adoption. Finally, doctor's scientific orientation does not influence the timing of adoption, either. It seems that doctors in city 4 do not trust the advertising by the major Tetracycline manufacturer. They would rather believe in the drug usage experiences by other doctors.

Table 3-7 The Estimation Results of Discrete Time Hazard Model in City 4

Log Likelihood = -35.607

BIC = 93.40 AIC = 87.22

Adopt	Coef.	Std. Err	P>|z|
constant	2.149	2.818	0.760
led	-16.956	10.882	0.119
oth	3.784	1.287	0.003
net020	4.688	2.383	0.049
logjourn	-6.248	2.629	0.017
profage	-1.802	1.152	0.118
profage2	0.206	0.153	0.178
sciorient	2.930	2.818	0.445

Our result shows that in city 1, the information dissemination efficiency is extremely low with $\delta = 0$. In other words, on average, an early adopter may only influence one non-adopter in one month. Only entities with one social tie can influence all of their social ties. Similar to city 4, entities with a small sized ego network play important roles in the dissemination process. Moreover, the advertising by both leading manufacturer and other manufacturers positively influences the timing of new drug adoption, as shown in table 3-8. Similar to the result of city 4, the number of journals read by doctors negatively contributes to the timing of adoption. The doctor's profession age and scientific orientation do not influence the timing of adoption in this city.

Table 3-8 The Estimation Results of Discrete Time Hazard Model in City 1

Log Likelihood = -57.09
BIC = 146.52 AIC = 130.17

Adopt	Coef.	Std. Err	P>|z|
constant	12.512	2.140	0.000
led	50.240	8.448	0.000
oth	10.897	1.687	0.000
net000	2.433	1.104	0.028
logjourn	-12.826	1.753	0.000
profage	-0.087	0.349	0.804
profage2	0.017	0.043	0.694
sciorient	0.078	0.384	0.840

Our results show that in city 2, the social influence dissemination efficiency is also extremely low with $\delta = 0$. Table 3-9 shows the results of estimation of equation (4) with $\delta = 0$. The social influence in this network is negative ($\beta = -5.792$, $p < 0.05$), which means negative word of mouth is transmitted in this network. Ironically, those network entities with a big sized ego network happened to block the flow of negative WOM in the network in the initial stage. Besides, similar to the results of city 1, the advertising by both leading manufacturer and other manufacturers positively influences the timing of doctor's new drug adoption in city 2. All other variables do not contribute to the timing of new drug adoption in this city.

Table 3-9 The Estimation Results of Discrete Time Hazard Model in City 2
Log Likelihood = -42.55
BIC = 107.77 AIC = 101.10

Adopt	Coef.	Std. Err	P>|z|
constant	-6.418	2.088	0.002
led	31.324	13.057	0.016
oth	1.914	1.064	0.072
net000	-5.792	2.712	0.033
logjourn	1.422	1.095	0.194
profage	0.643	1.127	0.568
profage2	-0.083	0.155	0.591
sciorient	2.705	0.812	0.001

Our result shows that the social influence does not significantly influence the timing of new drug adoption in city 3 regardless of the values of the efficiency coefficient. Thus, we did not find support of social influence within the doctor network in city 3. Besides, as shown in table 3-10, the advertising by leading manufacturer does not contribute to the timing of adoption in this city. Yet the advertising by other manufacturers positively influence the timing of adoption in this city ($p<0.01$). All other variables do not contribute to the timing of new drug adoption.

Table 3-10 The Estimation Results of Discrete Time Hazard Model in City 3

Log Likelihood = -48.84
BIC = 120.80 AIC = 113.68

Adopt	Coef.	Std. Err	P>|z|
constant	-36.967	62.490	0.554
led	-3.064	6.695	0.647
oth	2.583	0.961	0.007
net070	32.371	62.911	0.607
logjourn	0.971	1.597	0.543
profage	1.115	0.802	0.164
profage2	-0.148	0.116	0.201
sciorient	0.964	0.822	0.241

3.7.1 Discussion of Results, Limitations, and Future Research

The research results demonstrate the influence of a social network in diffusing a new product. Through the channel of the social network, network entities can transmit new product information that reduces consumer's perceived risks. As time passes, more people in the network are likely to adopt the new product, and the social pressure for adoption accumulates for each network entity. Thus, the probability of adoption for each network entity increases over time. The network channel of information diffusion differs from that which occurs through the mass media. It entails the social network characteristics of network structure, distance to the original adopters, and the efficiency of the diffusion by network entities.

Our research demonstrates the importance of entities with small number of social ties when average individual network entity's dissemination efficiency is low (e.g. city 1 and city 4). In this setting, if an entity has a large number of social ties in the network, he might be too busy to send out the social influence to all of his social ties. If similar new drugs appear in city 1 and city 4, manufacturers should not ignore the functionality of doctors with a small sized ego network in the initial dissemination period.

When the dissemination efficiency is extremely high, manufacturers should make efforts to convince the entities with large number of social ties as suggested by Goldenberg et al's study. In this way, the dissemination process could take advantage of the network hub's big sized ego network to *broadcast* the new product information to the members of its ego network.

The hubs in an online community, as depicted in the Goldenberg et al's study, could publish their decoration items on their own homepages and their network neighbors could access the item information conveniently without exhausting the hubs' time and effort. Thus, the number of online community users who receive the new item information from the hubs could be unlimited in a unit time period. However, when the product involves some risks like the new drug, discussion about the effect and side effect of the new drug might be necessary. Thus, it takes time and effort (better in a one-to-one setting) for a focal doctor to transmit the social influence/information out to other doctors in his ego network. Therefore, the number of influenced doctors in a focal doctor's ego network in a unit time period is limited if his time and effort are limited.

When the dissemination efficiency is high and the negative word of mouth is transmitted in the network (e.g. city 2), manufacturers should avoid the new product exposure to the entities with lots of social ties in the network. In this way, manufacturers could control the speed of the dissemination of the negative social influence

When the dissemination is low and the negative word of mouth is transmitted in the network, manufacturers should be careful of the power of the entities with only a few ties. They have similar powers of disseminating negative word of mouth to other entities as those entities with a large number of social ties.

Table 3-11 summarizes the managerial implications of pinpointing initial adopters of a new product in different types of social network (High/Low Information Transmission Efficiency X Positive/Negative Social Influence).

Table 3-11 Summary of Managerial Implications

	High Information Transmission Efficiency	Low Information Transmission Efficiency
Positive Social Influence	Look for entities with lots of social ties (e.g. virtual community as described in Goldenberg et al's study)	Cannot neglect the importance of entities with only a few social ties (e.g. city1, city 4)
Negative Social Influence	Avoid entities with lots of social ties	Be careful of entities with only a few social ties (e.g. city2)

Some limitations apply to this study. The first relates to the assumption that the network structure does not change over time. While this assumption holds if the information transmission process in the whole network does not take long, if the information transmission process takes a very long time, the network structure may in fact change, leaving expired entities and expired ties in the network. The measure of betweenness (Freeman 1977), which refers to the information control power of each entity, might address the issue of expired entities. However, there is no measure of the information control power of network ties. Future research could explore the information transmission efficiency of additional entities and ties to the existing network structure. For example, it could detect how the growth of a network with the mechanisms of random attachment (in which a new entity randomly attaches to an existing entity in a growing network) or preference attachment (in which a new entity attaches to an existing entity with highest degree in a growing network) (Bollobás 2001) would improve or impair the information transmission efficiency.

In addition, similar to the research using the Medical Innovation dataset, this study suffers from a problem of omitting right censored cases in survival analysis. Analyzing the truncated data with hazard modeling technique may over-estimate the contagion effect. Van den Bulte and Iyengar (2009) suggested a non-parametric method to solve this problem. Future research could follow their suggestion to protect the results from the contamination of the right censored cases.

Moreover, the algorithm developed in our study can only deal with bilateral relations in a network. Future research should develop the algorithm that could efficiently model the unilateral relations in a network. Thus, the range of incorporating various types of relations (e.g. advice network in Medical Innovation) could be expanded and leads to more precise analyses results.

Finally, the data used in this study are a classic data set from the 1950s.

Therefore, the data set does not incorporate several marketing variables that could potentially influence the information transmission efficiency in a network (this research has explored the effect of advertising on transmission efficiency). For the product characteristics, the conjecture is that the product value may positively influence the distribution speed. The greater the relative advantages of the product, the more efficiently the product information is transmitted through the network. Future research could also model multiple competitive products being distributed in the same network structure at same time. Thus, researchers could detect (1) whether the diffusion of social influence of one product facilitates or inhibits the diffusion of another product and (2) the capacity of the network to distribute the new products. Finally, future research could investigate whether the network entities' past diffusion experiences of a product could influence the efficiency of distributing a similar product in the same social network.

3.8 Conclusion to Chapter 3

Theoretically, this study confirms the social contagion effect within a social network while controlling for the advertising effect. Methodologically, this study models a new product diffusion process in a social network. In particular, it incorporates the time factor into a dynamic information transmission process over all network entities. Moreover, it introduces an information transmission coefficient into the model. Practically, managers could use this coefficient to pinpoint initial adopters in a social network that could efficiently transmit the product information to all other network members.

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Chapter 4 ： General Conclusion

The term social network or networking represents a concept, a behavior, a system and a research method. As a concept, a network refers to a relation or social tie that connects individuals and organizations. Social networking also stands for a behavior of building up relationship with individuals and organizations. Besides, the social network is a social system that consists of various network entities. And the social network approach is a method that studies the characteristics of a social network and the position of an entity within a social network. The relational embeddedness in the social network theory explains why the social relation is important to individuals and organizations and how they could develop the relationships with other individuals and organization. It covers the first two conceptions of the social network. The structural embeddedenss in the social network theory takes a structural view of the whole network system. It covers the last two conceptions of the social network.

My dissertation applies social network theory in the marketing management and extends the social network theory for its application in marketing field. Theoretically, my dissertation covers almost all important topics in marketing management in 21st century: network theory, relationship marketing, resource management, value and supply chain management (Vargo and Larsh 2004). Methodologically, my dissertation introduces a network entity's information dissemination efficiency coefficient in a social network (Chapter 3). Substantially, my dissertation studies business (Chapter 2) and individual agent (Chapter 3) in a social network theory framework.

The first essay contributes to the understanding of channel member relationship. It applies the relational embeddedness perspective to study the relationship between channel members. In marketing channel relationship area, this is the first study to link the channel relationship management variables to the firm's financial performance and hence justifies the economic value of the relationship building and maintenance. In social network area, this essay substantiates the types of resources that social network conveys to the network members. In strategic management area, this essay revises the definition of capability in that the reseller could demonstrate it relationship building capability to adapt the configuration of marketing and operational resources to reseller's sale area before the reseller actually owns these resources, which is in sharp contrast to the definition by Amit and Schoemaker (1993). Finally, this essay finds that too close relation between reseller and focal manufacturer compared with other manufacturer does not bring higher profit for the reseller.

The second essay adopts a structural embeddedness perspective of a social network and contributes to the methodological advances in modeling dynamic influence from ego network. This is the first study to simulate the information diffusion efficiency in a social network. We introduce a diffusion efficiency coefficient in a social network, by which, managers could evaluate whether the network entities with a large number of social ties are efficient information transmitters in a social network.

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Appendix A: The Original Items Used to Measure Relational Embeddedness Model in Figure 2-2

Communication Efficiency

1, What is your level of satisfaction with salespersons' visit and communication?
2, What is your level of satisfaction with salespersons' communication of business objectives?
3, What is your level of satisfaction with salespersons' feedback and reply to your advices?
4, What is your level of satisfaction with salespersons' provision of sales reports?
5, What is your level of satisfaction with salespersons' transmission of the sales policy?

Conflict Resolution

1, What is your level of satisfaction with salespersons' capacity of solving the complaints?
2, What is your level of satisfaction with salespersons' rationality of solving the complaints?

Strategic Promotion

1, What is your level of satisfaction with the response to competitor's promotion activity?
2, What is your level of satisfaction with the pertinence of promotion activity?
3, What is your level of satisfaction with timing of promotion activity?
4, What is your level of satisfaction with salespersons' feedback and reply to your suggestion on promotion activity?

Promotion Effectiveness

1, What is your level of satisfaction with the attractiveness of promotion gifts?
2, What is your level of satisfaction with the quality of promotion gifts?
3, What is your level of satisfaction with the supply of promotion gift?

Transaction Efficiency

1, What is your level of satisfaction with the order processing?
2, What is your level of satisfaction with the accuracy of order processing?
3, What is your level of satisfaction with people in the transaction processing?
4, What is your level of satisfaction with salespersons' notice of goods arrival?
5, What is your level of satisfaction with the services of transportation company?
6, What is your level of satisfaction with the options of financial payment?
7, What is your level of satisfaction with the efficiency of signing the contract?

Product Fit

1, What is your level of satisfaction with the product packaging design?
2, What is your level of satisfaction with the liquor quality?
3, What is your level of satisfaction with product positioning in your region?
4, What is your level of satisfaction with the product configuration in your region?
5, What is your level of satisfaction with the quality of packaging when receiving the product?

Profit

1, What is your level of satisfaction with profits from doing business with the manufacturer?

Note: The shaded items are disposed during the measurement model development process

Appendix B: Construct Name, Definition and Questionnaire Items Used in Models in Chapter 2

Construct Name Cronbach α Composite Reliability (CR)	All the questions use the 5-point scale to indicate reseller's level of satisfaction toward the XXX (name of manufacturer). 5 means "Satisfy very much", 1 means "Dissatisfy very much". Definition Item Name /Survey Question/Factor Loading		
Communication Effectiveness	The efficacy of information sharing between resellers and a manufacturer, representing the efforts of channel members to coordinate such mutual relationships with each other.		
α :0.74	Comm1	What is your level of satisfaction with salespersons' visits and communication?	0.67
CR: 0.73	Comm2	What is your level of satisfaction with salespersons' communication of business objectives?	0.71
	Comm3	What is your level of satisfaction with sales persons' feedback and reply to your advice?	0.69
Conflict Resolution	The resolution of conflict between reseller and manufacturer, resulting in cooperation concerning issues related to consumers, the market place and business objectives.		
α :0.87	Conflict1	What is your level of satisfaction with sales persons' capability of solving complaints?	0.87
CR: 0.89	Conflict2	What is your level of satisfaction with sales persons' rationality of solving complaints?	0.91
Strategic Promotion	The manufacturer's promotion strategy considering the consumer characteristic and the competitor's promotion behavior		
α: 0.71	Strprom1	What is your level of satisfaction with the response to competitors' promotion?	0.72
CR: 0.72	Strprom2	What is your level of satisfaction with the pertinence of promotional activities?	0.78
Promotion Effectiveness	The impact of the manufacturer's promotion efforts that are directed at resellers or end consumers		
α :0.86	Promeff1	What is your level of satisfaction with the attractiveness of promotional gifts?	0.69
CR: 0.72	Promeff2	What is your level of satisfaction with the quality of promotional gifts?	0.67
	Promeff3	What is your level of satisfaction with the supply of promotional gifts?	0.75
Transaction Efficiency	The manufacturer's customer order fulfillment capability.		
α :0.71	Traneffi1	What is your level of satisfaction with the order processing?	0.68
CR: 0.71	Traneffi2	What is your level of satisfaction with the accuracy of order processing?	0.64
	Traneffi3	What is your level of satisfaction with people in the transaction process?	0.68
Product Fit	The matching of product characteristics with consumer needs and wants in a reseller's sales region		
α :0.70	Prodfit1	What is your level of satisfaction with the product Packaging design?	0.54
CR: 0.66	Prodfit2	What is your level of satisfaction with the liquor quality?	0.52
	Prodfit3	What is your level of satisfaction with the product positioning in your region?	0.58
	Prodfit4	What is your level of satisfaction with the product configuration in your region?	0.60
Reseller's Profit	Reseller's profit from the business with the manufacturer.		
	Profit1	What is your level of satisfaction with profits from doing business with the manufacturer?	0.81
Over Embeddedness	The information redundancy due to too close a relationship with manufacturer		
	Topattn	What is your level of satisfaction with the attention from top management?	

Appendix C: Resolving Alternative Explanation of H_{10} in Chapter 2

The alternative explanation of H_{10} that links the attention from manufacturer's top management to the reseller's profit is that the latter could adversely influence the former. This reverse causality is most likely to exist when a reseller's purchase constitutes a considerable amount of sales of the manufacturer. Otherwise, the profit fluctuation of a small reseller's profit would not influence the manufacturer's profit. In our dataset, most of the resellers are small in size. Therefore, the profit increase or decrease of a specific small reseller would not arouse the attention of the manufacturer's top management who cares more about manufacturer's own profit level.

In addition, we found an instrument variable called "manufacturer's price system". There is significant correlation (coefficient=0.40) between "pricing system" and "attention from top management of manufacturer" since both of them could influence each other conceptually. Moreover, manufacturer's "pricing system" could influence individual small reseller's profit but individual small reseller's profit would not influence the manufacturer's "pricing system". Operationally, we first regress the variable of "attention from top management of manufacturer" on the variable of "pricing system" and get the fitted values. Secondly, we incorporate the fitted values of the instrument variable into the estimation of structural equation model. And the coefficient from the instrument variable to the reseller's profit is positively significant (β =0.42, t=4.79). Moreover, the overall model statistics shows that the model fits the data well (χ^2 =240.96, df =139, p = 0.000, GFI=0.94, RMSEA=0.044)

Finally, we test the structural model with the reverse linear relationship (the manufacturer's top management attention as a consequence of the reseller's profit to). Although the fit of reverse causality model (the error variance of the single item, attention from top management is set as 0.20 level, which corresponds to the structural model in Table 2-3,) is acceptable (χ^2 = 262.16, df =142, RMSEA=0.048), it is significantly worse than the structural model in Table 2-3 column 2 (χ^2 = 181.71, df =139, p = 0.82). The χ^2 difference is 80.45; The difference of degree of freedom is 3; and the corresponding p = 0.

Appendix D: Variance of Items Used in the Models in Chapter 2

Item	Variance
comm1	0.66
comm2	0.54
comm3	0.79
conflict1	0.92
conflict2	0.69
strprom1	0.80
strprom2	0.89
promeff1	0.88
promeff2	0.65
promeff3	1.06
traneffi1	0.48
traneffi2	0.44
traneffi3	0.46
prodfit1	0.55
prodfit2	0.50
prodfit3	0.47
prodfit4	0.66
profit1	0.86
topattn	0.78
topattn2	1.86