

CENTRALITY OF SURGEONS IN PURCHASING ORTHOPEDIC AND CARDIAC IMPLANTS

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ABSTRACT

Cost of orthopedic and cardiac implants are among the very high costs in American hospitals. We believe that one major reason for this high cost is the centrality of surgeons. This study inspects this problem from the lens of service triads, agency theory, social network theory, and balance theory. We proposes that a service triad forms when the hospital intends to purchase cardiac and orthopedic implants. Results of our pilot study shows that there are strong and significant relationships between the position that surgeons take, and the success rate of hospitals in their initiatives to reduce the cost and increase the quality of purchased implants.

INTRODUCTION

Reports show that this expenditure will grow at a higher speed compared to the growth of the national income in near future [1], [2]. Affordable care act intends to tackle this problem partially by reducing the cost of care while maintaining the required quality of care [3]. As part of the affordable care act, manufacturers of medical devices covered by federal health care programs, have to report every financial relationship with physicians and teaching hospitals [4]. Implantable medical devices (IMD) are medical devices that intended to be wholly or partially introduced into the body of a human being by surgical intervention [5]. U.S. implantable medical devices market will grow at an annual compounded rate of 8 percent over seven years to be worth \$73.9 billion by 2018 [6]. Orthopedic implantable medical devices include joint implants, most commonly hips and knees, as well as spinal devices used for spinal fusion. Cardiac IMDs include cardiac rhythm management devices and coronary stents [7].

In purchasing implantable medical devices, a unique situation emerges. We conceptualize this situation as a service triad [8] in which the buyer of IMDs is hospital, the service provider is the manufacturer of IMDs, and the customer of the IMDs is physician. In this service triad, both the hospital and the vendor try to maintain stronger bond with the physician. Unfortunately in most cases hospitals are not successful in this thug of war [7]. We proposes a theoretical framework to study this phenomenon, and based on an empirical research provide proof for the significance of physician role in the success of hospital initiative to reduce cost and increase quality.

THEORETICAL BACKGROUND

One of the very few studies that makes an important theoretical contribution to the service triads' literature is the study of structural hole, bridge, bridge decay, and bridge transfer [9]. Structural hole is the absence of relationship (tie) between two parties (nodes) in a network [10]. This concept in the study of triads, translates into lack of relationship between two of three actors. Bridge in a triadic setting, refers to the party that has positioned on the structural hole [10], [11]. Bridge could span the structural hole and benefit from the lack of connection between the two separated nodes. In the service settings, such as the setting

of this study, the bridge position does not last forever [9], [12]. This is one of the key characteristics of service settings that distinguishes it from manufacturing setting [13]. Consider the context of this study in which hospital (buyer) has no choice but to let the vendor's representative (supplier) and physician (customer) to interrelate with each other. In this scenario, physician and vendor representative build a relationship, and the bridge position of hospital starts to decay. This phenomenon is called "bridge decay" [12].

Since physician and vendor have a longstanding relationship, hospital is positioned in the state of bridge decay. Scholars propose a resolution for the bridge decay problem [9]. This resolution is called the permanent bridge decay [9], [14]. Permanent bridge decay is a situation in which buyer maintains close contact with both supplier and customer. Buyer also monitors the relationship between the supplier and the customer to control how the supplier is doing his job and how satisfied the customer is [9], [14]. This monitoring also prevents possible situations in which supplier and customer collude to bypass buyer or to force buyer to purchase products and services that are not economically optimal [9]. This situation is illustrated in Figure 1.

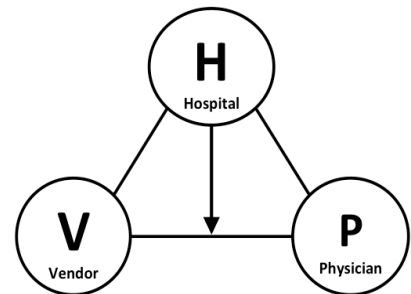


Figure 1. Permanent Bridge Decay in the Service Triad

According to balance theory, a triadic relationship will be in a balanced state when all the relationships are positive [11]. In such a triad, that all three parties have positive relationship with each other, they all show higher performance [11]. Drawing on this line of reasoning, in the context of this study, hospital has to maintain positive relationship with vendor and physician.

Agency theory investigates contractual agreements and monitoring mechanisms between principal and agent, under which the performance of principal would be higher [15], [16]. Scholars adopt agency theory to look at the buyer, supplier, and customer triadic relationship. They developed propositions on the design of contracts and monitoring [16]. Agency theory provides a dynamic view of the relationship between buyer, supplier, and customer [8], [17]. This theory has been recently applied to service triads [8] to determine the type of contract and monitoring suitable for a triadic relationship in service setting. Focus of agency theory is on the type of contract and type of monitoring [15]. Based on bounded rationality, self-interest, and difference in risk preference, agent(s) in most cases do not perform in the best interest of principal [8].

CONCEPTUAL MODEL

This paper reports the preliminary findings of testing a comprehensive model which investigates the antecedents and consequences of managing the IMD purchasing service triad by hospital. The preliminary model has been pilot tested on 68 hospitals across The United States. Broadly speaking, the comprehensive study proposes that certain mechanisms should be utilized by hospital to enhance its relationship with physician, and vendor. It also states that maintaining these relationships has a positive effect on hospital performance in purchasing IMDs and IMD services. It conceptualizes the relationships between physician and hospital, and physician and vendor as principal-agent relationships. Physician is considered to be agent of hospital, as well as agent of vendor.

The preliminary findings of the comprehensive model, shows that when the physician acts as the agent of the hospital, their relationship positively affect the efficiency of hospital in standardization of the process of buying IMDs. On the contrary, this model argues that when physician acts as the agent of vendor, this relationship negatively affect the efforts of hospital in implementing standardization strategies. This model proposes that the relationship between hospital and vendor has positive effects on standardization. The concept of standardization will be discussed in more details in the following section. The preliminary conceptual model is illustrated in Figure 2.

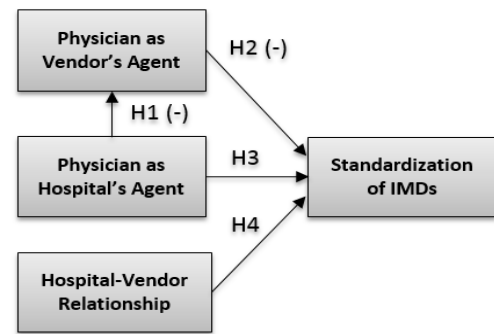


Figure 2. Conceptual Model

HYPOTHESES DEVELOPMENT

Studies that expanded the agency theory [15] to multiple principals [18] refer to a situation in which one agent is in relationship with two principals, as “common agency”. In such a situation, since agent is expected to increase its benefit, it leans toward the principal that offers better remunerations. The stronger principal-agent relationship negatively affects the weaker principal-agent relationship. When multiple principals interact with a common agent, the richest relationship persists and the other vanishes [18]. Also, according to the balance theory [19] and studies of triads built on this theory [11], when customer (physician) is well treated by buyer (hospital), customer (physician) becomes reluctant in its relationship with supplier (vendor). Therefore we hypothesize:

H1. Agency role of physician for hospital is negatively associated with the agency role of physician for vendor.

Based on prior studies in physician preference items procurement [20] define standardization of IMDs purchasing process as “the extent to which hospital has standard processes for managing, controlling, and coordinating the purchasing process of orthopedic and cardiac implantable medical devices.” Several studies [6], [20]–[22] referred to the fact that one of main barriers against standardization strategies of hospitals is the strong relationship between physicians and vendors. In other words, when physicians acts as the agent of vendor, they defends vendor’s position and try to convince hospital to pay higher prices and purchase implants from various vendors. This situation is in opposition with the standardization strategies. Same studies argue that when physicians’ goals are aligned with those of hospital, i.e. physician acts as the hospital’s agent, physicians defend hospital’s stakes in purchasing implants. For instance they actively participate in value analysis teams (VAT) to speak on behalf of hospital and helps to implement standardization strategies [23].

Moreover, according to “common agency” model [18] these two agency relationships are expected to work in contrary directions. The principal-agent relationship between physician and vendor has destructive effect on hospital initiatives for standardization, while the principal-agent relationship between physician and hospital has constructive effect on hospital initiatives for standardization. Therefore we hypothesize that:

H2. Agency role of physician for vendor is negatively associated with IMD standardization.

H3. Agency role of physician for hospital is positively associated with IMD standardization.

Based on an extensive literature review, we defines hospital-vendor relationship as “the extent to which, in purchasing process interactions, hospital relies on vendor for an optimum balance of quality and price of IMDs, vendor and hospital do not abuse their market power, and they openly communicate relevant and required information”. Scholars [20], [21] refer to such a positive relationship as a strong predictor of success of hospitals in implementing standardization strategies. For instance when vendor and hospital have such a relationship, vendors provides hospitals with updated information on new product availability and FDA approvals, and vendor assures hospital that they can provide the required quality of IMDs to meet hospital needs. In return, hospital commits to work with a particular vendor for appropriate price. Vendor facilitates hospital IMD inventory management [24]. This close cooperation, the culture of trust between the two parties, exchange of critical information, and more importantly not abusing the market power, will enable hospital to have a vivid view of the dynamics of the IMD market. In other words hospital has a clear visibility across the upstream of its supply chain [25]. This empowers hospital administration and procurement managers to swiftly respond to changes in the market, and take actions to reconfigure the supply base. Drawing on this line of reasoning, we hypothesize:

H4. Hospital-Vendor relationship is positively associated with IMD standardization.

ANALYSIS

We collected data from hospitals all across the nation in The United States. Contact lists were acquired from LexisNexis Academic Database [26]. In the pilot phase, survey was sent to 211 hospital officials. Final number of usable responses was 68, which yields the response rate of 32.22%. Multiple demographic variables have been gathered from the respondent sample. We the conducted a series of chi-square tests and a T-test [27] to find the differences between characteristics of respondents and non-respondents. According to the results, the difference between respondents and non-respondents is not significant for size (number of beds), ownership (For Profit, Not-For-Profit, Public), location (Urban, Rural), and teaching status (Teaching, Non-Teaching) of the hospitals. We performed structural equation modeling using EQS software [28]. In order to control for common method variance, Harmon’s single factor approach [29] and social desirability approach [30] were used. Both results show that the common method variance is not an issue. A summary of the model analysis, model fit indices, path coefficients, and significance levels is presented in Table 1.

Table 1. Results of Structural Model Analysis

Hypothesized Relationship	Standardized Coefficient (β)	T-Value	Standard Error	Sig.	Support	Model Fit Indices
H1: PHA \rightarrow PVA (Neg.)	-0.476	-2.144	0.45	<.05	Strong	RMR = 0.010
H2: PVA \rightarrow STD (Neg.)	-0.654	-3.534	0.37	<.01	Strong	CFI = 0.953
H3: PHA \rightarrow STD	0.356	4.322	0.035	<.01	Strong	GFI = 0.838
H4: HVR \rightarrow STD	0.227	4.071	0.022	<.01	Strong	AGFI = 0.825

CONTRIBUTION AND CONCLUSION

This study provides an integrated theoretical framework that enables us to study the centrality of physician in a service triad that forms when hospital reaches out to IMD market for purchasing cardiac and orthopedic implants. Further, this study shows that these triadic relationships affect hospitals’ efforts to standardize the process of purchasing cardiac and orthopedic IMDs. We found empirical support for the notion that for a physician, higher levels of agency for hospital are associated with lower levels of agency

for vendor. We also found empirical support that (a) the agency role of physicians for vendor is negatively associated with standardization of IMD purchasing procedures, (b) the agency role of physician for hospital positively affect the standardization of the process of purchasing IMDs, and (c) there is a positive association between a well-established relationship among vendor and hospital and the standardization of the process of purchasing IMDs. Scholars [8] have investigated prior studies in the triads literature. They believe that extant research is mainly focused on supply networks. Moreover, these studies are mainly conducted in manufacturing context. We extended these conceptual researches to the service setting, and contributed to procurement, healthcare, agency theory, and service triads literature [13].

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