Lean and integration for safety and financial performance in healthcare

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Abstract
This study informs relationships among lean, integration, patient safety, and financial performance. Data were collected from three sources for acute care hospitals in the USA. Results indicate that a lean orientation has a direct and positive impact on safety while it impacts financial performance indirectly through integration.

Keywords: Healthcare / hospital operations, safety, financial performance

Introduction
Patient safety and financial performance have been the focus of increased attention in the healthcare field. The Institute of Medicine defines patient safety as “freedom from accidental injury,” and claims that medical errors are responsible for about 98,000 deaths annually (IOM, 2000, p. 4). However, a recent study (James, 2013) reports that the number of deaths associated with preventable medical errors are actually substantially higher – closer to 400,000 deaths per year. This makes medical errors the third leading cause of death, behind heart disease and cancer. As a result, reducing medical errors – keeping patients safe – is receiving substantial attention from hospital executives given their serious adverse impact on patients and the notion that many such errors are preventable (IOM, 2000).

The escalating cost of delivering care is another key challenge which has created pressure on the healthcare industry. The belief that healthcare spending will account for approximately 20% of Gross Domestic Product, or $4 Trillion, by 2015 has caused some to suggest that any discussion of healthcare improvement ought to include the topic of reducing cost (Bourgeois et al., 2009; Hwang and Christensen, 2008). Hospitals are a major contributor in the ‘healthcare spending category’, as they account for approximately 40 percent of total spend, making them a ripe target.
for cost reduction efforts (CMS, 2011). As such, it is not surprising that financiers of healthcare, namely private insurance companies and the USA federal government (the Center for Medicare and Medicaid Services – CMS), have imposed tighter controls and reductions in reimbursements to hospitals which are squeezing margins (MPAC, 2012).

Improving patient safety and financial performance are real challenges for hospital executives. Consequently, this has led to a search for innovative technical and administrative solutions. Many healthcare organizations have implemented several types of quality initiatives such as lean manufacturing as a means of addressing this challenge. Empirical studies in manufacturing provide ample evidence of the effectiveness of a lean orientation in reducing lead times, improving space utilization, increasing throughput, improving quality, and increasing financial performance (Shah and Ward, 2007). Service organizations such as healthcare could expect to achieve similar types of performance benefits through lean thinking (Shah et al., 2008; LaGanga, 2011).

This study draws on the dynamic capabilities model and the resource-based view (RBV) of the firm as the theoretical basis to investigate how a lean orientation in acute care hospitals can be translated into improved safety and financial performance. These lens are useful in better understanding the links among lean, patient safety, and financial performance given that patient safety can be achieved through a commitment to changing practices and adapting to patient needs (change management) which can be characterized as a dynamic capability, while financial performance results from the effective management or integration of firm resources which can be explained using RBV.

**Theory and hypothesis development**

Lean principles originated in the manufacturing sector in the 1900’s at Ford Motor Company, and were later modernized and refined by the Toyota Motor Corporation. Lean production is an approach that focuses on removing all forms of waste and non-value-added activities throughout an entire system or process. Types of waste include eliminating defects (including medical errors), unnecessary process steps, excess inventory, overproduction, waiting time, and unnecessary movement of people and equipment. A lean orientation has been described by some scholars as more of a cultural phenomenon than as a set of tools and techniques (Westphal et al. 1997; Cameron and Sine 1999). Especially when framed in this context, it makes sense that leadership would be a driving force in shaping this orientation. Lean orientation can be characterized as an environment in which top leadership encourages process improvement, elimination of waste, understanding of patient needs, adapting to change, and providing personal care. Lean thinking can transform an organization toward a culture of patient safety (Wellman et al. 2010). An important aspect in eliminating waste in healthcare delivery systems is to seek a deep understanding of patient needs as end-to-end process redesign is undertaken.

Process improvement initiatives such as lean have been examined through the lens of dynamic capabilities. For example, Anand et al., (2009) provide empirical support for their framework on continuous improvement that was derived from the dynamics capability perspective. The premise is that a lean orientation is meant to be a dynamic capability.

An important tenet of a lean orientation is the ability to adapt to changing situations. Lean can be thought of as a process improvement initiative that institutionalizes organization learning (Linderman et al. 2004). Experience and enhanced knowledge from process improvement initiatives have been reported to result in improved hospital effectiveness (Halbesleben and Rathert, 2008).
Dynamic capabilities linking lean orientation and hospital performance

Dynamic capability is defined as “a learned and stable pattern of collective activity through which the organization systematically generates and modifies its operating routines in pursuit of improved effectiveness” (Zollo and Winter, 2002, p. 340). Dynamic capabilities theory emphasizes the key role of strategic management in effectively adapting, integrating, and re-configuring internal and external organizational skills, resources, and functional competences in a changing business environment (Teece and Pisano, 1994). The academic literature on dynamic capabilities evolved from the resource-based view of the firm (Acedo et al. 2006, Barney et al., 2011). The major difference between the resource-based view and dynamic capabilities theory is that the latter is more focused on competitive survival as opposed to achieving sustainable competitive advantage. The focus on organizational change is what differentiates dynamic capabilities from ordinary capabilities (Helfat and Winter, 2011). Research has identified four dimensions of dynamic capabilities: 1) propensity to make market-based decisions for changing customer needs, 2) assessment and taking advantage of opportunities and threats, 3) ability to make timely decisions, and 4) realignment of the firm’s resource base (Barreto, 2010). Hospitals are dealing with a whole set of changes ranging from radical technological advancements to the restructuring of the entire health care system. The dynamic capabilities model is appropriate for this study because a lean orientation would emphasize reconfiguring resources to produce dynamic capabilities that could result in improved patient safety and financial performance. Therefore, the literature supports the following research hypotheses:

H1: Lean orientation will be positively associated with improved patient safety indicators.

H2: Lean orientation will be positively associated with improved net income.

Figure 1 – Hypothesized Research Model

Controls:
- Teaching Status
- Level of Employed Physicians

Net Income (Secondary data)

H3
Resource-based view – the role of integration in hospital performance

The concept of integration is firmly rooted in the supply chain management literature. In that literature, integration is broadly defined as the extent to which an organization is connected and strategically aligned with its supply chain partners (Das et al. 2006; Jayaram et al. 2010). Supply chain integration has been conceptualized by Schoenherr and Swink, (2012) as involving three dimensions: customers, suppliers, and internal integration. The current study will focus specifically on internal integration and do so within the healthcare setting. Internal integration typically involves the use of cross-functional teams that demonstrate a high level of communication and coordination among members (Schoenherr and Swink, 2012; Williams et al., 2013). Health care teams could include admitting and attending physicians that are integrated with other functional area personnel for process design and improvement (Fredendall et al., 2009).

Much of the supply chain integration literature has used the resource-based view of the firm as a theoretical justification for explaining why internal integration should impact performance (e.g. Das et al. 2006; Devaraj et al. 2007; Chen et al. 2009; Schoenherr and Swink, 2012). This view proposes that organizations utilize unique resources in various ways that cannot be easily copied and therefore can differentiate themselves (Barney, 1991). The resources are often developed by implementing knowledge-based processes (Rosenzweig et al. 2003) and organizational routine (Holweg and Pil, 2008). Lean orientation involves interconnected and synchronized processes for quality improvement.

Internal integration is supported by Deming (1986) who advocated systems thinking to organizational leadership, development and improvement. A coordinated improvement method promotes common understanding which helps ensure that knowledge creation is not limited to a particular individual or team but can be utilized throughout the organization. Prior research has acknowledged the importance of coordination and communication issues for quality initiatives (see, e.g., Flynn et al., 1995; Samson and Terziovski, 1999; Alexander et al., 2006; Yeung et al. 2006). Lean production requires distinctive practices and processes that often utilize cross-functional teams that help promote better communication and coordination. Therefore it is reasonable to expect that a lean orientation would be related to internal integration.

In accordance with the resource-based view, internal integration activities provide information processing and other unique capabilities that are needed to create a shared understanding and coordinated effort among team members that reduces uncertainty and ambiguity. Consequently, greater information sharing and coordination makes integration efforts more valuable. Generally speaking, research suggests integration leads to greater operational performance (Schoenherr and Swink, 2012). Specifically, these research studies support that internal integration will be related to net income. We thus hypothesize the following:

H3: Internal integration will partially mediate the relationship between lean orientation and net income.

Methodology

Data were collected from three sources and a matched sample dataset was developed. Lean orientation and integration are multi-dimensional psychometric measures collected via survey. Literature review and academic and practitioner field interviews generated and validated items for valid and reliable measurement properties. The items measuring Lean orientation were motivated
by Vonderembse et al. (2006); Agarwal et al. (2006); Qi et al. (2009), while the items measuring integration were adapted from Schoenherr and Swink (2012) and Williams et al. (2013) who emphasized cross-functional coordination and communication. These items were subjected to additional testing using the Q-sort pilot testing methodology (Moore and Benbasat, 1991). Patient safety is a single-item measure, and net income is reported as a percentage reported from publically available sources. Of the hospitals reporting in the researchers’ survey, 211 provided identifying information and were matched with secondary data. As such, this study analyzes a dyadic sample collected from three sources. The items will be presented at the POMS conference.

The distribution of respondents is over 55% holding the titles of Chief Nursing Officer, VP of Patient Care Services, or Director of Case Management. The balance is primarily comprised of VPs of Case Management, Directors of Nursing, and Directors of Quality Initiatives. Hospital characteristics from the sample will be reported at the conference.

**Data analysis and results**

Confirmatory factor analysis was employed to examine the variables and path relationships hypothesized in this study. Specifically, structural equation modeling (SEM) in AMOS was used to test the data following the Anderson and Gerbing (1988) two-step process for assessment of the measurement and structural models. The measurement model was tested and produced adequate results of validity and reliability. Detailed results will be presented at the POMS conference.

The structural model also produced adequate model fit statistics. The results from testing the path relationships reveal that hypothesis 1 (testing the relationship between lean orientation and patient safety) is supported. Hypothesis 2 (testing the relationship between lean orientation and a hospital’s net income) is not supported, indicating the lean orientation is not directly related to net income. Hypothesis 3 (testing the mediated relationship between lean orientation and net income, suggesting that the two are linked by integration) is supported as lean orientation is directly related to integration and integration is directly related to net income. Given these results along with the absence of support for hypothesis 2 linking lean orientation and net income directly, provides support for the notion that integration fully mediates the relationship between lean orientation and net income. Detailed results will be presented at the POMS conference.

**Implications**

This study set out to examine the effects of lean orientation on important hospital performance measures; namely patient safety and financial performance in the form of net income. The literature at the intersection of these three variables is nascent and that which does exists has produced mixed results. Given this, we developed a model grounded in two well-known theories in the operations management arena; dynamic capabilities and resource-based view. RBV in particular emphasizes the integration of resources in the firm as a key to competitive advantage, thus we included integration as a key variable in the model to help us better understand the relationships among lean orientation and hospital performance. A robust dataset collected from three sources (primary survey data, and two secondary data sources) was analyzed and produced important results for scholars interested in healthcare operations and supply chain management issues as well as those interested in lean, integration and firm performance. This study also produced important findings capable of helping practitioners, particularly hospital executives, better manage their organizations toward multiple performance measures.
For scholars, the inclusion of integration in our model, provides an opportunity to clarify some of the ambiguity related to past studies of process improvement and financial performance in healthcare. Similarly, our study adds to the literature investigating lean and patient safety which is limited and has in some cases produced counter-intuitive results.

For practitioners, our study provides a number of important insights. Hospitals around the country are aggressively implementation process improvement programs aimed at cost reductions. These efforts are often met with resistance from key constituents such as physicians. Our results are anticipated to indicate that a lean orientation can directly and positively improve patient safety, thereby potentially deflating one major objection to process improvement. Our results will also unpack the link between lean orientation and net income. This is key as while many hospitals are implementing lean and other process improvement initiatives, the pathway to achieving favorable financial results is unclear.

References


