Original Article

Marketing for capital investment: Improving labour efficiency in health care

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ABSTRACT Health-care costs consume an increasing portion of any modern society's resources, and controlling those costs is a major issue. Although health care is complex and surrounded by deep-rooted traditions, it is not immune to a basic analysis of inputs of capital investment, labour and their effects upon outputs. This article compares capital investment in health care to general manufacturing over a period from 1950 to 2006 and the effect that has had on efficiency. Whereas post World War II, general manufacturing has seen dramatic investments in capital along with a corresponding decline in labour, the same has not been seen in health-care. Capital investment in health-care increased significantly from 2000 to 2006. However, it remains far below that of general manufacturing and has had no impact on the demand for labour. Indeed, the future demands for skilled health-care labour will dramatically outpace the labour supply and is expected to increase further through 2025 and beyond. This gap between the supply of labour and the demands of servicing an aging population presents an opportunity to focus marketing efforts upon those aspects of innovation that can address a growing need for increased labour efficiency in health care.

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INTRODUCTION

In 1900, roughly 40 percent of all US workers were farmers. For the remaining part of the twentieth century, that number would fall to where it stands today; at about 2 percent of the US labour force. US agriculture has been astonishingly productive in meeting the needs of a growing country that now has a population over twice what it was at the turn of the last century, while producing an 11 billion dollar agricultural trade surplus as reported for 2007. If not for improvements in per worker productivity and the investments in technology that made such improvements possible, it is unlikely that the United States would have gained the economic position it holds today. It is reasonable to suppose that were it not for this rise in agricultural productivity, current discussions about health-care system reform would not have arisen.

As productivity increased on the farm, farm labourers moved to cities and into manufacturing. At its peak in about

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1957, general manufacturing accounted for nearly 30 percent of the total US labour force, and like farming before it, has declined steadily throughout the remainder of the twentieth century, finally edging below 10 percent during the third and fourth quarters of 2007.

Figure 1,shows the percentage of labour attached to manufacturing from 1950 to 2006. The data shows a fairly steady amount of general manufacturing labour for nearly 20 years (1950 to 1970) followed by an equally steady decline in general manufacturing labour to today's figure of 10 percent. Enabling this decline in the proportion of the US national labour force involved in manufacturing was a consistently large investment in capital. With very few exceptions, such as the recession of the early 1960s and briefly again between 1972 and 1973, capital investment in manufacturing as a percentage of total capital investment in the economy was higher than the percentage of labour devoted to manufacturing.

As in the movement of labour away from farming before, Figure 1illustrates how capital investment in technologies made workers more efficient, improving per worker outputs and resulting in fewer general manufacturing workers and eventually a decline in capital expenditures as well.

THE HEALTH-CARE EQUATION

Provision of health-care services shares much in common with manufacturing with similar dependence upon a ratio of labour and capital inputs to produce service outputs. Notwithstanding this, in health-care provision, like other service-based industries, there are no 'inventories' of activities; health-care services are produced and consumed at the same time, making counting and reporting very challenging, though not impossible.

What can be counted, for example, is the number of days a patient stays in the hospital for a given procedure or diagnosis (see Figure 2). Length of Stay (LOS) metrics are often used as a proxy measurement for efficiency, with the assumption that fewer days in the hospital reduce costs directly, and that reduced LOS are the result of (sufficient) knowledgeable and talented people knowing what to do and following

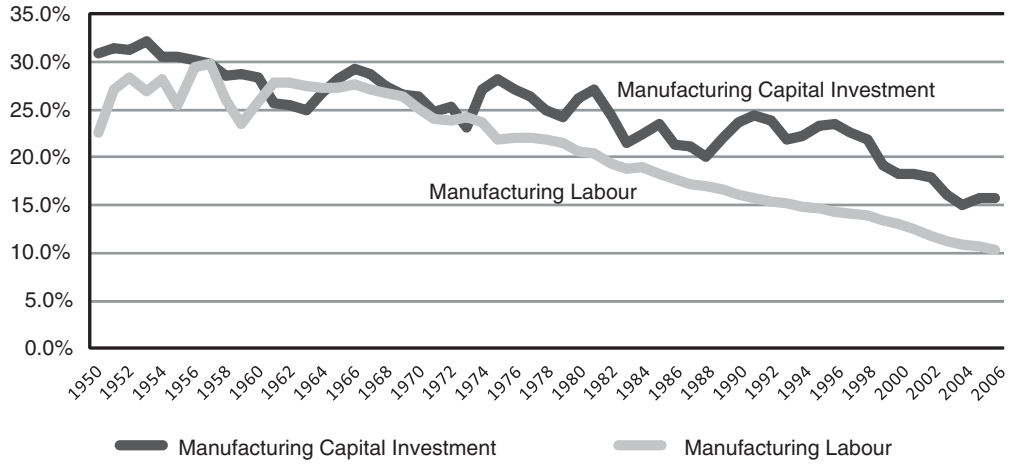

Figure 1: Percentage of aggregate capital investment in manufacturing and percentage of total labour force in manufacturing.

Source: United States Bureau of Labour Statistics National Historical Database [Online]. (2008), United States Department of Health and Human Services. (2006).

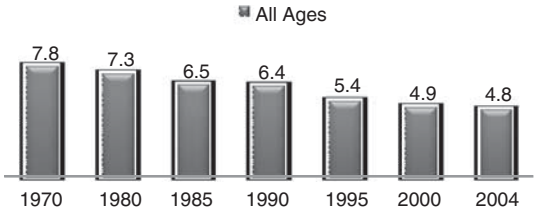

Figure 2: Average Length of Stay (LOS) in days.
Source: United States Department of Health and Human Services. (2006).

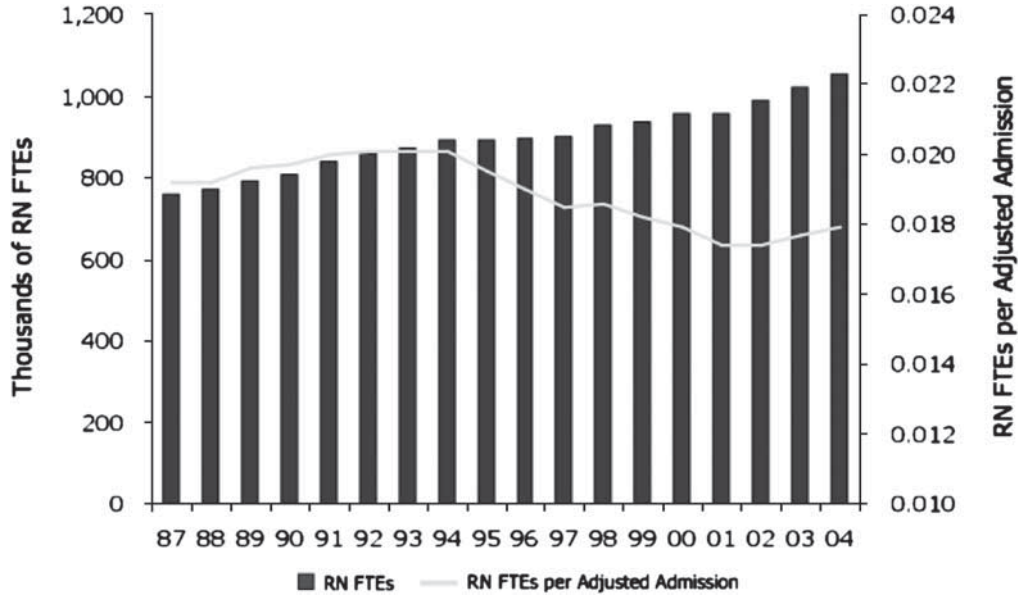

Figure 3: Number of RN full-time equivalent employees and RN FTEs per adjusted admission 1987–2004.
Source: The Lewin Group analysis of American Hospital Association Annual Survey data, 1987–2004, for community hospitals.

through. However, this assumption is open to challenge given that although the average LOS has declined, total health-care costs have continued to rise.

The focus upon reducing average LOS will continue, yet the marginal financial effects are minimal. As Figure 3 from the American Hospital Association suggests, reductions in LOS are being offset by significant growth in admissions and nursing labour costs. These data also reveal a significant fall in registered nurse (RN) full-time employees per adjusted admission. This is explained by a dilution of skilled medical staff attending to a growing number of patients, or said another way – the beds are not getting cold between patients. As the velocity of patients increases, nurses and caregivers are not exposed to patients long enough to appreciate subtle changes in clinical conditions, hence technologically the demand for skilled RN services is growing and the supply of those willing to participate in bedside nursing is not. The Bureau of Labour Statistics (BLS) estimates that with the median age of currently practicing RNs reaching 46 years in 2008, 50 percent of the health-care participating RN workforce will retire within the next 15 years. The American Hospital Association predicts that the shortage of RNs by the year 2020 will exceed 1 million.

The growing shortage of RNs puts into play a compelling challenge for health-care. Minimum training to become an RN is 3 years; clinical competency requires an additional 2 years.

Based upon known enrollment activity, our ability to address this increasing shortage through brute force of expanded training or recruiting of foreign graduated nurses to increase the supply of labour is poor at best. With the median age of licensed RNs approaching 48 in the next 15 years, simple arithmetic takes over and the gap between the number of nurses available to work and the need for their services continues to grow. The US BLS projects an additional 587 000 new nursing jobs by 2016 (Figure 4).[1]

The demand side of the health-care equation is demographically defined by trustworthy and unambiguous population statistics. In 2007, the first of approximately 75 million baby boomers began retirement, a population cohort not scheduled to peak until 2030.

LABOUR EFFICIENCY IN HEALTH CARE

Although many have tried, assessing per worker efficiency in health-care is difficult. Most such analyses have focused upon per worker *productivity* as is common in manufacturing, but that has proven unsatisfactory. The challenge with

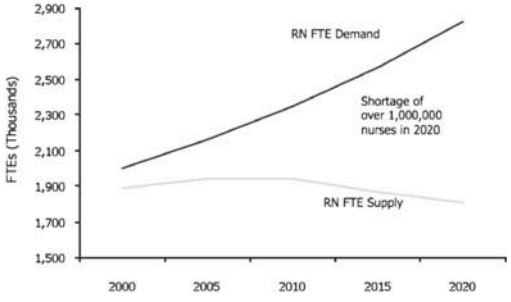

Figure 4: National supply and demand projections for FTE RNs 2000–2020.
Source: National Center for Health Workforce Analysis, Bureau of Health Professions, Health Resources and Services Administration, 2004.

productivity is that one would need a common understanding of what the desired output (or in medicine, outcome) would be. This, it turns out, is not always clear. We might think that for a patient to get better and go home would be a fairly universal desired outcome, however, in a hospice unit that would not be the case.

Given that, society needs a common understanding of what the proper output in health care should be, hence this article focuses upon efficiency. In effect, can health-care organizations help improve efficiency while wasting less time of health-care providers in a manner that optimizes the patients' likelihood of improving? Are there a set of technologies that broadens health-care workers' ability to effectively care for more patients while reducing risks and improving outcomes? And if so, are health-care organizations budgeting for, and researching those technologies as a means of addressing the growing shortage of nurses and other care providers?

The graph in Figure 5 compares the percentage of US employees involved in general manufacturing against the percentage engaged in health-care. The past 6 years of this graph reveals a remarkable convergence. Manufacturing employment continued its decline while the number of health-care workers experienced modest growth. For much of the past 50 years, health-care capital investment remained modest at about 5 percent of national capital investment. Since 1990 when the BLS began reporting on health-care employment*, the percentage of national health-care labour as a percentage of the economy has been greater than the percentage of health-care capital investment. Only rarely did this happen in manufacturing.

Since about 1973, the percent of national capital investment in manufacturing has been *higher* than the percent of national manufacturing employment.

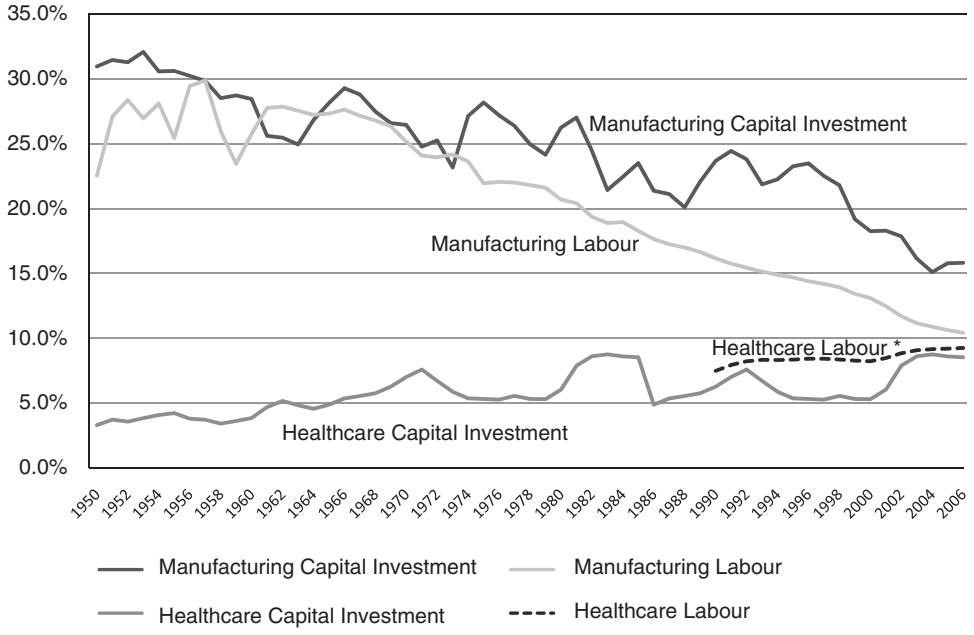

Figure 5: Capital investment and labour manufacturing as a percentage of the economy.
Source: United States Bureau of Labour Statistics National Historical Database [Online]. (2008), United States Department of Health and Human Services. (2006).

This is not an anomaly, but rather it tells a familiar story: capital investment improves outputs and reduces the need for some forms of labour. What might be shocking to some is that there is no obvious reason that what had been demonstrated in farming and in general manufacturing over the past century could not happen to the provision of health-care services for the remainder of this century. Increased levels of capital expenditures in technologies that enhance the efficiency of health-care labour will produce similar results. In the case of health-care, however, efficiency enhancing capital investments are also necessary to mitigate the effects of shortages in qualified health-care workers.

Figure 6 shows per employee capital expenditures as compared between general manufacturing and health-care, demonstrating a remarkable story. In both cases, capital expenditures are increasing, but in the case of manufacturing it is because of a declining number of workers. In 2006, general manufacturing made over US$11 000 of capital investment per employee, wherein health-care capital expenditures per employee ran about $6700, or about two-thirds that of manufacturing. By this analysis, it is unclear that the United States is spending too much in health-care; it may likely be that we are not spending enough, or at least not enough in the right areas.

IMPROVING LABOUR EFFICIENCY – LOOK AT THE USERS AND FOLLOW THE INFORMATION

Ever so slowly, investments aimed at improving efficiency are making their way into the health-care decision process. Workflow analysis, workplace architecture, product design and information technology play a considerable role toward improving efficiency in health-care, but not particularly a centerpiece of marketing. This is in part due to the result of the differences between those who purchase capital medical equipment,

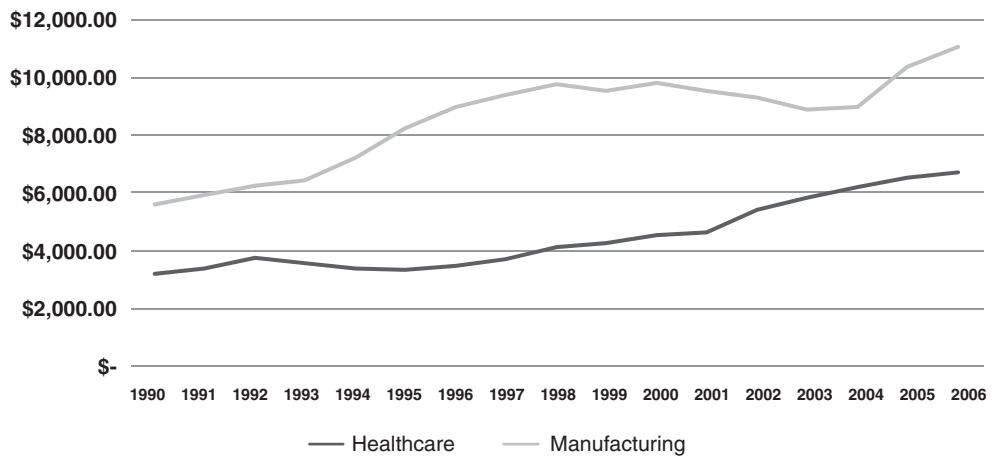

Figure 6: A comparison of health care and manufacturing capital investment per employee.
Source: United States Bureau of Labour Statistics National Historical Database [Online]. (2008), United States Department of Health and Human Services. (2006).

and those who actually use the products. High-ranking administrative decision makers who do not specifically use the products on a regular basis are influenced by a different set of marketing and purchasing motivators than are those who use the product as a routine aspect of their daily work. This distinction affects the kind of information provided to customers during the purchasing process, along with the marketing research done in support of the specific product.

For example, consider a hospital seeking to reduce LOS of its patients and that sees opportunity to encourage early patient activity in getting out of bed and walking. However, it is still important to keep a close eye on the patient's clinical condition. The facility seeks to purchase a new, mobile patient monitoring system for critical and ambulatory floors. Many makes and models are evaluated and a vendor selected. The objective is to have monitors that are as mobile as the patient needs to be so that they can be both active and well-monitored. But is mobility the only consideration?

After installation of the product, nurses on the evening and night shifts begin turning off the alarms because the monitors are not accurate and nearly all the alarms are false – adding more work to an otherwise busy job. Failing to understand the labour consequences of a product feature (monitoring reliability) has rendered the product ineffective for the very goal (reducing labour costs) for which it was purchased.

Health-care lives on information; nearly every imaginable clinical activity has at its root the need for information through its acquisition, interpretation and distribution. Information is so integral to the activities of providing efficient health-care that there are in effect no improvements in health-care without an understanding of information, how it is managed, distributed and used.

Information quality is defined by four critical conditions: it must be *accurate*, *relevant*, *timely* and *trustworthy*.[4] In the absence of these conditions, what one might naively call 'information' really is not because it is not genuinely actionable. Three out of four will not do, all four conditions must be satisfied. In the case of the example above, the alarms were not trustworthy and as a result did not provide what we would call information, but rather simple noise.

Unfortunately, too many products in the health-care space fail on one, if not more, of these attributes or conditions. For example, any patient monitoring technology whose data are accurate and relevant but not delivered to a health-care provider in a timely manner is not particularly helpful. If, in addition, that information is not trustworthy, it will at some time be ignored. Patients and caregivers can easily be lulled into a sense of security that is not legitimate or warranted. At a minimum, intense scrutiny of patient information and management technologies along these four criteria are necessary in order to provide any value toward improving outcomes while improving efficiency.

Health care has well-established internal hierarchies introducing biases that are often difficult to overcome. Physicians trump RNs but administrators can occasionally trump both, even when neither party to the decision has any unique knowledge or expertise. All too often the individuals making purchasing decisions are far separated from those who actually work with the technology. The position and title of an individual tells us little about their role in the purchase decision-making process.

Medical marketing and sales organizations then apply their own layer of biases and labels. Roles such as 'internal coaches' or 'gate keepers' help the seller navigate the institution and its politics. Then there is the customer, or 'champion' or 'opinion leader' who helps promote the product or service, and finally there is the perceived 'decision maker', whose approval is required for a purchase to occur. Often, these role labels apply to the process of selling but not to the process of buying.

To help improve the effectiveness of a purchasing decision, individuals need to self-organize based upon the roles they play in a specific purchasing event.

Figure 7: Self-sorting tool based on knowledge and personal impact.

These roles are different from their title, or perhaps clinical role, and are different than roles 'assigned' to them by the selling process.

Two variables are in play: how much they know or understand about the product or technology, and how much would they use that product or technology in their daily work. Figure 7 is a self-sorting tool by which one can help purchasers make certain that the right people participate and understand their role as relevant to any specific acquisition.

In Figure 7 people place themselves according to their product/technology knowledge (vertical axis) and how often they use it in the normal daily course of caring for patients (horizontal axis). Each graph becomes product/technology specific, in that one would place themselves differently when evaluating a Nuclear Medicine camera than where they might place themselves when evaluating bedside patient monitors.

It is best to start out with a plain piece of paper and have participants place themselves in the graph with their initials beside the dot as shown. In this example, we have a Purchasing Committee of four individuals looking to purchase bedside monitors for the ICU, each with an equal

voice in the decision, but as you will see, they are not equally affected by the decision results.

This committee involves Dave, a biomedical engineer, Brenda, the director of purchasing, Karen, the director of nursing and Susan, the director of the ICU, for whom the purchase is intended. Each member of the committee places themselves in this graph based upon the two variables. Dave ranks high in product knowledge but does not use it on a daily basis. Brenda has little knowledge about the technical aspects of the product and never uses it in her daily work. Karen understands the basics of the technology and is only involved when it fails to work properly and problems are brought to her desk as a result. Susan understands the technical aspects of the products and uses it daily in the management of her patients and those patients under her supervision.

In this next view of the same graph (Figure 8), we overlay roles that are a result of the committee members self-positioning. This view separates rank and functional role within the organization and replaces them with roles relevant to the task at hand, and alters our perspective on the importance of input from each team member.

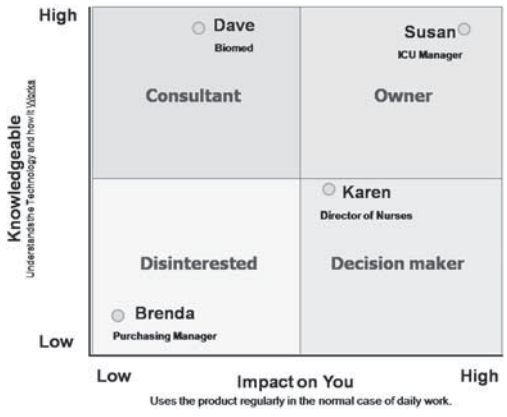

Figure 8: Roles are assigned as result of the members' self-positioning.

Karen might understand the technology and perhaps even be inconvenienced as staff members complain about its reliability, but she does not bear the full burden of the product if it is simply unreliable. That, unfortunately, falls upon Susan and the members of her team. Dave knows the technology and is called upon when it needs to be fixed, but in the end he too does not bear the full consequences. Brenda, in this example, is least burdened, and perhaps indifferent to the purchasing decision, other than to make certain that the transaction is properly accounted for and legally sound.

In this situation, Susan is the owner, in that she and her team are the bearers of the greater affect of the product and its ability to function properly. The challenge this example presents is that most people in Susan's position do not see themselves as the 'owner'. Often they are too busy actually doing the work, and may view themselves as 'too low on the food chain' to have a legitimate voice in the decision process.

When owners fail to assert their requirements, purchasing decisions many times default to the nominal price of the technology, often at the cost of success. The famous quality engineer, W. Edwards Deming wrote, 'The price tag is still easy to read, but an understanding of quality requires education'. The purchasing department must change its focus from the lowest initial cost of material purchased to lowest total cost and this includes the cost of labour. People in Brenda and Karen's position must depend and *insist* upon the owners to understand their preferences and assert their needs. Understanding positional or role biases and their influences on decision making help organizations focus on end-user performance requirements in technology decisions that directly affect labour efficiency. Failure to understand these roles results in poor decisions and wasted money.[5]

CONCLUSIONS

Biologic systems are complex, hence medicine and health-care is complex. Despite this, there is nothing so completely unique about providing health-care services that precludes it from taking advantage of efficiency enhancing technologies. The degree to which health-care service includes the performance of discrete repeatable tasks based upon various inputs of capital and labour, technologies; can and will be able to improve quality, repeatability and efficiency of those tasks and their clinical outcomes. In addition, there are no compelling reasons why capital investment in health care should not have a similar affect upon health-care labour efficient as it did upon labour efficiency in agriculture and manufacturing of the past century. The costs imposed by failing to enhance the efficiency of labour are, in the end, unavoidable. They are either concealed in the labour expense by requiring more labourers to sustain a specific level of services, or made more explicit through prudent, depreciable investments in technologies that work.

An opportunity exists in medical device marketing to look into the labour effect of devices as they are introduced, bringing attention to how devices influence labour efficiency in their use as well as their impact on clinical outcomes.

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