

# Capital Investment for Improving Labor Efficiency in Healthcare

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It is easy, perhaps bordering on a national pastime, to complain that healthcare costs in America are too high. Absent in such conversations are two questions: compared to what, and just how do we *know*?

Beginning with what we know, healthcare requires interaction with biologic systems, ergo it is complex and solutions will not be simple. The broader “swinging for the fences” approach such as national healthcare, offers plenty of room for opinion, but little room for rational hope. This paper focuses upon what are known to be tested and true: the role of capital investment in making labor more efficient, and a national industry desperately in need of efficiency. It is not exotic, nor is it complex - it’s simply about relatively small capital investments that enable healthcare facilities the ability to stop wasting the time of those trying to care for patients.

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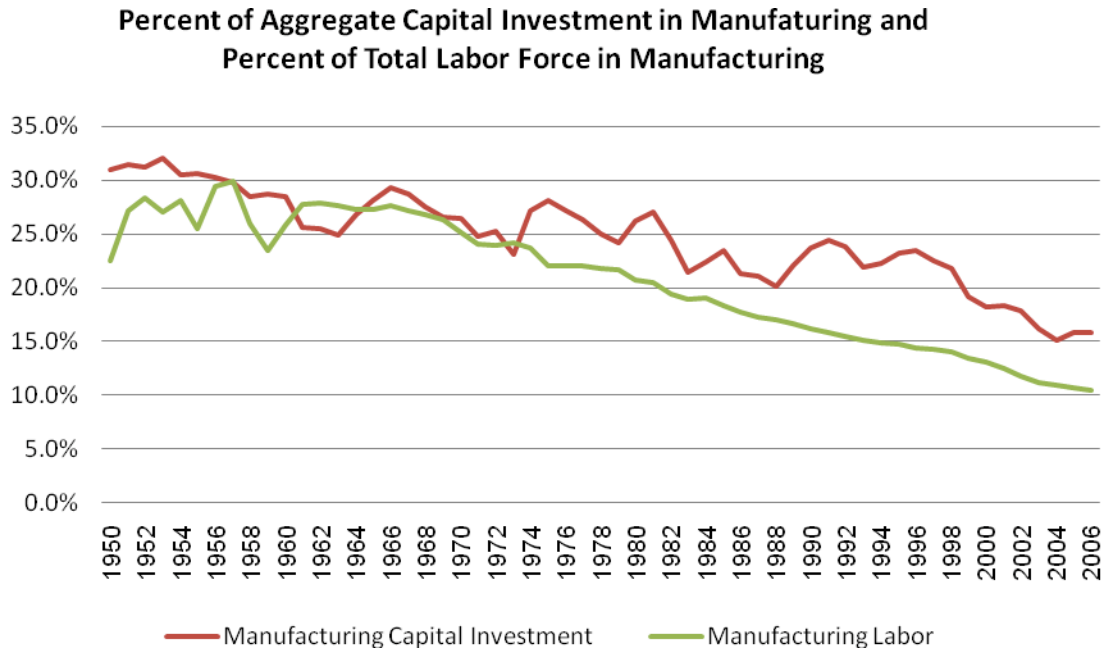
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**Introduction**

In 1900, roughly forty percent of all US workers were farmers. For the remaining part of the 20th century, that number would fall to where it stands today, at about two percent of the US labor force. US Agriculture has been astonishingly productive in meeting the needs of a growing country that is over twice what it was at the turn of the last century, while last year alone producing an 11 billion dollar agriculture trade surplus. If not for improvements in per worker productivity and investments in technology that made it possible we would not be the country we are today, and discussions regarding the price of healthcare would not even happen.

As productivity increased on the farm, farm laborers moved to cities and into manufacturing. At its peak in about 1957, general manufacturing accounted for nearly thirty percent of the total US labor force, and like farming before, has been on a steady decline throughout the remainder of the 20th century, finally edging below ten percent during the third and fourth quarters of 2007.

The following graph shows the percentage of labor attached to manufacturing from 1950 to 2006. The data shows a fairly steady amount of general manufacturing labor (green line) for nearly 20



years (1950 to 1970) followed by an equally steady decline in general manufacturing labor to where we are today. Enabling this declined in the percent of the national labor force involved in manufacturing was a consistently large investment in capital (red line). With very few exceptions, such as the recession of the early 60's and briefly again between 1972 and 1973, capital investment in manufacturing as a percent of total capital investment in the economy was higher than the percent of labor devoted to manufacturing.

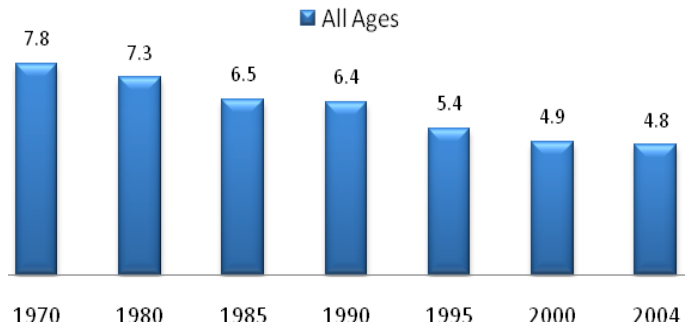
As in the labor movement away from farming before, capital investment in technologies make workers more efficient while improving per worker outputs resulting in fewer general manufacturing workers and eventually, a decline in capital expenditures as well.

### The Healthcare Equation

Providing healthcare services shares much in common with manufacturing, with similar dependence upon a ratio of labor and capital inputs to produce service outputs. One difference worth noting: that like other service-based industries there are no “inventories” of activities; healthcare services are produced and consumed at the same time, making counting and reporting very challenging, though not impossible.

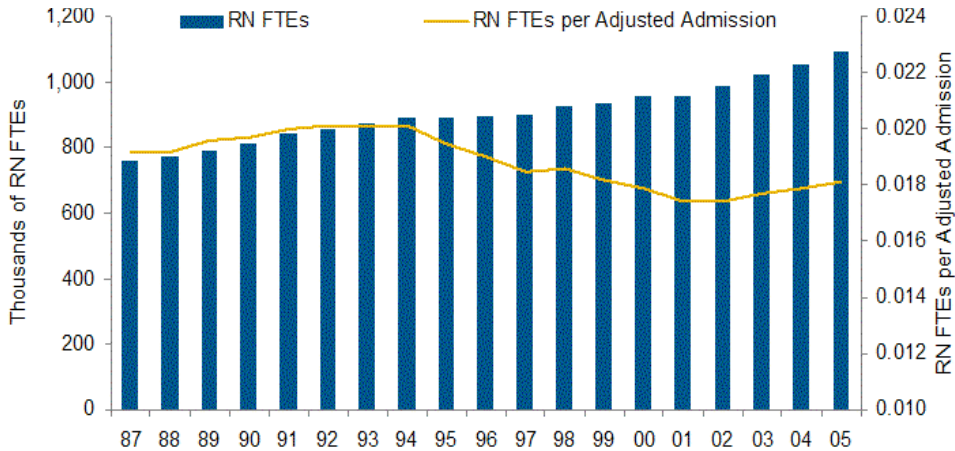
What can be counted, for example, is the number of days a patient stays in the hospital for a given procedure or diagnosis. Length of Stay (LOS) metrics are often used as a proxy measurement for efficiency, with the assumption that fewer days in the hospital reduce costs directly, and that reduced LOS are the result of (sufficient) knowledgeable and talented people knowing what to do and following through. The challenge remaining is that though the average LOS has declined, total healthcare costs have continued to rise.

Average Length of Stay in Days



The focus upon reducing average LOS will continue, yet the marginal financial effects are minimal. As the graph below from the American Hospital Association suggests, reductions in

Number of Nursing FTE's per adjusted admission



Source: Avalere Health analysis of American Hospital Association Annual Survey data, 2005, for community hospitals.

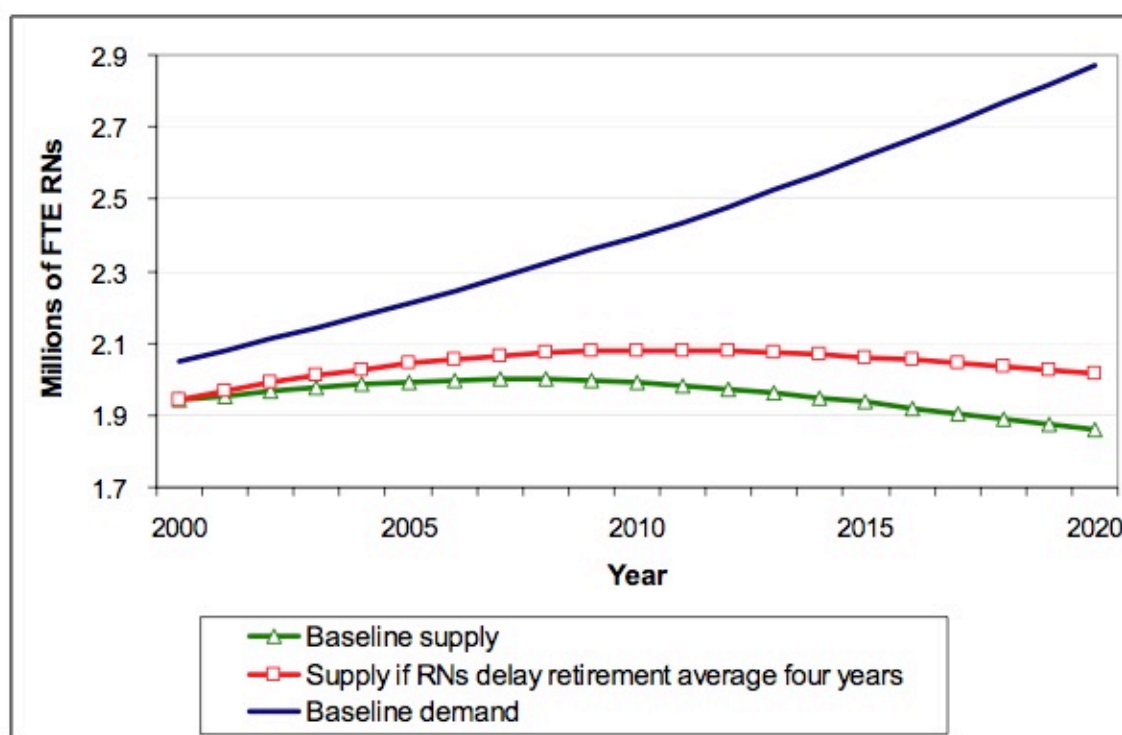
LOS are being offset by significant growth in admissions. Remarkable is the fall in RN full-time employees per adjusted admission. In effect, there is a dilution of skilled medical staff attending to a growing number of patients, or said another way - the beds aren't getting cold between

patients. As the velocity of patients increases, nurses and care givers are not exposed to patients long enough to appreciate subtle changes in clinical conditions, hence technological monitoring displaces personal observation.

The demand for skilled RN services is growing and the supply of those willing to participate in bedside nursing is not. The Bureau of Labor Statistics (BLS) estimates that with the median age of currently practicing RNs reaching 46 years in 2008, 50 percent of the healthcare 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 healthcare. Minimum training to become an RN is three years; clinical competency requires an additional two years.

### National Supply and Demand Projections for FTE Nurses through 2020



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Based upon known enrollment activity, our ability to address this increasing shortage through brute force of increasing the supply of labor is poor at best. With the median age of licensed RN's approaching 48 next year, simple math takes over and the gap continues to grow between the number of nurses available to work and the need for their services.

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

<sup>1</sup> "What's Behind the Nursing Shortage", <http://bhpr.hrsa.gov/healthworkforce/reports/behindrnprojections/2.htm>

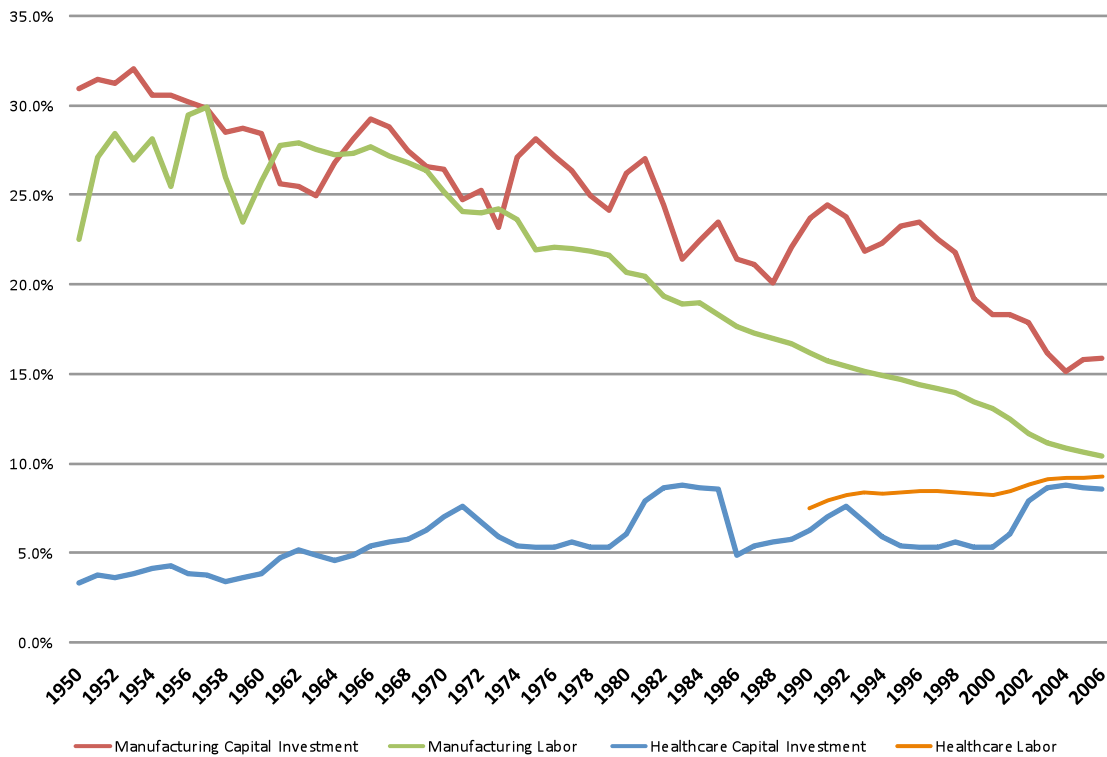
### Labor Efficiency in Healthcare

Though many have tried, assessing per worker efficiency in healthcare is difficult. Most such analyses have focused upon per worker *productivity* as is common in manufacturing, but that has proven unsatisfactory. The challenge with 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 healthcare should be hence this article focuses upon efficiency. In effect, can healthcare organizations help improve efficiency while wasting less time of healthcare providers in a manner that optimizes the patients' likelihood of improving? Are there a set of technologies that broadens healthcare workers ability to effectively care for more patients while reducing risks and improving outcomes? And if so, are healthcare organizations budgeting for, and researching those technologies as a means of addressing the growing shortage of nurses and other care providers?

The following graph compares the percent of US employees involved in general manufacturing against the percent engaged in healthcare. The last six years of this graph reveals a remarkable convergence. Manufacturing employment (green line) continued its decline while healthcare workers (orange line) experienced modest growth. For much of the past 50 years, healthcare capital investment (blue line) remained modest at about five percent of national capital investment. Since 1990 when the BLS began reporting on healthcare employment, the percent of national healthcare labor as a percent of the economy has been greater than the percent of healthcare capital investment.

**Capital Investment and Labor Manufacturing as a Percent of the Economy**

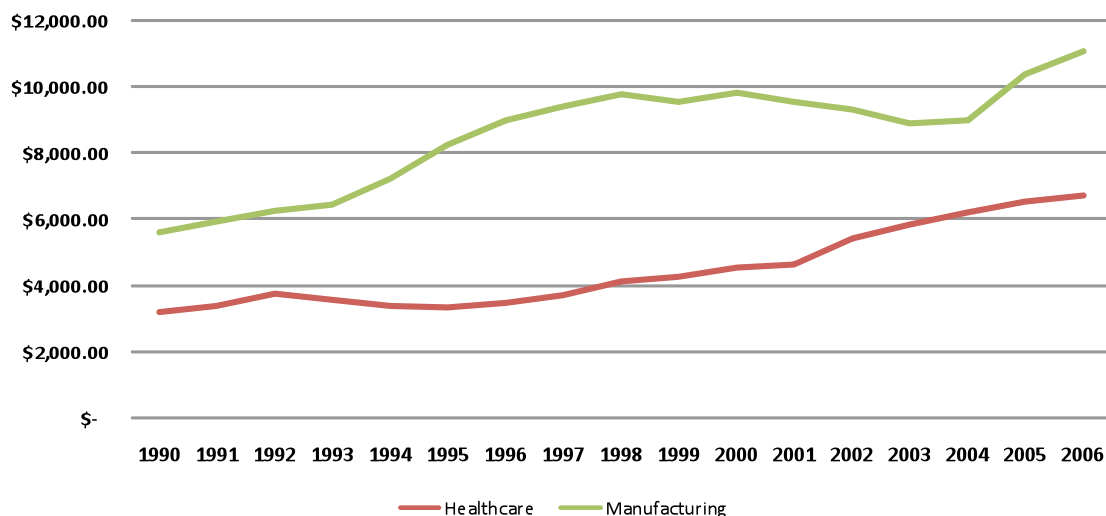


Only rarely did this happen in manufacturing. Since about 1973, the percent of national capital investment in manufacturing has been **higher** than the percent of national manufacturing employment.

This isn't an anomaly, but rather it tells a familiar story: capital investment improves outputs and reduces the need for some forms of labor. 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 healthcare services for the remainder of this century. Increased levels of capital expenditures in technologies, which enhance the efficiency of healthcare labor, will produce similar results. In the case of healthcare, however, efficiency enhancing capital investments are necessary to mitigate the effects of shortages in qualified health care workers.

The graph below shows per employee capital expenditures as compared between general manufacturing and healthcare, and demonstrates 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 \$11,000 of capital investment per employee, where in healthcare capital expenditures per employee ran about \$6,700 or about two thirds that of manufacturing. By this analysis, it is unclear that the US is spending too much in healthcare; it may likely be that we are not spending enough, or at least not enough in the right areas.

### A comparison of Healthcare and Manufacturing Capital Investment per Employee



### Information and the Purchasing Bias

Investments aimed at improving efficiency are making their way into the healthcare decision process. Workflow analysis, workplace architecture, product design and information technology play a considerable role. The challenge lies in looking closely into discrete activities that go into the care of patients, and understanding their intent and value with regard to improving outcomes. Some activities, such as taking patients to diagnostic procedures, often take exceptional effort and time. Diagnostic rooms that are too small or simply not designed in a way to provide for safe and effective movements of patients, imposes an ongoing time tax for years into the future. And then there is the issue involving the management of information.

Healthcare 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 healthcare that there is in effect no improvement in healthcare information centralization. Yet for all its importance, information still remains misunderstood. So what makes information, information?

Information, as it turns out, is defined by four critical conditions: it must be **accurate, relevant, timely** and **trustworthy**. Absent these conditions, what one might naively call “information” really is not because it is not actionable. Three out of four will not do, four conditions must be satisfied.

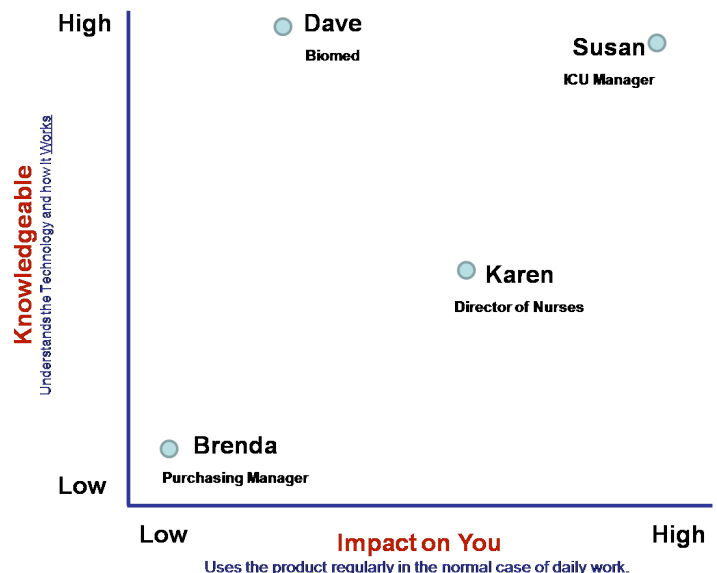
Unfortunately, too many products in the healthcare space fail on one, if not more, of these attributes. For example, any patient monitoring technology whose data is accurate and relevant but not delivered to a healthcare provider in a timely manner is not particularly helpful. If, in addition, that information 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.

Healthcare organizations struggle when making technology investments due to the hierarchy position individuals play in the purchasing process. Particularly in healthcare, well established internal hierarchies introduce selection biases that are often difficult to overcome. Physicians trump Registered Nurses 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. Purchasing roles are clearly different from position or title.

To avoid the consequences of positional biases, interested parties can self-organize, based upon two variables: how much they know or understand about the technology, and how much would they use that technology in their daily work. An objective in helping participants discover their role is to place themselves in the following graph according to their knowledge of the technology (vertical axis) and how often they use it in the normal daily course of caring for patients (horizontal axis). Each graph becomes technology specific, in that one would place themselves when evaluating a Nuclear Medicine camera different than where they might place themselves when evaluating bedside patient monitors.

It's 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 4 individuals looking to purchase bedside monitors for ICU, each with an equal voice in the decision, but as you will see, they are not equally affected by the decision outcome.

In this committee we have 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 doesn't 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 his 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, 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.

Karen might understand the technology and perhaps even be inconvenienced as staff members complain about its reliability, but he doesn't 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 fixed, but in the end he too doesn't 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 legally sound and is properly accounted.

In this situation, Susan is the owner, in that she and her team bear 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 don't see themselves as the "owner". Often they are too busy actually doing the work, and 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 often default to the nominal price of the technology, at the cost of success. As W. Edwards Deming said, "it doesn't take a college degree to read a price tag", hence people in Brenda and Karen's position must depend upon the owners to understand their preferences and assert their requirements. Understanding positional biases and their influences upon decision-making helps organizations focus upon performance requirements and outcomes in making technology decisions that affect the efficiency of labor. Failure to understand these roles results in poor decisions and wasted money.

## Conclusions

Biologic systems are complex, hence medicine and healthcare is complex, and still there is nothing so completely unique to providing healthcare services that would preclude it from taking advantage of efficiency enhancing technologies. The degree to which healthcare service includes the performance of discrete repeatable tasks, technology can and will improve quality and repeatability of those tasks, improve labor efficiency and clinical outcomes. Costs imposed by failing to enhance the efficiency of labor are, in the end, unavoidable. They are either burdened in the labor expense, or made more explicit through prudent, depreciable investment in technologies that work.

