

ADAPTABLE ENTERPRISE ARCHITECTURE AND LONG TERM VALUE ADDED PARTNERSHIPS IN HEALTHCARE

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Abstract

Healthcare expenditure has increasingly been growing as a percentage of the GDP of several developed nations and it is feared that it will soon become unbearable. Additionally hospitals are faced with an estimated nursing shortage and with an aging patient base that demands better quality at a lower cost. Furthermore, hospitals tie up a large percentage of their budgets in inventory and in the required labour to manage it. Moreover, future improvements will necessarily require a solution beyond statistically sound inventory policies and software packages. This paper adopts a holistic enterprise architecture approach encompassing technology, processes, strategy, and stakeholder values. The study included two hospitals leading the way in such architectures with a leading healthcare vendor in the USA market. The research methodology consisted of field observations, 47 interviews and data analysis of the visited hospitals. Research findings are presented and supported by graphical representations of soft data collected. Finally conclusions are provided and also include lessons learned on how to adapt enterprise architectures and align stakeholder incentives.

Keywords: Adaptable Enterprise Architectures, Healthcare, Value Added Partnerships

1 INTRODUCTION

The healthcare industry is one which has undergone significant pressure to become competitive and think innovatively. Healthcare expenditure has increasingly been growing as a percentage of the GDP of several developed nations and it is feared that it will soon become unbearable. A cost analysis of the healthcare industry indicated that the highest source of expenditure exists in hospital care (Pfrang, 2003). Hospitals, regardless of their ownership or management structures (e.g. public, private or both), tie up as much as 35% of their budgets in inventory and in the required labour to manage it (Nathan and Trinkaus, 2002). As such it makes sense to improve competitiveness for hospitals through improvements made to their inventory management practices that ultimately enable increased quality of care while using the same amount of resources. However, among other factors, hospitals are increasingly faced with the threat of nurse shortages and also a patient base that demands better quality at a lower cost, and therefore improvements will necessarily require a solution beyond statistically sound inventory policies and software packages.

2 LITERATURE REVIEW

2.1 Nursing Shortage and Patient Care

In 2001, healthcare costs in the US accounted for 14.1% of the GDP (Levit et al, 2003). In 2002, an article in the Wall Street Journal read “Serious Health Risks Posed by Lack of Nurses” (Johannes, 2002) as it described the findings of a study published in the New England Journal of Medicine which determined that a positive impact is given by nurses on hospitalized patients. A study reported in the Journal of the American Medical Association has projected that a nursing shortage greater than 600,000 will take place by the year 2020. Similarly, a publication from the US Department of Labour indicated that registered nurses were the third most demanded category of professionals by 2010. However, the National Council of State Boards of Nursing reported that between 1995 and 2001 there was a 29% decline in the number of graduates taking their national license exam.

The impact of a nursing shortage can understandably be difficult to measure however there have been studies that indicate how a nurse’s role is related to a patient’s safety and ultimate health. One such study determined that a nurse who takes care of 7 patients instead of 4 may contribute to a higher risk of 21% on patient death after surgical procedures (Aiken et al, 2002). The higher risk identified may be related to the errors that revolve around the administration of medication which is a function largely undertaken by nurses. In fact according to a report in 1999 published by the Institute of Medicine in the US preventable medical errors are responsible for more deaths per year than auto accidents.

2.2 Stockless Programs in Healthcare Industries

Recognizing the burden of inventories in hospital operations, both vendors and hospital administration boards have looked to reduce the cost of inventory. Several inventory management methodologies already existed in other industries however for healthcare one needed to factor the loss of life resulting from an inventory shortage, therefore making the problem more complex.

The 1980’s witnessed what has been referred to as the “stockless craze” (Marino, 1998) which aimed at reducing the inventory held at hospitals and giving vendors complete responsibility in monitoring and managing inventory levels and flow beyond hospital stockrooms and into points of use. Initially there were visible positive results from such initiatives, including for instance the significant reduction of materials management employees (Wilson, 1992) and also the reduction of inventory itself by as much as 80% in a 427 bed facility (Kerr, 1991).

However, by the early 1990's interest in stockless agreements between hospitals and vendors had begun to fade (Marino, 1998). Some argued that vendors leveraged their position by raising the prices of their products by as much as 15% therefore increasing once again inventory related activities at hospitals. Raising prices increased inventory related activities because stockless programs were defined as service fee percentage related to the price of each individual product. Others identified that stockless arrangements were not suitable for everyone due to geographic dispersion (Marino, 1998).

2.3 Vendor Managed Inventory

Vendor Managed Inventory (VMI) which is also known as continuous replenishment or supplier managed inventory became popular in the late 80s by Wal-Mart and Procter & Gamble (P&G) (Waller et al, 1999). VMI became one of the key programs in the grocery industry's pursuit of "efficient consumer response" and the garment industry's "quick response". It is said that retailers have been the main drivers for VMI given their constant pressure on vendors to provide more variety, lower prices, improved quality, and increased customer service (Wexler, 2000). However, unless a manufacturer is able to perform reliably and according to demand it will need to build up its safety inventories in order to accommodate requirements of its customers (Robinson, 1999). P&G saw VMI as a way to extend its visibility and control of the supply chain and bring market information back into its planning and manufacturing processes (Cooke, 1998). In the healthcare industry specifically, vendors estimated that for every dollar hospitals spent on supplies, they spent an additional 40 cents on supply chain logistics (Kontzer, 2003) while ordering, tracking, using and discarding products. As such VMI was additionally regarded as a vehicle to lower the customer's costs of handling and managing their inventory (Taylor, 1998) and as a potential new business opportunity.

With VMI a vendor manages inventories at a retailer's location or distribution centres. Typically in a VMI environment a manufacturer is responsible for maintaining a certain level of inventory and service level for its customers (Wexler, 2000). This means the vendor monitors the customer's inventory levels (physically or via electronic messaging) and makes periodic resupply decisions regarding order quantities, shipping and timing (Waller et al, 1999), usually based on receipt of retail point of sale and inventory data. In addition the vendor delivers material, handles the receiving function, counts and puts away material, and performs any necessary on site counts such as cycle counting or "wall to wall" counts (Geetinger, 2001).

The operational benefits of VMI are very attractive (Waller et al, 1999) when considering the initial investment required in technology and change processes which have become dramatically less expensive than in the day and age of EDI (Ubois, 1997). However it is important to note that vendors often work with organizations that have poor or non existent monitoring systems in place. Without any historic data to begin with vendors will find themselves "juggling to prevent stock out" (Geetinger, 2001). As a result, vendors find themselves making more frequent shipments to maintain the agreed upon inventory levels at the customer's distribution centre or store (Cooke, 1998). Therefore when considering VMI one should regard the perspective of both the vendor and customer to better understand the alignment of each group's perceived benefits and risks.

Investments of a large scale are prone to failure not only because of the risks involved but also because of the methodologies applied while rolling out those investments. One of the reasons often quoted for the failure of generalized application of VMI across vendors in different industries is the incremental nature of the changes introduced which avoid making overall changes to the incumbent supply chains (Robinson, 1999). To that effect, trust between the partners is critical from the outset, and that trust should grow as the partnership develops (Geetinger, 2001), promoting the practice of sharing data (Ericksen, 1997), and of establishing common goals and measures (Surden, 2000). Ultimately VMI is a mechanism to gain a competitive advantage and differentiate an otherwise commodity product (Taylor, 1998) while ensuring a long term relationship with their customers (Geetinger, 2001).

3 PROBLEM STATEMENT

When studying ways to address the ever increasing healthcare expenditure and demand for better patient care and safety, it is important to adopt an enterprise view of the industry itself (see Figure 1) so as to begin understanding why system level change within and across complex healthcare organizations has proved to be so difficult and challenging.

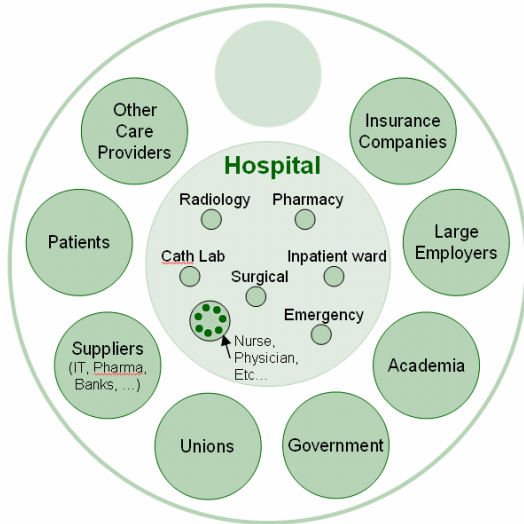


Figure 1: Healthcare Enterprise

The healthcare industry has an inherently complex architecture fuelled by the multiple stakeholders (i.e. hospitals, patients, vendors, government, etc) which abide by individual needs and objectives that are not necessarily aligned with those of other stakeholders. It beckons the question of how is one to eliminate enterprise waste with the goal of creating value? (Murman et al, 2002).

Acknowledging the industry's focus on inventory related practices, and the success of VMI in other industries, the author's set out to explore how enterprise architecture, including and beyond VMI, can begin to deliver the much needed results for healthcare.

This research greatly benefited from the involvement of JAFKO Enterprises (disguised name of a major vendor in the USA healthcare industry) which provided the means and access to two of its existing client hospitals

that have been implementing JAFKO Enterprises' future generation inventory management program. The One4all program relies on the transparency and reliability of information capture at the hospital so as to better align the vendor's supply chain. To do so, automated point of use systems are used and placed in the various wards throughout the hospital, allowing only authorized personnel to pull inventory. These systems keep perpetual inventory records and automatically place orders based on the established reorder and order-up-to points. Furthermore, JAFKO offers to handle the replenishment of these systems therefore going beyond the hospital dock and delivering to the "point of care". The cost of the One4all program is considerable therefore requiring from the onset a closer collaboration between hospital and vendor, with the ultimate potential of encompassing a holistic view of the enterprise (Nightingale and Rhodes, 2007).

4 RESEARCH METHODOLOGY

The rationale behind establishing close partnerships between vendors and hospitals in the healthcare industry necessarily entails quantitative and qualitative factors, therefore dictating the nature of the research methodology. Case studies are a particularly useful strategy when the phenomena of interest cannot be clearly separated from the social, technological and organizational environment in which they occur (Yin, 1989). With the intent of understanding the decision process and relationship evolution between stakeholders, a case study was conducted on two individual hospitals that are currently leading the way in next generation enterprise architectures. A cornerstone of the case study research method is the use of multiple data sources (Yin, 1989) which allow the phenomenon of interest to be examined thoroughly and reduce the limitations of any single data source. With the support of JAFKO two of its client hospitals were identified according to the following criteria:

- Hospitals would provide access to both CEO and lower operational levels
- The hospitals would be at different stages of the implementation of JAFKO Enterprises' One4all program allowing for an assessment of change management processes in place

- Hospitals would release relevant financial records
- The contractual agreements established between them and JAFKO Enterprises would reflect fundamentally different characteristics with regards to consignment, inventory buy out, risk sharing clauses and other factors
- The hospital functions (e.g. Cath lab, nursing floors, pharmacy, etc) addressed by the One4all program would follow different plans from each other with regards to their respective implementation schedule

Consequently California Hospital and Omaha Hospital (disguised names) were the selected hospitals for the purpose of this research. Each of the onsite visits lasted two days and was separated by a month. Subsequent to each visit, extensive follow up calls and emails took place therefore enabling the compilation and verification of the collected data before engaging the subsequent research entity. The data collection strategy was to interview individuals at all levels of the hospital organization that were part of or impacted by the decision of implementing One4all. Additionally, field observations were carried out as well as gathering of data (e.g. project proposals, annual reports, internal assessments, deliverables, point of sale data). Semi structured interviews were preliminarily conducted at an individual level, followed by focus group discussions that encompassed up to 8 people at a time. The interview sets included 26 people from the hospital organizations as well as 14 people from JAFKO Enterprises which had been involved with the hospital organizations in the negotiation or/and implementation of One4all. Furthermore interviews were conducted with experts from various perspectives, including the Director of the Supply Chain 2020 Project at The Massachusetts Institute of Technology, a Vice President of Information Systems at one of the two main competitors of JAFKO Enterprises, a Vice President of Healthcare at JP Morgan, and executive officers from 4 hospitals other than the ones provided by JAFKO Enterprises.

5 ANALYSIS

5.1 Healthcare Industry Characterization

The Healthcare industry was characterized as a cottage industry by one of the interviewed CEO's as he described the free standing and independent nature of hospitals. Historically hospitals have been unable to set "best practices" as has been the case of other industries such as the automotive which has led the way with lean manufacturing and six sigma initiatives. The lack of a best practice mindset in healthcare is particularly evident in the way it has disregarded the materials management function which after all drives as much as 30% of the costs of a hospital. Additionally, the career path of those individuals responsible for such function normally entails a lengthy progression with various roles that range from house keeping, to a supply tech position, onwards to purchasing, etc. The opportunity of operating inventory supply chains in an efficient manner can signify a reduction of 2% to 3% from the annual \$80 to \$90 million dollars spent in pharmacy and medical surgical supplies, as mentioned by the researched hospital institutions. Notably however several obstacles exist in the path of reaching such potential savings. Specifically, when hospitals face financial challenges they do not tend to focus on the enterprise overall but rather only on some parts of it. Instead of measuring benefits resulting from supply chain level changes, hospitals focus on aspects that are easier to act upon, thereby changing product lines, cutting labour, cutting services, without care of the intricate long term effects of such changes. Additionally, hospital departments are known to be very protective and particularly so around inefficient niches that were created internally. One such niche is the use of "secret inventory stashes" by nurses that may have in the past been verbally reprimanded by a physician because of stocking out on a particular item, therefore holding secretly in some closet as much as 2.5 years of supply. Finally, hospital senior management can meet considerable internal resistance to change and all too often the path of least resistance is the one chosen. Such was the case accounted for at the researched hospitals where the product portfolio included as many as 80,000 different items at one point in the past so as to accommodate the individual needs of everyone.

5.2 Stockless Inventory Management at Researched Hospitals

In the literature, stockless systems were said to be an attempt to blend the common external supply chain with the hospital's internal logistic network. Materials management directors at the researched hospitals however, found that stockless failed to materialize its promises precisely because it stopped at the hospital dock and did not go beyond it. Supply techs would go up daily at 8 AM to the nursing units to try to determine what the nursing staff of each unit had used the previous day. Theoretically these counts would be made by comparing hand written records that indicated what was meant to be at a nursing unit with what was indeed there, and the difference would be the order amount. After performing the counts supply techs would return downstairs to the general store room and key punch their orders, a task that would extend throughout the day, as they were not sophisticated computer users and also were prone to data inputting errors. The order was then sent at 8PM by EDI to the vendor, who would then pick it, put it in plastic tote bins, load a trailer, and drop them on the dock. Therefore the same supply techs which handled the counting and ordering, also had to be available to collect the bulk shipments received at the dock, take them to the storage room, break them, replenish the nursing units, and finally be on call in case a stockout took place and a nurse needed for an item to be sent from the general storage room to the nursing floor, a walk which could take as long as 15 minutes if it was at the far end of the hospital. Stockouts were said to be the result on several occasions of non organized inventory layout and also of private stashes kept by nurses that would further distort the inventory counts or provoke items expiring.

In stockless, supply techs were meant to count everything everyday however the interviewed materials managers contested that such was an impossible task to do by hand. Understandably there was no visibility on whether an item was low in inventory or not, and worse yet item PAR levels were being set without the aid of mathematical formulas as there was no ready available and accurate data to drive them. As a result, there was either product in abundance or product requiring continuous crisis management, which invalidated the stockless inventory management methodology as it still required a local general store room to serve as a buffer. Furthermore, vendors would use a "fill & kill" policy at their DCs which potentially meant that several of the items ordered would not reach the dock and a hospital could go days without a critical item.

For instance, Radiology would have an item charge master comprised of 14 thousand billable items with unique charge codes which due to data redundancy led to significant losses. Specifically, Radiology would only update its item charge master upon receiving instructions to do so by the financial department. Meanwhile, a change to a product's price could go unnoticed for as long as 2 years and during that period Radiology would be undercharging patients. Another example was that of the Cath Lab on one of the hospitals where highly trained staff clinicians would spend as much as 4 hours a week in an asynchronous format handling inventory related tasks. Purchase orders would be written down by hand for each separate lab and each separate vendor. Clinical staff would then have a handheld voice recorder in order to keep track of the required orders and at the end of the week would place the order by faxing it to the purchase department who would then in turn process the orders. Original purchase orders were kept in order to check against what was received and also to maintain a hand written backlog. As a result the Cath Lab which has inventory items as expensive as \$24,000 was said to be overstocked most of the time in order to avoid stockouts. At an extreme, clinical procedures were being cancelled even when patients were already on the table due to the required tools not being available.

Understandably the financial controller of one hospital reported that its Cardiac Cath Lab did not manage perpetual inventory and as a result incurred large expenses due to the expiry of products which would cost on average \$.5 million annually. Finally, on the financial aspect of stockless' agreements it was said that vendors could charge as much as 9.25% markup service fee on top of the price charged per item which gave the vendor a strong incentive to drive up the individual cost of non contracted items. Moreover, hospital financial controllers felt that their stockless agreement lacked an alignment of their interests and incentives with those sought by the vendor.

5.3 Beyond Stockless and onto One4All

The CFO of one hospital reflected that the primary driver for change was the need to figure out ways to drive down cost and become more flexible to perform capital investments. Even though an appropriate inventory monitoring system was not in place he said that visibly “a lot of waste was lying around”. Furthermore, there was the added pressure of addressing the issue of patient safety which for one of the hospitals was costing as much as \$9,000 on average to accommodate the adverse effects caused in patients. Worth noting is that the calculated cost did not include any losses of potential lawsuits, but rather the required extra patient days, extra drugs, extra tests and extra labour to rectify a mistake. Such was not acceptable at either one of the researched hospitals as both were found to be in financial distress and at a time which coincided with the decision made to engage JAFKO Enterprises in its One4all proposition.

On one case the hospital’s senior management approached its main vendor at the time and bluntly requested for it to consider “applying a supply chain model similar to that of Wal-Mart”. During the subsequent 18 months the vendor struggled hard to come up with a model, but ultimately it was unable to meet the hospital’s expectations with regards to risk sharing and established performance measures. When setting out to find a new vendor the hospital made the decision that it would not want to maintain contracts with as many as five different vendor companies. JAFKO Enterprises at first was not very receptive of this requirement as it was not its customary business practice; however with the proper involvement of senior level management from both institutions a decision was made where JAFKO Enterprises agreed to change its practices accordingly. Contractual negotiations lasted a lengthy 18 months yet they were said to be filled with plenty of opportunity to set the foundation for the parties’ trust based relationship. After all the hospital was taking a leap of faith by ceasing the relationship it had with an organization for the previous 20 years, and was willing to “turn over the keys” to a different organization with which it had had no previous dealings with.

On the other case it was more of a matter of the hospital being given notice that its vendor was going to markup its cost structures a full 5% without adding any services. Essentially the hospital did not have sufficient volume in order for the vendor to consider it a profitable account. The CIO of the hospital felt that there wasn’t any room for negotiation with the vendor and therefore decided to look elsewhere.

5.4 Selecting JAFKO Enterprises

The thought of establishing the next generation supply chains by themselves was only briefly considered by the studied hospitals as they both considered it financially prohibitive and even under normal circumstances they would be unable to accommodate the required set up costs both in terms of hardware and software, as well people expertise. Specialized functions like the Operating Room initially engaged themselves in product standardization initiatives of their own, however they were short lived for even though they yielded positive results, they were far too labour consuming or unattainable due to a lack of bargaining power with separate vendors. Therefore, upon selecting a new vendor both hospitals were looking for market intelligence and clinical expertise that would help them reduce supply expenses and improve patient care safety. Hospitals no longer wanted to have a distributor relationship with their vendors but rather a “enterprise partnership”. Even though several of the vendors enquired were strongly interested to serve the studied hospitals none of them, other than JAFKO Enterprises, was willing to accept the risk sharing considered fundamental for the contractual agreements to be struck. However most vendors would understandably refuse such a setting for they did not hold internally the necessary relationships to address in a cost effective and integral manner the supply chain goals set by hospital senior management and would therefore have to build from scratch new external relationships. As such, in both cases JAFKO Enterprises was the selected vendor mostly due to its wide range of services enabled by what was considered a sufficiently vertically integrated organization given its availability of a corporate technology company, a distribution company and also

a consulting company. Ultimately, JAFKO had to become proficient in nurturing trust based relationships where a hospital's initially perceived loss of control eventually evolved to a notion of "gain in control which was previously unattainable".

6 RESULTS

Figure 2, allows for a visualization of the correlation between perceived benefits and issues across the multiple functions present within hospitals. A direct correlation was found between the benefits and issues across the common functions of the studied hospitals. As such, the results visualization aggregates common functions and augments independent functions, as was the case of pharmacy and the cardiac cath lab which were not engaged in One4all simultaneously in either of the studied hospitals. A cell left blank indicates that the function representatives ultimately did not find that there was a significant correlation between either benefit or issue and their specific function.

	CEO, CFO, CIO	Financial Controller	IT Director	Support Systems Director	Materials Management Director	Radiology Lead Technologist	Resource Control Director	Surgery and Emergency Services Director	Nursing Resources Director	Medical and Surgical Director	Cardiac Cath Lab Manager	General Stores Supervisor	Nursing Floor Manager	Pharmaceutical and Clinical Director
Benefit														
Improved patient safety														
Supply chain cost reduction														
Product availability														
Accounts payable reduced processing														
FTE reduction														
Space reduction														
Standardization														
Data visibility														
Trend analysis														
Tracking product expire dates														
Audit Tools														
Substitute product identification														
Inventory security														
Inventory reduction														
Decreased private inventory stashes														
Charge capture														
Value Model														
Business process re alignment														
Vendor expertise														
Negotiating with 3rd party vendors														
Cut operational costs														
Vendor prompt response														
Vendor leadership involvement														
Issues														
Vendor underestimated implementation effort														
In house learning curve														
Training provided by JAFKO														
Vendor Divisional Fragmentation														
Product price fluctuations														
Data report templates														
Substitute product pricing														
Available unit of measure														
Vendor knowledge of functional areas														
Changing product locations in cabinets														
Communication with Distribution Center														

Figure 2: Benefits and Issues perceived by hospitals in relation to One4All

The following is an unordered listing of benefits mentioned that were supported by examples with strong evidence of interviewee personal experience and also by collected data (i.e. financial scorecards and point of sales information) when appropriate:

- Product availability above 98% according to hospital scorecard. In both hospitals product availability was not measured in the past however there is shared consensus that product availability has increased significantly
- Product standardization has allowed for one hospital to reduce its 80,000 individual item portfolio to 23,000 items. Additionally standardization was said to be largely accountable for the verified \$1.3 million reduction mentioned after the first year of operation
- Data visibility allows for:
 - Trend analysis to be carried out on consumption behaviour by individual departments and physicians
 - Non moving items to be identified therefore enabling a better management of products that are nearing their expiry dates
 - Business process realignment to ensure that supply technicians perform replenishment duties before the peak period of 8AM on nursing floors
 - Inventory security as was the case of AAA batteries increasing fivefold in demand by Xmas
 - Audit tools (see charge capture below)
- Charge capture improved significantly allowing for both hospitals to have a more accurate understanding key performance measures in the management of hospital performance. At one of the hospitals the following was noted after a period of 5 months:
 - A monthly average of 16,300 patient days and 2,800 patient discharges
 - The total supply expense per patient day decreased by 8.8%; per patient discharge decreased by 8.9%; as a % of net patient revenue decreased by 2.06%
 - The medical / surgical / lab inventory expenses per patient day decreased by 10.4%; per patient discharge decreased by 10.5%; as a % of net patient revenue decreased by 1.4%
- Inventory management is no longer a labor intensive task. Ability for clinical staff to focus their attention on the tasks they were trained for and avoid losing time with inventory related tasks which used to be frustrating and time consuming (i.e. as much as 4% in the Cardiac Cath Lab). Additionally, clinicians felt an increased job satisfaction, and their respective managers thought that they were better able to provide patient care.
- Systems integration spanning across multiple departments allows for prices on item masters used by individual departments to be automatically updated therefore avoiding the charging of incorrect item prices to patients
- Private inventory stashes were said to have been reduced significantly if not completely eliminated on nursing floors
- Availability of vendor expertise to successfully handle negotiations with specialty vendors, as was the case with orthopedic procedures which resulted in annual savings of \$1 million in total. The Cardiac Cath Lab was also noted commending the vendor expertise in its ability to provide detailed cost benefit analysis supported by an intricate knowledge of the industry
- Substitute product verification is triggered whenever placing an order, signaling if similar products close to their expiry date are in stock
- Purchasing department admitted to having more time to verify contractual prices established with 3rd party vendors given that their purchasing function had been significantly simplified
- Physician – nurse relationships were said to have improved as a result of product availability reducing events where a physician would express his impatience to a nurse due to a stockout
- Capital equipment investments made possible by operational cost reductions allow for physicians to consider hospital as a valued provider and therefore collaborate to bring down expenses
- The ability to maintain the number of Full Time Equivalents (FTEs) at one particular hospital was found to be a benefit of reduced supply chain related costs.
- The vendor accountability for supply chain related tasks provides “piece of mind” to financial controllers concerned with Sarbanes Oxley

There were other benefits noted however these were found to be specific to the contract arrangement established on an individual basis with each hospital, and not necessarily the result of changing supply chain practices:

- Inventory buy back allowed for one of the hospitals to virtually increase their cash reserves by \$4.8 million. The buy back would be processed by not charging new inventory replenishments made to the hospital dock
- Consignment was considered a step beyond the benefit entailed by the “value model” as it allowed hospital management not to concern itself with higher PAR values set in the process of hedging against stockouts. It is important to note however that some departments are space constrained and therefore would not simply stockpile on a particular item. Additionally the nature of the product (e.g. shelf life) would also constraint the stock amount to be held
- Unlike the stockless fee structure which marked up as much as 9.25% on each individual item price, the contract agreement set in place by the vendor charges a flat annual service fee for the following 5 years. Given that the service fee is not based on the individual item, the vendor does not have an incentive to drive up the item prices

The 26 interviews conducted at the two studied hospitals demonstrated that the perception of One4All’s benefits and issues varied considerably across the different hospital functions. Indeed it is understood that some benefits only concern specific functions and therefore rightly so are not shown across the remaining functions. Also, there is a clear buy-in from the senior management of the studied hospitals as they acknowledge over 90% of the total benefits made available. However, some benefits which the vendor traditionally thought were regarded as selling points were not at all perceived as such by the relevant functions within the hospitals. Similarly, there were several issues identified, some of which commonly acknowledged across all functions and hospitals, which were unknown to the vendor’s senior management.

7 LESSONS LEARNED

In light of the uncovered benefit and issue perceptions the following main recommendations are made:

- Assessing hospital preexisting infrastructure: Bringing a hospital up to speed through the required “paradigmatic change” can be a very costly process. The unknown status of a preexisting infrastructure at the time of signing a contract can give ample room for later mismanaged expectations. It is recommended that the vendor’s account selection processes include the status of a hospital’s preexisting infrastructure. An initial field work should be done prior to negotiations taking place so as to assess the level of effort required to bring people, process and technology together at the hospital. The result of this field work will allow the vendor to better negotiate the contract (if at all), to schedule more accurately the implementation plans, to better manage client expectations, and also to establish initial contacts vital for subsequent buy-in from key individuals at different functions within the client.
- Coaching hospital senior leadership: Firstly, the level of involvement from senior leadership varied at the two visited hospitals, and notably the hospital which had visible presence from both CEO and CFO was relishing stronger buy-in across the hospital. Secondly, once a hospital’s senior leadership is indeed onboard, it is recommended that the vendor equip them with the necessary knowledge on how to adapt the value proposition to each of the internal functions, therefore allowing them to become effective and successful project champions themselves.
- Placing an effective change manager onsite: The level of buy-in of the required changes can also be correlated to the quality of the vendor’s onsite manager. Given the different results captured and the different skill sets demonstrated by onsite vendor managers, it is recommended that the vendor only make available on site managers who are knowledgeable of the solutions in place and who also have significant business and people skills to address appropriately the needs at both senior and operational levels within hospitals. In essence, the appropriate manager onsite will be

the first link available for the vendor to troubleshoot and/or realign a particular benefit offering within a specific hospital function.

- Aligning inter divisional incentives: The non seamless service offering made by the vendor's different divisions was found to be mostly due to conflicting key performance indicators in place. It is therefore recommended that the vendor react accordingly and implement mechanisms such as transfer pricing and profit and loss visibility so as to strengthen its seamless and diverse offer. For instance, the incentive structure of the sales force should be tied to each account's operational results, which are after all accounted for in the "value model", therefore prompting them to draft better contracts and nurture the relationship still long after the contractual ink has dried.
- Establishing template and sharing intra regional learning: From inspection the vendor did not have in place a template on how to implement the One4All program and was therefore generally perceived as unaware of the full scale implementation resources required. Such is understandable given that the studied hospitals were early adopters of the program and the vendor was undergoing a learning curve of its own. However, for subsequent implementations it is not sufficient to claim that each implementation is unique. A template should be devised including previously implemented One4All best practices which will be useful for training, guiding onsite vendor managers as well as enabling them with a "proof by example" toolset for triggering change, and ultimately establishing a more accurate and appropriate project timeline.
- Implementing targeted training sessions: Any training should not be provided solely upon initialization of a given process. Information is available pertaining to the compliancy rate of individual departments, and it should be used to signal specific departments and/or individuals that require further training sessions on how to use the secured inventory cabinets in place.

8 CONCLUSIONS

Paradoxically a knowledge intensive industry such as healthcare is traditionally accompanied by poor information management practices where handwritten notes, prescriptions and orders are still the norm in place at hospitals. Understandably mere "tune ups" are inadequate to address the needs of closer informational and human relationships between hospital and vendor, therefore requiring hospital leadership to embrace "Paradigmatic Change" amid their existing financially strained context. However, deciding to undergo significant change is but the first phase of a long and intricate process during which many leaders are tempted to return to the path of least resistance upon clashing with rooted cultures that favour task over process. Nonetheless, "Paradigmatic Change" has not been more widespread solely because of hospitals but also because of the vendors themselves who are not ready to provide the necessary commitment to partnerships. The commitment from vendors entails a breadth of integrated services which is not commonly found in the industry. Indeed there are those who establish external partnerships to attempt to provide a single offering to hospitals however those vendors were described as unable to deliver reliably true value and ultimately unsuccessful.

Unlike previous supply chain management practices (i.e. stockless) within the healthcare industry, the One4All initiative was found to be an enabler of long term value added partnerships between hospital and vendor. However, the main conclusion of this research is that the potential delivered derives not only from the physical and informational supply chain platform, but also and perhaps more importantly, from the enterprise architecture intangible relationships and incentive alignment developed before, during and after signing a contract.

Ultimately, the One4All picked up the "missing link" attributed to the general failure of stockless in the healthcare industry. Through the implementation of Vendor Managed Inventory the studied vendor was able to meet expectations of its client hospital. The vendor was willing to change its own organizational culture which was initially found unsuitable to address seamlessly the needs of the client hospital. Additionally the vendor had a prompt response to whenever a complication arose and allowed for issues to be escalated to vendor senior management if need be, therefore demonstrating full commitment in its partnerships. Also, the vendor set in place revealing mechanisms which allowed

for client hospitals to gain trust in the system and progressively shift from a traditional transactional mindset towards strategic value added horizons. Lastly, the vendor set in place a “value model” which allows vendor and hospital to share the results, good or bad, of the supply chain platform therefore ironing out previously existing misaligned incentives inherently present in stockless arrangements that were prone to generating opportunistic behaviour.

All in all, a significant opportunity was identified for vendors to differentiate themselves not only in terms of their product and supply chain offerings, but also in terms of a newfound change management capability that would enable hospitals to reap exponential partnership benefits within shorter timeframes and at a lesser cost.

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