**A Core Competency Model for**
**Aligning Information Technology with Business Objectives**

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Submitted to the Sloan School of Management and the Engineering Systems Division in partial fulfillment of the requirements for the degrees of

**Master of Business Administration**
And
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# Abstract

Advances in Information Technology and Information Systems delivery over the past decades have restructured industries and created enormous value. Interestingly however, research shows companies traditionally have a very difficult time *capturing* the value from their investment. Any surplus created by these improvements is often competed away and given back to customers.

Wall Street's irrational exuberance of the late 1990's has given way to a far more conservative and critical view concerning IT investment. Decision makers are focused on demonstrating that Information Technology expenditures result in positive net returns to the company. IT managers are faced with a fundamental question: How does the organization use Information Technology to create sustainable competitive advantage and capture value in its industry?

This thesis proposes a framework, the Core Competency Model, to help companies think about Information Services strategy and Information Technology deployment. Instead of seeking to create competitive advantage through IT investment alone, it introduces the concept of core competencies. IT resources can be quickly duplicated by competitors, as has been shown in the research. Core competencies, the complex blending of unique resources and capabilities, are much more difficult to duplicate and form the basis for true sustainable competitive advantage. At its heart, the Core Competency Model suggests that the role of the IS group is to support the formation and enhancement of the organization's core competencies. It further identifies several capabilities and resources that the IS group must possess to fully support the core competencies of the enterprise.

This model, if truly utilized, would change the nature of a company's internal dialog on IT spending. Debate over which business units should get which IT resources would be replaced with discussion of the strategic direction and core competencies of the company. Decisions concerning IS resource allocation and IT spending would follow very naturally from this discussion. The Core Competency Model provides a framework for this dialog, beginning with the strategic identification of core competencies, and ending with the tactical analysis of the Information Systems group's capabilities and resources. The final chapter presents some recommendations aimed at helping BMC West successfully develop a set of core competencies, the first step toward creating sustainable competitive advantage in their industry.

Thesis Supervisors: Christopher L. Magee and Stephen C. Graves

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# 1. Introduction

## 1.1. Thesis Overview and Motivation

Delivering Information Services (IS) and Information Technology (IT) that result in positive net value for the organization is inherently difficult. In the vast majority of companies, a systemic divide exists between the IS group and the business units that it services. Business unit leaders complain that the IS group doesn't understand the needs on the front line. IS managers contend that business unit leaders aren't sensitive to the limited resources available. In many cases, the relationship between the two groups suffers and the strategic alignment between the actions of the IS group and the needs of the business unit is severely compromised.

In BMC West's case, the situation is complicated by the fact that the corporate IS group is serving two masters: SelectBuild and BMC West. SelectBuild is a new company with an innovative business model. As such, it needs a fast and flexible IS group that provides the latest in IT aimed at wringing out the inefficiencies in the homebuilding process. BMC West, on the other hand, is a traditional materials distributor and supplier. It needs an IS group focused on quality of service to both internal clients and external customers, and incremental improvement of existing processes and software.

In March of 2006, three months before my LFM internship began, BMC West acquired Home Millwork and Home Lumber in Rosenberg, Texas. The new locations were put under the regional management headquartered at Lonestar Millwork in Houston, Texas. From an information technology and business process standpoint, elements of the newly purchased Home Millwork's system were superior to that of Lonestar. Much of this internship was dedicated to integrating the operations of the two millwork facilities and translating those superior processes from Home to Lonestar.

In the process of completing the internship objectives, I interacted heavily with the corporate IT group and was able to use and participate in BMHC's software development methodology, called the Solution Delivery Methodology, or SDM. These experiences

led me to consider the process by which software is implemented within companies like BMC West, and more importantly, what companies like BMC West can do to capture value in the marketplace and create real, lasting competitive advantage through the use of information technology.

The goal of this thesis is to consider the following question: How does a company like BMC West fully utilize its significant information technology resources and economies of scale in the building materials industry to create and capture sustainable competitive advantage?

## 1.2. Thesis Outline

Chapter One introduces the topic and outline of the thesis. Chapter Two provides background for both the company and the industry. Readers familiar with BMHC and the homebuilding industry may choose to skip this material. Chapter Three summarizes some of the literature on the subject of achieving competitive advantage through investment in information technology. Chapter Four introduces the Core Competency Model, a framework that could be used to inform and guide Information Services decision making at BMHC or another similarly positioned company. The remainder of the chapter analyzes BMC West using the proposed model. Finally, Chapter Five summarizes and makes specific recommendations for BMHC going forward. Chapters Six and Seven are appendices containing case studies of two projects I was involved with during the internship.

In the course of conducting my internship, I was given a very unique perspective on the political, cultural, and strategic operations within the company. Access to Jeff Lucchesi, Terrill Rust, and others at the executive and vice presidential level gave me an understanding of the vision that was being created from the top. At the same time, working at the business unit level allowed me to experience ground level workings of the company in a way that would be impossible for others in senior management to replicate. In addition, my role was that of an *outsider on the inside.* As an outsider, I could remain somewhat unbiased by the cultural and industrial environments that have developed over

the years. Yet, as an insider, I was able to experience the day to day operational realities of the company. This unique amalgamation of roles allowed me to identify and analyze the vision, expectations, and assumptions that exist in the company. I was able to witness the degree to which the vision at the top aligned with the realities at the bottom. I was able to experience the culture within the millwork industry and contrast it with the broader business environment we are exposed to as Leaders for Manufacturing students.

If BMC West has one major challenge, it is that the business units seem to be moving in independent directions; all are pursuing their own goals and interests with little cohesive or collective movement in any one direction. My goal is to create a tool that BMC West and the Information Services group can use to align their actions and strategic objectives. I do not intend to simply offer a critique of the company. Rather, I hope to inspire the company to clarify and communicate its vision and to identify those core competencies that it desires to cultivate. I hope that the IS group is able to use the Core Competency Model to articulate its goals in developing the underlying resources and capabilities that support the business units. Ultimately, my hope is that the Core Competency Model, or some derivative of it, may serve as the lens that focuses the efforts of the various functional groups on a single successful mission and vision.

# 2. Company Background

## 2.1. US Homebuilding Industry

The US Homebuilding industry is composed of all residential construction, including apartments, condominiums, individual home developments, and pre-built, modular, or manufactured homes. In 2005, the market value of the industry was $646.4 billion. Since 2000, low interest rates have driven impressive industry growth at 14.9% CAGR despite population growth below 1% and GDP growth below 5%.

The industry is very fragmented, with the two largest homebuilders, Pulte and Lennar, each accounting for less than 3% of industry revenue[1]. Much of the industry still consists of privately owned regional homebuilders; although recent years have seen increased consolidation in the industry due to the economies of scale that exist for multiregional players.

In the traditional single-family-home market, the past fifty years have seen very little change in the underlying process by which a house is built. Today, just as in the mid 1950's, the average home is constructed on the job site with lumber and building materials delivered from a local lumber yard. It is built using subcontracted labor under the supervision of a general contractor or superintendent. Today, as in the past, the home may sit up to two-thirds of the time waiting for materials, permits, labor, or other inputs, with no critical-path work being accomplished[2]. The following pictures show a home under construction in the 1950's on the left, and in the 1990's on the right. The two jobsites and the construction methodologies are indistinguishable[3].

[1] Homebuilding in the United States: Industry Profile
[2] Cushman, 1
[3] Alexander, 6-7

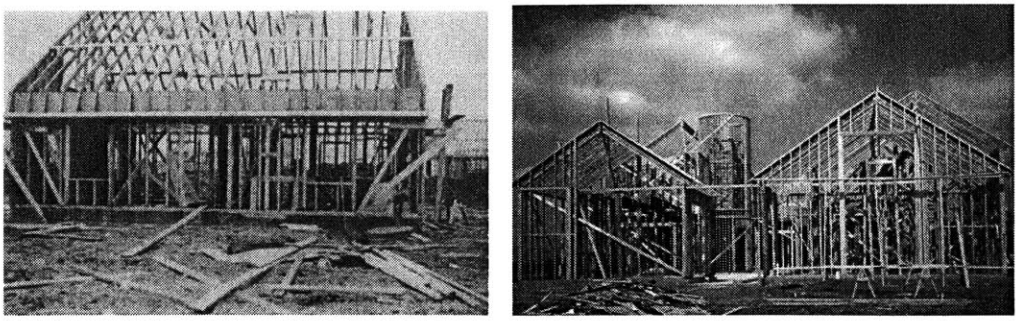

**Figure 1: Homebuilding circa 1950 vs. 1990**

Although the process of building a home in 2007 still looks very much the same as did fifty years ago, the industry is in the midst of a transformation. Large homebuilders have grown and consolidated to the point that they are beginning to see significant economies of scale. Larger homebuilders are able to access capital from the public debt markets at rates lower than that of the bank debt that funds smaller homebuilders. Whereas bank debt dries up in recessionary periods, public debt is more patient, long term, and forward looking. This increased access to capital for larger players is becoming more important as land in the most sought after areas becomes scarce. As populations increase, the regulation of land use is increasingly being determined at the state level rather than the city or county level. As major housing markets become more regulated, the land entitlement process becomes more difficult and capital-intensive to navigate. Those companies with greater access to capital are finding themselves at a distinct advantage in the industry[4].

In addition to having increased access to capital, large homebuilders are able to experiment with technologies that make the homebuilding process more efficient. New materials like steel studs, structural adhesives, composites, and recycled materials, pioneered and once relegated to the commercial construction and manufactured home industries, are being seen with increasing frequency in traditional homebuilding. New manufacturing technologies like pre-built wall panels, trusses, and engineered wood

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[4] Porter

products are becoming more common, especially in markets with unionized or otherwise expensive labor.

In addition to using new and innovative materials, developers, contractors, subcontractors, and materials suppliers are increasingly finding ways to use information technology infrastructure to enhance communications and coordination in an effort drive cost out of the homebuilding process. For instance, Kansas City-based Liberty Homes has created an interactive scheduling portal to streamline communication with its subcontractors. The on-site construction supervisor updates the status of each construction site on a laptop computer running Microsoft Project. The contents of his project plan are later pushed to a web portal where subcontractors go to find out what needs to be done next. Because all communication is handled through this portal, the finger-pointing that typically happens when something goes wrong is significantly reduced; it is obvious who caused the delay in the system. Liberty Homes' system is so successful that they have built over 1200 homes and have never been late on a closing date. The company is now expanding its portal, www.jobsiteontime.com, and offering it to other homebuilders[5].

As homebuilders seek to improve the construction process, cooperation and integration with trade groups and building materials suppliers is becoming critical to achieving efficiency in the homebuilding supply chain. BMC West and SelectBuild have foreseen this need and are positioning themselves to become strategic partners with the leading homebuilders.

## 2.2. Company Background

The history of BMC West, Select Build, and BMHC is recounted on the company's corporate website:

> On September 23, 1997, Building Materials Holding Corporation merged with BMC West Corporation into its current holding structure. BMC West Corporation, the

[5] Cushman

Company's predecessor and principal subsidiary, was formed in 1987 through the acquisition of 20 building materials centers from Boise Cascade Corporation. SelectBuild was formed in 1999 as part of an investment in Knipp Brother's Industries[6].

The two wholly owned subsidiaries, BMC West and SelectBuild Construction, employ more than 18,000 people nationwide in fourteen of the fastest growing states in the US. The chart below shows BMHC's growth over the past 12 years. Much of the impressive growth in the last few years has been through the acquisition of trade groups under the SelectBuild side of the business.

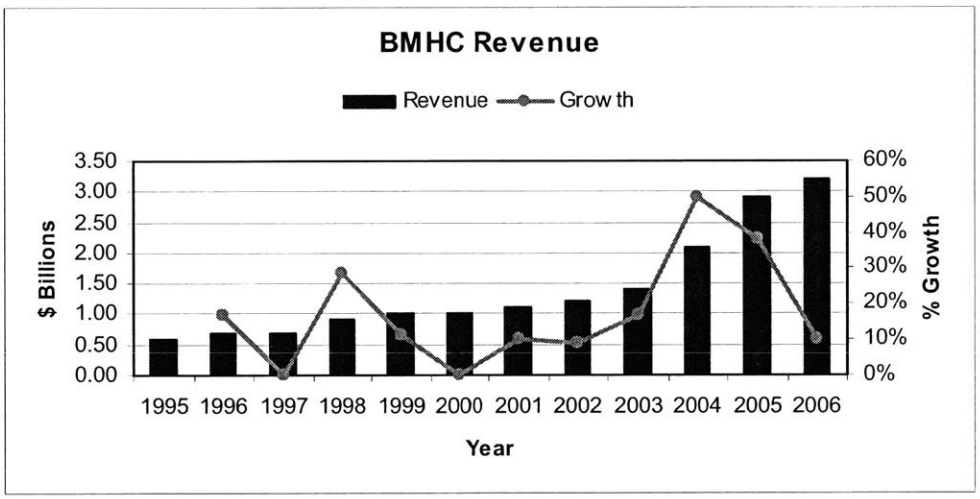


**Figure 2: BMHC Revenue and Growth from 1995 to 2006[7]**

Although growth has slowed recently due to the softening residential construction market, particularly in California, BMHC has remained profitable and has continued to shift revenue toward the construction services market (SelectBuild) and away from the more traditional and less lucrative building materials market (BMC West). The shift can be seen in the following chart.

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[6] www.bmhc.com, Investor Information FAQ's
[7] 2005, 2006 Annual Report, BMCH

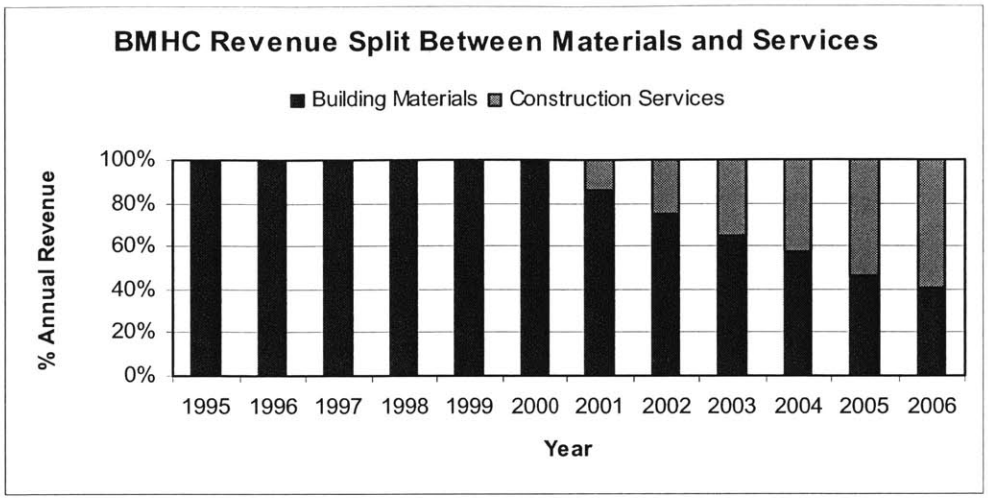


**Figure 3: BMHC revenue split, Building Materials and Construction Services**[8]

## 2.3. *SelectBuild Construction, Inc.*

SelectBuild Construction, Inc. is a wholly owned subsidiary of BMHC providing construction services to large homebuilders in the residential construction market. To understand SelectBuild's value proposition, it is first necessary to understand the process by which land is developed into housing communities.

Large homebuilders typically purchase sections of land and create value both by correctly speculating that the chosen land will be in an area that people will want to live, and by navigating the regulatory and zoning hurdles put in place by cities, counties, and states. They then develop these sections of land by laying roads, sewers, water, and electrical services, and carving the land into plots that will eventually have houses built on them. The builders pick off a portion of the lots, normally the best, to offer to customers under their own brand. They then sell the rest of the lots to other builders in order to pay down the investment in the land and other development costs. Often a single development will be broken up into multiple sections and will be grouped by either construction phase or lot size.

[8] 2005, 2006 Annual Report, BMCH

Lots are considered developed when roads, electrical, water, and other services are run to the site. At this point, building can begin. Large homebuilders will build multiple houses at a time and attempt to schedule the various construction projects such that a crew performing a specific task, say interior trim installation, can move from house to house with little or no downtime between. Typically builders employ a superintendent who is responsible for one or more ongoing construction projects. A typical superintendent may complete 30 houses in a given year, implying that they are monitoring approximately 10 projects at any given time[9]. The superintendent schedules trade groups to perform narrow tasks such as concreting, plumbing, framing, or electrical. They also schedule inspections, obtain necessary permits, schedule and release material deliveries, and monitor the project finances.

Superintendents are faced with a very difficult job. Most trade groups are subcontractors who focus narrowly on their niche and do not have expertise in other functions. They are contracted to provide their service and their service only. This causes an inherent misalignment of incentives. For instance, a framing sub-contractor might come out to the jobsite to discover that the concrete sub-contractor failed to complete his job to some specification. The framing sub has no incentive to either fix the problem, or to work directly with the concrete sub because he is being paid on a per job basis to complete his work. His only recourse is to leave the jobsite, contact the superintendent, and come back later. Building a house requires the completion of hundreds of tasks with dozens of contractors, and situations like this extend the time necessary to build a house to three or four times the actual value-added time.

SelectBuild seeks to make the building process more efficient by offering its customers an integrated labor force. Selectbuild owns multiple trade groups and is therefore able to schedule their work more efficiently. Moreover, SelectBuild attempts to cross-train their trades such that a framer who arrives at a jobsite to find minor problems with the

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[9] Cushman. Calculation based on 120 days per house and one house completion every 12 days. Little's Law says that In process inventory equals completion rate multiplied by throughput time. 1/12 * 120 = 10 housing projects at once.

concreter's work is able to simply fix the problem, rather than cause delays by notifying a third party and going to a different jobsite. By putting the trades under one roof, incentives are more aligned, and coordination mechanisms are centralized and standardized. This leads to much more efficient builds. Traditionally, large homebuilders make their money off of the development of lots, and build and retail houses simply to maintain their brand and connection to the end customer. They are in the land speculation and development business, so the outsourcing of construction and project management is very compelling.

SelectBuild is indeed finding success with this new model for residential construction. They have partnered with and offer their services to large homebuilders like KB Homes and, as seen in the company overview section, are growing very quickly both organically and through acquisition.

## *2.4. BMC West*

While SelectBuild is creating a very new business model and value proposition in construction labor and services, BMC West is fulfilling the much more traditional role of materials supplier. BMC West's offerings include the following:

**Lumber** – Lumber is selected and assembled into "house packs" which contain the right amount and combination of lumber to build a certain house or phase of a house. The lumber is then delivered to the jobsite on flatbed semi trucks.

**Engineered Wood Products** – Engineered wood products comprise laminated beams, manufactured trusses, manufactured joists, and other wood products that are in some way value-added. Trusses are an example of a product that requires extensive customization and provides the opportunity for a materials supplier to add considerable value to what is usually a commoditized product. Trusses are the triangular sections that determine the shape of the roof of a house. The truss design for a particular house requires many hours of engineering time and represents a considerable upfront investment on the part of the homebuilder. In return, the homebuilder's framing crew is able to simply tack the trusses in place, rather than

having to build them on the jobsite. This results in both cost savings and a superior quality product.

**Pre-hung Doors** – Pre-hung doors are interior and exterior door units with pre-installed frames, hinges, and decorative casings. Doors are also assembled into "house packs" that contain all the doors for a given house. Often the exterior doors are shipped before the interior walls are sheet-rocked, allowing the builder to lock up the unfinished house. Once the interior walls have been sheet-rocked, taped, and textured, the interior door units and other interior trim, like crown molding and base board, are shipped. The to-order assembly of pre-hung doors takes place in a "millwork". Oftentimes trim, cabinetry, and windows are offered from the same location. Lumber and engineered wood products are generally separate operations from millwork, though they could be co-located and managed using the same property and resources.

**Cabinetry** – Cabinetry comprises the kitchen, bathroom, and utility cabinets in a house. In the majority of markets, cabinets are ordered to specification from manufacturers and delivered to the jobsite. Cabinets are one area where large homebuilders now leverage their scale and go directly to the manufacturers to obtain preferred pricing, effectively cutting out distributors like BMC West.

**Trim** – Trim includes crown molding, base molding, stair railings and balusters, finish-quality wood and plywood, and all other products that finish the interior of a house. These supplies are often delivered to the construction site with the interior doors.

In all of these areas, a materials supplier like BMC West might sell to three different types of builders, each with somewhat different needs. Although some differences might exist in lumber and engineered wood, the main differentiation exists in the quality and construction of the doors, cabinets, and trim that each segment would typically require. The different builder segments include:

**True Custom** – True custom builders do just what one would expect; they build truly customized houses. These customers order custom designed, hand built, hardwood doors and windows manufactured to their exact specifications. A typical true custom front door might have two door panels, two sidelights (panels on either side of the door, often with glass), and a transom, sometimes arched, curved, or artistically designed in some way. The price of a complete door unit could easily top $10,000. These builders may also employ finish carpenters who fabricate and install hardwood paneling and trim, as might be done in a library, office, or kitchen for instance, and order the finish-quality wood from a material supplier like BMC West. In many markets this is a dying art, and cabinets and other finish carpentry items are built offsite in a factory setting. Houston, however, is one market in which this type of craftsmanship is still readily available.

**Production Builder** – The production builders are the KB Homes, Pulte Homes, Lennar, and other companies that are in the business of mass development and construction. These companies often construct larger, more expensive homes that fit into the custom builder category below, but the majority of their business is in lower end, entry level homes. These entry level homes are built to compete on price. They use standard components, doors, and trim to save cost. From the materials supplier standpoint, production builders offer a higher volume and lower margin revenue stream. Their casing, trim, door frames, and door panels are more standardized and rarely deviate from the standard.

**Custom Builder** – A custom builder is halfway between a production builder and a true custom builder. They build or remodel homes that require a certain amount of customization, but stay within a set of pre-manufactured components. For instance, a custom builder might order a special-order pre-built door, with a specific hinge type, and a non-standard casing, but would not specify a fully custom-built door or window like a true-custom customer. In addition, their interior doors might be specified as solid wood, rather than the cheaper hollow-core doors more commonly used by production builders.

# 3. Literature Review – Extracting Value from IT

## 3.1. The Business Value of Information Technology

During the 1980's, many studies explored the relationship between a company's investment in information technology and the firm's value. Although the results were mixed, the evidence overwhelmingly suggested that no positive relationship exists. The term "productivity paradox" was coined to describe this phenomenon and Nobel winning economist Robert Solow summed the research up in his oft quoted quip, "You can see the computer age everywhere but in the productivity statistics."

Over the next decade, however, evidence began to build suggesting that investment in IT did in fact increase firm level performance in a variety of ways. In 1993, Erik Brynjolfsson was among the first to use production functions describing the relationship between firm output and several inputs like labor hours, IT capital stock, etc, to show that IT investment did in fact contribute to firm productivity[10]. Subsequent studies showed that IT not only offered positive returns on investment, but that IT offered *excess* returns, indicating that firms might actually be under-investing in IT[11].

In 1996, Brynojolfsson and Lorin M. Hitt published a critical article that helped to clarify the seemingly contradictory results of previous work, some indicating a significant benefit from IT investment and others showing no benefit at all. Their research focused on three different measures of value: firm productivity, firm profitability, and consumer surplus. Their survey of 370 firms over the period from 1988 to 1992 showed that while productivity increased with investment in IT, profitability did not. In fact, in some cases it seemed that profitability might actually fall slightly. At the same time, they showed that consumer surplus increased. The paper concluded that "firms are making the IT

[10] Brynjolfsson, E. 1993.
[11] Dedrick, J., Gurbaxani, V., and Kraemer, K. 2003.

investments necessary to maintain competitive parity, but are not able to gain competitive advantage.[12]"

## 3.2. IT as an Infrastructural Technology

In his book entitled Does IT Matter? Nicholas G. Carr attempts to explain why companies fail to achieve competitive advantage through information technology. He highlights the difference between *proprietary technologies* and *infrastructural technologies*. *Proprietary technologies* are those that can be owned, and whose value can be extracted, by a single company. Technologies that are protected by patents, for instance, are unavailable to competitors and therefore proprietary. Innovative processes that are difficult or impossible for competitors to replicate, what other texts call a capability based advantage, may also constitute proprietary technologies. Carr described *infrastructural technologies* as those that are far more valuable to society when shared by all than when used in isolation. I would further refine the definition to the following:

> An infrastructural technology is one in which the benefits of creating a customized, proprietary solution are outweighed by the costs of creating that technology. When faced with this choice, companies settle for a more publicly available, yet perhaps not fully optimized technology. This technology then becomes an infrastructural technology.

Carr identifies some properties of infrastructural technologies:

> **There is significant benefit to standardization** – electricity, railroads, and the interstate highway system are examples of traditional standardized infrastructures. The GAPP accounting rules, in addition to being mandated by the SEC, are a less obvious example of a standardized infrastructure that allows a company's financial information to be compared to that of other companies. In all cases, there is significant benefit to standardization, either to the company or to the consumer.
>
> **Returns to scale exist** – the net benefit to individual users is increased when more use the technology, either because the cost is spread over a larger user base, i.e.

[12] Hitt, L. M. and Brynjolfsson, E. 1996.

supply side returns to scale, or because the inherent value is increased when others use it, i.e. demand side returns to scale or network effects.

Although not specifically identified in Carr's book, I believe infrastructural technologies also have the following properties:

**It is better shared than kept to oneself** – An infrastructural technology is one in which the owner receives substantially more benefit from distributing the technology than it would by keeping it proprietary. For instance, the Microsoft Windows operating system is much more valuable to Microsoft if it licenses it to others than if it were kept by Microsoft and used as a competitive advantage in some other market. By contrast, Coca Cola Company's formula for its Coke products is valuable precisely because it *does not* allow others to use it; the Coke formula is therefore a proprietary technology. As a consequence, infrastructural technologies end up being available to all competitors in a market and their benefits are therefore not available to any single user in isolation.

**Its value is easily transferred, yet it is not easily replicated** – This property is a corollary to the one stated above. In order to be valuable if shared, the technology must be relatively easy to transfer. To avoid simply being copied once it is distributed, replication must be difficult. Windows again provides an illustrating example. In the US, where copyright and patent laws are rigidly protected by the courts, software is very easy to distribute, and quite difficult to replicate legally. Software companies are able to create infrastructural type technologies and able to extract value at the same time. In foreign markets, however, where these laws are not respected, software piracy provides a formidable challenge and one would expect to see fewer infrastructural type technologies being developed due to the lack of protection afforded the owner.

Toyota provides an interesting counter-example illustrating the connection between the two properties above. The Toyota Production System is clearly a proprietary technology. One could argue that it would be much more valuable for Toyota to teach other

companies its system, rather than to manufacture and sell cars. The technology is very difficult to transfer, however, because it only exists in the complex relationships and culture of the company. Moreover, if a method of efficiently transferring the Toyota Production System was discovered, the system might then become easily replicated, thus destroying the value for Toyota. For this reason, the Toyota Production System remains a proprietary technology.

By definition, due to the availability of infrastructural technologies, and the cost/benefit tradeoffs involved in replicating what already exists, users of infrastructural technologies are virtually incapable of using them to create any sustainable competitive advantage. In fact, if a defendable competitive advantage could be created simply by using the technology, the technology itself would have to be redefined as a proprietary one.

Carr goes on to effectively argue that although many executives continue to talk about using information technology to create strategic value for their companies and for shareholders, information technology is fast becoming an infrastructural technology. Extracting competitive advantage from IT is therefore becoming increasingly difficult, and will continue to get more elusive as the technology matures and the playing field levels. Enterprise Resource Planning (ERP) software serves as an illustrative example. At one time, businesses were forced to create software systems from the ground up that were highly customized to their business and processes. As generic software packages like Oracle and SAP became more powerful, the need to reinvent the software "wheel" was diminished. Providers of targeted software solutions created add-ons aimed at specific industries, and companies increasingly questioned the need to customize. Carr quotes a writer from Inbound Logistics. "While most companies once thought that their business processes were too unique to use configurable software (as opposed to customized software), transportation managers are quickly realizing that leveraging industry best-practices far outweighs the benefit of perpetuating a unique process.[13]" As ERP systems continue to become larger and more powerful, the market is forced toward

[13] Carr, 83.

standardization, and the technology ceases to be a source of advantage, and instead becomes a commoditized input necessary for effective competition.

## 3.3. Some Firms Do Extract Value from IT

Although studies show that *on average* investment in information technology does not lead to competitive advantage, they also show that the returns among individual companies are highly variable. In other words, the variance in benefit gained for each dollar spent on IT (marginal benefit) is higher than the variance in benefit gained from other non-IT investments. This leads to the conclusion that some firms are able to use IT more effectively, and those firms do in fact capture value from their investment. There are two factors to which this variance can be attributed, idiosyncratic firm factors and firm-level capabilities and resources. *Idiosyncratic characteristics* include market position, cost structure, brand, and other qualities that are not easily manipulated in the short run by management, but contribute to a firm's ability to derive benefits from IT investment. *Firm-level capabilities and resources* include the specific management practices and complementary investments that also serve to enhance the benefit of investment in IT[14].

Some research has focused on identifying scenarios under which IT investments become valuable. Carr points out that firms in slower moving industries are often able to take advantage of IT investment to create temporary competitive advantages that simply last long enough to provide a decent return on investment[15]. Other studies have shown that firms in monopolistic or duopolistic situations are able to more effectively capture value from IT[16]. These studies serve to identify the characteristics of industries in which IT investment will likely have a higher payoff.

In his 1994 paper, Gary W. Loveman argued that the variance in firm results could be explained by differences in firms' ability to integrate IT with the business and human

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[14] Dedrick 9.
[15] Carr.
[16] Ravichandran, T. and Lertwongsatien, 240.

resource management strategy, and in the ability to efficiently allocate resources. In 2000, Tallon went on to show that aligning IT and business strategy increases the return from IT investments. Devaraj and Kohli also found that IT investment, when combined with business process reengineering, produces positive returns[17]. This stream of research indicates that strategic alignment between the business and the Information Service department (IS) is a critical element in capturing value from investment in IT.

The above research shows that the strategic value gained from investment in IT is not simply a matter of the amount spent, but also a question of the firm's capabilities and resource utilization.

[17] Dedrick, 10.

# 4. The Core Competency Model

## 4.1. Information Services Support for Core Competencies

In their 2005 paper, Ravichandran and Lertwongsatien (R&L) attempted to unify much of the previous research by creating and testing an empirical model for delivering value from IT. At its heart, their research identifies the creation and development of *Core Competencies* as the primary means of creating sustainable competitive advantage.

Core competencies are unique and tightly woven bundles of overlapping resources and capabilities that are valued by the marketplace and are difficult to replicate by competitors. Different combinations of these core competencies are what allow for differentiation among firms in a marketplace. The strategic use of core competencies leads to tangible competitive advantage, i.e. the ability to extract abnormally high profits from and industry when compared to the competition.

To extract value from IT investment, R&L suggest that activities performed by the Information Services group must be aimed at developing and enhancing the core competencies of the organization. This focus, they propose, results in higher profits, greater differentiation, and increased firm value. In their words, "firms that target IS initiatives toward their core competencies are likely to realize greater value from their IS assets than those that are less focused in their IT deployment."

The researchers go on to define some specific capabilities and resources that they believe are indicative of an organization's "support for core competencies". An organization possessing these capabilities and resources is better able to focus its IT efforts on those projects that help create core competencies, and therefore competitive advantage.

The Resource Based View of the firm (RBV) provides a definition of resources and capabilities. *Resources* are "stocks of available factors of production owned or

controlled by a firm.[18]" They might be intellectual property, a large manufacturing capacity, or a very strong brand. Resources are possessions which belong to the firm and cannot be easily carried away.

*Capabilities*, on the other hand, are defined as an organization's capacity to perform a task or activity. They are not assets in and of themselves; however they are often formed through combinations of resources, employees, established processes, and other company assets.

As an example, consumer products company Johnson & Johnson possesses some strong resources: a strong product development process, an influential brand, and a network of marketing and retail relationships. It is able to combine these resources to form a very strong capability; the ability to continually develop, manufacture, and distribute new products that its customers find compelling.

R&L suggest that an IS group possessing the following four capabilities would be better suited to create and sustain the organization's core competencies:

- IS Planning Sophistication
- IT Development Capability
- Support Maturity
- Operations Capability

These capabilities in turn are heavily influenced by the development of the following key resources:

- IS Partnership Quality
- IS Human Capital
- IT Infrastructure Flexibility

R&L's study concludes that possession of the proposed capabilities and resources does in fact assist in the delivery of information technology solutions that allows the firm to capture positive net benefits from its investment.

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[18] Ravichandran and Lertwongsatien, 240.

R&L's model provides a powerful framework for structuring a company's internal dialog around the strategic and tactical delivery of Information Services. Their research model, however, uses language that is referential to the body of literature on the subject of IS delivery, and is therefore non-intuitive to an end user in a IS group or business unit. For this reason, I have created the following representation of their model that is more appropriate for use in a business setting. This representation is referred to as the *Core Competency Model.*

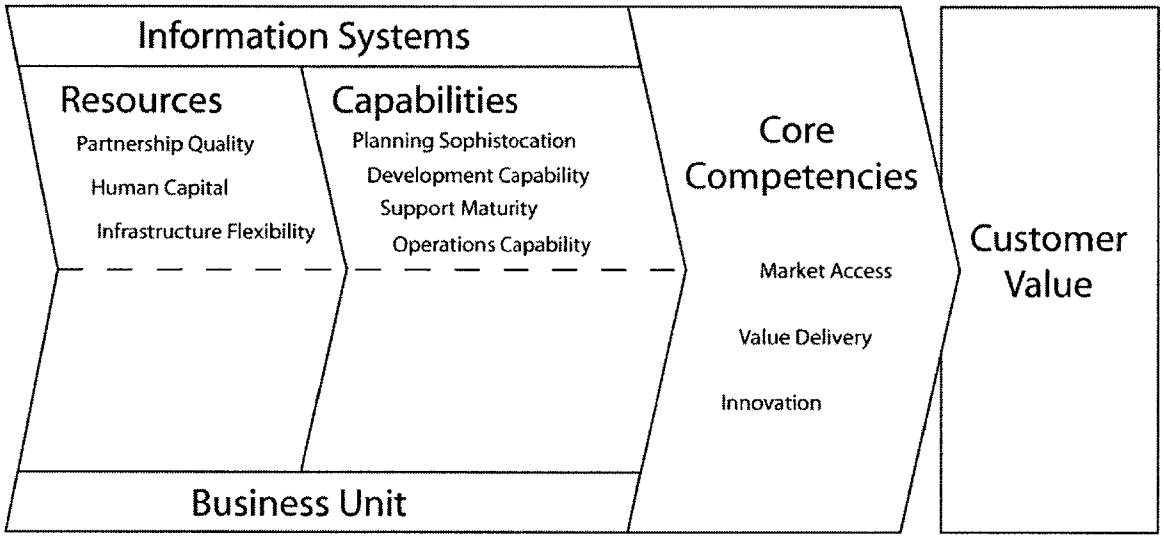


**Figure 4: The Core Competency Model**

The Core Competency Model illustrates the relationships between resources, capabilities, and core competencies. Resources are the basic building blocks that an organization possesses. These resources are combined to form capabilities. Each department or business unit within the organization might possess its own resources and capabilities. In this version, aimed at the IS Group, the "Business Unit" is included to suggest that it too possesses unique resources and capabilities.

The resources and capabilities of all of the functional groups in the organization combine to form the company's core competencies. These core competencies encompass the competitive advantages and strategic direction the company is pursuing. The core competencies, in the end, are designed to provide value to the customer.

The inclusion of both the IS group and the business units emphasizes the importance of the partnership between the two groups, and the shared goal of creating organization-wide core competencies and customer value.

## 4.2. BMC West's Core Competencies

The Core Competency Model, as its name suggests, requires that an organization identify those competencies that it believes will lead to perceived customer value and sustainable competitive advantage. Although it may sound straightforward, the identification and negotiation of core competencies among the various stakeholders in a company might take a team of people several months to complete. It is as much a process of inventorying current resources and capabilities as it is a strategic exercise in determining which resources and capabilities must be developed in the future. It requires the company to understand the current state, articulate a future state, and tangibly quantify the gaps between the two. Most importantly, it requires a cultural shift in the organization away from talking of products, markets, business units, and geographical boundaries, and towards talk of more broadly defined capabilities and competencies. Core competencies transcend individual products, services, and business units to focus on those abilities possessed by the entire organization that allow it to grow into new markets and reinvent old ones with new technologies or business models.

In the following section, I will identify some possible core competencies that BMC West could develop. Before introducing the specific competencies, however, I must first spend some time defining exactly what does and does not constitute a core competency.

In his article The Concept of Core Competence, Gary Hamel[19] describes core competencies as the end product resulting from a firm's choice about which resources to acquire, combine, and deploy over an extended period of time. They are formed by creating a complex web of strategically linked resources and capabilities. To create lasting value for the company, they must be difficult to replicate by competitors, either

[19] Hamel.

because the specific combination of factors is hard to ascertain, or because key resources necessary to build the competency are tightly held by the organization.

Core competencies must deliver a fundamental and differentiated customer benefit if they are to add value to the organization[20]. Toyota offers an example of the difference between a true core competency and a capability.

Many would argue that Toyota has a core competency in building high levels of quality into its cars. Their abilities are unique and difficult to replicate, and customers value the ability as evidenced by the company's growing market share. Toyota has also built a capability around managing their dealer network in the United States. This expertise in managing dealers, however, does not rise to the level of a core competency because it does not offer a significant and differentiating benefit to the customer when compared with the competition. Every car maker has a similar dealer structure.

On the other hand, suppose they were to implement a radically different approach to selling cars by offering a fully customized car from factory to customer in five business days. In such a case, Toyota could claim a core competency around the manufacturing processes and distribution network required to provide such a unique service.

At the corporate level, a true core competency should also help a company enter and succeed in new markets, not simply sustain the markets that it already has. For instance, Amazon.com's warehouse network and back-end software capabilities allowed it to expand from its original market, selling and distributing its own goods, to an additional market providing e-commerce, warehousing, and distribution services to third parties like Toys R Us and Target. Similarly, Toyota's core competency in manufacturing high quality, low cost cars prompted it to begin selling high quality, low cost modular housing in Japan.

Hamel suggests that a given company, upon forming a group to identify the competencies possessed by the organization, should arrive at a list of about five to fifteen core

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[20] Hamel, 13.

competencies to focus on. In this definition phase, a fine line exists between what he calls meta-competencies, core competencies, and constituent capabilities. An example from Hamel's work illustrating the difference is FedEx. Logistics in general would be a meta-competency. Although it passes the tests laid out above, it is too large and vague a classification to serve as a useful core competency. FedEx's package routing and tracking, however, might be an appropriately defined core competency. These capabilities are far superior to competitors (with the possible exception of UPS) and therefore provide a differentiation and a distinct customer value. They also allow FedEx to move into new businesses like warehousing and distribution of third party goods. Bar coding, on the other hand, is probably too narrowly defined and non-differentiating to be a useful core competency; everyone can and does implement similar technology. Bar coding is really more of a constituent capability.

Hamel describes core competencies as falling into three fundamental categories. *Market-access competencies* are those that allow a firm to maintain close contact to its customers, identify their needs, and respond quickly to shifts in customer needs and tastes. *Integrity-related competencies* are those that allow a firm to offer reliable, convenient, and appropriately priced products and services to meet those needs. "Efficient manufacturing operations, streamlined supply chains, and integrated business processes are some indicators of integrity-related competencies.[21]" *Functionality-related competencies* are those that "enable a firm to offer unique products and services with distinctive customer benefits.[22]" A company that possesses a competency in this area will likely have strong product development and innovation capabilities. In the following sections, I will define and comment on each category and identify specific core competencies that BMC West might develop in an effort to create competitive advantage in their industry.

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[21] Ravichandran and Lertwongsatien, 243.
[22] Ravichandran and Lertwongsatien, 243.

## 4.3. Market Access Core Competencies

A competency in *market access* is defined as the skills that put a company in close proximity to its customer; it is the ability to create a relationship with customers, understand their needs, and respond quickly as those needs change. Examples might include the development and management of a brand, sales and marketing techniques, or a distribution process.

On one hand, market access competencies comprise the skills a company uses to capture value from the market it currently possesses. In the business of building materials distribution, these skills center on the sales process and the ability to deliver product quickly, accurately, and with minimal disruption to the customer's building process. While it already has many capabilities in this regard, BMC West would benefit from developing a core competency in *sales support* to streamline the sales process and capture the resulting value. On the other hand, market access competencies also describe many of the skills that allow a company to enter new markets, both in terms of vertical and horizontal product scope, and in terms of geographical boundary. BMC West was built largely through acquisition, and each new acquisition brings with it a new market. The company would also benefit from building a core competency in the *acquisition and integration* of these new business units and the resulting new markets.

### 4.3.1. Competency in Sales Support

BMC West does relatively well at selling its products to customers. Most locations follow the standard industry structure of having "outside" salespeople who interact with customers, walk the houses, and schedule deliveries. These outside salespeople are supported by an "inside" sales staff that enters orders, monitors production progress, and communicates internal status back to the outside salesperson. The outside salesperson, however, has a tremendous amount of power in the transaction. Customers work almost exclusively with the outside salesperson and each salesperson develops unique routines to satisfy a particular customer. When a salesperson moves from one building material distributor to another, customers routinely follow, as it is far less disruptive to change

suppliers then it is to change salespeople. The amount of power in the relationship is illustrated by the surplus that is extracted in each sale. Typical gross margins in the industry are 25 to 30%. Of that, the distributor might capture approximately 5% of the total sale as profit. A salesperson, however, might capture 5 to 10% of the gross margin, or 1.5 to 3% of the total sale for themselves. The ratio of profit to the company versus profit to the salesperson can serve as a proxy for the relative importance of the two entities in the transaction.

Although this model works well to get product to customers, much of the value in the transaction is captured by salespeople who, although employed at any given time by a distribution company, end up looking a lot more like free agents. BMC West pays a premium for highly experienced salespeople, and lacks formal training mechanisms that would allow the use of less experienced labor. Moreover, the company does not possess any overriding system that would allow it to take some of this surplus back. In effect, BMC West is outsourcing the majority of its market access capabilities to salespeople, and paying the market rate for it. The company is therefore not capturing any abnormal portion of the value, and therefore cannot claim a core competency in this area.

If BMC West focuses on sales support as a core competency, and concentrates on developing capabilities, resources, systems, and processes around it, the company could minimize the power salespeople currently have in each sales transaction. The most important aspect of a competency like this is the development of a stronger relationship between the company and the customer, with the aim of proportionally weakening the relationship between the salesperson and the customer.

To achieve this goal, a more universal sales process must be created that allows one salesperson to take over the work of another more seamlessly. A formal training program would allow new salespeople to achieve proficiency more quickly, thereby reducing the dependence on a highly experienced sales force. The sales support system should also establish links from the customer to the distributor in an attempt to create barriers to exit. For example, applications that enable customers to automatically initiate orders, view status, retrieve documentation and invoices, and rectify problems might create such links.

Regardless of the specific capabilities and resources that are combined to create this competency, such a process requires a complex mixture of culture, back end processes, IT systems, and hardware that link salespeople and customers into the order processing system.

One location manager I spoke to understood this issue and implemented policies to combat it. The location initiated a "Three Points Program" where the best customers had three points of contact within the company: the salesperson and two others, one of which was the plant manager or operations manager. Second tier customers were given two points of contact, and the lowest value customers were allowed to have the salesperson as a single point of contact. This way, if a salesperson leaves the company, the most important customers retain personal relationships with representatives of the company.

By formalizing the above concepts at the corporate level, and creating company-wide systems that support the development of a sales support core competency, BMC West can mitigate the economic power of salespeople and the associated risk of losing large portions of business every time a salesperson switches employers.

Developing a core competency aimed at increasing the relative value of a company in the sales cycle might be resisted by members of the sales staff. Salespeople rely on finely tuned and closely-guarded sales processes to create security and individual competitive advantage. Politically, any effort to directly undermine their power will fail. Rather, an integrated sales support system can only be created if the sincere intent is to provide superior customer service. In so doing, the company will capture both benefits.

### 4.3.2. Competency in Acquisition and Integration

BMC West and its parent BMHC have grown tremendously over the past decade. The vast majority of this growth has been through acquisition. The ability to identify markets or locations that are of strategic importance would be a very powerful core competency. Wal*Mart provides a great example of a company with a competency in this area. Wal*Mart grew to be the dominant retailer in the US by selecting locations in small towns that could only support one store of its size. Research has shown that in those

areas where competition is precluded, Wal*Mart is able to charge a price premium and therefore extract a surplus from its competency in location selection[23]. The distinction should be made clear between the locations themselves, and the ability to select new locations. The existing locations constitute a physical resource, whereas the ability to identify and build stores in the right locations and extract a profit constitutes a core competency.

Currently, acquisition decisions at BMC West are made on an individual basis and are justified by gut level intuition rather than a methodology backed by data and market analysis. The drawbacks of this approach became obvious midway through the internship when management was looking to purchase land for a lumberyard in North Houston. They were faced with determining the best land acquisition option without any analytical tools or decision-support mechanisms to aid the process.

Two suitable sites for the new lumberyard were found, each with its own benefits and drawbacks. One of the key tradeoffs between the two was ease of development versus physical proximity to current construction sites, i.e. the location that was closer to customers was less suitable for development, and vice versa. From Houston's perspective, the corporation had no tools or established processes to help inform the decision.

To make the best decision, management wanted to have an objective understanding of the proximity of housing developments to the two potential lumberyard sites. This information was available through a piece of software called MetroSearch[24], but this software is very complex and learning how to effectively use it requires many hours of training and practice. Despite the fact that other locations in the company use the same software, no centralized expertise has been developed to help transfer the knowledge gained by one location to another. Therefore, a question that could have been answered

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[23] Bradley

[24] http://www.metrostudy.com - Metrostudy monitors construction in markets around the country and makes the data available through its MetroSearch product.

in two hours by an experienced user, took many days worth of effort and weeks worth of time.

This example illustrates only one of the hundreds of questions to be considered when a new acquisition is being made. At the very least, having a basic checklist of the questions to ask, issues to consider, and resources and expertise available in the company would be beneficial. Unfortunately, because the process is not formalized, all of the learning acquired during the purchase of this new lumberyard location in Houston will only reside in the minds of those involved at the local level and will essentially be lost to the company. Other locations will need to reinvent the same "wheel" each time a new location is acquired.

In addition to developing a core competency around identifying acquisition targets, the company would also benefit from the ability to integrate newly acquired companies into their organization in a more efficient way. When BMC West acquired Home Lumber and Home Millwork, support was given from the corporate level for the conversion of the MRP system to SX.e, and for the training of new employees on the new system. Assistance with aspects of integration beyond software conversion was neither available nor wanted by the local management. For example, business processes were simply mirrored to match the existing Houston locations rather than being brought up to the best practices in the company or industry. The new employees and management were only marginally integrated into the existing company, and to this day cultural conflicts continue to create problems. Those that fail to integrate will likely leave or be forced out of the organization, taking years of experience and customer relationships with them.

The Houston region boasts some of the most experienced and successful management in the company, and the acquisition therefore went relatively well. Nevertheless, these types of integrations happen only a handful of times in any one manager's career; they shouldn't be expected to have all the answers when it comes to merging companies, cultures, and processes. It is easy to envision a process and support system for the integration of newly acquired companies that goes beyond simply duplicating the software and information technology infrastructure to the new location; one that allows a

manager to more successfully integrate and deploy the talent and resources that existed before the acquisition. It is easy to imagine that with some effort a more formalized process could be created at the corporate level to bring new acquisitions into the organization, and to train management, unify business processes, and reassure employees more quickly and successfully.

## 4.4. Value Delivery Core Competencies

Core competencies in *value delivery* are, to quote Hamel, the skills that "allow a company to do things more quickly, flexibly, or with a higher degree of reliability than competitors.[25]" They might include things like process improvement, quality of service/product, manufacturing, or inventory management. For an operations-oriented company like BMC West, one would expect these core competencies to be the most developed.

Over the course of my internship, I often heard executive management speak very highly of local and regional management at BMC West. Many plant managers have grown up in the building materials business and have not had the benefit of observing other industries or products. Most have not had formal training in operations or management. Many managers are the first to joke about the fact that they started as truck drivers or line workers. Nevertheless, it is said that these managers' capabilities *should not* be underestimated; they run very sophisticated and finely tuned organizations. I found this to be very much the case. The Houston millwork was manufacturing thousands of doors a month just-in-time for its customers, and finished-goods inventory was virtually non-existent. It was impressive to see an operation built from the ground up by people with little formal training, but a huge amount of practical experience, rivaling Dell in its complexity and ability to deliver built-to-order products to customers within a four day production window.

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[25] Hamel, 16.

Interestingly, when executive management speaks of these capabilities, they always refer to local management in the third person. *They* are very capable. The executives never refer to the company's ability *to create* capable management. Although it is subtle, this sentiment indicates that the corporation as a whole has not yet discovered how to formalize and institutionalize the knowledge and abilities of local management. If operational capabilities are truly held at the local level, and no method exists to appropriate and redeploy the abilities in new markets or products, the company will fail to achieve synergies as a corporation, and local entities will be no better off from an operational perspective then their locally owned competition. Many large companies have successfully created operating systems that make the whole company better than the sum of its parts. Focusing on the development of value delivery core competencies at the corporate level will help to fully leverage the skills and talents possessed by local and regional management as the company moves into new geographical and product markets.

The building materials market has been consolidating over the previous decade. No player has established dominance as of yet. If BMC West wants to be a leader in this industry, the company must act now to create two specific value delivery core competencies: one in delivering an efficient build process to its customers, and another in process improvement.

### 4.4.1. Competency in Delivering an Efficient Build Process to Customers

Some of BMC West's value delivery competencies are quite obvious. In the Houston region, for instance, the company has the ability to offer same day delivery on orders entered by 10:00am. Furthermore, they are able to offer two deliveries every day. A customer's doors might arrive in the morning, and any materials ordered by 10:00am would still arrive that afternoon. This represents a level of service that is unmatched by BMC West's competitors, and local management attributes their steady increase in market share to this offering.

The Houston millwork bends over backwards to satisfy the customer. All deliveries are free, no matter how small the order. Customers can order more material than they think

they will need, and the remaining material is picked up and credited back to the customer on the next delivery to the site. If asked, management of the Lonestar millwork in Houston would describe their core competency as providing an unparalleled level of service.

Unfortunately, however, the ability to *reliably* schedule the delivery of a set of doors to the morning or afternoon of a specific day remains elusive. Delivering the product on time, every time, is perhaps the most important aspect of quality to a customer in the building industry. Despite that, orders are entered into the production system with no tracking of the effort required to complete the work on time. It is only the next day, when the paperwork has been processed, that it becomes obvious to the production line manager that too many doors have been scheduled for the day's production. Even then, customers are only notified on the day they should receive their doors that the order will be shipped late. Often, during the busier seasons, the backup of production on a Monday puts the entire system behind schedule by half a day for the remainder of the week, only getting back on schedule by Thursday or Friday. If Lonestar viewed its role as creating the most efficient build process possible for its customer, rather than simply delivering a high level of service, focus might be shifted towards those activities that result in on-time deliveries and therefore tangible value in the customer's homebuilding process. It is very possible that customers would readily trade the current offering of high cost ancillary "services" provided by Lonestar for dependable and reliable scheduling of delivery dates.

On the SelectBuild side of the business, BMHC does seem to recognize the enormous benefits to be reaped from a core competency in delivering a more efficient home building process to its customers. SelectBuild has learned that many of the inefficiencies that exist in a typical construction project involve material scheduling and delivery. The theft or damage of raw material is a constant problem on jobsites, and the obvious solution is to coordinate the delivery and installation of materials to avoid leaving them sitting unattended or uninstalled for any period of time. To achieve this coordination, SelectBuild has acquired or built a number of lumber and building materials supply depots in an effort to coordinate delivery with the availability of labor.

By viewing the creation of a more efficient build site as a core competency, BMC West locations would be driven to attempt the same level of coordination. One of the best ways to do this is to follow the SelectBuild lead and simply take over the installation process. In this way, materials are delivered and installed at the same time and theft and damage are significantly reduced. The Houston millwork locations do offer this service, but the installation is currently outsourced to a third party. The contract installer does not have the same focus on quality or on-time delivery that an internal group would have, and therefore puts this line of business in jeopardy in the long run.

Despite the fact that the Houston locations do a very good job of pleasing the customer, many of their advances have not been duplicated in any other BMC West locations. This indicates that although the location possesses a capability in this area, the corporation does not yet possess a core competency. Furthermore, their capabilities are fragile, as they reside in the unique processes, culture, and minds of Houston's employees and management. Without some institutionalization, the capability could very well be lost when and if management retires or moves on.

### 4.4.2. Competency in Process Improvement

BMC West would also benefit greatly by creating a core competency in process improvement. Overwhelming evidence exists to show that Lean Manufacturing principles can significantly increase quality and speed, while at the same time decreasing inventory and manufacturing costs. Other than isolated experiments at the local level, no attempts have yet been made in the company to create a process around process improvement. In fact, no guidelines or best practices even exist in the areas of business processes, preventative maintenance, employee training, inventory policies, and other activities at the core of the business. As the company grows, maintaining common practices becomes more and more difficult. A process improvement methodology, led from the corporate level, would serve to document, unify, and share the best practices developed at the local level.

The company has repeatedly tried and failed to institute best practices from the corporate level. The most recent attempt seems doomed to the same fate, as many members on the team believe it is a futile effort. A corporate-wide process improvement program, on the other hand, would give locations the tools necessary to continually improve their own operations, and structured knowledge sharing would help the locations converge on best practices organically.

Anecdotally, in every industry, the companies that dominate have very formal processes, cultures, and commitments to process improvement. Examples include Dell's pursuit of minimal inventory, Toyota's production system, Wal*Mart's pioneering of cross docking, RFID, and other warehousing technologies, Intel's copy exactly program, and GE's lean six sigma. In other words, in *every* industry that has a clearly dominant player, that company is distinguished by its dedication to relentless process improvement.

If BMHC hopes to lead the building industry toward a new business model, the company *must* develop a system that allows it to leap ahead of its competition rather than simply keeping pace with the rest of the industry. That capability does not yet exist.

## 4.5. Innovation Related Core Competencies

Innovation related core competencies are those that allow a company to continually develop new products and services that are valued by its customers. For example, since the release of the first iPod digital music player, Apple has shown that it has a well developed core competency in bringing new products to market that its customers find compelling. Furthermore, Apple continues to release a new version of its product on a yearly basis and delivers exceedingly high quality each time. The ability to deliver new products year after year constitutes an innovation related core competency[26]. It is likely formed by the combination of many capabilities, including the ability to understand the

[26] Apple can also be used to exemplify the other categories of core competencies. Apple's ability to identify profitable locations for its retail stores would constitute a market access competency; and its ability to offer iPod products that are etched with custom text and delivered to a customer within 48 hours would constitute a value delivery competency.

needs of the customer, the ability to engineer high quality products, the ability to successfully transfer experimental manufacturing techniques into mass production, and a culture obsessed with quality at all costs.

In the homebuilding industry, the majority of the product innovation occurs in one of two areas; new products and materials, or new and more efficient homebuilding processes. Suppliers are always searching for alternative technologies and materials that provide their product with superior performance or lower cost. For example, Marvin, a large window and door slab manufacturer, sells a line of technically advanced windows that offer the beauty of stainable wood on the interior, and the durability of pre-finished aluminum cladding on the exterior. Likewise, Masonite, one of the leading door slab producers, offers a full line of fiberglass exterior doors that are virtually indistinguishable from real wood. In the traditional (i.e. not manufactured) homebuilding market, advances in materials and technology tend to come from suppliers rather than from materials distribution companies or the homebuilders themselves.

Homebuilders, however, are often responsible for advances in the homebuilding process in the form of efficiency improvements. The recent success of SelectBuild provides an example of homebuilders experimenting with new operational methodologies and business models in an attempt to improve the cost and quality of the final product.

As a materials distributor, it is very difficult for BMC West to create its own core competencies around either of the two innovation areas discussed above. The company lacks large scale product development resources and therefore cannot immediately compete with window and door slab suppliers; any attempt to keep pace with the flood of new products coming from these suppliers would be futile at best. Furthermore, the company simply supplies materials to the jobsite and therefore does not exert much influence on the homebuilding process, and does not immediately benefit from wringing out efficiency gains. In short, BMC West is stuck in the middle of the value chain without the power or resources necessary to bring innovation to the market. It would be unwise to attempt to directly compete on innovation with either of the other layers in the supply chain.

### 4.5.1. Competency in New Product Introduction

At the same time, BMC West's position in the value chain does put it in the unique position to create a core competency in introducing newly released products to the market. The majority of BMC West's competitors (like BMC West themselves) have very rigid catalogs of products, and limited ability to introduce new products to customers outside of printed marketing material and expensive showrooms.

Large customers frequently demand that BMC West warehouses begin stocking a particular line of products. The location may start carrying the product, but the smaller, higher margin customers have no way of knowing that the product is available. A *new product introduction* competency allows for the rapid introduction of new product offerings to the full range of customers. Building this competency would likely require an adaptable electronic catalog system that allows salespeople to effectively inform smaller customers of new offerings. The catalog could have some built-in capabilities for order entry or customer relationship management. Furthermore, an efficient system might also include lean purchasing and inventory systems on the back end that allow customers to very quickly change the product mix they offer, resulting in a corresponding change in BMC West's stocking decisions and inventory levels.

In addition, each new product offering requires new manufacturing setups, new procurement relationships, new part numbers, and a host of other internal processes that slow its release to customers. A new product introduction competency would also streamline the product development and release process. The introduction of multipoint locks illustrates how BMC West could derive benefit from this competency. Multipoint locks are a new alternative to the traditional deadbolt on exterior doors. They have a set of three or more locking mechanisms, spaced evenly along the door, and are actuated by a single knob. The product is far superior to the old technology, and some builders have said that they could be selling nothing but multipoint locks at this point[27]. The production manager at Lonestar has worked for months with lock suppliers, machinery

[27] From a conversation with the Production Manager for Lonestar Millwork in Houston, Tx.

vendors, and door slab suppliers in an effort to offer this new product. Unfortunately, it is still stuck in the development phase because the production manager has numerous responsibilities and cannot dedicate large amounts of time to this project, nor is there standard machinery yet that can accommodate multipoint locks. Worse yet, he is working in complete isolation and may be duplicating work occurring at other locations throughout the company. The corporation as a whole does not currently possess any capability that would aid in the quick delivery of this new product to market. If such a capability existed, BMC West could establish a reputation for offering new products to their customers before the competition.

A new product introduction competency would allow BMC West to respond to changing customer needs with a speed and efficiency that is difficult to recreate. Developing the competency may require the formation of a team dedicated to evaluating, testing, and integrating new products. It might also include an internal process by which local business managers and salespeople are educated about new product offerings from major suppliers. It could also include an easily updated electronic visual catalog that is available to salespeople on tablet PCs in the field, so customers could easily be shown the benefits and costs of switching to new products. Ultimately it requires a concerted cultural commitment from the organization to being the first to offer the latest product advances to the customer.

## 4.6. Information System Capabilities

An organization's capabilities are the routines its members use, in combination with resources, to accomplish specific tasks or goals. Capabilities are the building blocks that when combined in unique ways create and support the core competencies in a company.

The Core Competency Model identifies four capabilities that the Information Services group should possess in order to fully support the core competencies of the organization. *Planning Sophistication* speaks to an ability to identify business priorities and deploy resources in the most efficient way possible to achieve strategic objectives. This

capability is critical in aligning the IS group's activities with business priorities[28]. *Systems Development Capability* is the ability to effectively and efficiently deliver IT projects on time and within budget. This capability is critical to building trust and commitment between the IS group and the firm's business units. *Support Maturity* ensures that the systems that are developed are properly utilized by end users. Help desks and training materials fall into this category. *Operations Capability* refers to the ability to provide a continuity of basic business operations to both internal and external IS customers. A competency in this area implies that the organization's software and hardware is reliable and secure[29].

These four capabilities form the basic framework for thinking about IS delivery and IT investment. It is possible that other capabilities also exist that would assist in capturing value from IT investment. Specific industries, corporate structures, or company cultures may influence the selection and prioritization of capabilities. As BMHC critiques their own capabilities in these four areas, the company should also make an effort to identify any additional capabilities that should be added to the list.

To be truly beneficial to the organization, capabilities must support the core competencies of the company. R&L show that simply possessing the above key capabilities is positively correlated to the IS group's support of core competencies. For practical and strategic planning purposes, however, a simple correlation is not enough. Attention should be given to both to the degree of capability the organization possesses, *and* the degree to which that capability ends up supporting the agreed upon core competencies. In reality, the organization must ask both questions.

It is interesting to note that the four capabilities identified by the Core Competency Model (Planning, Development, Support, and Operation) form a continuum that spans the

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[28] Ravichandran and Lertwongsatien, 245.

[29] As an example illustrating the four key capabilities, imagine the implementation of a corporate email system. Identifying an appropriate email server product that will meet the business's needs requires the Planning Sophistication capability. Quickly implementing the email system requires a Systems Development Capability. Training on the new system and services to reset passwords and solve other customer problems requires Support Maturity. Finally, maintaining a high level of software availability requires an ongoing Operations Capability.

range from the beginning of an IT project cycle to the end. Likewise, the capabilities cover the broad spectrum from strategic planning to tactical operation. The figure below illustrates this concept.

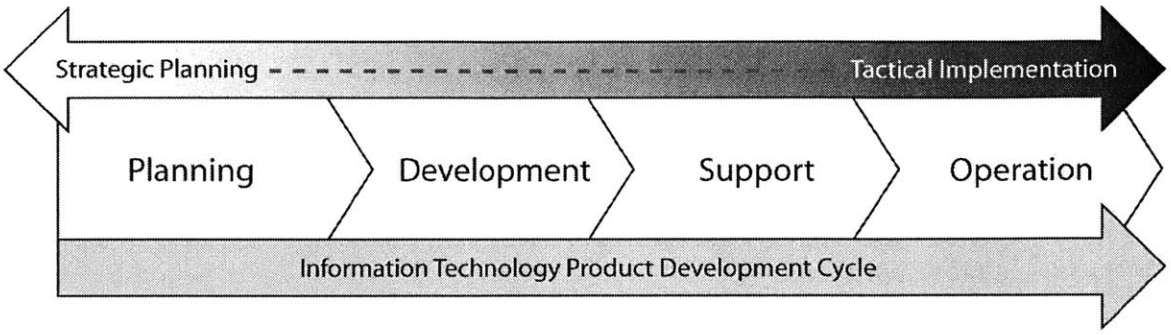


**Figure 5: The Four IT Capabilities**

It is very difficult to say conclusively whether or not a company possesses a given capability. Because they are not tangible assets, it is impossible to point to something specific and quantifiable to prove its existence. Therefore, when analyzing the capabilities of an organization, one must instead look for evidence of the exploitation of the capability to produce an intended outcome. In this section, I point to some specific events that illustrate the degree to which BMHC's IS department has succeeded or failed in deploying each capability identified in the Core Competency Model.

### 4.6.1. Planning Sophistication

*Planning sophistication* is defined as the IS group's ability to identify and consolidate the priorities of business units and other stakeholders in the organization. Furthermore, it speaks to the ability of the organization to select those projects that will add the most value to the corporation as a whole and deploy resources accordingly in an efficient manner.

The first example concerns one of the projects with which I was involved, the Imigit document imaging implementation. In March of 2006, BMC West acquired Home Lumber and Millwork, and the new locations were put under the management of the Houston region. One of the benefits of the acquisition was the fact that Home had a

document imaging system and process that virtually eliminated the archiving of paperwork from the office. By contrast, Lonestar Millwork had no such digital document imaging solution. If all the paper generated *daily* in the warehouse was stacked, it would likely reach six to eight feet.

Houston leadership saw the value in this document imaging system, and as soon as the two millwork locations were using the same MRP system, they began the process of converting Lonestar to the document imaging software. To do this, of course, resources were requested from the IS group, and a project manager was assigned.

What is interesting from a planning sophistication standpoint is that the corporate IS group already had a document imaging solution using a different, and relatively superior piece of software. Despite having this solution, for whatever reason, they lacked the resources necessary to deploy it in Houston. By demanding that Imigit be installed immediately, Houston leadership tied up valuable resources duplicating a solution that already existed. There may be many reasons for this series of events. Politically, Houston is very powerful because it is one of the largest and most profitable millwork locations in the organization. Practically, it was very important to implement a document imaging solution in Houston, and given the situation at the time, it was probably the right thing to do. Regardless of the reason, the decision and the resulting resource allocation was not planned, rather it was born of the political and tactical realities that existed at the time. In short, it was a reaction.

Likewise, on several occasions I saw the IS group reacting in a similar manner to the requests of the business units. Toward the end of the internship, for instance, we decided to undertake a project to implement the automatic generation of bar codes using the MRP software. This would entirely automate the existing manual process that occupied a very experienced employee for more than an hour every day. Initially this seemed to be a simple change, but after further research it became obvious that it would require the assistance of the group that oversaw the Bills of Materials in the MRP system. The leader of that group already had a very good rapport with Houston management, and was more than willing to have his team work with us to implement the solution.

What was surprising from a planning sophistication standpoint was that the team leader had almost absolute control over the projects his team worked on. In strategy literature, there is a classic tradeoff between an organization's entrepreneurial energy and the coordination of the various constituents. A sophisticated planning capability in the IS group would seem to necessitate a high degree of coordination. It is not clear that entrepreneurial energy is a desirable quality in the IT implementation teams. The fact that this particular team had such autonomy implies that it came at the expense of organizational coordination, and thus planning sophistication.

### 4.6.2. Development Capability

*Development Capability* is defined as the ability to effectively and efficiently deliver IT projects on time and within budget. There are many indications that BMHC's IS group possesses, or is in the process of developing, a strong development capability. At the same time, there are some indications that the group still has major hurdles to overcome. One of the most promising signs that the group is pursuing a development capability is that the group has created a structured software development methodology, referred to within the company as the Solution Delivery Methodology, or SDM process. More importantly, the company seems to be using this process with success and improving it with experience.

To deliver IT projects that meet the needs of the internal customer, known in the SDM as the client, the IS group must have an understanding of the priorities and goals of the business unit. As I will discuss in the resource section, the best way to achieve this understanding is to build strong relationships with the business units. To this end, BMHC created the role of the Business Systems Manager, or BSM. BMHC's SDM documentation defines the roles and responsibilities in the following way:

> The BSM…
>
> - Requests and guides projects
> - Insures client decision making
> - Identifies project objectives
> - Helps define business requirements
> - Approves SDM deliverables

- Receives status reports
- Is involved with changes to requirements, cost, schedule
- Ensures communication with Business Sponsor (Client)
- May function as a companion "Project Manager"

The BSM's day to day job is to develop relationships with the business units, and guide them through the process of identifying priorities, clarifying requirements, and requesting resources from the corporate IS department. The BSM's job is to function as an advocate for the needs of the business unit, as well as to communicate the broader corporate priorities back to the client. In many ways, the BSM's role is half project manager, half politician.

The BSM role, if supported and empowered by leadership and given to the right person, is a very powerful way to create alignment between the business unit goals and the actions taken by the corporate IS department. The fact that IS leadership has recognized the need for this role bodes very well for the cultivation of a development capability. In reality, however, the BSM role on the BMC West side of the business is being underutilized and is for the most part ineffective. I found this to be true when I began working on my first project during the internship. After developing the documentation and requirements for the project, I submitted a request to the IS department. At no time did anyone in the local organization instruct me to call upon the BSM to help navigate the process. Furthermore, as I made my request, no one in the corporate IS group referred me to the BSM either. Only much later did I learn that in theory it would have been better to work with the BSM. Although the position exists, it is almost completely ignored and dismissed by the organization. Despite corporate leadership's strong belief in the value of the BSM role, it has been very slow to rectify the situation.

Another key example illustrating the gap between the current state and the preferred state of development capability is the Warehouse Management System (WMS) project in Houston. While the company is sufficiently competitive in the millwork industry, the operational processes used to drive manufacturing are a decade old at best. Paper based work orders track the progress of each order through the production system. Production scheduling is significantly limited, if not impossible, as all orders are printed to hard copy

and placed in an unsorted stack reaching eight to twelve inches daily. What's more, a small number of orders simply vanish from the system on a daily basis because their paperwork is lost or misplaced.

The WMS project was initiated by Houston's regional management in the third quarter of 2006 with the hiring of a project manager with expertise in the installation of the proposed system. The project quickly reached high priority within the company, and is currently the third project listed on the BMC West IT dashboard. The original go-live date for this project was March of 2007. As of April 2007, the project is stalled at the beginning phases. The project is so far behind, for example, that one of the first milestones, the installation of wireless network hardware necessary to implement bar coding on the shop floor, is now scheduled for installation in early April, a full month after the project was originally supposed to finish[30]. Examples like this illustrate that, despite the existence of very detailed and promising development methodologies and roles like the BSM, the company has a long way to go to achieve their development capability goals.

### 4.6.3. Support Maturity

*Support Maturity* ensures that IT systems are properly utilized by end users. A mature support system includes documentation, training materials, help desks, and online Frequently Asked Questions (FAQ) pages. A key aspect of support maturity is user awareness. Users should know where to go to get help, and should be satisfied with the service they receive.

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[30] After writing this section, a conversation with a key executive provided more information on the delays in the implementation of the WMS. Much of the delay may have come from the Houston business unit's desire to focus on the integration of the new Home Lumber and Home Millwork locations. In addition, BMHC's IS group received incorrect information from the WMS software vendor at the beginning of the project indicating that the current version of the MRP would be compatible. In fact, the MRP upgrade, scheduled to begin in late 2006, was required for the WMS to operate properly. The MRP upgrade was completed in April of 2007 and the WMS project is now fully underway. In addition, the BSM roll and associated processes have been refined in an effort to more effectively capture the potential benefits of BSM involvement in business unit requests.

One sign that BMHC is making strides toward support maturity is the presence of a highly responsive help desk staff. I used the help desk on several occasions to fix computer connection issues or request access to reports in the MRP system. The staff was always helpful and polite.

On the other hand, there is some confusion about the role of the help desk in responding to requests from local users. Many business unit locations have an on-site IS representative. This person manages the local network and serves as the liaison between the corporate IS group and the business unit on software and hardware issues. Typically a user will go to this representative with questions and problems.

The corporate IS department, however, has the explicit goal of encouraging users to contact the help desk directly with IT requests. Unfortunately, the underlying help desk processes fail to align with this goal. On one occasion, I created a "help ticket" to request access to a report in the MRP system. The requested report was not particularly sensitive; rather it was simply deactivated in my account. The help desk software forwarded my request to a corporate representative, who had no way of knowing if I had the authority to view the report. The representative then forwarded the ticket to the junior of the two local IS representatives in Houston. The junior IS rep asked me what I needed it for, but did not know if he had the authority to approve the request, so he in turn forwarded it to the more senior IS rep in Houston. The senior IS rep repeated the conversation with me concerning the purpose of the report. He was ready to authorize the access, but was unable to do so himself because local representatives do not have the ability to modify user settings. Instead he contacted the corporate help desk representative with the proper authorization, and only then was the corporate help desk able to give me access to the report. The following diagram illustrates the transaction.

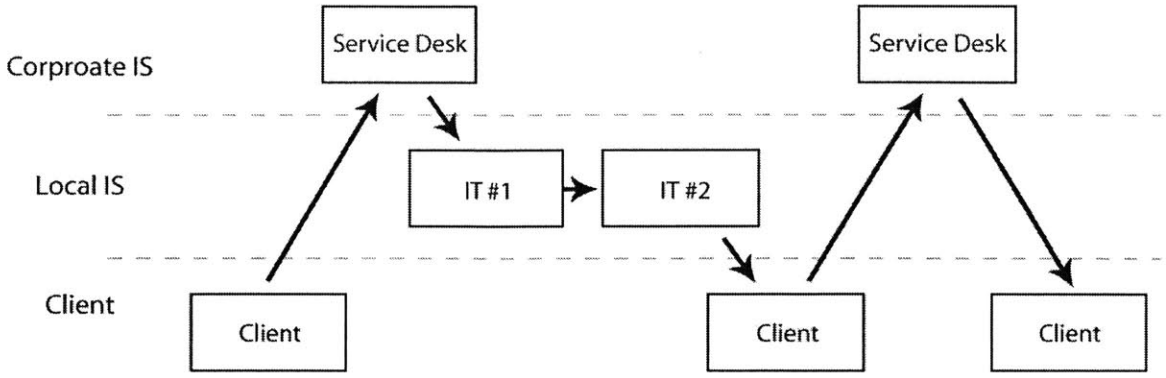


**Figure 6: Requesting new access from the Help Desk**

The inefficiency in this situation resulted from the structure of the system, and not from the lack of effort by any one person. Help desk requests are directly routed to the corporate level and therefore the local IS reps were unaware that a request had been made. Corporate level help desk personnel do not have the authority to approve changes to user accounts, yet they are the only ones with the actual ability to modify user settings. A far more usable system would look something like the following:

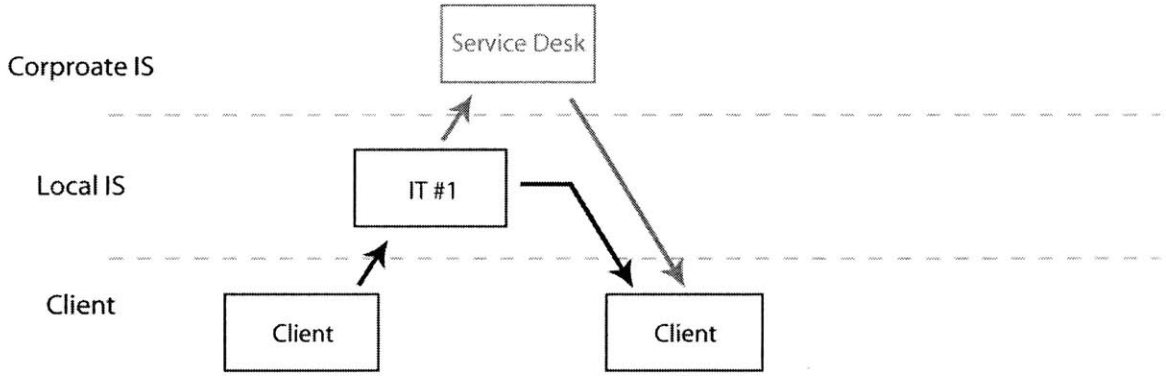


**Figure 7: A revised Help Desk workflow**

In this proposed system, help desk requests are routed first to the local IS rep. The IS rep then forwards to the corporate rep if necessary. Experienced local IS reps are given the authority and ability to make some changes to users accounts, but the more sensitive reports may only be activated by a corporate representative. In the event that a local IS rep does not have the appropriate level of experience to authorize a specific change to a

user account, he or she simply forwards the request to the corporate level. In this way a request is routed efficiently, minimizing the effort necessary to satisfy it.

The fact that BMHC has a functioning and competent help desk shows that corporate leadership understands the importance of support maturity. On the other hand, the continuing confusion over the purpose of the help desk, as well as the inefficiency of the help desk processes, indicates a need for the continued development of support capabilities.

BMHC's support capabilities would also benefit from improvements in software training. The MRP system is extremely complicated and requires users to memorize strings of letters to navigate to reports or data entry screens. For instance, from the main menu a user enters OEET to bring up the order entry screen. From that screen, each of the function keys (F1-F12) provides a different functionality, and additional functions are available by using combinations of keys. After six months at BMC West, I never became truly proficient at using the system. The only training available is a small book listing some of the more common commands. The vast majority of training occurs through conversations among coworkers.

Employee training on the shop floor and in the office is equally weak. Although this is the domain of the Human Resources organization, the IS group could help the situation by providing a means to create published training materials.

BMHC should be commended for setting up the infrastructure necessary to support the IT systems they develop. That being said, the company should recognize the need to develop and refine these support mechanisms in order to take full advantage of the technology they have.

### 4.6.4. Operations Capability

*Operations Capability* refers to the ability of the IS group to provide continuity of basic business operations to the IS clients. In other words, a capability in this area means that

email and web services are rarely interrupted, MRP and ERP systems have high levels of "up-time," and errors are recovered from quickly.

BMHC is already maturing their operations capability. Late last year, the company consolidated its servers in a hosting facility in Las Vegas, Nevada. The company is moving quickly to implement a single version of the MRP system across its business units. The IS group maintains strict hardware and security policies, and all software is kept current with frequent updates through networked management utilities.

There is, however, a company-wide apprehension about the eventual upgrade to the next version of the MPR software (SX.e). This upgrade will be either very expensive because of the hundreds of modifications that must be ported to the new version, or, very disruptive because underlying business processes will be forced to change if the company decides not to pay for the transfer of these modifications.

Other lumber and millwork operations use the same software, but do so within the bounds of the systems program, making only a few dozen modifications. It is the hundreds of modifications that make upgrading difficult and expensive. Moreover, at BMHC the modifications are made on the whims of individual business units, and thereby threaten the operations capability of the entire organization. To minimize this threat, BMHC should either find a new software vendor that better meets their needs, or shift the company culture away from constantly modifying software. The short term benefits of these modifications, i.e. the ability to avoid changing local business processes to work within the bounds of the software, must be weighed against the long term costs and large scale disruptions incurred by having hundreds of software modifications. By requiring that local business units adapt their processes to work within the capabilities of the software, BMHC will align local business processes with company best practices. In so doing, BMHC can avoid finding itself in the same position three years from now when it upgrades to the next version of SX.e, which would demonstrate a much stronger operational capability.

In short, operational capability is the fundamental capability necessary for the success of an IS department and its IT infrastructure. Without reliability in the infrastructure, all the strategic planning, careful and focused development, and quick and efficient support will not ensure the delivery of the necessary support to the core competencies within the organization.

## 4.7. Information System Resources

Resources are assets, both tangible and intangible, that a company owns and controls. The organization's resources and routines are the fundamental building blocks that, when combined in unique ways, form capabilities. Combinations of still more resources and capabilities form core competencies.

IS literature identifies three key resources necessary for the development of the Information Systems capabilities listed in the previous section. *Partnership Quality*, or the quality of the relationship between the IS group and business units and IT vendors, is critically important to the strategic alignment between the actions of the IS group and the goals of the organization. *IT Infrastructure Flexibility* enables a firm to deliver IT solutions quickly and efficiently. It enables data to flow to those who need it for management or process improvement purposes, and it allows new technologies to be added to the existing system without compromising system availability, reliability, or support. Underlying all other resources and capabilities, *Human Capital* encompasses the knowledge and experience of the personnel involved in IT projects. Professional and interpersonal skills, and deep technical and industry-specific skill are critical to the development of IS capabilities.

### 4.7.1. Partnership Quality

An organization is fundamentally a group of people whose individual relationships contribute to a prevailing culture that is characterized by unspoken assumptions, agreements, and expectations that govern the daily routines of the employees. These relationships, when open and positive, assist in the creation of sustained alignment between the corporate IS group's actions and the local business unit's objectives.

*Partnership quality* is a measure of the quality of the relationships between the IS group and the groups it interacts with, primarily the business units and the software/hardware vendors. These relationships represent stocks of goodwill that can be filled or depleted through ongoing interactions. During my internship, I had the opportunity to observe the internal relationships between BMC West's IS group and their local business units.

My observations over a six month period revealed that the relationships between BMC West's IS group and its individual business units vary a great deal depending on the degree to which the groups have worked together in the past. The managers I spoke to from business units outside the Houston region had either neutral or positive things to say about their relationship with IS, but they admittedly had very little experience actually working with the IS group. Management in Houston, however, has a more extensive history with corporate IS and had much more negative feelings toward the corporate IS group.

One source of bad feeling arose from Houston's experience with the corporate IS group when Lonestar Millwork converted to the SX.e MRP system. This was the first installation of the SX.e system within the company and, as with any completely new software package, there were many unforeseen problems and challenges. The changes to the system resulted in numerous orders shipping late, and even worse, the loss of several orders entirely, which was discovered only when customers called to check on the status of their order. For a year, management in the Houston region worked closely with customers to keep them with Lonestar, and fixed the bugs in the new order process one by one. In my conversations with Houston's management, they described how at the time they thought there was a very real chance the location would go out of business that year. Every single one of the managers admitted that he or she seriously considered leaving the company because there seemed to be no end in sight to their troubles.

This experience severely damaged the goodwill between BMC West's corporate IS department and the local Houston management. Further incidents in which the IS department failed to support the Houston business units added fuel to the fire. For example, during the conversion of Home Millwork to SX.e in June, the conversion team

informed the corporate IS team that the printing of bar codes on order paperwork was a necessary step for go-live. The IS group assured them it would not be a problem at all. As the week of go-live approached, the conversion team in Houston grew nervous because bar coding remained non-functional and the appropriate printers still had not been ordered. The already delayed go-live date had been set for a Friday; on Wednesday or Thursday of that week the corporate staff informed Houston that there was, in fact, a problem with bar coding and that several $4000 bar-code-capable printers would need to be ordered and delivered overnight to the location at Houston's expense. Although the go-live proceeded the following week with the new printers installed, this experience reinforced Houston management's belief in the incompetence of the corporate IS group.

I do not recount this story in an effort to deride the IS group for past mistakes, but rather to illustrate the dramatic difference that can be achieved when more effort is put on partnership quality. For example, the IS group was tremendously successful with the implementation of the Imigit document imaging software in Houston in September of 2006. The corporate IS group, located in Boise, assigned a project manager from the Boise team to lead the project. This project manager made a concerted effort to travel to Houston during the project and to over-communicate the status of the project and the responsibilities of everyone involved through emails, conference calls, physical meetings, and other project status documentation. The project manager worked very closely with a local champion and served as the point of contact in Boise for any problems. The project manager was given sufficient formal authority to correct problems as they arose. In short, the project went very smoothly, and the relationship between the IS group and Houston management was significantly strengthened through this experience.

Unfortunately, much of the animosity that still exists today between Houston and the corporate IS group in Boise has its roots in the stressful series of events surrounding the original SX.e conversion in Houston. Informal conversations with leaders at the corporate level indicate that Houston is not the only location with a strained relationship. Houston's experience with Imigit, however, shows that the relationship can be improved with effort, and moreover, that projects can run much more smoothly when that relationship is stronger and the communication is free flowing. Although it will be a

slow process, with each new interaction at the local level BMHC's IS group will be given the opportunity to strengthen the relationship with individual business units.

### 4.7.2. Infrastructure Flexibility

*Infrastructure flexibility* speaks to the ability of the IT infrastructure to move data and information to those who need it for management or process improvement purposes. It is also the ability to efficiently add new technologies to the hardware and software of the existing system without compromising system availability, reliability, or support. The most recent wisdom and research in strategy tells us that it is the corporations that are adaptable to the changing business climate, rather than those that simply possess depreciating resources, that have the strongest competitive advantage. Flexibility in the IT system is imperative to a company's ability to improve and reinvent themselves as the competitive landscape shifts.

BMHC has made great progress in the past three years on this front. Application and data servers were recently consolidated in Las Vegas in a reliable and secure data center. The network is very secure and strict policies prohibiting personal software and computers from the network are enforced. Software packages like Citrix and WebEx that allow for the quick implementation and distribution of training materials, software, and documentation are in place, even if not fully taken advantage of.

Executive leadership understands that the establishment of a strong IT foundation is one of the key resources necessary to build the capabilities and core competencies discussed above. The company is to be commended for their progress in this area.

### 4.7.3. Human Capital

Human capital is the stock of talent and experience that a company possesses. In the resource based view of the firm, an organization is, at its essence, defined by its people, routines, and resources. An individual person is typically not considered a resource because he or she is not owned or controlled by the corporation. For this reason, it may seem odd at first to think of human capital as a resource. Nevertheless, there is a subtle

distinction between an individual person and the resource of human capital. Human capital is the collective talent in a company. It is the tangible outcome of the corporation's capability to recruit, develop, and retain that talent. As a collective, it is basically "owned and controlled" by the company, even if individual employees are not. It is somewhat fragile, however, as the capability to retain talent can be quickly and severely undermined in an organization that fails to empower, respect, pay, or otherwise reward the talent that exists.

Human capital is critical to building and improving routines, capabilities, resources, and core competencies. It is the fundamental building block. Without the appropriate human capital, other resources like infrastructure flexibility and partnership quality are impossible to achieve in the long run.

BMHC has been growing very quickly over the past decade. As the amount and scope of work increase, the stock of human capital thins and the once strong capabilities to recruit and retain become strained. Growth, by definition, requires a constant influx of new human capital if it is to be sustained. Unfortunately, from a human capital standpoint, I am concerned that BMHC and BMC West have not been keeping up with the demands of their own growth.

The events around the recent hiring of a project manager exemplify my concerns. In the third quarter of 2006, the corporate IS group hired an experienced project manger to implement a warehouse management system (WMS) package. Corporate IS instructed the new manager start his project at the Houston location. This WMS is arguably the most important technological undertaking currently occurring at BMC West. The system lays the foundation for further process improvement steps that could easily knock double digit percentages off the cost of doing business in millworks like Lonestar. The implementation of this software combined with changing the culture around process improvement is the first fundamental step toward creating a true core competency, which in turn will afford BMC West a sustainable competitive advantage in millwork operations.

Management in the Houston region recognized WMS as a critical capability that the company should pursue and identified the project manager as someone who is highly qualified to develop that capability. Despite the importance of building an expertise in warehouse management, the hiring of this project manager was not aggressively pursued at the corporate level. Houston management confessed that at some point they seriously considered simply offering the project manager a job at the regional level, even though the region could not afford to retain his talent without spreading the cost over other locations, in an effort to get him on board as soon as possible.

When the project manager was finally hired at the corporate level, he was put in a position with no formal authority in the organization. The existing bureaucratic culture and the IS group's lack of accountability to the project made it very difficult for him to keep the project on schedule. In fact, the ongoing frustrations faced by the project manager are so apparent that Houston management has expressed its concern he may likely leave the company once the WMS is installed in Houston and his obligations to the Houston management, to whom he feels loyal, are fulfilled. This example shows that BMC West may not fully appreciate critical value of human capital in the setting of a rapidly growing company[31].

[31] There have been many changes at the company since my internship completed in mid December, 2006. The project manager responsible for WMS has been promoted to the position of Director of Inventory and Logistics and has been given the formal authority necessary to bring his project to successful completion. This and other personnel changes and new hires in the corporate IS group are very encouraging signs that BMHC management has identified and is acting on some of the deficiencies that previously existed in the area of human capital.

# 5. Conclusion and Recommendations

## 5.1. Overview

This thesis analyzes BMC West using The Core Competency Model, focusing specifically on how this model applies to the Information Systems group within the company. I have systematically gone through and highlighted the strengths of the IS group and, based on the model, pointed out areas in need of improvement. I believe the recommendations I make throughout this thesis are key to the continued success of the IS group.

At the same time, because the Information Services group exists to support the core competencies of the larger organization, it can only be successful if the organization as a whole understands what its core competencies are. Currently, those core competencies are not clearly communicated or agreed upon throughout the company. Many of the problems that exist today might very well be symptoms of the fact that different parts of the organization are moving in different directions. In the last few paragraphs of this document, I would like to discuss some of these larger issues that need to be addressed in order for improvements within the IS group to succeed.

Despite my access to company leadership, as an intern working in a single business unit my perspective of the corporation is essentially from the bottom up. Some of my conclusions may seem incorrect or uninformed when viewed from the other direction, i.e. from corporate leadership looking down. My sincere hope is that BMHC's leadership will consider these recommendations and understand their source. It is just as important to understand why someone from the bottom of the organization might come to these conclusions as it is to determine whether or not they are fully correct in their interpretation.

## 5.2. Create and Communicate a Vision for BMC West

During this internship, I had the opportunity to work with an extremely experienced group of people in one of the biggest and best millwork facilities in the company. The location's rising market share shows they clearly offer a compelling service to their customers. I was able to see first-hand the core competencies that Lonestar Millwork has successfully created over the years in Houston.

The completion of this thesis, however, prompted the question "What are *BMC West's* core competencies?" This question was much more difficult to answer. After a great deal of thought, I concluded that BMC West is not really doing *anything* at the corporate level that differentiates it from its competitors. Conversations with business unit leaders confirm that there are doubts as to the value the corporate structure delivers. Ultimately, BMC West does not seem to have a global vision for what it currently is or where it wants to take the lumber and building materials industry. Without a unifying vision, each business unit will continue to make decisions based on optimizing their local concerns without respect to the rest of the company, resulting in the loss of the organization's synergies.

The Core Competency Model introduced in this thesis is aimed at the Information Services group in Boise, but it relies on the organization as a whole identifying its core competencies, i.e. those skills and resources that differentiate BMC West from its competitors. Once the current and desired core competencies have been identified and communicated to all parts of the company, the entire organization can then focus its energy in the same direction and make decisions that move all parts of the company toward these goals. This shared vision would produce the organizational alignment necessary to make BMC West finally add up to more than the sum of its parts.

Thinking in terms of core competencies is only one of the many ways to approach corporate strategy. Ultimately, it is not important for BMC West to choose *this* particular approach. ***It is imperative, however, that the company figure out what it is good at, figure out what it wants to be good at, and communicates that message from the top of***

***the organization to the truck loaders on the docks of Lonestar Millwork.*** If the company fails to do this, a competitor will eventually rise that can, and BMC West will be at risk of losing everything it has gained.

## 5.3. Create an Operations Center of Excellence

The Information Services group at BMHC is in the process of building a sophisticated IT infrastructure. Development occurs in a centralized location (Boise, Idaho) and all modifications to the system are, in theory, regulated so as not to conflict with existing operations. Notwithstanding the exceptions I have presented, the duplication of efforts is minimized. Communications and planning are coordinated through a hierarchy of committees and the SDM process serves to unify the implementation of projects across the company.

By contrast, the operations organization is not well aligned. Every business unit has its own way of operating and that individuality is condoned or even supported, most notably by the IS group modifying the MRP at every impasse. Product development efforts are conducted at the local level without any real method of sharing the lessons learned. Innovative processes, software, or business models are stalled at the local level, and only shared through word of mouth with other parts of the organization. Occasionally an enterprising business unit leader might investigate further, but the infrastructure used to share capabilities is primitive.

BMHC has now taken its place as a Fortune 1000 company. Unfortunately, many of the underlying processes lag behind other companies of similar size. Large companies like BMHC often develop "operating systems" that guide and focus the decisions of business units. By drawing upon the wealth of experiences across the entire organization, BMHC can establish guidelines to help local managers with process improvement, making acquisitions, and developing products.

BMC West should create a center of excellence that serves as a focal point for the advances made in the company by the business units. It is very exciting, for instance, that Houston employees are developing the ability to sell multipoint locks. To derive the

most benefit from this experience, the Houston employees should be reporting to a product development group in Seattle that distributes the new technology to the other business units once it is developed. That same group could then analyze the opportunity and determine how much it is worth, potentially allowing the company as a whole to allocate more resources to the project than the employee at the Houston branch can justify to his or her management team.

In addition to product development, this center of excellence group could monitor and help distribute advances in process improvement, millwork machinery, installed services, and other relevant topics in the lumber and millwork business.

Most importantly, this entity would need to exert real political power within the organization. First, they would need to be the final word on operational issues at the local level. Business unit managers would need to acquiesce to this groups ruling on modifications to the suggested best practices, for instance. Second, the group would need to work with the IS group to mutually create a single vision for the technological direction of the company.

The operations group should follow the lead of the IS organization and create a headquarters in Seattle that truly leads the operations organization. Regional and business unit managers currently feel as much (if not more) "led" by the IS organization than they do by the leadership in Seattle. The new version of SX.e should be installed in Seattle first so leadership has a chance to use it and understand its benefits and limitations before converting the rest of the company. The Warehouse Management System may be installed first in Houston, but the installation should be led by the operations organization, not the IS group. The benefits of WMS are minimal without the reengineering of business processes, and the proposed Operations Center of Excellence should be framing that process.

Not all development must come from this location, but it can serve as the hub where information is collected and disseminated to the other locations. Currently, the operations organization is decentralized and most of the power in the company is shared

by the larger lumber and millwork regions. The centralization of the operations organization is critical to the development of capabilities and core competencies by the company.

## 5.4. Build a World Class Process Improvement Capability

The most important thing BMC West could do is to undertake a serious effort to create a process improvement capability within the organization. It is listed as my third recommendation only because the first two steps are necessary prerequisites for effectively accomplishing this third and vital one.

As students of business and operations, Leaders for Manufacturing Fellows are exposed to a wide array of industries and companies. We become very familiar with the operating principles of some of the worlds most preeminent companies. While each has unique industry forces, operating methodologies, business models, and leadership styles, there is one factor that is almost always present in the companies that dominate their respective industries; ***each of these companies has an almost religious dedication to their version of a process improvement method.***

Research shows that industries go through cycles of consolidation and disintegration[32]. The lumber and building materials industry is currently in the process of consolidation. In the past, small local or regional competitors simply lived with inefficiencies in their operations. In the new business climate, larger consolidated materials suppliers will bring their massive economies of scale to bear, wringing out those inefficiencies using process improvement methodologies to develop new processes and quickly disseminate them through the business. BMC West must begin developing this capability now, before other larger material suppliers succeed at doing the same. By the time a single dominant player becomes apparent, it will be too late to play catch up.

BMC West's current answer to this problem is to create a best practices committee. Unfortunately, the majority of the committee members feel they are completely

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[32] Fine.

ineffectual due to the pro-business-unit political climate the company has perpetuated. Furthermore, none of the company's locations are currently operating at an obviously higher level of efficiency, so it is very difficult to sell a new system to a business unit manager that believes he or she is doing a decent job already.

Instead, BMC West should use its Operations Center of Excellence to create a process improvement methodology and a model location that shows the substantial efficiencies that can be gained by adopting the process. An internal group needs to be developed that not only has the ability to improve processes, but has the entrepreneurial drive necessary to go to locations and teach the process to them as well. By creating visibility around this group, picking the right incentives for plant managers that align their motivations behind process improvement, and adapting IT to fit with the process improvement solutions, local leadership will end up fighting for who gets the process improvement team's attention next. To truly create best practices in the organization, leadership must create a cultural pull from the bottom up rather than attempting to force it from the top down.

## 5.5. Create Synergies or Sell BMC West

After spending six months working with BMC West, it is apparent that corporate resources are being stretched in opposing directions by the two halves of the business, BMC West and SelectBuild. BMC West is a traditional, commoditized building material supplier whose margins are thin and whose competition is fierce. The corporation has essentially stopped investing in BMC West's growth, focusing instead on the other half of the business. SelectBuild, on the other hand, represents an exciting new business model in residential construction. It is growing quickly through acquisitions, and commands much of the corporate management's attention and energy.

In Information Technology, BMC West is focused on creating rigid and robust MRP software that will satisfy the needs of the very mature millwork and lumber business. By contrast, SelectBuild requires a fast and flexible IT infrastructure led by an IS group that is willing to take the risks necessary to create applications for an entirely new industry and business model. The two cultures and goals are fundamentally different, and

arguably incompatible. It is unfair to BMC West that the IS resources are busy delivering the latest and greatest products to the company's golden child, and it is unfair to SelectBuild to burden the company with the infrastructural weight of a large, slow materials business.

In his book, The Innovators Dilemma, Clayton Christensen describes in detail the way new "disruptive" technologies or business processes end up dominating an industry[33]. He points out that traditional incumbents are often powerless to stop the industry shift because sound business decisions that lead to higher profit margins end up propelling the shift in the market and sealing the eventual fate of the incumbent.

One day, strategy theorists may look back at SelectBuild's business model and recognize it as a disruption in the industry. The company is currently working with the large homebuilders and offering them a service that promises to take over some of their most complicated and least profitable business, the homebuilding itself. Over time, however, SelectBuild may be able to take more and more of this business until the company is asking itself, "Why aren't we just buying land and building our own houses on it?" At that point, homebuilders will have been divorced from the actual building process for so long that they are incapable of stopping the shift in the market.

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[33] The US steel industry offers a perfect example of a disruptive technology. Traditional steel mill technology consisted of massive, dirty, coal fired forges. Mini-mill technology promised a small, comparatively clean, electric arc fired solution. Mini-mills were cheaper to operate and required less capital to build, however, the steel they produced was of poor quality. The rebar used for concrete construction was the only product they could feasibly manufacture. Traditional steel mills, on the other hand, hated the rebar business. Margins were slim and steel quality, the metric traditional mills competed on, was unimportant. Mini-mills quickly established themselves as niche players making rebar. Traditional mills happily relinquished the business as it allowed them to focus on higher margin business. Unfortunately for traditional mills, mini-mills used the rebar business to move along the learning curve and were eventually able to make slightly higher quality steel for use in steel plate. Steel plate had become the worst performing product line for traditional mills, and again they happily relinquished the business. This process continued until mini-mills completely dominated the US steel industry, and traditional plants were put out of business. None of the traditional steel manufacturers were able to make the leap to mini-mill technology. By the time the incumbents knew what was happening, it was too late; mini-mills were too far down the cost-learning curve and traditional mills could not catch up.

One of the most interesting aspects of disruptive technologies is the fact that traditional incumbents are rarely able to make the jump to the new business model. The metrics and technology they compete on are simply not applicable in the new business climate. By maintaining BMC West, the corporation is forced to become schizophrenic. Decisions that are good for BMC West may not be good for SelectBuild and vice versa. One company represents the traditional homebuilding model and the other represents the future. BMC West slows SelectBuild's growth and maneuverability and jeopardizes its potential to truly disrupt the traditional homebuilding industry.

I do believe there are significant synergies to be captured in the combination of the two sides of the business. At this point, however, those synergies are completely non-existent. The markets in which BMC West competes successfully could serve as jumping off points for SelectBuild. Houston, for instance, installs exterior doors for some of its clients using a third party installer. SelectBuild could take over this installation business with a small group of people and use it to build a bigger business in the area. SelectBuild has duplicated resources and built its own set of lumberyards on the west coast because the two companies have failed to effectively work together. In fact, it very well may be that the difficulties faced by BMHC in getting the two sides of the business to cooperate is simply evidence of the typical friction experienced by incumbent companies trying to pioneer disruptive technologies. At this point, corporate leadership has made the decision to let the two companies drift further apart rather than forcing them to build synergies together.

As difficult as it would be for the organization, my final recommendation is that BMHC seriously consider the degree to which they are capturing value from the possession of both BMC West and SelectBuild. There is no doubt that the combination of integrated labor and efficient materials logistics could prove unbeatable in the homebuilding industry. Unfortunately, the corporation has simply failed to realize any of those potential synergies. The relationship between the two sides of the business is getting more distant, not closer as time goes on. The sharing of resources between the two companies is unfair to both, and truly holds each back in its own way. If BMHC cannot take immediate and concrete steps toward capturing value from the combination of the

two companies, I would suggest that leadership considers selling the lumber and building materials side of the business. Some of the better locations could be sold to SelectBuild as entry points into new markets, and the rest to an outside interest. The cash gained from the sale could be used to further grow in the area of integrated labor to national homebuilders, or to develop a more complete and integrated materials delivery infrastructure under SelectBuild management. By taking this drastic step, the corporation as a whole would be more free to define its core competencies from the top to the bottom, rather than trying to operate in two distinct marketplaces, one traditional and one disruptive.

## 5.6. Conclusion

The suggestions above are outside of the scope and control of the Information Services group. However, I take it as a given that the role of the IS group is to support the core competencies of the organization. Currently, the definition of the greater organization's core competencies remains unarticulated at the local level. The result is a company where strategic decisions at the top are resisted and misunderstood at the bottom and support groups like IS are stuck in the middle serving multiple stakeholders with disparate goals. I believe that the Information Services group can only become world class if it is supporting a company with a clearly defined mission and vision in its market. The suggestions above are intended to help solve this more fundamental issue that will necessarily limit IS group's ability to improve.

# 6. Appendix – Millwork Technology and Processes

## 6.1. *Millwork Terminology*

This section defines some common terms in the millwork business.

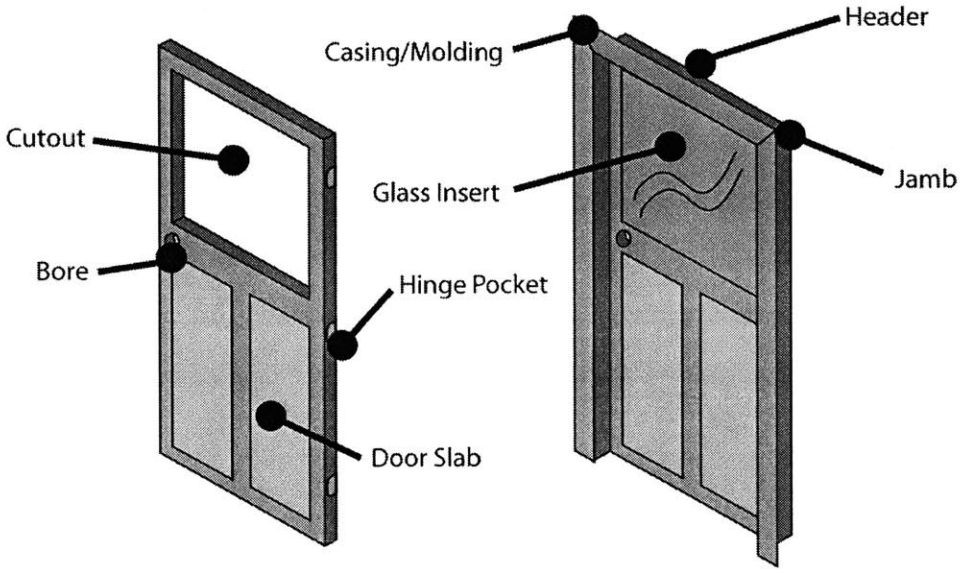



**Figure 8: Door terminology**

**Bore** – A bore is the hole on a door panel where a doorknob is installed. Doors are often sold as single or double bore, denoting the presence of one or two holes. A double bore door traditionally would be installed with a doorknob and a deadbolt.

**Cutout** – On an exterior door, and less frequently on an interior door, a window is installed in the door. The cutout is the hole in the door panel that accommodates the window. The window is referred to as an Insert.

**Jamb** – A door jamb is the frame around a door that the hinges attach to, and the door latching mechanism mates with. Pre-hung doors are installed in frames of differing jamb widths.

**Panel** – A panel can refer to two items. A door panel is the raw door, without a frame, before it is "hung". A panel can also refer to an inset rectangle of wood, normally used

for decoration, on a doors surface. For instance, a door might be called a "six panel" if it has six decorative rectangles on its surface.

**Slab** – Slab is another word for a door without a frame.

**Molding or Casing** – Molding and casing are used interchangeably to refer to the decorative trim that surrounds a door, window, or other architectural feature.

**Sill** – A sill is the bottom of a door frame, particularly on an exterior door. Often they are aluminum and incorporate a strip flexible rubber, called a sweep, to keep air and debris from blowing under the door.

**Insert** – See cutout.

**Transom** – A transom is a rectangular frame that sits on top of a door frame. Often a transom will have glass in it. Older buildings often incorporated hinged transoms that could be opened to allow air flow when the door is closed.

**Sidelight** – A sidelight is a frame on one side or the other of a door frame. Often a sidelight will contain decorative glass.

## 6.2. Door Assembly

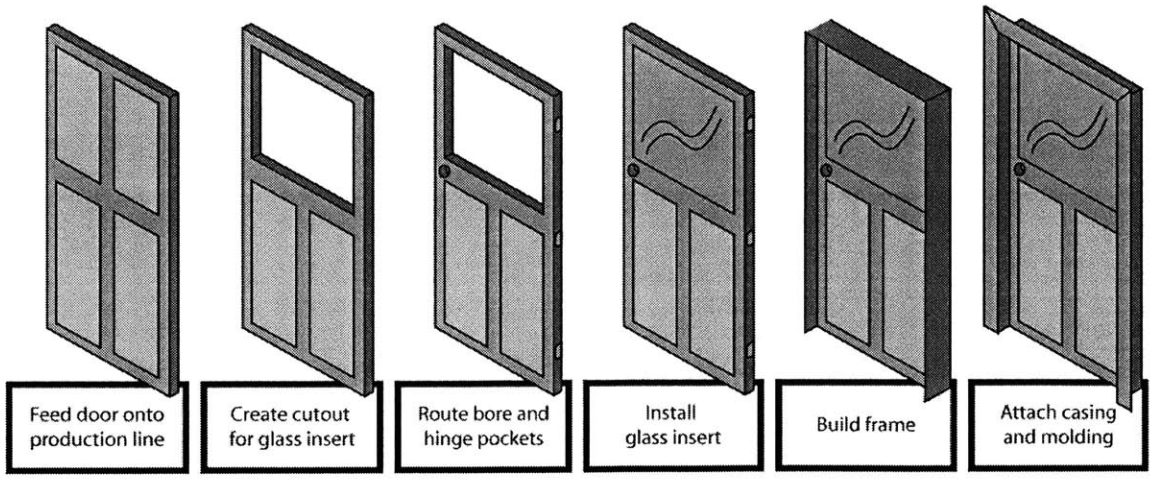



**Figure 9: The pre-hung door assembly process**

The production process by which door panels are converted into pre-hung door units is shown in the figure above. In a production facility the size of Lonestar Millwork in Houston, these steps occur on a manually paced assembly line using automated door assembly equipment. The following description is for a metal or fiberglass exterior unit, however, the basic process is the same for other types of door units.

Before production begins, door slabs are grouped by order and stacked on wheeled dollies or *buggies* up to 35 units high. The buggy is brought to the *Door Handler/Feeder* machine. The Door Handler/Feeder automatically picks door slabs off the stack and places them on the main conveyer for assembly. When the current stack of door slabs is exhausted, a new buggy is wheeled into position.

After a door is placed on the conveyer, it is moved to a machine called the *Door-Light Router*. This machine cuts a rectangular hole in the door for a pre assembled glass window insert. After the door-light is cut out, two workers install the glass window insert.

The slab then moves to the *Hinge Router* where the *bores* and *hinge pockets* in both the door slab and the *hinge-side jamb* are routed. Various locations have different levels of automation, but in Houston's case, all three or four hinge pockets are routed simultaneously and the operator follows with a screw machine, called a *six-shooter* or *eight-shooter*, that attaches the hinges by simultaneously inserting six or eight self-drilling screws. Hinges can be installed in approximately three seconds per hinge.

After the hinges are attached, the slab moves to a *Frame Assembler*. The operators insert the *lock-side jamb*, *header*, and *sill*, and the Frame Assembler clamps the doorframe in place. The operators verify that all jambs are aligned and the machine uses air-actuated staple guns to finish the jamb assembly.

After the jamb is assembled, the door rolls to its final step. Casing and brick mold are attached to one side of the frame, while the casing for the other side of the frame is bound together and stapled to the side of the frame. The door is then lifted to its upright

position using a lifting table, and is moved to a *door buggy* waiting nearby. When the door buggy is full, it is put in a storage location until its doors are selected for delivery.

## 6.3. Millwork Order Processing

The following section describes the order entry, order processing, production, and shipping of millwork products at the Lonestar Millwork and Home Millwork in Houston, Texas. Many of the procedures would be similar in other locations with minor variations.

Orders fall into two categories: assembled items and stock items. Assembled goods are pre-hung doors, mantels, windows, or any other items that are built or assembled to order on the production floor. Stock goods are those that are simply pulled from inventory for shipment to a customer. Stock goods included pre-built columns, standard molding, and retractable attic stairs. Some stock goods like molding are produced on the shop floor, but are built to stock rather than being built to order. The process for stock items is very similar to that of assembled items. The following description applies to both categories of products and any deviations between the two are noted. Furthermore, this is a description of the process before the document imaging software was introduced.

Each order starts with a salesperson. For a typical new construction project, the salesperson creates a *walk sheet* that describes the number and types of doors included in the project. The salesperson may be able to look at the blueprints to ascertain this information, but they will often also visit the house being built to verify that the blueprints match the physical structure. For instance, in the world of production homebuilding, a blueprint can have a *left hand* or *right hand* version, one being the mirror image of the other. The builder will sometimes specify the wrong version in error, thereby flipping each interior door from a left-hand to a right-hand opening unit, and vice versa. Although it may vary by region, the walking of the construction site to verify the accuracy of the order is part of the service provided by millwork suppliers in Houston.

Each outside salesperson is teamed with an inside salesperson and the walk sheet serves as the communication medium between the two. Outside salespeople are responsible for communicating with the customer, while inside salespeople are responsible for entering

orders and monitoring their progress through production. When the inside salesperson receives the walk sheet and the purchase order for the sale, they enter the order into the production system and give it a *ship date*, i.e. the date on which the order is scheduled for delivery.

The vast majority of orders are entered with the soonest possible ship date. In BMC West's Houston Millworks, this is four days after the order is entered. In theory, if an order is entered on a Monday, the paperwork is processed on Tuesday, the doors are assembled on Wednesday, and the order is shipped to the customer on the fourth day, Thursday.

Upon entering the order into the MRP, an *order acknowledgement* is created and printed. The order acknowledgement serves as the only indication that the order is to be processed. At this point, if the order acknowledgement were to be misplaced or lost, the order would likely go unnoticed until a customer called to complain. For assembled items, the acknowledgement is then sent to the next department, *trafficking*, to be processed for production.

The trafficking department regulates and processes the flow of paperwork onto the production floor. Each day at the 2:00pm order cutoff, trafficking collects all the order acknowledgements generated by the inside sales force and processes them for use in production. For each order, several *work orders* are printed, one for each physical production line required to fulfill the order. The order acknowledgement is then stored in a day file to record the order's presence on the shop floor. At the same time the work orders print, another smaller label printer generates a label for each door on the work order. This *jamb label* will eventually be attached to the door jamb of the finished product and will provide identification for the material pullers, truck drivers, and customers. One of the production lines, the metal and fiberglass exterior door line, is more automated and requires a bar code describing the operations to be completed on the door. This barcode is generated manually using a separate Microsoft Access application. Barcodes, jamb labels, and work orders are assembled into a pack and placed in the production supervisor's desk.

Before beginning production on a given day, the supervisor quickly looks through the pending orders to identify any special or complex orders that need particular attention. In addition, the supervisor will sometimes override the default decision made by the production scheduling system as to which production line will be used for a given order. In this case, the order must be removed from the stack and inserted into a different stack.

Work orders are then sent to the production floor where the corresponding doors are assembled and stored according to the process described in section 6.2 on door assembly. Each work order is marked with the storage location of the doors and the work orders are returned to trafficking for delivery scheduling.

Back in trafficking, the work orders are filed with the order acknowledgement. When all work orders for a given sale are returned and completed, the acknowledgement is pulled and a *pick ticket* generated for the order. Pick tickets are printed in the trafficking office on five part carbon copied paper and are picked up by the shipping department at various times during the day.

In the *shipping office*, pick tickets are separated into three stacks. The green copy, or *green* as it is known, goes to the door pullers. The *white* goes to the molding pullers. The remaining copies go to the driver who gives one copy to the customer, and returns the remaining copies to the shipping office where they are routed to the accounts receivable department. The shipping office enters each order into yet another Microsoft Access database that tracks truck routes or *dispatches*. Each shipped order has a record in the dispatch database indicating the route and stop number, the driver, the truck number, and other relevant information.

In accounts receivable, each order is recorded in the MRP system as having been shipped successfully. Each night, an automated routine prints an invoice for each shipped order. In the morning, each invoice in the stack is matched up to the original purchase order, and if necessary, the signed copy of the pick ticket that was used to deliver the order. This stack is then folded and put in an envelope for delivery to the customer. Payment is tracked using the MRP system and various aging reports.

# 7. Appendix – Shortest Point Shipping

## 7.1. Overview

In March of 2006, BMC West acquired Home Lumber and Home Millwork in Rosenberg, Texas, and put them under the management of the Houston region. Rosenberg is a small town about 35 miles southwest of downtown Houston. With the acquisition, BMC West entered the lumber distribution business in Houston. While this was the primary driver behind the acquisition, Home's small millwork also provided BMC West with additional capacity in a location well suited to serve the southwest corner of Houston.

The Home acquisition added three distinct locations to the Houston region: The Home Millwork, Home Lumber, and the Home Lumber Retail Store. The Home Millwork was a small production millwork facility that was supplying about $1/20^{th}$ of Lonestar's volume at the time of purchase. Home Lumber was an established lumber facility that provided the bulk of Home's revenue. Finally, the Home Lumber Retail Store was a small retail lumber and hardware store in downtown Rosenberg. Figure 10 below shows the locations of both Lonestar Millwork and Home Millwork in relation to the city of Houston.

After the merging of the two millwork locations, BMC West had two independent facilities, each with its own set of customers spread throughout the greater Houston area. When my internship started in June, each millwork location would routinely dispatch delivery trucks to addresses within one or two miles of the other location. Trucks from one location could be seen driving past the other location on a daily basis. Management wanted to optimize the manufacturing and shipping of orders so they would originate from the location closest to the delivery address. This project was called Shortest Point Shipping.

The following goals were identified for the Shortest Point Shipping project:

**Optimized Outbound Logistics** – Although the two millwork facilities shared the same software by the end of June, there were no processes in place for one location to enter orders into the other warehouse's production system. As a result, orders for a specific customer were shipped from the same warehouse their outside salesperson reported to, regardless of delivery address. The first goal of the Shortest Point Shipping project was to optimize the order entry and delivery processes to supply products from the location closest to the delivery address.

**Production Leveling** – In June, the peak homebuilding season was just getting underway. Lonestar Millwork was operating very near its maximum effective capacity. Employees were already working five to ten hours a week of overtime. Meanwhile, Home Millwork was operating at $1/4^{th}$ to $1/3^{rd}$ of its effective capacity. The second goal of the Shortest Point Shipping project was to shift orders from one facility to the other in an attempt to balance the workload.

**Order-Entry Centralization** – The third and final goal of the Shortest Point Shipping project was to centralize the order-entry staff into the Lonestar location. In June, each millwork had its own set of employees responsible for entering orders in their own location's production system. By combining the two groups into a single location, customers could be assured of having a single point of contact and the order-entry staff could be more efficiently utilized. The centralizing of the two groups could only occur if a reliable process for entering orders from a single location was created.

## 7.2. *Methodology*

### 7.2.1. Limitations of Existing Process and System

There were several obstacles to reaching the goals of the Shortest Point Shipping project. Solutions were limited by existing company-wide objectives, the MRP system, and the local business processes.

The local and corporate IT stakeholders informed us early on that the MRP software was due for an upgrade to the next revision at the end of 2006. In preparation for the upgrade, BMHC's IS group "froze" any modifications to the system, as each modification would need to be ported and tested with the new version of the software. This meant that any solutions proposed for the Shortest Point Shipping project were restricted from making major modifications to the MRP.

For the purposes of inventory control, materials purchasing, and other business processes, the two millwork locations were specified as separate "warehouses" in the MRP system. For each new order, the MRP software required the user to designate a warehouse before entering the contents of the order. As a result, each subsequent step in the order-entry process (i.e. inventory checks, default shipping address, etc) was dependent on the assigned warehouse. This limitation, in combination with the moratorium on modifications, precluded any logic in the MRP that would *automatically* assign orders to a warehouse based on existing inventory, facility capability, proximity of the shipping address, or any other information contained in the order or customer profile.

### 7.2.2. Shortest Point Shipping Solution

As described above, the limitations of the MRP system made it impossible to automatically assign a warehouse based on inventory or address proximity. Orders would therefore have to be manually entered into the correct warehouse based on external criteria. Given that Home Millwork did not stock the full range of products available from Lonestar, a customer would only be eligible for Shortest Point Shipping if the range of products they typically ordered was available at both warehouses. From the start, only the larger production customers were considered eligible, all others were serviced by Lonestar.

Each order for a qualified customer would then need to be assigned to a warehouse for manufacturing and delivery. Since a homebuilder might be simultaneously building houses in dozens of subdivisions spread across Houston, each subdivision was assigned

to a warehouse based on a line drawn along the boundaries of Houston zip codes, as demonstrated in the map below.

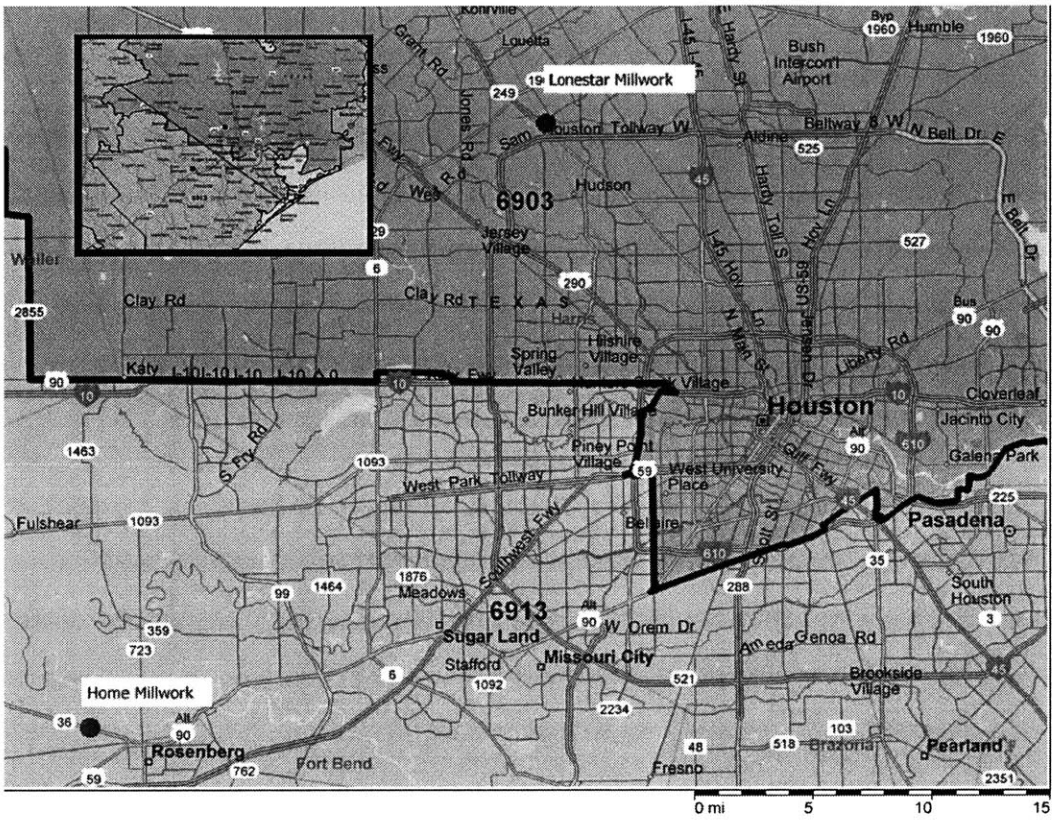



**Figure 10: The Houston Region - Lonestar and Home**

In the main section of the map, the blue dot (upper middle) represents the location of Lonestar Millwork in the northwest corner of Houston. The red dot (lower left) represents the location of Home Millwork in Rosenberg. The dark line is drawn along the boundaries of zip codes such that each zip code lies on one side or the other of the line. The inset map shows the greater Houston region.

To determine where the zip code line would fall, I started by drawing a line geographically separating the two facilities. This is shown as the red (dark) diagonal line in the inset map. In theory, all shipping destinations on one side of the line would be most efficiently served by the facility on the same side of the line. Using a zip code map, I assigned each zip code in the greater Houston area to a facility depending on which side

of the line it fell. Some zip codes were moved from one side to the other so the line would fall along intuitive boundaries like the I-10 and I-610 freeways.

Using historical data, I then calculated the theoretical volume that would ship from each facility based on the presumed boundary. I compared this with the actual capacity of each facility. Fortunately, this initial boundary divided the Houston market according to the capacities of the two facilities. The original dividing line, however, cut the southeast corner of Houston, called League City, in half. League City could easily be served by either warehouse, but it didn't make sense to serve it from both. Because the proposed boundary resulted in Lonestar being at a slightly higher utilization, the decision was made to serve League City from the Home Millwork location in Rosenberg.

Because subdivisions, rather than individual addresses, were assigned to a warehouse, the order entry staff was able to quickly memorize the optimal warehouse for the most common subdivisions. Maps showing the boundary and the subdivision assignment were distributed to help with the remaining locations.

The second and more difficult challenge in the Shortest Point Shipping project was to create a process by which orders could be entered at the Lonestar location but produced and shipped from the Home location.

The existing order entry process at both millwork facilities was entirely paper-based. If an order was to be entered at one location and shipped from the other, the shipping location had to have access to the paper copy of the order to process it. An obvious way to meet this requirement was for orders to be entered at Lonestar and printed to a remote printer at Home Millwork. Unfortunately, this solution was deemed unacceptable because the MRP system did not have a print spooler that was able to determine whether or not a specific document actually printed. This meant that a paper jam or a printer malfunction could result in lost orders. Although the orders would still exist in the system, it would be impossible to determine whether or not they had been printed and put into production. In this event, an employee would have to track down all the orders previously printed and compare them with the orders entered that day to determine which

orders failed to print. Worse, if the printer malfunction was transient and unnoticed, the orders might be lost until a customer called to complain.

Another possible solution involved reengineering the order entry processes to more fully utilize the capabilities of the MRP software and diminish the reliance on paper documents. The software already had built-in reports that allow the trafficking and shipping departments to query the system for outstanding orders that need their attention. Under a reengineered process, the trafficking department could run a report showing all order acknowledgements to be printed to work orders for a given delivery date. Unfortunately, the delivery dates in the system had become unreliable because of the longstanding dependence on paper copies, and a shift toward the revised process would represent a major cultural and tactical change. Both the management and the employees were unsupportive of such a drastic change, so this option was out of the question.

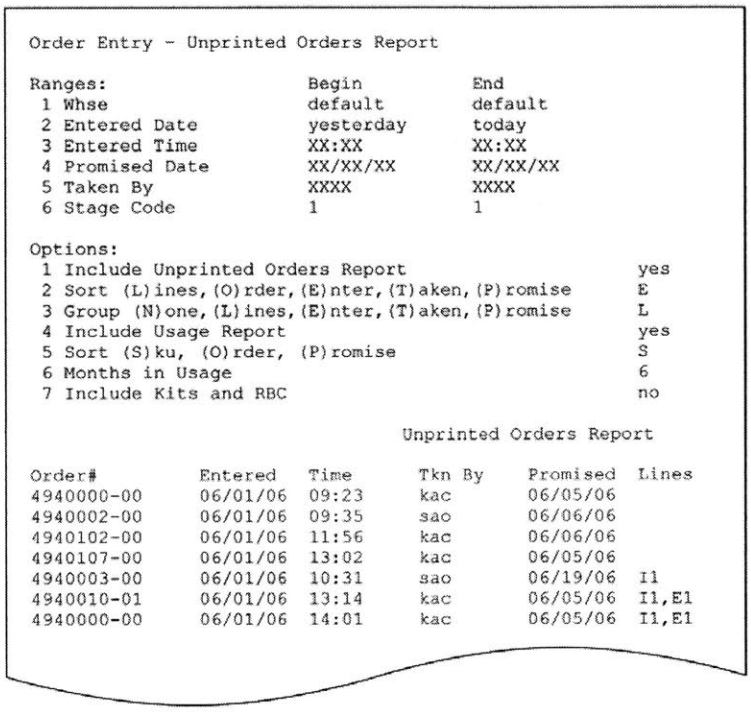
Ultimately, we decided to use an existing "flag" in the software to designate the pending orders that were yet to be printed and put into production. A custom report was created that listed the "flagged" orders for personnel at the other warehouse.

In the existing paper-based system, order acknowledgements were put into production once they were printed. Subsequent printed copies of the order had the word "***REPRINT***" at the top, notifying employees that this order had printed before and may already in production. This precaution was put in place to avoid making and shipping the same order multiple times.

Under the proposed Shortest Point Shipping process, each order destined for Home Millwork would be entered at Lonestar and *not* printed. This would keep the flag described above from being set. We then developed a custom report that listed all orders for the Home warehouse that were never printed. These orders were then printed and put into production at Home. As soon as they were printed, they would be excluded from the list and would not appear the next time the report was run.

The workflow for the new process was presented to and validated by the relevant stakeholders at Lonestar and Home. The custom report described above was created in

coordination with the Information Systems group in Boise. A sample of what the report output would look like is reproduced below.



Order Entry - Unprinted Orders Report

| Ranges: | Begin | End |
|---|---|---|
| 1 Whse | default | default |
| 2 Entered Date | yesterday | today |
| 3 Entered Time | XX:XX | XX:XX |
| 4 Promised Date | XX/XX/XX | XX/XX/XX |
| 5 Taken By | XXXX | XXXX |
| 6 Stage Code | 1 | 1 |

| Options: | |
|---|---|
| 1 Include Unprinted Orders Report | yes |
| 2 Sort (L)ines, (O)rder, (E)nter, (T)aken, (P)romise | E |
| 3 Group (N)one, (L)ines, (E)nter, (T)aken, (P)romise | L |
| 4 Include Usage Report | yes |
| 5 Sort (S)ku, (O)rder, (P)romise | S |
| 6 Months in Usage | 6 |
| 7 Include Kits and RBC | no |

Unprinted Orders Report

| Order# | Entered | Time | Tkn By | Promised | Lines |
|---|---|---|---|---|---|
| 4940000-00 | 06/01/06 | 09:23 | kac | 06/05/06 | |
| 4940002-00 | 06/01/06 | 09:35 | sao | 06/06/06 | |
| 4940102-00 | 06/01/06 | 11:56 | kac | 06/06/06 | |
| 4940107-00 | 06/01/06 | 13:02 | kac | 06/05/06 | |
| 4940003-00 | 06/01/06 | 10:31 | sao | 06/19/06 | I1 |
| 4940010-01 | 06/01/06 | 13:14 | kac | 06/05/06 | I1,E1 |
| 4940000-00 | 06/01/06 | 14:01 | kac | 06/05/06 | I1,E1 |

**Figure 11: OEZRA "Unprinted Orders" Report**

The custom report, called OEZRA in the MRP system, indicated which orders needed to be printed and put into production. A second report, WORZU, was used to identify any orders that had reached their production date but had mistakenly not been printed to work orders yet. Between these two reports, all orders destined for production at Home Millwork would be produced and delivered on time.

In December of 2006, the OEZRA report was first used at Home Millwork for a single customer. Much of the work had already been shifted to Home Millwork, but was being entered by Home's inside sales force. This group was officially disbanded in mid December. In January of 2007, the Shortest Point Shipping process was rolled out to the other customers being served by Home Millwork.

## 7.3. Results and Discussion

Houston management began shifting work from Lonestar to Home Millwork almost immediately after Home's conversion to the standard MRP. The following chart shows the combined monthly revenue for the two millworks, with the darker shaded portion showing the revenue that was shipped from the "wrong" warehouse based on the geographical zip code boundary described in the previous section. This chart was constructed using the customer designation of production or custom builder. Only production builders were considered candidates for having products shipped from both warehouses, as Home Millwork is not capable of supplying the full range of custom products. The line chart on the secondary axis shows the percentage of revenue shipped from the wrong warehouse.

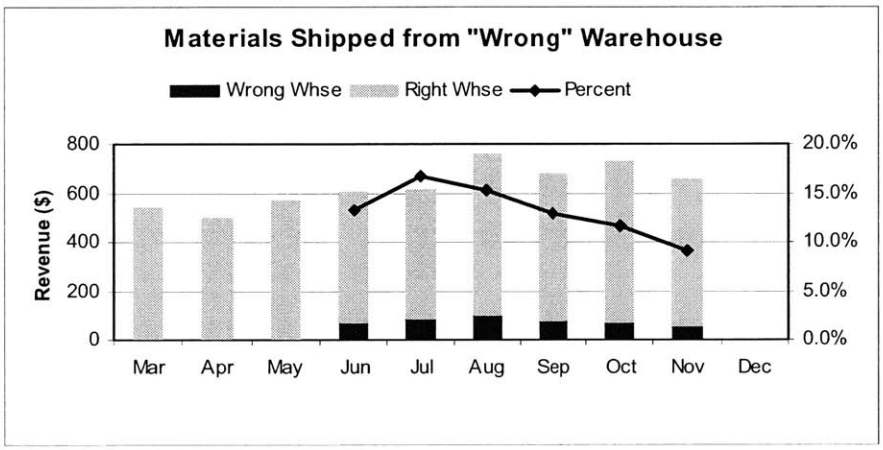



**Figure 12: Materials shipped from the wrong warehouse**[34]

The chart indicates that even as the two warehouses were merged, the majority of orders were essentially being shipped from the correct location. Given a uniform distribution of orders over the city of Houston, one would have expected the ratio to have been closer to 50% at the start. Over the second half of the year, the percentage of orders shipped from the farther warehouse slowly and consistently fell to a level of about 8% by the end of the

[34] Dollar amounts are scaled to protect confidentiality.

year. It is expected that this number will not fall to zero, as some customers require special processes or products that currently cannot be produced at both facilities.

Although the Shortest Point Shipping effort has resulted in a continuing improvement in the outbound logistics, it is not clear that the optimization translates into significant cost savings. The following discussion analyzes BMC West's logistics data and quantifies the theoretical and actual reduction in miles traveled by delivery trucks under the Shortest Point Shipping scenario.

The shipping offices at each millwork collect data on every order they process and every truck they dispatch. With this information, I was able to reconstruct the routes taken by each truck on a daily basis. In addition, each delivery address is entered into the MRP system with an associated "Key Map Page" [35]. The Key Map Page indicates the geographical location of the address to within a ¾ by ¾ mile grid. By combining this information, I was able to determine the approximate distance each truck traveled for any given route. I was also able to construct two theoretical scenarios. Under the first, each truck made deliveries to its assigned addresses, but was dispatched from the optimal warehouse based on the zip code boundary. This scenario allowed me to calculate the maximum possible reduction in miles driven if each order was optimally dispatched. In the second scenario, all trucks were dispatched from the Lonestar millwork. This scenario allowed me to calculate the increase in miles driven if Home Millwork were shut down and all orders originated at Lonestar.

In this analysis, I chose to neglect the customer type (production vs. custom) and therefore overestimated the potential savings in the "optimal" scenario. I also did not attempt to reroute the individual deliveries made by each truck, rather I simply dispatched them from one warehouse or the other. It is entirely possible that more sophisticated routing techniques could further optimize outbound logistics. Each route distance was approximated "as the crow flies", i.e. with straight lines between each

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[35] http://www.keymaps.com –The Key Map is a detailed set of multi-page maps covering the southeast Texas region sold by Key Maps, Inc.

delivery point instead of actual miles driven. Finally, December's dispatch data was incomplete, so only half of the month is included in this analysis. The potential savings in this month are abnormally high which could be an artifact of the incomplete data. The following chart shows the three comparison scenarios. The line chart on the secondary axis indicates the potential savings possible between the "Lonestar Only" and the "Optimal" scenarios. This means that for the month of September, for instance, the total miles driven in an optimal scenario would be approximately 8% lower than if *all* deliveries originated at the Lonestar Millwork. The actual miles driven falls between the two extremes.

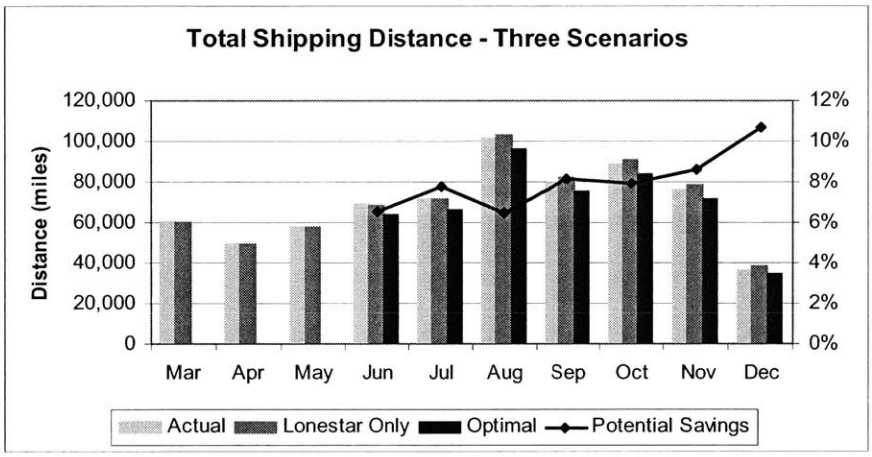


**Figure 13: Total shipping distance under three scenarios**

This chart indicates that the actual miles driven monthly fell toward the level of the "Optimal" scenario as the year progressed. More interestingly, however, the chart indicates that the potential cost savings from this decreased delivery distance, even if it reached the level of the optimized scenario, is relatively small. The average of the potential savings between the "Lonestar Only" and the "Optimal" scenarios between June and November is approximately 6,250 miles per month, representing a decrease of about 7.6%. Over the same period, the actual miles traveled were on average about 1.9% below the "Lonestar Only" scenario. Although the data is unavailable at the time of this writing, I strongly suspect that much if not all of the benefit gained from the optimized shipping is outweighed by the higher manufacturing costs at the smaller Home Millwork,

as well as the additional overhead and organizational effort expended to coordinate the joint operation of two facilities

Home Millwork, however, is not being operated because it provides a more optimized shipping location, but because Lonestar Millwork is currently operating at capacity. Although the products being produced in Rosenberg are more costly and require a duplication of overhead, the Houston region simply has no short term choice if they are to meet the growing demand of their customers. That being said, it would be very interesting to follow this analysis with a more thorough investigation of the costs incurred by operating the second facility in Rosenberg. By assigning a "per mile" cost for deliveries, the reduction in total delivery miles shown above could be quantified in dollar terms and compared against the costs.

If the Houston region is in fact spending more at Home Millwork than they are saving, management would be left with a strategic decision. One option would be to keep spending money in Rosenberg, viewing it as the cost of maintaining the excess capacity. Another option would be to spend the same money in increasing the capacity at Lonestar, perhaps by optimizing the material storage and delivery on the production lines, or by expanding the existing facility and adding production lines.

# 8. Appendix – Document Imaging Implementation

## *8.1. Document Imaging at Lonestar Millwork*

### 8.1.1. Overview

As previously described, in March of 2006 Home Lumber and Home Millwork were acquired by BMC West and put under the management of the Houston region. Home was acquired for several reasons, foremost among them was the entry into the lumber market in Houston. A valuable aspect of the deal, however, was that Home had a working document imaging process that virtually eliminated the archival of paperwork and significantly reduced the effort necessary to invoice completed orders.

After the acquisition, the first order of business was the conversion of Home's MRP system to the same system used at Lonestar. This conversion happened in the first month of the internship. Soon after the conversion was completed and the majority of the bugs were found and fixed, focus was put on implementing Imigit, Home's document imaging software, at Lonestar in Houston.

### 8.1.2. The Business Case for Document Imaging

The Lonestar Millwork in Houston, Texas is one of the largest millwork facilities under one roof in the United States. In a given day, the facility might ship as many as 50 *house-packs*, each containing 15 or more doors. Each order generates a stack of paper documentation as it flows through the order entry and manufacturing process.

BMC West's MRP system maintains an electronic record of each order and tracks its progress through the manufacturing process. The paper copy of the order, however, is the master document. It is the manipulation and passing of the physical copy that actually regulates the flow of manufacturing. At certain stages of the process, if the paper copy were to be misplaced, it would not be apparent until the customer called to complain about their missing materials. Redundancies in the system exist to avoid this situation. Nevertheless, order paperwork is periodically misplaced.

Home Lumber and Millwork used a piece of software called Imigit, developed and maintained by Profitability of Hawaii[36]. Imigit is an application suite that allows for the storage, indexing, and retrieval of digital and scanned documents. Although it did not replace the paper based production process at Home Millwork, it did allow for the massive quantity of paperwork generated by the process to be scanned and discarded. Before implementing the Imigit software at Lonestar, all paperwork was archived in file boxes. The picture below shows the location where this paperwork was stored.

**Figure 14: Archival area for order processing paperwork**

Another major benefit of document imaging was the streamlining of the invoicing process. Each invoice at Lonestar was bundled with the purchase order from the customer, and if necessary, a signed pick ticket verifying that the goods were delivered to the jobsite. These documents were stored by the accounts receivable group. Each day, the documents for each invoice had to be pulled from the files and associated with the correct invoice. These documents were often missing and had to be tracked down. With Imigit, documents could be scanned in such a way as to indicate whether or not they should be printed with the invoice. All signed pick tickets, for instance, were scanned in this way. When the accounts receivable department ran the invoicing process, invoices would print, along with all documentation that was scanned to indicate that it should also be included. The stack of papers for a single order was then simply put in an envelope

[36] http://www.poh.com – Profitability of Hawaii owns and maintains the Imigit software suite.

and sent to the customer with no searching for and retrieving of the necessary supplemental documentation. Imigit allowed for a significant reduction in the effort and time necessary to complete the daily invoicing process.

In addition to streamlining the invoicing process, the stack of file cabinets used to store the paperwork for each order could be eliminated. Before Imigit, these file cabinets occupied an area of approximately 400 square feet in the accounts receivable department. The following picture shows these file cabinets prior to the installation of Imigit.

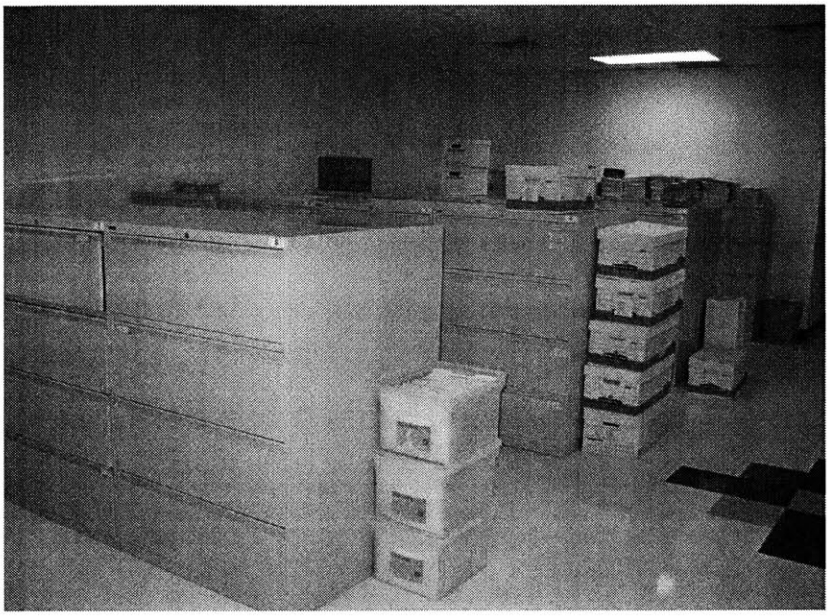

**Figure 15: Accounts Receivable file cabinets**

### 8.1.3. The Imigit Document Imaging Application

Imigit is split into a server application and a client application. The server stores and retrieves the digitized documents, while the client application presents an interface that allows users to sort, search, and view documents.

Digitized documents are organized as if they are in a physical filing cabinet. In this way, the conversion to digital documents presents less of a shift in the minds and processes of the employees who will use the system. At the highest level of the document hierarchy are *cabinets*. A cabinet represents a collection of folders and documents and each region

would likely receive its own cabinet to work from. In Houston's case, for instance, the region had a cabinet called HOUS_OE for all order entry documents for both millwork locations. Each cabinet contains *folders*. Folders hold individual collections of documents and were named to correspond to the customer number. For instance, all of the order entry documents pertaining to customer number 2231349 would be stored in the folder called C2231349 in the cabinet called HOUS_OE. Each folder contains *documents* and each document may contain one or more *pages*. Documents were stored by order number and included a letter prefix indicating the type of document. For instance, all order entry documents were stored with a prefix "A". So for instance, the order acknowledgement for order number 1234567-00 would be stored with a document name of "A1234567-00". All document names are unique, and if more than one order acknowledgement was generated, the second would be stored as "A1234567-00.1". The following figure from the training materials shows this hierarchy in graphical form.

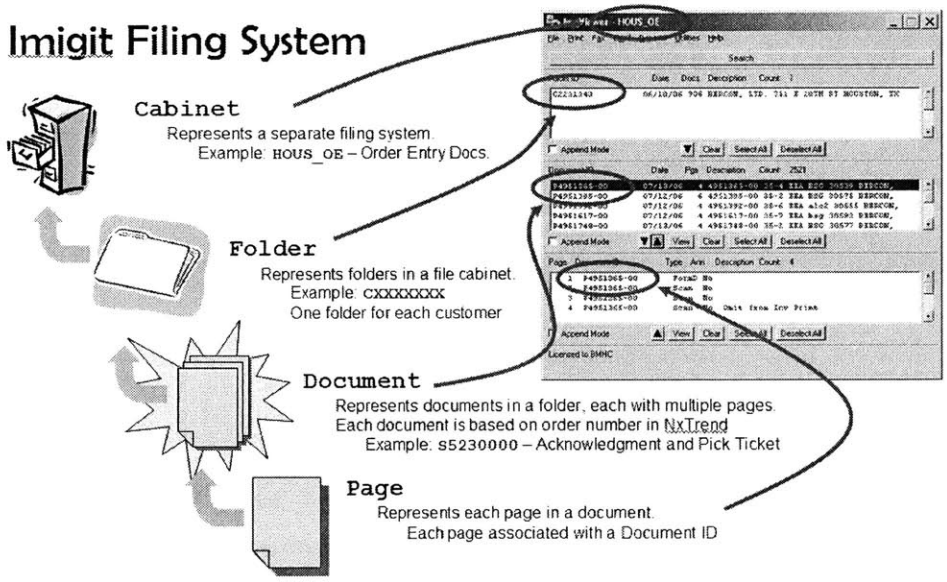


**Figure 16: The Imigit filing system**

Much of the process around digitizing documents was developed at Home Lumber and Millwork before the acquisition. During the MRP system conversion, the document imaging process was translated as well. All documents printed from the MRP were forked at the print driver. One copy went to the physical printer that was specified by the user. The other copy went to the Imigit software. The Imigit software would then "read"

the document, recognize its format (Order Acknowledgement, Work Order, etc) and would create both the digitized image of the document, and the metadata associated with it, including order number, customer number, and all other information contained in the document.

Several physical paper documents containing signatures and other markings were also stored in the document imaging system. For this, a group of employees was designated as the *scanning team*. In the case of documents printed from the MRP, each document had a barcode printed on it that encoded the order number. For all other documents, the order number was written in the top right-hand corner of the document. Stacks of similar documents like purchase orders or completed work orders would be fed through a black and white scanner[37]. Those documents with barcodes would be automatically recognized and filed under the appropriate customer folder and order number. Those documents with handwritten order numbers would be put in a *batch* for continued processing. After scanning all the documents, the user would go back and look at all documents for which the software could not read the barcode, or which had a handwritten order number. The user would then type in the order number manually. Documents could be coded in approximately one to two seconds each.

Retrieval of documents was very fast and easy. Documents were stored based on document type and order number, and either criterion could be used to search for single documents or ranges of documents. For instance, one could search for all invoices (documents beginning with I, as in I1234567-00) generated within a certain range of dates. One could also search for all documents for a given order number. Wildcards and Boolean operations made it possible to construct very sophisticated searches. In addition to searching for documents, one could also search for folders using similar methods.

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[37] Lonestar and Home Millwork used Fujitsu Document Scanners and they performed very well and produced decent scanned images. The rollers in these scanners would at times wear out and multiple pages would feed through the scanner at one time. Scanning personnel became very skilled at monitoring the scanning process and catching these errors.

## 8.2. Methodology and Procedure

### 8.2.1. Project Scope

The goal of the Lonestar Imigit project was to implement the Imigit software and introduce the associated procedural changes at the Lonestar Millwork in Houston, Texas. At the time I became involved with the project, Home Millwork had converted from its old MRP to the BMC West standard MRP. Home had also successfully implemented the Imigit software and process in their location and therefore served as a model for the implementation at Lonestar. At the same time, Lonestar processed approximately ten times the order volume of Home Millwork, and procedures and job functions were accordingly more complex.

### 8.2.2. Requirements Gathering and Workflow Documentation

Many of the requirements for the implementation of Imigit at Lonestar Millwork were known at the beginning of the project. Home Millwork already had an operational process and many of the MRP software modifications were already completed. Lonestar, however, had a much larger operation and had a much more complicated range of products than did Home Millwork. Whereas Home Millwork produced only *production millwork*, Lonestar manufactured and sold *full custom* products that required CAD drawings and other documentation in addition to the standard set of production documents. Lonestar also sold cabinets and windows, both products having non-standard documentation. Furthermore, Lonestar worked with a third party to install exterior doors. Although Lonestar's Imigit workflow would be patterned after Home's implementation, the added complexity meant that differences in the underlying business processes could still exist. This made it necessary to first understand the existing workflows before moving ahead.

To understand the current workflows at the Lonestar Millwork, I conducted interviews with the various groups involved: Order Entry, Trafficking, Production, Purchasing and Shipping. The local project leader, Lettie Huber, and I constructed the existing workflows for both production products and full custom products. Using the existing

workflows, we constructed proposed workflows based off the existing Imigit implementation at Home Millwork. We then validated both sets of workflows with the appropriate functional groups.

### 8.2.3. New Process Training

After constructing and documenting the new workflows, the employees at Lonestar were trained using the new system. We created training materials and introduced the Imigit software during hour-long training sessions with groups of six people per session. The new workflows were very similar to the existing process, so the change was relatively intuitive. The biggest difference was in having to search the "virtual" file cabinet instead of going to a physical file cabinet to find paperwork.

Some groups, including the accounts receivable department and scanning team, required far more extensive training, as their workflows were changed to a large degree. In all, training took place over an entire week, with some follow up sessions conducted over the following weeks as needed for specific groups.

## *8.3. Results and Discussion*

### 8.3.1. The Solution Delivery Methodology (SDM)

The Imigit project team fully utilized BMHC's Solution Delivery Methodology, or SDM. The methodology specifies the process by which a project is advanced from the original idea, through implementation, and to subsequent version upgrades. It specifies the key stakeholders involved in the project and outlines their responsibilities. The details and inner workings of the SDM are considered proprietary and are therefore confidential. The results of using the process, however, were very positive.

The Imigit project was completed very successfully due to the use of the SDM process. In the past, IT projects in Houston have not run so smoothly due to breakdowns in communications, schedule overruns, confusion over responsibility and deliverables, etc. During this project, the project manager was very clear about roles and responsibilities and was very active in maintaining an accurate project plan and making sure that people

lived up to their promises concerning the project. In addition to the project manager, a local champion, Lettie Huber, was identified and fully staffed on the project. This employee was given access to various stakeholders at the corporate level and the software vendor, and was given the authority to drive the project to completion. Between these two roles, one at the local level and one at the corporate level, communications back and forth were smooth, timely, and accurate.

### 8.3.2. Reduced Effort in Invoicing

The Imigit software and process significantly decreased the effort necessary to invoice customers. With the old process, accounts receivable employees spent the better part of each day searching for missing documentation to complete the invoice packets for customers. With the new process, missing documentation was eliminated and all that remained was stuffing invoices and the associated scanned documents into envelopes.

### 8.3.3. Reduced Storage of Documents

At the time the internship ended, the organization had completely switched to document imaging, and therefore had eliminated its need for archived copies of completed paperwork. The database was hosted on the corporate servers in Las Vegas and was regularly backed up. The organization, however, was still keeping hard copies for 60 days for backup purposes until the new system was proven to be trustworthy. It is expected that the large volume of archived documents shown in Figure 14 will be eliminated in the near future.

### 8.3.4. Increased availability of Documentation in Production

The production employees found the document imaging software to be immensely valuable. Often, a production supervisor must look up paperwork to check on the information contained. Before the document imaging software, the person had to search a physical file located in a central area. Now supervisors have the information directly at their desks and are able to quickly search for the documents they need. The feedback from this group was overwhelmingly positive.

# 9. Bibliography


Alexander, Barbara T. "The U.S. Homebuilding Industry: A Half-Century of Building the American Dream." *John T. Dunlop Lecture at Harvard University*, 12 Oct 2000.

*BMHC Web Site*. Investor Information FAQ's. 27 April 2007 < http://phx.corporate-ir.net/phoenix.zhtml?c=80510&p=irol-faq/ >.

*BMHC 2005 Annual Report*. San Francisco: Building Materials Holding Corporation. 27 Feb 2006.

*BMHC 2006 Annual Report*. San Francisco: Building Materials Holding Corporation. 21 Feb 2007.

Bradley, Stephen P. and Ghemawat, Pankaj. "Harvard Business School Case 9-794-024: Wal*Mart Stores, Inc." Boston: Harvard Business School Press, 6 Nov 2002.

Brynjolfsson, E. "The Productivity Paradox of Information Technology." *Commun. ACM 36*, 12, 66-77. 1993.

Carr, Nicholas G. *Does IT Matter?*. Boston: Harvard Business School Press, 2004.

Christensen, Clayton M. *The Innovators Dilemma*. Boston: Harvard Business School Press, 1997.

Cushman, Ted. "A large and a midsize builder share their secrets for working the production schedule." *Builder Magazine*. 11 Jan 2006.

Dedrick, J., Gurbaxani, V., and Kraemer, K. "Information Technology and Economic Performance: A Critical Review of the Empirical Evidence." *ACM Computing Surveys* 35. 1, 1-28, pg 7. 2003.

Fine, Charles H. *Clockspeed*. New York: Basic Books, 1998.

Hamel, Gary. "The Concept of Core Competence." *Competence-based Competition.* Eds. Gary Hamel and Aimé Heene. Chichester: John Wiley & Sons, 1994. 11-33.

Hitt, L. M. and Brynjolfsson, E. "Productivity, Business Profitability, and Consumer Surplus: Three Different Measures of Information Technology Value." *MIS Quarterly*. June 1996, 121-142, pg 139.

*Homebuilding in the United States: Industry Profile.* New York: Datamonitor USA, July 2005

Porter, Michael E. "The U.S. Homebuilding Industry and the Competitive Position of Large Builders." *Centex Investor Conference.* 18 Nov 2003

Ravichandran, T. and Lertwongsatien, C. "Effect of Information Systems Resources and Capabilities on Firm Performance: A Resource Based Perspective." *Journal of Management Information Systems*. 21, 4, 237-276, Spring 2005.



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