# A Framework for Business Process Integration to Achieve Fulfillment Excellence

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Submitted to the Engineering Systems Division in partial fulfillment of the requirements for the degree of

**Master of Engineering in Logistics**

at the

**Massachusetts Institute of Technology**

June 2004

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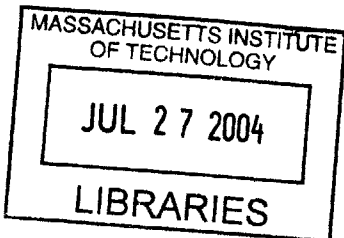
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BARKER

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## ABSTRACT

Process integration has become more and more important in today's world where companies' supply chains have become more complex. Companies around the world are beginning to realize the importance of integrating their supply chain business processes to achieve fulfillment excellence. Unfortunately, process integration is still somewhat a novel concept and relatively little research has been conducted in examining how companies can effectively implement successful process integration across their supply chains. To complicate matters further, many companies still confuse the concept of business process integration with that of mere data integration.

The primary motivation for this research study is to provide a framework on how best to implement process integration to achieve fulfillment excellence.

The methodology employed in this particular study comprises the use of two case studies with real-life companies, which provide real-world examples of how companies try to "integrate" their complex supply chain processes. A deep and thorough analysis is then conducted to identify the challenges presented by the firm's current practices from a business process integration perspective. Further analysis then provides an overall view of what is done right and what could have been improved. Last but not least, a generalized framework of best practices and a prescription of how best to implement successful process integration to achieve fulfillment excellence are presented.

Thesis Supervisor: Dr. Larry Lapide
Title: Research Director, Supply Chain 2020

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I would like to thank Yantra Corporation, a world-class supply chain software provider; in particular Bob Steele, Director of Business Development, for providing insights, time and invaluable contacts to complete this thesis.

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This thesis is dedicated to my mother, Constance, a woman of incredible wisdom, strengths and accomplishments. She is an inspiration to me. I am abundantly blessed to have her as a mother. You are always dear to me, Ma!

# Table Of Contents

# 1  Executive Summary

Business Process Integration (BPI) to achieve fulfillment excellence is the focus

of this thesis. Business Process Integration is the ability to link two or more processes, so

that they present a common face to the customers even though the processes are

separated.  One might separate a single process into several processes to simplify it or to

complete one of the processes at a lower cost by aggregating it with other like-processes.

Once processes are separated, communication must take place among them to enable the

complete delivery of a product or service.  With the advancement of information

technology, this communication has increasingly taken the form of electronic

transactions.

In addition to discussing BPI, this thesis also discusses the application of BPI to

order management and shows how this application assists companies in delivering the

highest standards in customer satisfaction. In essence, business process integration

enables a company to have a better order management system, which in turn, results in

the ability to deliver customers' orders perfectly (fulfillment excellence). In today's

world, fulfillment excellence can only be achieved through successful business process

integration within and outside a company's walls.

The thesis has three main components that are worth noting.  The first two

components are two business cases -- a big ticket retailer (i.e. one who sells furniture,

carpets, window treatments, etc.), and a wireless technology logistics provider.  The third

component is the key insights and general applications of BPI.

The big ticket retailer case is a good example of a channel where the retailer is

serviced by numerous vendors. Some of these vendors are small and thus, BPI is not a big

priority to the retailer because it derives little revenue from these companies. The retailer is also faced with two distinct barriers -- visibility, and order brokerage. Each one of these barriers is applicable primarily to one of the forms of fulfillment. Respectively, barrier 1 applies to fulfillment from inventory and barrier 2 to fulfillment from make-to-order processes; with the fulfillment breakout as follows:

- o Fulfillment from Inventory (70% of Sales):

    In Stock (11%), Vendor Warehouse (79%), On Order (3%), and Vendor Warehouse Next Available (VWNA) (7%)

- o Make-to-order (30% of Sales):

    Special Orders

Within fulfillment from inventory, 90% of sales (11% + 79%) are drawn from finished goods, hence suggesting that obsolescence costs are high and that the retailer is highly dependent on good forecasting. BPI reduces lead times by bringing vendors and retailers closer together, not necessarily physically, but at least process-wise. Herein we extensively discuss that BPI achievements should lead to sales increases from the On Order and VWNA fulfillment processes, leading to reductions in forecast reliance and obsolescence costs.

Fulfillment from Make-to-Order incurs very long lead times, extending up to six months. Herein we extensively discuss that BPI achievements should result in lead time reductions, which in turn, improve service levels. In addition, BPI should significantly diminish the recurring problem of manufacturing the wrong product, and then having to sell it at a discount. Imagine a scenario where a couch is manufactured per customer specifications and an XML transaction that includes a high definition picture of that

couch captures these specifications exactly as the customer sees them at the store. Imagine if this scenario is **scalable** and enables all retail outlets to communicate this picture across vendors.

The wireless technology logistics provider (LogiCell) case studies reverse logistics to fulfill orders from customers who have insured their wireless phones. The process can be summarized as follows:

- The customer contacts the insurance company
- The insurance company sends an EDI transaction to LogiCell with customer information
- LogiCell sends a phone to the customer **from inventory**
- LogiCell receives the phone from the customer, repairs it (at its domestic or off-shore facility), and stores it in inventory for future disposition

LogiCell is not interested in doing repair in-house, but has built this capability in order to be able to offer reverse logistics services and maintain low inventory levels. If it did not repair the product in-house, product turnaround would be so slow that inventory would need to be much higher than it is now that it conducts the repair operation in-house. The thesis explores the fact that BPI achievements facilitate visibility into the off-shore repair operation as well, thus allowing LogiCell to reduce inventory levels. BPI achievements also allow close coordination with a third party vendor that can provide the repair service with better economies of scale. If LogiCell was able to turn the phone around quickly, it would be well positioned to also offer other value-added services such as returning the same phone to a business user who may have important contact information stored in it.

Lastly, the LogiCell case draws a distinction between batch and single flow of both product and information. Batch flow of information does not allow granular visibility and hampers LogiCell's ability to make decisions based on more accurate inventory positions across its network.

These two cases lead us to a generalized view of BPI. BPI requires selecting the right partners, and then pursuing BPI based on both the human and the technology factors. Failure to align these two and their internal workings would likely lead to BPI failure. In the realm of order fulfillment, it appears that the best way to conceptualize BPI is by introducing the concept of a Full Circle Process (FCP) view. Order fulfillment begins with a customer order and ends with the delivery of items or services to the customer. Once we lose sight of this paradigm we lose knowledge of customer requirements and therefore, cannot offer an integrated service 100% of the time.

The way to accomplish an FCP view is by implementing the Single Platform Model. This is the equivalent of the one point-person model commonly used in business practices to assign responsibility. A single platform across enterprises or processes brings separate processes closer together. Such a model is not at all futuristic – it is in fact, pragmatic – some software vendors have embraced this model and claim it as the basis of their value proposition.

Introduction

According to the Information Technology Infrastructure Library[1], Business

Process is a group of business activities undertaken by an organization in pursuit of a

common goal. Typical business processes include receiving orders, marketing services,

selling products, delivering services, distributing products, invoicing for services, and

accounting for money received. A business process usually depends upon several

business functions for support, e.g. IT, personnel, manufacturing, etc. A business process

rarely operates in isolation, i.e. other business processes will depend on it and it will

depend on other processes. Process integration has become more and more important in

today's world where companies' supply chains have become more complex. In the old

days, it was adequate for a company to fulfill a customer order from within its own

corporate walls. Today, however, a company will most likely have to deal with a

complex extended supply chain in order to fulfill its customer orders successfully.

Companies around the world are beginning to realize the importance of

integrating their supply chain business processes to achieve fulfillment excellence.

Unfortunately, process integration is still somewhat a novel concept and relatively little

research has been conducted in examining how companies can effectively implement

successful process integration across their supply chains. To complicate matters further,

many companies still confuse the concept of business process integration with that of

mere data integration. It is important to be able to draw this distinction – data and process

are not the same, although are related to each other – data integration enables process

integration, but data integration itself is NOT process integration. This is the primary

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[1] ITIL (Information Technology Infrastructure Library)

motivation for this research study – to provide a framework on how best to implement process integration to achieve fulfillment excellence.

This study is sub-divided into six chapters. The introduction is followed by a brief section explaining the business problem faced by many companies today in relation to the disconnect they experience in their extended supply chain. Following this is a chapter on an overview that explains what business process integration and fulfillment processes are. In the overview of fulfillment processes, this study explains why it is important for companies to understand their fulfillment processes well and why it is a challenging area that needs a special focus. Chapter 3 of the study presents a literature review that introduces previous work and articles on such issues as business process integration, distributed order fulfillment, and reverse logistics fulfillment.

Chapter 4 explains the methodology employed in this particular study, which comprises the use of two case studies with real-life companies. These companies are selected because each provides real-world examples of how companies try to "integrate" their complex supply chain processes presently, the challenges they face, and how best to remedy these challenges. The first case focuses on a distributed order fulfillment and the multi-party environment of a big-ticket item department store operation, while the second case zeroes in on reverse logistics in a multi-party environment involving an electronics third party logistics operation. The primary research methods used to write these case studies were phone interviews with representatives from the respective companies, as well as extensive conversations with Yantra, a software provider relevant to both. Each of the case studies presents a thorough introduction of the company and a process map review of how it currently handles its respective processes across its extended supply

chain. After all these are laid out, a deep and thorough analysis is then conducted to identify the challenges presented by the firm's current practices from a business process integration perspective. Further analysis then provides an overall view of what is done right and what could have been improved.

Last but not least, a set of recommendations is provided on what can be improved and how to do so. Chapter 5 provides a generalized framework of best practices and a prescription of how best to implement successful process integration to achieve fulfillment excellence. The conclusion then summarizes why business process integration is important and the ways to successfully implement it.

# 2 Overview

## 2.1 Business Process Integration

It is in the context of processes within and outside an enterprise that the abundant complexities involved in various business processes are most often noted. For example, a company receives an order from a customer for a given product or service. The company's goal is to successfully deliver this customer's order seamlessly and on a timely fashion. There are numerous ways by which the company can fulfill this particular customer's order – by fulfilling from a warehouse (make-to-stock), by purchasing the product from another vendor (off-the-shelf), by producing it (make-to-order), or by having it manufactured by a third-party vendor (outsource). Afterwards, the company then follows a series of steps to deliver the item directly to the customer or through a consolidator. These various steps and many others add up to the complexity of the processes involved. The steps include information flow, physical flow of goods, and processes. Process integration is of the utmost importance because without it, many negative impacts such as delivery mistakes, inefficiencies, uncoordinated delivery of complementary products, and others arise.

Process integration is increasing rapidly, allowing companies to tap huge, long-hidden reservoirs of value. In a number of industries, virtually all companies soon will be affected. The motto is, "Adapt, or get ruled out!" Experience shows that proactive companies gain first mover advantage, but this is not enough, companies ought to stay proactive to stay competitive in business.

Successful process integration can create huge savings and deliver the highest level of customer satisfaction, but it is almost impossible to achieve unless a company

changes the fundamental way it does business. Managers must act strategically, developing inter-functional capabilities, and linking resources both inside and outside their companies. Tightly connected multi-company integration is emerging as the competitive force in the 21$^{st}$ Century. Forging a new perspective based on this paradigm is the key to unlocking the latent value of process integration and achieving true fulfillment excellence.

True process integration entails full visibility of the whole supply chain, enabling a company to coordinate the manufacture and flow of information and products throughout the entire channel, from the supply of raw materials to the movement of finished products into the hands of customers. The emergence of process integration is beginning to transform the structure of enterprises, requiring companies to develop new ways of managing their businesses.

Companies have to be fully committed in order for process integration to succeed. Those who try but are not fully committed might encounter serious problems – cost overruns, cancelled projects, and ultimately, alienated customers. Integration across companies seems deceptively tactical and simple to implement, but in reality requires *fundamental changes* in the way managers think about how a company operates.

The problem companies most commonly face in trying to implement successful process integration is:

*The lack of awareness of the root causes of the problem or opportunity for improvements.*

A company traditionally takes the introspective approach to solving problems – looking inwards within the company's own walls. A lot of improvement efforts are conducted within this traditional introspective framework. The possibility of dramatically

improving performance through cross-company coordination usually does not surface as an important issue in a company, its customers, or its suppliers. In order to see outside the box, companies need to have the vision and courage to *challenge everything*.

Challenges to process integration usually stem from two areas:

- The lack of available data needed to understand product and information flows within and across companies. Many companies' Information Technology (IT) systems do not integrate well within the whole supply chain, thus, resulting in blind spots in operations analysis. Companies need full visibility of the whole supply chain for process integration to succeed.

- The fact that process integration requires fundamental, organizational changes in the company. It is human nature not to like change in general. Therefore, managers are required to have substantial courage and will power to successfully manage change for the better in their organizations. Managers will face stiff resistance from various factions. Organizations must have a paradigm shift to achieve successful process integration because the view these organizations must now take is one of a more strategic, long-term view, rather than a tactical/short-term one. In short, trying to implement new things within the old framework simply will not work!

## 2.1.1 The Alignment of Channels and Operations

In many channels, lack of communication and coordination within and across companies often create artificial ordering, replenishment, and manufacturing patterns that

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have little in common with the actual consumption pattern. In essence, the "real" news is not communicated accurately across the channels, but instead, distorted. This, in turn, causes such problems as high operation costs, excess inventory, and inefficient manufacturing. Additionally, chronic problems of not being able to get the right products at the right places at the right times persist.

The coordination effort crucial to integration within and across companies remedies the distortions, effectively aligning channel product and information flows. This coordination effort provides two things – first, and most critical to a successful integration is the agreement that one channel member makes *commitments* and takes responsibilities for key portions of another channel member's operations. This agreement allows the company to align product and information flows within and across companies, and distribute the resulting benefits to keep the channel partners fully committed. Second, it enables the broadcasting of the "real story" throughout the channel, eliminating uncertainty about actual demand.

While coordination and process integration within and across companies might seem simple on the surface, deep down they require profound shifts in company boundaries – what has always resided under the control of one company or functional department may shift within the decision-making authority of another channel member. This requires tremendous trust and commitment from all channel members.

Process integration within and across companies have a significant impact on corporate margins and returns on investment because they greatly lower overall costs and increase product availability and service levels to the customers.

## 2.1.2 Trends in the Industry

The reality today is that the benefits of process integration have remained unrealized to many integration partners. There are many reasons that can be attributed to this. The first reason is, many companies and functional departments within a company have maintained a traditional view of their operational boundaries – particularly, the decisions that are "theirs" to make – and this view has obscured the new process integration paradigm. This problem is further reinforced by IT systems that do not integrate well within a company and with those of other companies outside its own walls. Second, barriers among functional departments coupled with the lack of a holistic perspective, not only hide the opportunities for gain but also hamper needed internal coordination. In some companies, internal territorial issues, different goals and metrics prevent partners from developing the close working relationships crucial to developing and fostering successful process integration within and across companies. Last, many companies lack the data, knowledge, and new framework required to identify problems and discover opportunities.

Fortunately, as powerful as these impediments may be, today's dynamic, highly-competitive environment creates even more powerful forces to break down these barriers. Companies are forced to respond and create sweeping changes, or be obliterated. The magnitude of the potential gains that can be achieved is too big to be ignored. Success stories from the few innovators are becoming more widely known, and these companies are serving as role models. The need to differentiate products, to shorten product cycles, and to achieve fulfillment excellence are all driving changes in all industries.

There has also been a "follow-the-majority" phenomenon in several industries. Company A forges a successful process integration with Company B. Aware of the

benefits from this integration, company A now contacts all its other partners to participate in a similar arrangement. Meanwhile, Company B does the same by contacting all its partners to also do the same. Soon, other companies notice the growing competitive advantage in these alliances, and join forces as well. In a relatively short period of time, the whole industry follows.

The trend today is that companies develop closer operating relationships with fewer, more important business partners, instead of maintaining haphazard relationships with too many partners. This trend is changing the structure of several industries – proactive firms are winning at the expense of their more hesitant competitors.

## 2.2 Overview of Fulfillment Processes

In today's world, how well a company handles its order fulfillment processes –

the speed, accuracy, and steps it takes to fulfill an order – defines how valuable the

company is to its customers. Order management is of the utmost importance because it

mediates many of the customers' interactions.

The fulfillment process technically starts when a company receives an order from

a customer for an item or service. This order receipt triggers the outset of the fulfillment

process. All the steps and processes that then follow in order to fulfill the order are

considered fulfillment processes.

### 2.2.1 Order Management

Among all our numerous readings on order management, we found that Greg

Girard's 1998 AMR research report hit the essence of order management right on target[2].

For that, we employ his research extensively in our effort to present an overview of order

management as completely as possible.

All customers nowadays have raised their standards for what constitutes an

excellent customer service and demand that their orders be fulfilled flawlessly. The

following supply chain excellence standards apply: Shorter order cycles, faster inventory

turns, perfect execution of customer-specific requests, accurate fill rates, perfect on-time

delivery, error-free billing, and superlative customer service.

Order management looks in two directions at once – forward at the customer and

backward to the company itself and its vendors. In both directions, order management

deals with numerous business rules, enterprise applications, workflows, strategies, and

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[2] Girard, Greg, What Should You Expect from Order Management? AMR Report, April 1998

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policies. In essence, excellence in order management and fulfillment defines who the company is to its customers and differentiates itself from its competition. Furthermore, order management also dictates how a company marshals its resources and those of its third-party vendors to meet customers' demand – Determining inventory levels, manufacturing resources allocation, and third party vendor selections; Communicating criteria for customer satisfaction; and Providing supply and demand management.

**Order Management Requirements**

When the enterprise interacts with its customers, order management plays a critical role. At the inquiry and order stages, order management captures all the relevant business rules governing the sale. The following factors define these rules: The items in the transaction itself (for example: quantity ordered and delivery date); The business rules of the enterprise and customer; The hierarchy of precedents that involve items such as contract, customer type, customer credit history, currency, and country. Downstream activities in sourcing, delivery and settlement are governed by the information captured at order time.

## 2.2.2 Process Map of Order Management and Customer Satisfaction

According to Greg Girard in his 1998 AMR report, "order management" includes five distinct steps in the pursuit of delivering the highest standards in customer satisfaction: *Capture* of the customer's demand and requirements; *Validate* the enterprise's ability to meet such demand and requirements; *Source* the products from in-house and/or third-party vendors; *Distribute* products; and *Settle* all accounts associated with that particular order.

**Capture**

*Capture* enables the enterprise to acquire a customer's demand specifics (quantity, item type, etc.), and to attend to customer's requirements (delivery, value-added processes needed, etc.). Capture also supports inquiries, quotes, and changes. This ability should support various streams of order entry: High volume EDI (Electronic Data Interchange); Web customer direct; and Sales supported by customer service representatives and the sales force.

**Validate**

*Validate* ensures that order content and attributes correspond to the business rules of the enterprise and its trading partners. Validate may include customer credit check, pricing standard, and special promotional affecting prices.

**Source**

*Source* encompasses the necessary steps to commit inventory, work-in-process (WIP), and capacity to an order. This activity might be as simple as placing a product reservation or as complex as deploying an advanced planning and scheduling system to *source* an order against a plant in a Make-to-Order (MTO) environment. In some environments, source might be tightly coupled with procurement.

**Distribute**

*Distribute* entails the picking (in the make-to-stock scenario), packing, and shipping to customer. These activities may vary by product and channel. In some instances, an enterprise may add a great deal of value between pick and pack, such as the practice common to an electronics reseller such as Dell who employs a postponement strategy to assemble final products according to specific requirements. In other instances,

an enterprise may not care much about adding value between pick and pack, such as the practice common to the pick-and-pack operation of a coffee cup manufacturer.

**Settle**

*Settle* looks into all the data and business rules gathered with the order at *capture* and added in *source* and *deliver* to round out all accounting and financial transactions necessary to close the order. Settle uses all these data and rules to settle the account with the customer and vendors or suppliers, as necessary.



Source: AMR, 1998
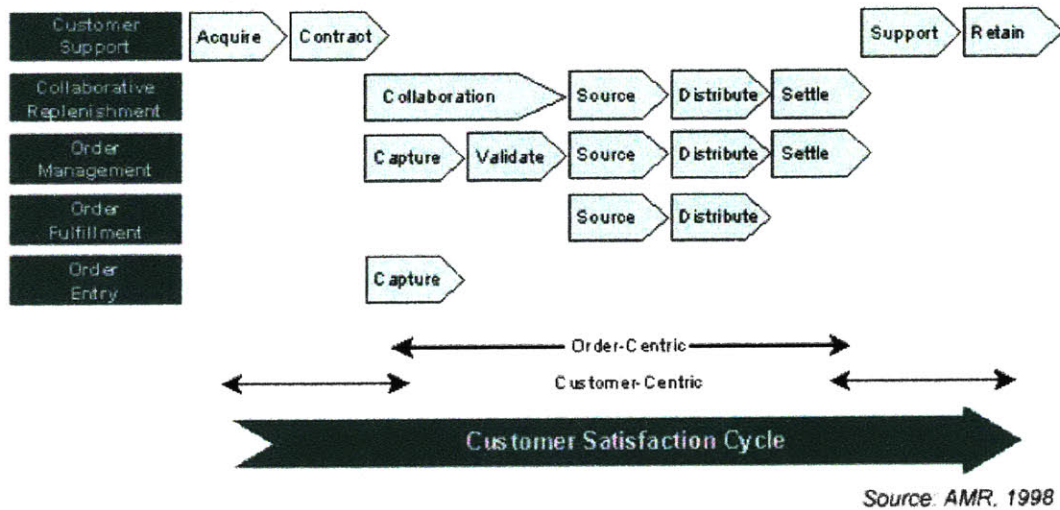
**Figure 2.1.  Order Management within Customer Satisfaction Cycle**

Figure 2.1 looks at order management within the customer satisfaction cycle. As opposed to only being order-centric, order management also needs to be customer-centric as its main purpose is to deliver the highest quality of products and/or services to customers.

The added benefit of process integration and full visibility over the order fulfillment process is evident in the companies' abilities to better manage its customer relationships. Being able to see the whole order fulfillment process also enables

companies to take a proactive approach to satisfying customer needs, providing a more

personalized and targeted service specific to these particular needs. Companies who are

able to do this differentiate themselves from those who are merely responding reactively

to the needs of their customers and position themselves with competitive advantage.

Moreover, a holistic view allows room for customer asset management, which

complements order management and helps in customer acquisition and retention by

tracking and resolving issues and delivering high customer satisfaction. This ability is

captured in Figure 2.2.



Source: AMR, 1998
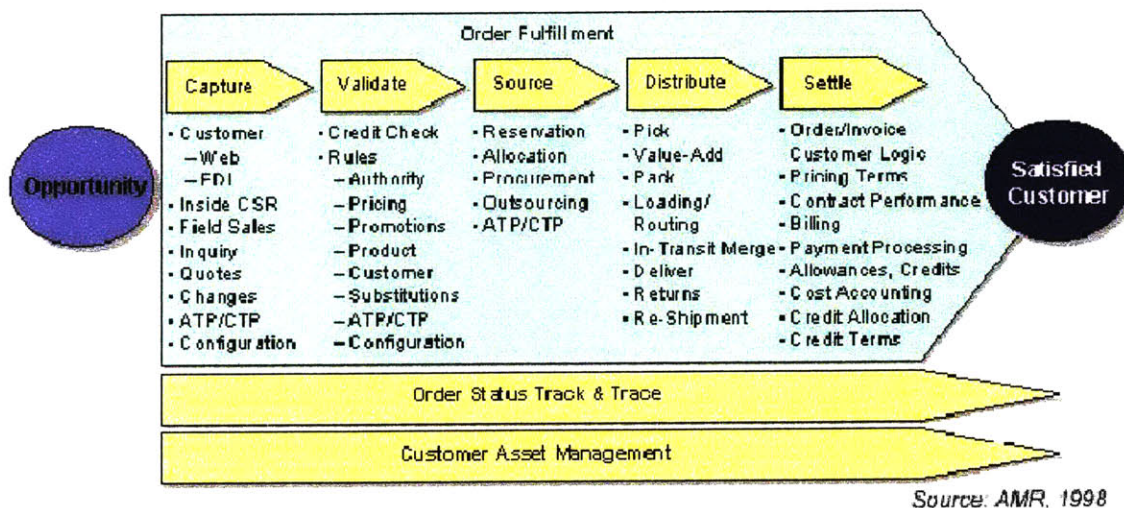
**Figure 2.2. High-Level View of Order Management Functionality**

Good order management and supply chain planning in process integration entail

the ability of the "disparate" functional departments within and outside a company to

break the functional barriers and have a holistic view of the channel. Each of the five

distinct steps discussed previously commonly entails a specific department. For instance,

*Capture* is usually managed by the Customer Service and Sales department. *Validate*

includes Customer Service and Finance while *Distribute* is the responsibility of the

Manufacturing and Logistics departments. Despite these "specialized" responsibilities, all these functional departments must be able to have a holistic view of the whole order management and supply chain processes, and have direct and clear communications among them. The functional scope of order management – from capture to settle – is defined in Figure 2.3.
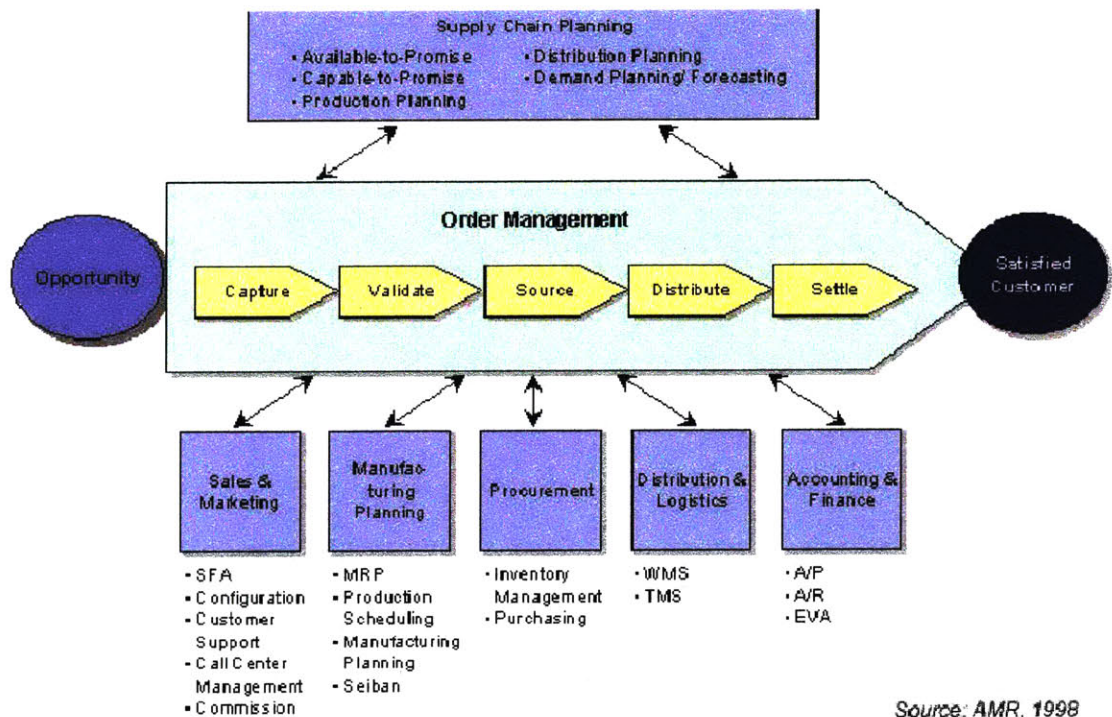


**Figure 2.3. Cross-Functional Order Fulfillment Interfaces**

## 2.3 Why Are Process Integration and Fulfillment Excellence Important?

Managers at companies across the globe understand that the key to success is to meet the real needs of their customers better than their competitors do. These companies have developed strategies that focus on developing core competencies that will lead to higher levels of customer satisfaction. Fundamental to this goal is the notion of process integration.

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Current supply chain industry practice embraces process integration dearly. As opposed to the old notion that focused on a functional area, process integration entails the integration of cross-functional activities within and across enterprises to ensure smooth coordination and communication across the supply chain. When focused on delivering value to customers, process integration is considered the key to future competitive success.

In today's highly-competitive environment, many companies oftentimes go through mergers and acquisitions, and are faced with the daunting tasks of synchronizing their processes to deliver the highest standards of customer satisfaction. Many companies, however, confuse process integration with mere data integration. This write up discusses some challenges currently facing companies' process integration strategies, and the steps that can be taken to remedy these problems.

Excellence in order management entails high rewards to those who can achieve it. Among other things, it is a key success factor in: Growing and maintaining market share, charging premium prices warranted by excellent service, and penetrating major accounts. Criteria that customers have on superior order management are most likely more extensive and higher today than ever before. To meet these criteria, a company needs to align its business processes to each of the customers' particular requirements.

Order management success oftentimes depends on the ability not only to meet customer-specific criteria, but also to meet channel-specific criteria. Many companies today sell through multiple channels and into different markets, thus, must be able to manage these multiple order management processes simultaneously. For instance, a consumer packaged goods manufacturer such as Procter & Gamble, must be able to meet

the order management requirements of grocery chains, superstores, small mom-and-pop stores, government agencies, and institutional channels.

## 2.4 Why Are Process Integration and Fulfillment Excellence Challenging?

Process integration is challenging because people are unable to have a holistic framework and think outside their own silos and companies boundaries; and because systems often do not communicate with each other, be it within a company or across multiple companies. Process integration is made more challenging by today's business practices such as:

- the proliferation of mergers and acquisitions with their disparate systems and cultural differences;

- the proliferation of outsourcing leading to interactions with numerous partners;

- companies having various business units whose goals might differ;

- having different profit and loss (P&L) centers leading to silo-centric management

Fulfillment excellence is challenging because of people, systems and complex processes that have to be coordinated and synchronized -- each process stream must be uniquely configured for the requirements of a specific channel or market segment, some of which may contain as few as a single customer. Thus, not only is it challenging to integrate processes outside companies, but also within a company. As an example of the

complexities within a company, the average company has 5.2 order management systems and 4.3 order fulfillment systems[3].

Part of the challenge faced by the new competitive process integration initiatives is that they fail to take into account persistent barriers to change. Much resistance stems from long-established attitudes and habits, which are deeply entrenched in operating procedures and performance measures. Oftentimes, these challenges are made worse by an incompatible IT infrastructure prevalent across the organization's supply chain – no one technology or information system works across companies, or within the enterprise or across groups in a sector; some do not even work across closely-related divisions.

Furthermore, even though increased customer focus and restructuring efforts are recognized, operating goals across departments, functions and enterprises remain inconsistent and poorly communicated and coordinated. This failure to operate as an "integrated system" hinders the attainment of competitive advantage that requires coordination and cooperation throughout the supply chain.

The first barrier to effective order process integration is the fact that many firms have ineffective systems to communicate customers' orders accurately across the supply chain. They do not have full visibility across the channels. Oftentimes, general perceptions substitute for real communication. Moreover, many firms do not formally and systematically measure customer satisfaction; nor do they benchmark customers' performance measurement systems.

A second major barrier emerges from a lack of consistency among operating goals across departments/functions/enterprises. Despite the desperately-needed "shared goals"

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[3] Johnson, Rod, Consolidated Order Management – ERP Alone Doesn't Deliver, AMR Research, February 2003

of the functions, many entities in the supply chain still find it difficult to abandon the local and narrow goals that have traditionally driven their operations. Another barrier focuses on counterproductive performance measurements that are not coordinated across various departments/functions/enterprises. Performance measures that promote functional results over integration reinforce counterproductive functional decision making.

The third barrier is the difficulty in integrating the disparate information systems throughout the supply chain. In many instances, incompatible IT systems are used throughout the supply chain. When systems do not talk "automatically" to each other, manual interventions are needed. This is highly inefficient as manual processes (such as phones, facsimile, etc.) are highly prone to errors, relatively inconsistent, and unscalable. Monolithic Supply Chain Management (SCM), Enterprise Resource Planning (ERP) and Customer Relationship Management (CRM) software packages usually work best with its own solution packages. For example, a company that uses SAP throughout its enterprise might find it impossible to integrate its IT system with that of its newly-acquired partner, who might use another ERP package. Meanwhile, to completely overhaul a company's ERP system might not be most cost-effective. Therefore, a software solution that leverages existing infrastructure to allow a company to quickly integrate and synchronize with its new partners' processes and systems is highly critical. In spite of the importance of IT compatibility to process integration, it is imperative that managers realize that IT itself will not solve communication problems without a sincere effort from all parties in the supply chain to improve communication. In other words, IT cannot be a substitute to real human interaction and communication. Many companies get caught up in the *"IT syndrome," expecting passive investment in IT infrastructure to solve all communication*

*problems. Better information exchange, not just better IT infrastructure, is required for true process integration.*

# 3 Literature Review

The objective of this literature review is to understand the overall background setting by examining previous relevant work and identifying a knowledge gap, if any. Another objective is to fully understand the order management process in order to be able to integrate business processes successfully to achieve fulfillment excellence.

In our literature review process, we have not found much work done in viewing order management in the context of process integration. We found this interesting because we view business process integration as essential to order management to achieve a company's goal of delivering the highest in customer satisfaction.

## 3.1 Process Integration Literature Review

The concept and application of process integration practices have become increasingly important to people in many industries over the last decade. Many adjectives have been coupled with the word "process," and other seemingly unrelated words have emerged: Process innovation, process integration, reengineering, and process coordination. Supporters claim that a process view of business allows companies to fulfill customer requirements more reliably, at lower costs, and in a smoother manner.

A few early proponents of a process vision include James Champy and Dr. Michael Hammer. These two are the authors of "Reengineering the Corporation," a book that presents processes as broken down, small mindless pieces in today's corporations. They propose that these pieces be integrated to some degree to complete a process more effectively and efficiently. Furthermore, they argue that the reengineering or process innovation that they speak of is achievable thanks to the information technology systems that can be used today to facilitate the completion of complex processes.

In the book, Champy et al. discuss how various processes are usually done in a certain way due to the unavailability of supporting IT infrastructure. This results in unnecessarily long cycle times. For instance, an insurance reimbursement process that would only take twenty minutes to complete provided a good IT infrastructure existed, may actually take twenty days to complete, due to the unavailability of this infrastructure. Champy further elaborates how a good IT infrastructure allows visibility and scalability over whole supply chains. The work also touches upon the fact that, due to the nature of the complexities involved in process integration, it requires more skilled labor who can perform cross-functional tasks and communications better than their function-specific counterparts.

The book concludes that despite the success stories, many companies that begin process integration efforts do not succeed at it. In fact, 50 to 70 percent of integration attempts fail to deliver the intended dramatic results. They end their efforts precisely where they began – making no significant changes, achieving no major performance improvement, and fueling employee cynicism with yet another ineffective business improvement program.

Many have wondered if it is not foolhardy to undertake programs with such high failure rate. The fact is, that failure rate is historical, not predictive. 50 to 70 percent of integration efforts have failed, not will fail![4] Integration efforts fail because the organizations undertaking them make common, avoidable mistakes. Based on historical learning, it is very possible for companies to avoid these mistakes and succeed at process integration. The key to success remains – in the knowledge and ability.

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[4] Champy, James, and Hammer, James, Reengineering the Corporation: A Manifesto for Business Revolution, Harper Business, New York, NY, 1994

In his book titled "Process Innovation: Reengineering Work through Information Technology," Thomas Davenport concluded that process innovation is a new and desirable approach to transforming organizations and improving their performance. Process innovation resonates well with process integration in that both seek to improve business process performance through the use of innovative tools and work designs; and have roots in the quality movement and other approaches to operational betterment of business activities.

Information and information technology (IT) are powerful tools for enabling and implementing process innovation. IT is both an enabler and an implementer of process change. The relationship between IT and process-based structures is reciprocal – process requires IT to achieve radical change, and to harness the performance capabilities of IT in a cross-functional, performance-driven manner requires a process view. Information is itself a powerful process resource. It is clear that accurate, real-time information on process performance is a prerequisite for effectiveness.

In addition to IT, how a firm approaches organization and human resources is critical to the enablement and implementation of process integration. How people are organized and managed and the degree to which they are empowered to do their work are critical to the success of process integration. Specific organizational and human resource approaches are likely to enable process integration include empowering workers to handle entire processes, establishing autonomous work teams, and creating new, more process-oriented organizational structures. These human aspects generally work together with information technology.

Others worth noting in this arena are professors and researchers at MIT, who work under the Center for Coordination Science, and focus on business processes. They investigate organizational structures, people and the IT infrastructures that enable processes to occur. These people are Thomas W. Malone, Kevin Crowston and George A. Herman, who are all members of the Center for Coordination Science[5].

## 3.2 Order Fulfillment Literature Review

There are numerous publications on order fulfillment management out there. Principally, our sources include articles from AMR Research, i2 Technologies, and trade publications such as Inbound Logistics, Logistics Today, and Computer World.

One article from AMR Research's Greg Girard explores and details the fundamentals that anyone should know about Order Management. This article 'What Should You Expect from Order Management' is previously referenced in this thesis extensively under the Order Management Overview.

Order Fulfillment requires numerous things, such as focusing on the customer and aligning one's assets to provide excellent customer service. Increasingly, it also requires process adaptability and configurability. This is an issue touched upon in the AMR Research's Louis Columbus article 'Configuration Is the Heart of Customer Fulfillment for Complex Product manufacturers.' This article, although oriented to Manufacturing, touches upon one key concern of ours, namely, complexity. It is for complex processes that configuration makes sense, and it is for that reason that the introduction of software products that are re-configurable by business process owners is paramount. This leads us

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[5] 'Organizing Business Knowledge' is the title of one of their latest books.

to the business focus of our sponsor, Yantra, namely software products that are configurable by business process owners in the order fulfillment space.

Configuration is essential because order management really takes the form of what is known in the industry as Distributed Order Management (DOM). Distributed Order Management simply means that any one order may be sourced from various vendors or facilities of an organization, and thus visibility and traceability of the order across these various sources are paramount. Publications in this space are scattered, but nonetheless worth noting. i2, for instance, was kind enough to grant us access to their DOM tutorial which gave us a good overview of DOM's fundamentals and potential benefits. The figure below captures their view of what DOM is:
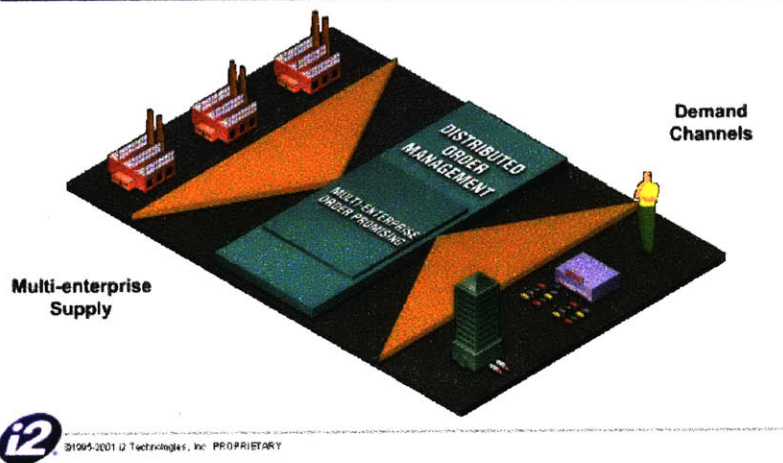


**Figure 3.1. i2's Distributed Order Management Concept**

One article that successfully captures the potential in process integration that the DOM framework brings is from AMR Research's Chris Newton, and it is called

'Managing Order Fulfillment Across the Supply Chain[6].' Among the key discussion points in this article are:

- Why ERP systems do not deliver in today's multi-player environments

- Which of the software vendors have products out there

- Who are some early adopters

- What does the platform look like

In addition, there are already articles out there that feature industry cases, such as "Supply Chain Apps Target Complex Orders" by Marc L. Songini in Computer World. The article mentions head-to-head competition between i2 Technologies Inc. and Yantra Corporation in offering DOM software products. In addition, it mentions companies such as APL Logistics, which is among some other 40 companies that have installed Yantra's software. The article also mentions the gains these companies have from having a software that works across enterprise boundaries.

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[6] Newton, Chris, Managing Order Fulfillment Across the Supply Chain, AMR Research, October 2001

# 4 Case Studies

The case studies included in this thesis came about because they are among the few companies that have tried DOM software solutions. More importantly, they are quite satisfied with the software and their software provider – Yantra – put us in touch with them.

## 4.1 Big Ticket Retailing

Retailer AgoraHome is a wholly-owned subsidiary of a bigger retail group, Agora. Agora has large department stores and carries a wide range of products. In addition, most of its customers tend to be very price sensitive. On the other hand, AgoraHome also has large department stores and carries a wide range of products, but it has a clientele within a higher income bracket; thus, not as price sensitive. A small, but very profitable component of AgoraHome's business is big ticket items, such as carpets, furniture, and window treatments. This case focuses on the big ticket item operations within AgoraHome. Given the fact that big ticket items do not constitute a high percentage of the business, both AgoraHome and Agora have focused their Order Management Systems around the smaller retail items within the businesses. In so doing, big ticket sales have been supported by legacy systems installed over 10 years ago.

In addition to supporting its retail stores, AgoraHome also supports web, catalog and phone orders. For big ticket items, the retailer refers potential customers to visit a store so that the customer can experience the product or a similar product firsthand. In the arena of non big-ticket items, multi-channel retailing is more acceptable; thus there is more activity and familiarity with web and phone orders compared to the big ticket items.

## 4.1.1 AgoraHome Fulfillment Environment

AgoraHome has five fulfillment options or procurement types as explained below (See figure 4.1, and 4.2). Each fulfillment option is consecutively ranked based on certainty of being able to make an on-time delivery:

1.  In stock on product: This occurs when the retailer has the product in stock at a store or at one of its warehouses. AgoraHome would in such a case fill an order from this stock. The visibility in this case is complete and AgoraHome has real time knowledge of stock position. On-time delivery certainty is 100% for items coming from this type of procurement.

2.  Vendor Warehouse (VW): AgoraHome may sell to customers directly from a vendor's inventory. This sourcing type requires visibility into vendor warehouse inventory; thus it is only feasible with large vendors to date. Stock position updates occur via an EDI transaction and the information comes daily from large vendors. With this type of procurement, AgoraHome is able to commit to a firm delivery date, with 98 to 98.5% certainty. Usually, this type of procurement can deliver within a 21-day period. This sourcing type is uncommon in industry, and signifies a degree of integration with vendors that is above average.

3.  On Order: In this case the product has been ordered from a vendor, but AgoraHome does not know whether it is already in production, has been made or not. If a customer wanted to order a product at a store of those characteristics, AgoraHome would not be able to offer the product since it cannot quote an estimated time for delivery.
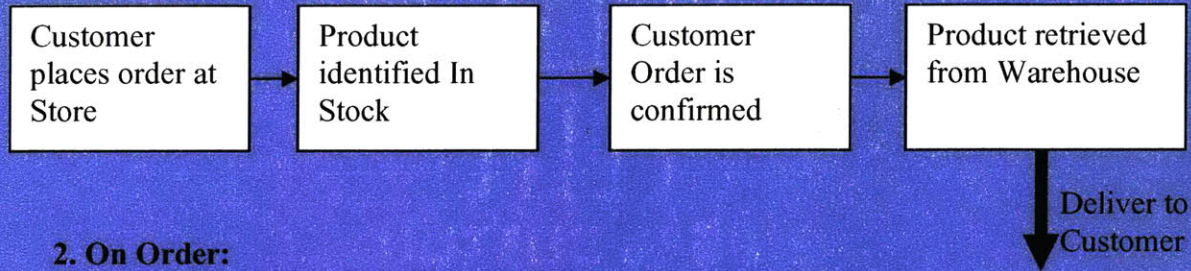
37

4. Vendor Warehouse Next Available (VWNA): AgoraHome may sell against a vendor's products coming into a vendor's warehouse. That is, a product is in transit or is in the process of being made by/for a vendor and AgoraHome has knowledge of these products and their lead times to reach the vendor and ultimately AgoraHome's warehouse. Visibility is limited by the frequency of updates on Next Available Inventory. The update method phone or EDI transaction has inherent error and efficiency implications that should be taken into consideration. In this case, the vendor is also the manufacturer, as it does not really need to deal with other third parties for procurement of items. Similar with the On Order type, the Vendor Warehouse Next Available procurement type does not schedule a firm delivery date until the merchandise actually arrives at its warehouse. It may provide customers with an Estimated Time of Arrival (ETA), but not a firm delivery date.

5. Special Order: Special orders are essentially custom orders and are the most complex. They are filled at the request of the customer and according to his/her specifications. The order is created based on AgoraHome's knowledge of what the manufacturer or manufacturers can do. The retail store has approximately 100 frames from which different customizations can be made. This order scenario requires the most coordination of all five possible scenarios: In-Stock, Vendor Warehouse, On-Order, Vendor Warehouse Next Available, or Special Order. The coordination may in fact be led by a design studio team if requirements are too complex or involve the remodeling of a home. The design studio coordinates among multiple vendors, customer service, physical delivery and delivery

schedules, and independent contractors. The design studio has a store sales force and interior designers that can do full interior design for a home or office. Interior design projects can be heavily involved and may include interior construction and home painting through third- party vendors with established relationships with AgoraHome. Another important established relationship is one with third parties that perform drapery installations.
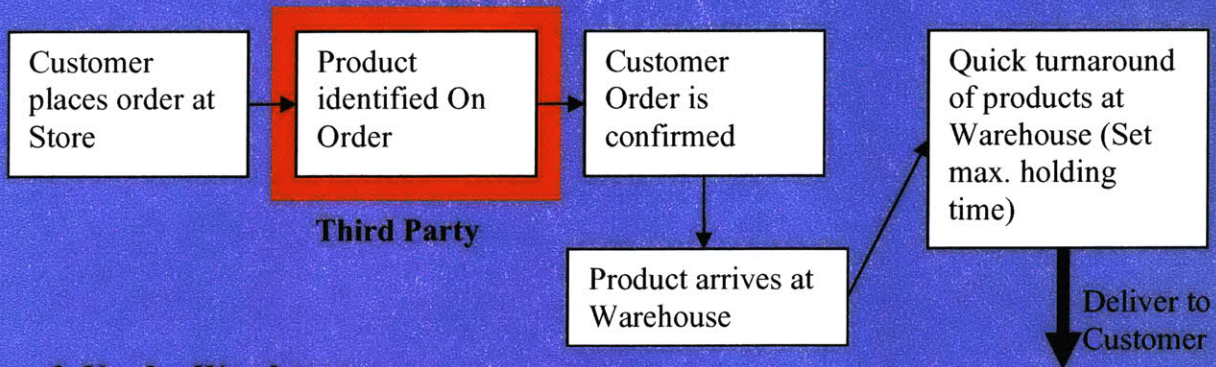
This particular procurement type is especially complex because it depends heavily on component availability and the die yard of the die lot (i.e. sometimes it is impossible to be able to die a certain fabric the exact same color to match the whole materials to be made into a piece of furniture). Communication among various parties is of utmost importance. This process typically involves two vendors or more, where vendor A provides the material/fabric for a sofa, for instance, and then ships it to vendor B for manufacturing (via an assembler). All orders use the same purchase order (PO). What makes this especially complex is the fact that it is an exception business in nature. When exception occurs, all vendors must be able to coordinate well and smoothly to deliver the product satisfactorily. The process can be summarized as purchasing material/fabric from vendor A, shipping it to vendor B who will then manufacture it. Vendor B usually also acts as the installer, but sometimes, a third-party subcontractor will perform the installation.
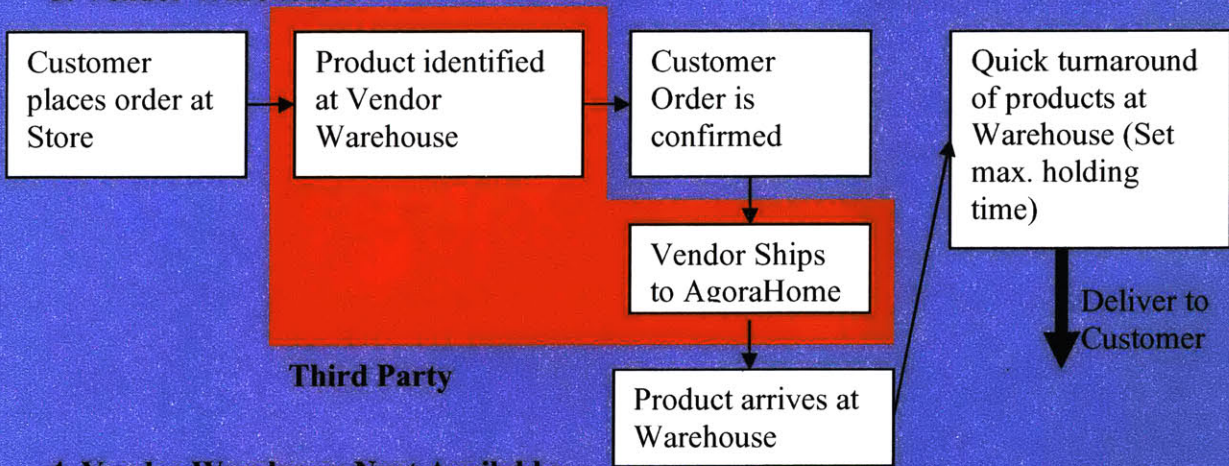
**Key Challenge: Order Visibility**
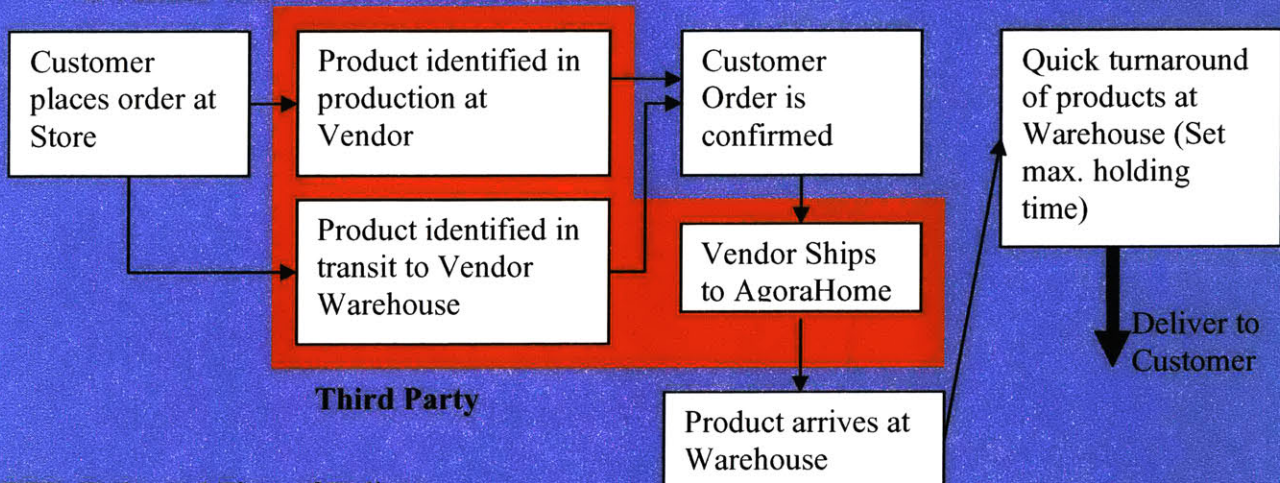
**1. In Stock:**

Customer places order at Store → Product identified In Stock → Customer Order is confirmed → Product retrieved from Warehouse

Deliver to Customer

**2. On Order:**

Customer places order at Store → Product identified On Order → Customer Order is confirmed → Product arrives at Warehouse → Quick turnaround of products at Warehouse (Set max. holding time)

**Third Party**

Deliver to Customer

**3. Vendor Warehouse:**

Customer places order at Store → Product identified at Vendor Warehouse → Customer Order is confirmed → Vendor Ships to AgoraHome → Product arrives at Warehouse → Quick turnaround of products at Warehouse (Set max. holding time)

**Third Party**

Deliver to Customer

**4. Vendor Warehouse Next Available:**

Customer places order at Store → Product identified in production at Vendor / Product identified in transit to Vendor Warehouse → Customer Order is confirmed → Vendor Ships to AgoraHome → Product arrives at Warehouse → Quick turnaround of products at Warehouse (Set max. holding time)

**Third Party**

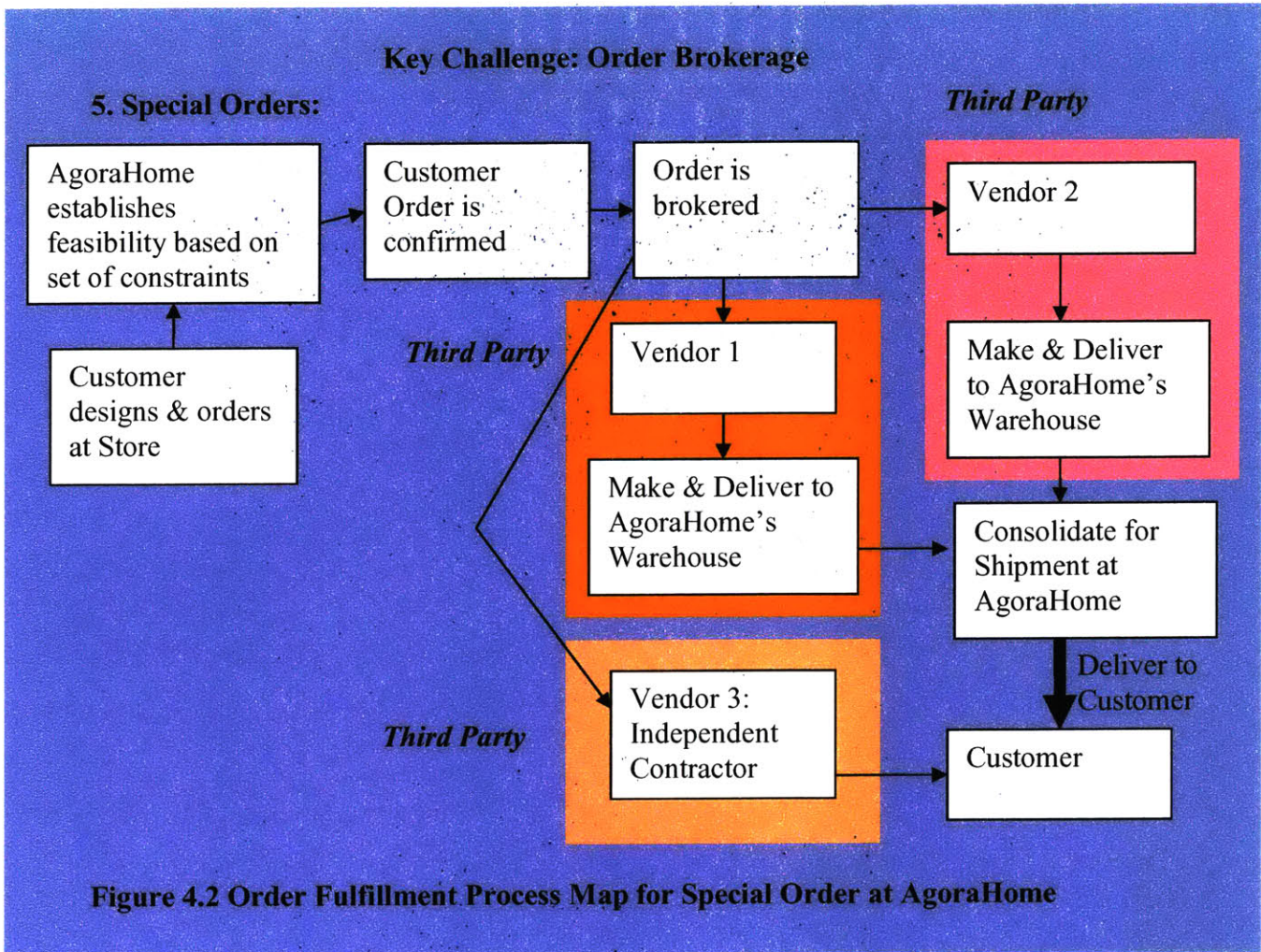Deliver to Customer

ETD: Estimated Time of Delivery

**Figure 4.1 Order Fulfillment Process Map for 'from Inventory' at AgoraHome**

**Figure 4.2 Order Fulfillment Process Map for Special Order at AgoraHome**

For all these order formats AgoraHome has approximately 600 to 700 active vendors (An Active vendor is a vendor that has sold to AgoraHome at least once in the last year). Vendor fulfillment lead times vary based on product type. For instance, a mattress or box spring would be at AgoraHome's warehouse in 3 days. This is considered a 'quick ship' by AgoraHome. Hand made products for special orders could take up to six months for delivery. Many of the special orders may go directly to the customer from the vendor. On average, 80% of orders would take 30 to 60 days to deliver.

Two other general comments about AgoraHome's supply chain are that AgoraHome operates in a particular region of the country. Within this region

AgoraHome has three warehouses and AgoraHome chooses to only ship to customers that are within a one-day drive from one of the warehouses. Thus, the company does not service customers outside this geographic area.

In addition, error rates are about 5%. This is hard to quantify since some deviations may be accepted by the customer. Products that are not accepted by the customer are taken back to AgoraHome's warehouse and sold through 'Warehouse sales.' These sales obviously constitute a loss to AgoraHome. Therefore, it is in AgoraHome's best interest to ensure that customer satisfaction is met, to avoid having to handle customer returns and selling at a loss, and to ensure continued business and the upholding of excellent reputation.

**Current Practice to Fulfill Orders**

Order fulfillment is initiated with the sales check created at the store by a customer either in person or by phone. The sales check would go into the legacy order management system. The order would then be reviewed and approved manually. Subsequently, the order would go into the purchase order system and go to the vendor via EDI. Upon receipt, the vendor would send an EDI acknowledgement, including estimated time of arrival (ETA) and purchase order (PO) acknowledgement. The vendor would be responsible for delivery to AgoraHome's warehouse. From AgoraHome's warehouse, the order would then be shipped to the customer via AgoraHome's private fleet, handled by personnel employed directly by AgoraHome. Very few orders (10%) would go to the store and not directly to the customer. AgoraHome views ownership of the delivery fleet and personnel as a competitive advantage to offer the best customer service possible.

Some high-end vendors would also deliver directly to the customer. In this case, AgoraHome only serves as the face to the customer or the point of sale. AgoraHome would create the sales check, review and approve, and send a PO to the vendor. The vendor would generate an ETA and PO acknowledgement and send via EDI to AgoraHome. Goods would then flow directly to the customer without any physical flow to be handled by AgoraHome. Upon delivery, the vendor would notify AgoraHome via EDI and AgoraHome's information system would be automatically updated based on the EDI transaction.

AgoraHome's legacy system was very restrictive and would require manual order brokerage in either of the following two events:

1. Multiple vendors: If an order had two line items that came from two different vendors, the order would be split and two new orders would need to be created for each line item. These would be manually created and sent via EDI to the specific vendor.

2. Multiple procurement types: Even if the order line items all came from the same vendor, but line items within the order were to come from different procurement types, namely, from In Stock and from Vendor Warehouse, the order needed to be brokered manually. In this instance, similar to the multiple vendor case, for one order with two line items, two new orders needed to be manually created for each line item.

**New Software System - Yantra.** AgoraHome puts a new system in place essentially to eliminate manual order brokerage. The software talks to the legacy systems within AgoraHome. Visibility extends further into stock positions within the individual

warehouses, or in transit to AgoraHome. Further visibility will require integration with AgoraHome's vendors.

## 4.1.2 Big Ticket Analysis

The manufacture and delivery of big ticket items is non trivial; specially, when one considers that the products are typically made by more than one vendor. These vendors must meet certain aesthetic specifications and source materials that meet the criteria.

Many of the products made go into inventory, thus making forecasting accuracy and precision extremely important. As for custom products that do not go into inventory, but directly to customers, coordination of vendors becomes crucial to make products in an error-free, timely fashion. Thus, the two key barriers to an excellent order fulfillment practice faced by the big ticket retailer are:

1. Visibility

2. Order Brokerage

Each one of these two barriers is applicable primarily to one of the forms of fulfillment. Respectively, barrier 1 applies to fulfillment from inventory and barrier 2 applies to make-to-order.

This distinction is paramount so that a process integration initiative is focused and applies to the specific processes. Note that the emphasis should be on process characteristics to drive the process integration strategy.

**Visibility**

The first four sourcing types, In Stock, On Order, Vendor Warehouse, Vendor Warehouse Next Available, are definitively affected by the visibility barrier. The

problem is that the retailer can only tell a customer what he has In Stock, or what is at the Vendor Warehouse – The vendor provides a daily EDI update as to his warehouse stock. The retailer is thus limiting the inventory from which he can service an order. Should he not have the product/service visible to him it is as if he did not have it. The customer order may turn into a lost sale, a back order, or a lost customer.

To further explore the issue of visibility, let us refer to figure 4.3, which shows the percent of orders filled from each procurement type. Note that AgoraHome fulfills orders primarily from VW. At first glance, one would think that efforts to optimize In Stock, On Order, or VWNA processes or visibility could be better spent on optimizing VW. In reality, this may equate to focusing on the wrong problem. The question to ask is: Could orders be filled from elsewhere at lower costs? The cost of obsolescence is maximum at In Stock and secondly at VW. It is lowest when product/service is drawn from On Order or from VWNA. However, the service level provided from On Order or VWNA is suboptimal, with highly variable lead times. What does the retailer see as the problem? "Our biggest problem is that we should have better forecasting." Forecasting is always wrong, especially in industries that deal with consumer taste and fashion trend.
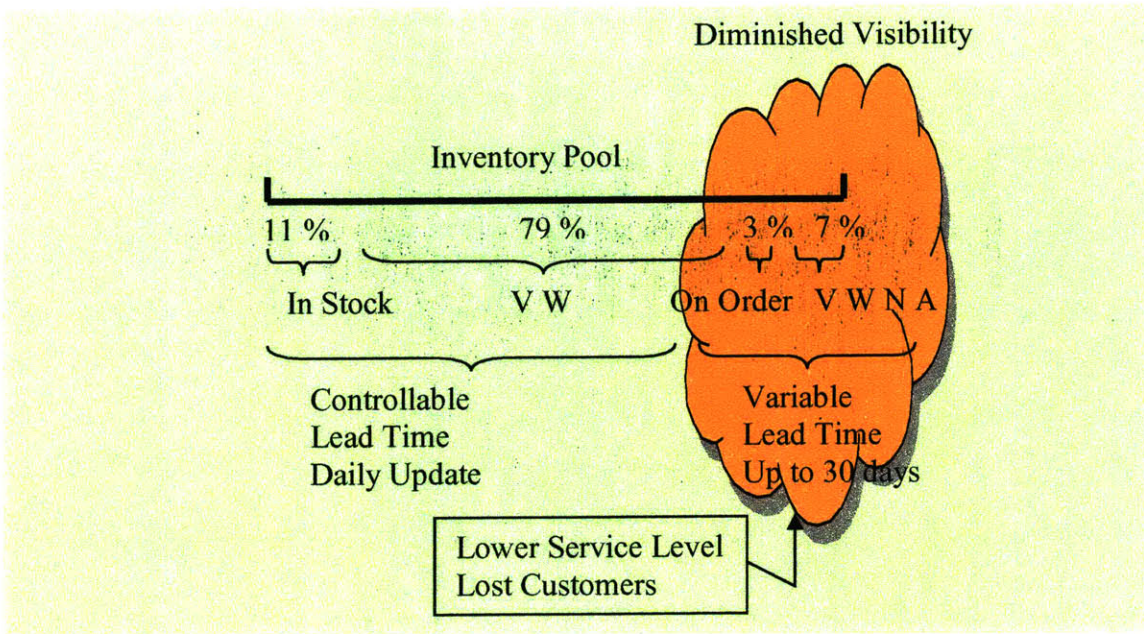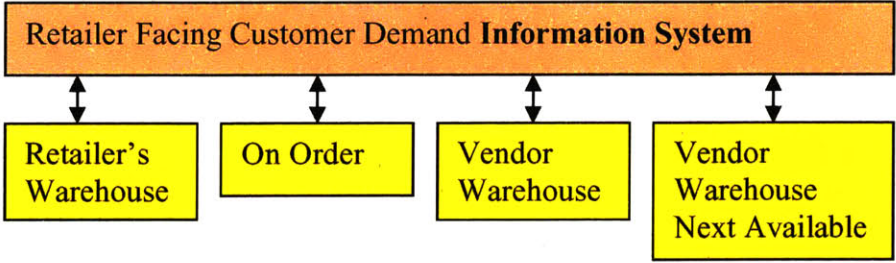
**Figure 4.3. Inventory Pool for Order fulfillment**

What can be done? To deliver from On Order, or from VWNA, the retailer must be able to fill demand from these sources with higher service, particularly, controllable lead times. Order fulfillment from these sources is currently minimal, but couldn't the practice of fulfillment from these sources be comparable to the practice of a company like Dell? Identifying opportunities like this is one thing, but being able to capitalize on new processes would require flexible processes and BPI for visibility and synchronization.

Additionally, the problem is partly rooted on the information systems used by the retailer and its vendors. These information systems focus on the internal workings of making a product/service. More deeply, the problem is also the result of most processes to track and trace product/service delivery which are rooted in ancient practices, practices that are based on the use of paper documents to track and trace single product/process progress.

To take this one step further, the problem is compounded by the batch nature of information exchange. In other words, I have a number of products in the pipeline and I update my customer every so often based on my inventory level, or on a fixed schedule. This discrete information exchange is the result of the high historical cost of information transactions.

In the end, the result is to have to tell the customer: Yes, I have it or No, I do not have it. The process integration to be proposed here leads to a much larger inventory to draw from without the commitment to higher inventory levels. The framework to the solution is simple (see figure 4.4), but likely difficult for numerous reasons. One other reason that makes it difficult is the vendors' skepticism of retailers seeing their inventory and lead time capacity.

| Retailer Facing Customer Demand **Information System** | | | |
| --- | --- | --- | --- |
| Retailer's Warehouse | On Order | Vendor Warehouse | Vendor Warehouse Next Available |

**Figure 4.4. One Information System for Single Point Visibility across players**

## Order Brokerage

The fifth type of fulfillment, Custom Order, faces a different type of challenge, namely Order Brokerage. When the end customer asks for a customized product/service, this product/service is to be made once to fill those specific requirements (see figure 4.5).

This challenge is worth explaining independently since the retailer will need to coordinate sourcing of different components for the end product/service from different vendors. The challenge is to identify the vendor who actually has the product and can best fill the order at the best cost and within a reasonable time horizon.

Process integration in this scenario must focus on being able to identify vendor capacity, or inventory to make the component or final assembly that the retailer requires. Additionally, process integration would facilitate the easy information transfer of requirements to the vendors and the coordination between the vendors since a component might need to go from vendor to vendor.
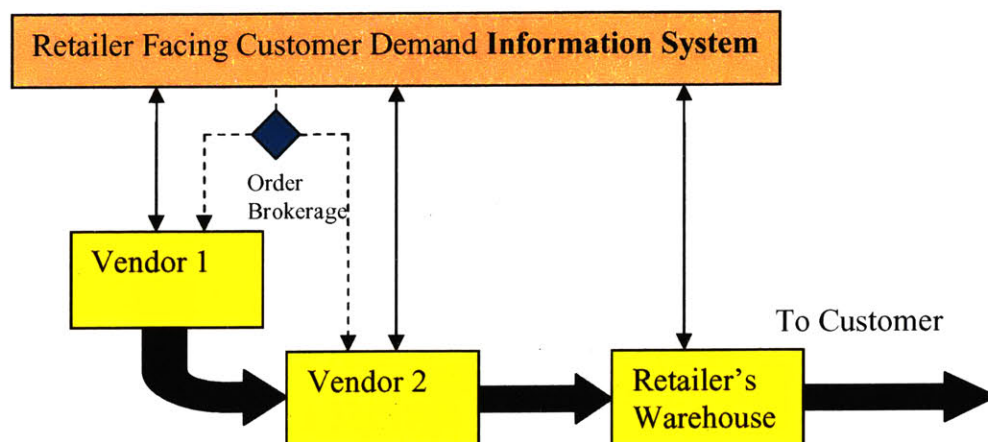


**Figure 4.5. Order Brokerage System for Custom Order Coordination**

There are software packages available that broker an order to different vendors and the orders associated with each vendor's part of the process has a parent-child relationship with the original order. The system maintains this relationship and allows tracking throughout any of the players.

In the case of no automated relationship between the retailer and the vendors, the vendors track the order independently within their own information system or by paper tracking. There is no automated communication and hence no visibility into the progress of the internal processes taking place within a vendor.

## 4.2 Logistics Services for the wireless communication Industry

This second case is with a leading global provider of innovative logistics services to the wireless communications industry, serving network operators, agents, resellers, dealers, and retailers. We will refer to this company throughout this case as LogiCell. They provide best-in-class distribution services for competitively priced, quality products from leading manufacturers such as Motorola, Sony-Ericsson, Nokia, Samsung, and others. Beyond handsets, they offer a comprehensive line of Original Equipment Manufacturer (OEM), aftermarket, and specialty designer brand accessories, as well as satellite TV systems and broadband wireless solutions.

### 4.2.1 LogiCell's Fulfillment Environment

All U.S domestic customers are serviced from one National warehouse in Texas. General groupings for these different business markets are:

- Bulk fulfillment: This type of fulfillment involves the use of standard warehousing practices of various products that are packaged bulk and distributed to store fronts on a pallet. For instance, a delivery to an AT&T store of 100 wireless phones on one pallet in one single shipment.

- Direct to consumer: LogiCell caters to corporate customers that require the delivery of single units to their customers. For instance, if Amazon.com were a customer of LogiCell it would require that LogiCell be capable of delivering individual units to individual customers. This scenario involves many more shipments than bulk fulfillment, and across a vast geography making it very complex.

- Wireless Carriers (i.e. AT&T Wireless):

    o Direct channel: Wireless Carrier has company stores around the country. These stores are replenished by LogiCell as the 3PL selected by the Wireless Carrier under an extended time period contract.

    o Independent Retailers: The retailer is independent of the Wireless Carrier, but carries products from the Wireless Carrier within a larger assortment. These stores are replenished by LogiCell as the 3PL selected by the Wireless Carrier for an extended time period contract. LogiCell offers a line of credit to these independent retailers.

- Insurance Carrier: Consumers may buy an insurance plan with their cellular phone purchase from the Wireless Carrier. The insurance plan offering is that it will replace the handset for the user in the event of damage at no additional cost. These orders are filled by LogiCell as the 3PL selected by the Insurance Carrier for an extended time period contract. The process can be categorized as *Reverse Logistics for fulfillment.*

For the three first customer types - Bulk, Direct to Customer, and Wireless Carriers - LogiCell houses all information flow in one single ERP system. It is confident that information is available in real time. The ERP system is coupled with a Web interface.

In this case, we will primarily look at the services they provide in reverse logistics for Insurance Carriers (see figure 4.6). Briefly discussed, the process is as follows: LogiCell receives an order from the insurance carrier and sends a like, working phone to the customer. The customer's broken phone is repaired and sent to storage at LogiCell's warehouse for future disposition. The majority of repair operations are internal at

LogiCell.  However, LogiCell is not interested in owning repair operations, but thus far it has built that capability to some degree.  Our contacts within LogiCell inform us that it is not in LogiCell's interest to continue building a repair capability since they do not view repair operations to be in line with their core competency.  In addition, LogiCell feels that an independent repair operation should be able to achieve better economies of scale and provides such service at top quality.  In fact, repair operations, both domestic and off-shore, need to be certified by the OEM.  In line with LogiCell's desire to outsource repair operations, one such operation is currently in Chile.

**Like phone: Multi-Party Reverse Logistics for Fulfillment**
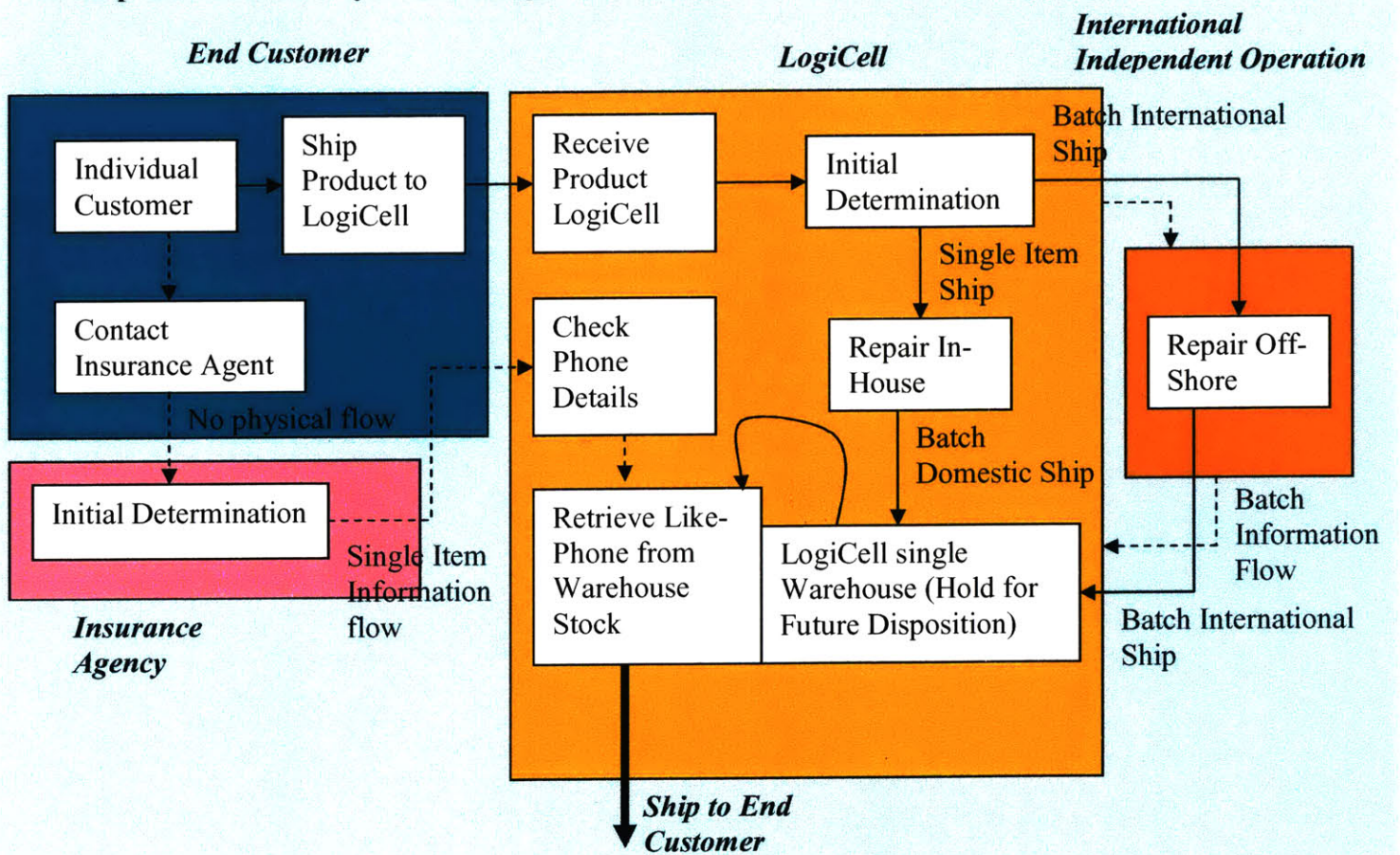


**Figure 4.6. Process Map at Wireless Communications Logistics Service Provider**

Observe that the process description for repair (domestic and offshore) is coupled with a batch delivery system to and from the repair process. In addition to the physical batch flow, information flow is also in batch. For instance, the internal repair operation updates the information system twice per day, and the off-shore operation updates less frequently – approximately once weekly. The information flow is via EDI exchange with both repair operations. The batch flow of information does not allow continuous knowledge of equipment status; namely, repair progress or finding of permanent damage. In addition, if LogiCell wanted to have a same day turnaround for phones it would require hourly updates. It is important to underscore that in the reverse logistics case, LogiCell represents only a fraction of the customer's chain. The customer in this case is the Insurance Agency.

## 4.2.2 LogiCell Analysis

Our first realization was that we must think in terms of flow; most importantly, flow ought to be looked at in two subgroups:

- Information Flow

- Physical Flow.

Then, we categorized whether each of these flows was:

- Discrete (single piece) or

- In Batch

Within this reverse order fulfillment process, information flow tends to be batched within different time intervals depending on the repair location. For instance, off-shore repair information intervals are longer than domestic repair information intervals.

In the domestic and international repair operations customer information is irrelevant, given that the phone will not return to a specific user. This in turn results in the following scenario -- Batching gains more importance, lack of unit traceability is warranted, and economies of scale gain prominence. Can one foresee a case when unit traceability at this level may improve customer service? Certainly, LogiCell, in fact, identified the desire to offer business phone users the option of receiving their own phone in case they kept contact information on it. Such service was unavailable because of long lead times and thus the likely loss of air time valuable to the customer.

In the business user scenario our process requirement would be to trace the repair process as granularly and continuously as possible. In fact, LogiCell stressed that if they were looking for same day turnaround, they would require at the minimum hourly status updates daily on all work in process. Similarly, improvements in repair lead time would reduce inventory levels at LogiCell's warehouse.

What we see as the bottleneck to efficiency gains and higher inventory turns are batch information and batch physical flow. In addition, the same factors influence the inability to offer higher service levels with different degrees of customization.

**How can LogiCell turn cell phones around quicker?** We have thus far made broad claims about the ability of Process Integration to streamline processes and shorten lead times. In the real world, however, to be able to integrate processes the key is to build trust with people across functional groups within the organization and with people in partner organizations, and then to search for increased visibility. Trust is first because the visibility is across functional groups and across company boundaries. Functional

groups and organizations tend to be skeptical and protective of their turfs, thus creating barriers to process integration within the organization.

Moreover, the creation of the links that will permit visibility is important. These links have substantial Information Technology requirements, such as EDI or XML. We see BPI as the way to offer two things:

1. Differentiated service plans in line with customer needs, i.e. delivery of the same phone to business users;

2. Repair operations by a specialized organization that can achieve economies of scale and conduct the repair off-shore at more competitive labor rates.

LogiCell can do #1 if it can turn phones around in a reasonable time horizon. To do so, it must do it internally with close tracking of product progress through the repair process. If it was to involve a third party, then the BPI required would be significantly higher, but then further economies of scale would be realized. Similarly, accomplishing #2 without hugely increasing inventory levels is possible only if LogiCell is closely connected with the third party in terms of information, traceability, and ability to deliver in a reasonable time horizon.

# 5 Generic Analysis

Based on our analyses on the two case studies discussed previously, the next analysis seeks to generalize the challenges faced in process integration and presents the framework to overcome them. The analysis will look at both the human and non-human factors (such as systems, organizational structures, incentives, etc.) that affect process integration implementation efforts.

As discussed in chapter 2.2, order management interfaces with the customer, the organization and its suppliers and thus affects their relationships. Well executed order management can significantly enhance these relationships.

This chapter focuses on taking order management as a microcosm of business processes and generalizing the business process issues and subsequently the opportunities for integration. This section includes a listing of the challenges more broadly, an analysis of the problems, and the suggestion of a framework as a way to implement successful process integration to achieve fulfillment excellence.

## 5.1 Problems and Challenges

This analysis leads to the following list of organizational problems:

- Independent organizations protect what they believe is their intellectual capital without the realization that sharing it with partners may lead to competitive advantages

- The scope of some functional organizations is unrepresentative of processes and their scope

- Organizational or functional metrics are misaligned from those of their supply chain partners

This analysis also leads to the following list of Information Technology problems:

- In line with the functional specific groups comes the creation of Information Systems that cater to one group's needs without regard to the entire process

- Similarly, independent enterprises that complete parts of a process build their own Information Systems infrastructure which is not aligned with other enterprises also participating in the same process

- Limited order visibility across various participants in the order fulfillment process

- Limited physical flow visibility across various participants in the order fulfillment process

- Unscalable information transfer among participants due to system constraints

- No single platform to align all independent processes and enterprises

These challenges are not only applicable to the processes we have analyzed. In fact, the literature suggests that the similarities are very high between the issues found here and those experienced by other organizations. Enterprises share issues of:

- Functional alignment with business process

- Information exchange across systems

- Order and product/service visibility

Although barriers to BPI are similar, business processes are not the same in different organizations. Hence, the need for systems that are configurable to the needs of a business. This issue will be further explored in The Single Platform Model section (Section 5.3).

## 5.2 Human Factors in Process Integration

The compelling benefits of process integration are becoming widely known, however, companies are not as adept as to how to overcome the significant challenges in developing successful process integration across companies, particularly because it requires a significant degree of focus on human issues.

The key determinant of success in creating and managing process integration is the understanding that it requires a fundamental change in a company's perspective and ways of doing business. The human factors framework presented here is modeled after the ideas of Professor Roy D. Shapiro and Dr. Jonathan Byrnes as presented in "Intercompany Operating Ties: Unlocking the Value In Channel Restructuring[7]." In this paper they suggest that the effective companies that they studied went through three stages of change: awareness, orientation, and implementation. In this section on Human Factors, we follow the same model, but name the stages: Idea Propagation, Alignment, and Implementation.

The problem really is, principally in terms of human factors, that companies that proceed immediately to implementation without spending sufficient time in the propagation and alignment stages may experience serious problems. For one, by quickly jumping into implementation, the company may focus in low payoff areas. Moreover, by

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[7] Dr. Byrnes, Jonathan and Professor Shapiro, Roy, Intercompany Operating Ties: Unlocking the Value In Channel Restructuring, 1991.

moving directly into implementation without sufficient due diligence, the company

cannot focus on the organizational and process changes to achieve long-term success.

## A. Idea Propagation

Idea Propagation is the development of a systematic knowledge of what

integration is possible and how coordination between people and processes will take

place. Companies entertaining process integration initiatives must also methodically

communicate and permeate this knowledge throughout their organizations early on, to

prepare the organization and pave the way for future changes. Deep understanding in Idea

Propagation encompasses:

- Strategic Alignment: How does process integration fit the process and the channel structures

- A Holistic Perspective: the ability to look beyond companies' own boundaries and to have a holistic view of the whole supply chain channel

- Communication is crucial so that all players and stakeholders are well aware of how things are changing and how their processes might be affected

## B. Alignment

Alignment provides a framework for joint development efforts with other supply

chain participants by giving a company a view of its opportunities, and a specific vision

of its strategic direction. In the Alignment stage, a company must define:

- Target Area – the analysis of particular integration mechanisms for a set of supply chain participants

- Metrics – analysis of suitable performance measures and performance goals

- Change Management – for organizations to rally around processes vs.
   functions, a great deal of change ought to be properly management

Effective alignment analysis is quite different from the traditional introspective operations review. New information must be developed on the activities that happen beyond a company's traditional boundaries. Spending sufficient time understanding other channel members' businesses and developing relationships are crucial.

Some companies seek ways to restructure the information and product flows radically to meet newly defined objectives. It may be appropriate to utilize a pilot project at this stage. A pilot project offers an opportunity to carefully conduct hands-on experiments, and is designed to neutralize the change process. A pilot project enables managers from within the company and from other supply chain participants to learn together how the integrative mechanisms should be structured.

## C. Implementation

In the implementation stage, companies approach their partners and help them understand the benefits of process integration and jointly develop the mechanisms to achieve process integration. Implementation must encompass the overcoming of business inertia, the likely desire of continuing to do things as they have always been done, and the structuring of systematic ways to manage relationships – relationship management.

Business inertia evolves from distinct functional practices that lead functional groups within one organization to work in isolation. Each functional group develops its own performance metrics and reaches objectives in its own way. Performance metrics often build walls that drive functional groups to focus on internal improvements that

might be counterproductive to the overall business tactics, and worse, to the overall business strategy.

Performance metrics are generally coupled with compensation practices. Employees are used to being compensated on the basis of some clear deliverables, such as sales, or cost reductions. More importantly, a sales or cost reduction as it pertains to their specific function and compensation is specific for achievements within that function. In the end, employees do what they are paid to do; thus it is important to align their compensation with the more strategic business process view. For instance, one could think of compensation on the basis of a full process being properly coordinated and delivering higher value for the organization, and not just for one functional group.

In addition to all these internal barriers, there are also barriers due to the need to bring supply chain partners along for the ride. A process-centric vision would be incomplete without inclusive participation of partners. This requires even more degrees of trust, and the further break-down of typical ways of thinking that tend to be internally focused. Companies that are going to work in a process integrated manner must have similarly aligned performance metrics and compensation systems for the integration to work. This must be carefully studied and deployed because the requirements are both tactical and strategic. This also means that the selection of partners that are to be process integrated must be careful, so that the integration is successful and leads to higher value.

The implementation must also include a well defined education program. First, people are neither trained, nor experienced in working in a process-centric organization. The transition must be understood as a necessity for business competitiveness and there is no better way to clearly communicate that than through a systematic education program.

The significant change that people are subject to due to becoming process-centric is not a one time event; thus, the education must be established as an on-going practice.

The second aspect that must be appropriately implemented is the management of relationships. Process Integration rests upon relationships and thus this is paramount. Strong relationships, in turn, rest upon trust and the clear definition of the objectives of the relationship. In business, objectives typically come in the forms of higher returns or the delivery of higher value in customer service, for instance. Clearly drawing the expectations of the relationship is first.

Because there must be well defined objectives, process integration and relationship building are not for every supply chain partner. The champion of process integration for any case must carefully choose who he/she will pursue further integration with. The cultures and the way companies have been doing business must be aligned.

Relationships are not mere connectivity or information technology integration. In other words, EDI and Extensible Markup language (XML) connectivity are insufficient to achieve process integration. The companies must focus their efforts in the human aspect of organizational relationships, so that processes can be aligned and then integrated.

## 5.3 Suggested Framework

### 5.3.1 Full Circle Process Visualization

Order generation to fulfillment is truly what we will refer to as a 'full circle process (FCP)' and thus should be looked at in that perspective:
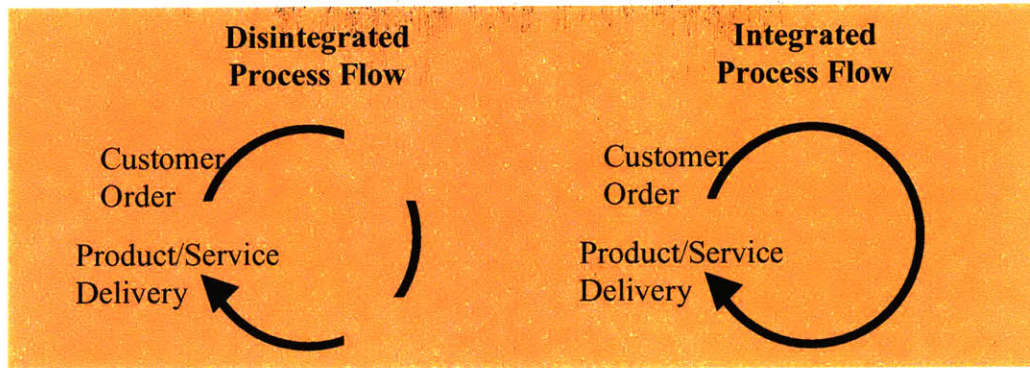


**Figure 5.1. Full Circle Process Visualization**

In the figure above, note that the Customer Order ($1^{st}$ step) includes numerous specifications that should be met for the customer. The fulfillment excellence of the organization is achieved when the Product/Service Delivery (last step) is accomplished according to the numerous specifications defined in the first step. When an organization engages in true process integration, it must not lose sight of FCP since it integrates all other internal and cross-enterprise processes and should guarantee meeting all customer specifications.

The FCP tends to be invisible to the many participants in the order fulfillment supply chain since they focus on their own internal complex processes. Their narrow focus leads to the lack of end-to-end visibility. This process disconnect is comparable to that resulting from the high decomposition of labor in an assembly line. In the assembly line, a worker ,Joe, is only concerned with the performance of his task, and the metrics

and rewards associated with the work he completes. In reality, there are numerous relevant factors - organizational, human, and information related - with an impact in process completion that Joe misses. Furthermore, the complexity of internal or enterprise specific processes leads to the development of information systems (IS) that best accommodate internal processes. When the IS are meshed with other IS that were developed with another goal in mind, they find themselves mismatched.

Information systems host process information, and more specifically host information on product/service creation and progress through a number of steps within a process. However, when the product/service creation jumps from one distinct process to another it often finds itself jumping without any identification. The product/service is thus unknown to its new host (a downstream organization). The new organization assigns the product/service a new identification by which it will now be known. The product/service is now unidentifiable outside the current organization in which it is currently located, and shall progress invisibly to the FCP throughout the current host. This practice is commonplace and impairs FCP visibility enormously. To avoid the mismatch of IS and processes, an FCP view should always be maintained.

In the order fulfillment realm, the impact of a lack of an FCP view across players is noticeable particularly in three fronts:

- Store front cannot see vendor inventory, and thus, it cannot fill orders from vendor inventory

- The organization cannot offer value added services, guarantee higher quality or error-free delivery due to lack of process synchronization across vendors and product/service providers

- Accurate lead time or lead time compression becomes unattainable

The product/service delivery organization must act as the full coordinator of all internal and cross-enterprise activity. The one organization as coordinator model is similar to the one point-person model used in business practice to assign responsibility. The logic behind the choice rests on the need to see across the FCP, as well as, the need to align independent processes with more global business goals.

In addition to FCP visibility, what we shall refer to as continuous visibility further positions the enterprise for service/cost/lead time improvement or process innovation. Continuous visibility is the enterprise's ability to look at product and process progression continuously. Our research and industry observations suggest that continuous visibility is rare. In fact, when a process is outsourced off-shore, visibility is reduced even more to scheduled updates spread as far apart as weekly or worse. Even when a given operation is conducted internally, that department may only update once, twice per day or worse.

When engaging in process integration it is critical to concentrate on the boundaries across which processes and enterprises must relate to each other. As mentioned earlier, we found that most companies focus only on their core process and excel at it. However, they do not focus on information transfer from one process to another or from one organization to another. The transfer of information is often via older means of communication such as a paper purchase order, a phone-to-fax transaction, or a phone call, especially when one of the participants is a small player. This practice tends to require human participation and thus is prone to mistakes. In addition to being error prone, human intervention makes the practice not scalable.

## 5.3.2 The Single Platform Model Framework

A single business platform is something that organizations have considered critical for many years, hence the rise of Enterprise Resource Planning (ERP) systems. ERP is an overarching system within an organization and thus offers the required internal process integration.

ERP systems, however, are designed for one enterprise, and today's business environment requires the integration of multiple independent organizations. It is increasingly common for organizations to contribute only a piece of a product/service offering, and have to collaborate with others to offer the complete product/service – what we know as horizontal organizational structure vs. vertically integrated organizations.

Multi-player order fulfillment and the outsourcing practice in general underscore the need to have the like of an ERP system but that extends the multiple players prevalent today. Such a framework would be similar to the single platform shown below:
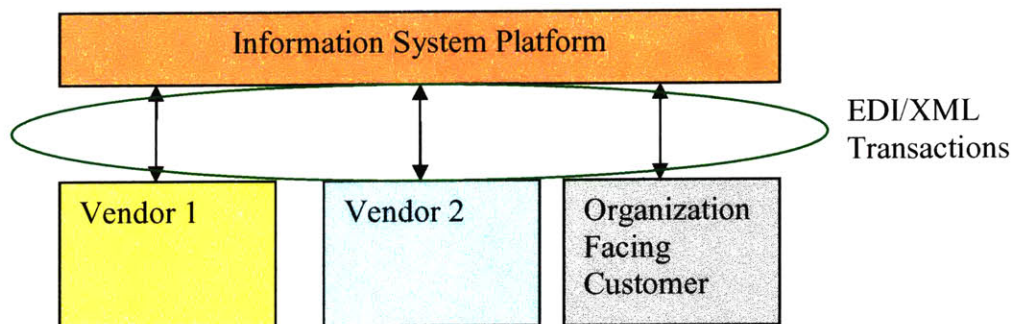


**Figure 5.2. Schematic of Single Platform Model**

The single platform model requires a highly adaptive environment. In other words, the platform must be able to deal with numerous organizations and different types of orders/processes. Designing a robust system with such flexibility turns out to be very

challenging. Principally because no two processes are identical and because processes do not stand still so the system must accommodate continuous change in the processes that it supports. It turns out some software vendors have tried to create a visual interface for the creation and/or rearrangement of processes by the business process owners at their discretion and without technical support.

The challenges of communicating within and across enterprise boundaries and aligning the business processes of these various players are exacerbated by the fact that some of these companies turn out to be small players with limited capital resources to develop the needed Information Systems infrastructure. Companies such as retailer AgoraHome have taken steps to allow some degree of automated communication via the Internet, which many small business owners do have. In the case of AgoraHome, the web channel is extremely limited with only three or four transaction lines. It is nevertheless an attempt to automate communication with the small companies. Further development of the internet channel would link small vendors with AgoraHome, but all the development cost and resource appropriation would be incurred by AgoraHome alone. An evaluation of the value of such an undertaking would require a return on investment (ROI) analysis which we do not intend to do here. We must highlight, however, that an ROI typically focuses on hard cost analysis vs. value drivers and flexibility, and thus undervalues the value proposition of the initiative.

Worsening typical ROI analysis findings is the fact that small vendors represent a relatively low percentage of AgoraHome's total sales, thus making an all out investment from AgoraHome unjustifiable. The issue is looked at as a causal relationship: Small vendors supply 20% of our product sales, thus they should not warrant high resource

allocations. It all leads to BPI not being pursued for the small vendors. Nevertheless, hypothetically BPI would allow AgoraHome the freedom to turn any relationship into a larger or smaller one depending on the service/product/price offered to it. In the end, AgoraHome is constrained by the scalability of the relationship both from the physical capacity of the vendor, and AgoraHome's lack of desire to allocate resources to the development of a centralized Information System that would allow full BPI with the current small players.

**Single Platform Implementation**

The Single Platform model includes a read/write system that sits atop any number of enterprise specific systems. The system must support both visibility across the various players and transactions between them. Such systems are available today and have EDI, HTML and XML capability, as well as, the ability to interact with legacy systems. The cost of an implementation ranges from $200K to $1.5 million, according to a conversation we had with one of the software vendor's representatives.

Aside from the technical implementation, there are organizational and human factors to address prior to any successful BPI initiative. The human factor includes the training of process owners who understand the process details well and can use a modeling interface in the top layer software to model the processes. The process owner is critical since it gives the specific process a cohesive leader who bypasses functional differences as the product/service progresses through functional areas. The process owner ability to model the process independently is a radical improvement in software features, yet a fundamental one. The modeling capability at the finger tips of the process owner gives the process higher flexibility in the hands of one single responsible person.

Organizational factors are closely coupled with the human factor and thus the issue has been touched upon in the previous paragraph. Nevertheless, it is worth adding that the functional organizations bring with them metrics that may be misaligned when compared across the FCP. Functional organizations, however, remain necessary given the complexity of internal processes. Multi-functional alignment is achievable via the use of aligned metrics and some degree of reporting through the process owner.

The overlay of a top control system above internal systems and the displacement of previously manual or paper transactions may conflict with established processes. In fact, the automation may lead to some conflicts and even increases in error rates. The answer is allowing things to settle down and become integrated with the way people interact with a business process. A problem of this type was encountered and briefly discussed in the AgoraHome case.

To avoid overextending the desired scope of the BPI initiative, partners should be picked carefully as the relationships are to grow and must be nourished. Once the selection of business partners is complete we suggest the use of a progressive well-defined approach to implementation: Idea Propagation, Alignment, and Implementation. This approach includes the definitions previously detailed in section 5.2, and should be closely coupled with the information system and the people supporting the processes.

# 6 Conclusion

Business Process Integration is the ability to link two or more sub-processes, so that they present a common face to the customers even though the processes are separated. One might have separated a single process into several sub-processes to simplify it or to complete one of the processes at a lower cost by aggregating it with other similar processes. Once processes are separated, communication must take place among them to enable the complete delivery of a product or service. With the advent of information technology this communication has increasingly taken the form of electronic transactions.

Business Process Integration is becoming increasingly critical with the continued horizontal structuring of organizations, and the outsourcing of some processes to deliver a product/service. The two cases presented here are clear examples of the need for BPI in an environment of multi-player order fulfillment and multi-player reverse logistics for fulfillment, and the efforts these players have made to achieve BPI.

The road to BPI requires selecting the right partners to pursue it with, and then pursuing it both on the human and technology sides. Failure to align the two and their internal workings leads to BPI failure. The Single Platform Model both in systems and in human factor is one approach we consider successful and it is the approach followed by the cases we have included here.

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