

# **eBusiness Technologies and Trends in the Pharmaceutical industry**

by

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Submitted to the Sloan School of Management in Partial  
Fulfillment of the Requirements for the Degree of

SM, Management of Technology  
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## **Abstract**

eBusiness is rapidly becoming the defacto business model of many firms. The pharmaceutical industry will continue to thrive regardless of recession, terrorism, war, or other external forces. Question is: what eBusiness technologies and trends are being currently pursued by pharmaceutical companies in managing critical relationships with business partners such as doctors, physicians, suppliers, retailers, distributors, and consumers? The purpose of this research is to provide a high-level overview of the pharmaceutical industry and companies that dominate in this vast arena. This is followed by an in-depth analysis of eBusiness in terms of phases, models, architectures, vendors, and products. Finally, eBusiness technologies and trends in global pharmaceutical organizations related to procurement, sales, and supply chain are analyzed in various case studies. This analysis ultimately leads to a carefully orchestrated conclusion that recaps this entire research based on eBusiness in the pharmaceutical industry.

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## Introduction

Gartner predicts that IT spending in the pharmaceutical industry will increase from \$3 billion in 2000 to \$5 billion in year 2005. IT spending is categorized into hardware, software, and networks. The software component is composed of various categories, one of which is eBusiness, a term coined by IBM in 1997.

Kalakota refers to eBusiness as the 3<sup>rd</sup> phase (beyond 2000) of e-commerce, where the main goal of organizations is to focus on how the Internet can increase gross margins. Kalakota goes on to define eBusiness as “not just about e-commerce transactions or about buying and selling on the Web...it’s the overall strategy of redefining old businesses which, with the aid of technology, maximize customer value and profits.”<sup>1</sup>

This thesis facilitates a discussion about existing eBusiness technologies and trends within the pharmaceutical industry. How are pharmaceutical companies selling their products using the Internet? What eBusiness solutions have been implemented to manage supply chains and procurement activities? What technologies, if any, did these pharmaceutical companies use in the past to sell products or manage the supply chain, versus what technologies are being currently used in eBusiness implementations? It is fascinating to see that companies still have ecommerce links on their corporate website where business partners have the option to upload the obsolete, yet proven, Electronic Data Interchange (EDI) files to order products.

Additionally, what eBusiness models are being pursued? What emerging eBusiness technologies can impact pharmaceutical companies in the near future? What

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<sup>1</sup> Ravi Kalakota and Marcia Robinson, “e-Business 2.0: Roadmap for Success,” Addison-Wesley, Boston, 2001, p. 5.



challenges and issues did they face with their eBusiness solutions? Are package solutions more useful than custom eBusiness solutions? What eBusiness products and vendors were utilized in organizations? How is Pfizer selling Viagra® to its business partners such as doctors who can then prescribe this product to their patients? Is it via salespeople, or phone and fax orders, or through online transactions? Furthermore, how is Johnson & Johnson selling Tylenol® to business partners and consumers? These questions just scratch the surface of this research that tries to delve deep into the pharmaceutical industry to see how eBusiness is being performed in this relatively low-key industry when compared to other high-tech industries such as financial services.

## **Thesis Layout**

This thesis initially provides a high-level overview of the pharmaceutical industry. This is followed by a discussion of the leading players in the pharmaceutical industry. Next, eBusiness is discussed in terms of phases, models, architectures, vendors, products, and how they are applicable in the pharmaceutical industry. Furthermore, this thesis delivers a variety of case studies of eBusiness implementations in various pharmaceutical organizations, specifically related to procurement, sales, and supply chain management. Finally, a conclusion is derived that allows us to see existing eBusiness technologies and trends in the aforementioned phases of the pharmaceutical companies, and where this industry is heading in the near future.

## 1.0. Chapter One: The Pharmaceutical industry

The Pharmaceutical Research and Manufacturers of America (PhRMA) states in their 2002 annual report that “pharmaceutical companies will advance the frontiers of medical science by continuing to develop new life-saving, cost-effective medicines, vaccines, and other therapies to predict, prevent, diagnose, treat, and cure disease”.<sup>2</sup> The pharmaceutical industry is focused on the well-being of humans and animals. This goal is being achieved by performing extensive research to develop drugs, medications, and vaccines to treat diseases that incur high tolls in terms of human lives and financial costs. Pharmaceutical firms will spend in excess of \$30 billion in the US alone in 2003 to research and develop new drugs and medications.<sup>3</sup> The pharmaceutical industry has delivered many products that treat conditions like cancer, vision correction, impotence, gastrointestinal disorders, AIDS, HIV, colds, flu, diabetes, hypertension, hyperactivity, depression, and many more diseases that affect millions of lives throughout the world.

The goal of this research is to determine the role of the Internet and Information Technology (IT) in the pharmaceutical industry for selling drugs and medications to business partners such as doctors, physicians, wholesalers, distributors, and retailers. This research will analyze how pharmaceutical firms implement eBusiness solutions for their business partners in both front-end (customer interface) and backend business processing. There are four eBusiness models being pursued in the pharmaceutical industry. First of all, there are the content providers such as WebMD and MedScape, who provide online data related to health, drugs, and diseases. Secondly, there are

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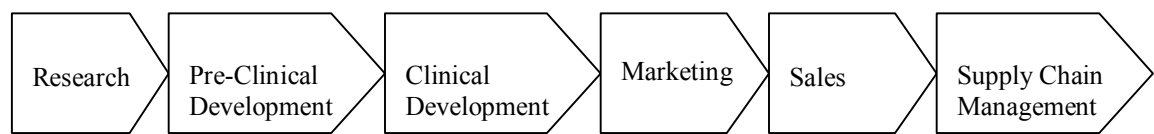
<sup>2</sup> Pharmaceutical Research and Manufacturers of America, Annual Report 2001-2002: New Medicines New Hopes, [www.phRMA.org](http://www.phRMA.org).

<sup>3</sup> Ibid

market-makers, such as HealthAxis or Neoforma, who are application services providers to pharmaceutical companies for establishing a web presence and performing online business. Thirdly, there are eTailers such as drugstore.com or cvs.com who provide the Business-to-Consumer (B2C) interface for many pharmaceutical companies. Finally, there are service providers such as InfoMedics who provide products and services to pharmaceutical companies, in regards to detailing, gaining market share, and increasing brand performance. This research is interested in eBusiness models where products are being sold to business partners and consumers.

### **1.1. Pharmaceuticals Value Chain**

McAfee mentions that the Internet will strongly influence strategies of pharmaceutical companies.<sup>4</sup> The following steps portray a typical pharmaceutical drug manufacturing process:



**Figure 1-1 – Pharmaceutical Value Chain<sup>5</sup>**

McAfee further notes that data-sharing, databases, connectivity, and quick screening will influence the ‘Research’ phase. Similarly, recruiting, data capture, and virtual trials will impact ‘Preclinical and Clinical Development.’ Branding, product data,

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<sup>4</sup> Andrew McAfee, “eBusiness at Novartis”, Harvard Business School, August 2001.

<sup>5</sup> Ibid

and online communities will affect ‘Marketing.’ Furthermore, online sales and detailing will influence the pharmaceutical firms ‘Sales.’ Finally, forecasting, procurement, and place & trace order will influence supply chain management (SCM) in this industry. The main interest of this research will be on the impact of the Internet on eBusiness, therefore, mainly related to the ‘Sales’ and ‘SCM’ processes in the pharmaceutical industry.

## **1.2. Key Processes**

The pharmaceutical industry is highly regulated and several key processes make this an extremely competitive market. Key processes in developing drugs in the pharmaceutical industry include drug discovery, drug development, and clinical trials. Additional processes for distributing drugs to partners such as pharmacies, doctors, and wholesalers include sales, marketing, and SCM. The Internet and IT play critical roles in all these processes.

### **1.2.1. Food and Drug Administration**

“The primary responsibility of Food and Drug Administration (FDA) is protecting public health by permitting safe and effective products to reach the market in a timely manner and monitoring products for continued safety after they are in use.”<sup>6</sup> The FDA is the governing body in the pharmaceutical industry and is responsible for setting standards. Historically (since colonial times), individuals and companies in the US have claimed to have developed the ‘all-curing’ drugs. However, it was not until the 1930s when the Federal Food, Drug, and Cosmetic Act (FD&C) was enacted to set standards for approving new drugs. Besides, it was not until the 1960s that standards for drug efficacy

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<sup>6</sup> Lambert van der Walde and Kristen Choi, “Health Care Industry Market Update: Pharmaceuticals, Centers for Medicare and Medicaid Services,” January 10, 2003, p.14.

and safety were brought forth. Since then, the FDA is the leading federal agency to monitor prescription drugs sold to patients and has the authority to withdraw any drug from the marketplace if public health risk becomes high and they overshadow the benefits.

### **1.2.2. Drug Discovery**

Drug discovery is associated with identifying drug targets that could add value to society by curing diseases. The primary goal of the drug discovery process is to find multiple factors that are causing the disease. The role of IT in this phase is associated with data-sharing, databases, and connectivity. It is critical for pharmaceutical companies to maintain, exploit, and exchange data related to drug discovery. Hence, drug discovery precedes pre-clinical testing and is concerned with identifying targets.

### **1.2.3. Drug Development**

Drug development includes pre-clinical testing. This is performed by scientists in pharmaceuticals labs to test new compounds. These compounds are believed to provide benefits such as prevention, cure, or treatment of a medical condition. Screenings in the drug development phase could be performed on between 5,000 to 10,000 drug candidates, and 250 of those make it to the final pre-clinical trails.<sup>7</sup> Drug development sets the precedence for the clinical trials.

Clinical trials in drug discovery are critical to delivering a valuable drug in the pharmaceutical industry. These three-part stages are described in the **Table 1-1**. Seldom,

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<sup>7</sup> Ethan Parvis, "The Pharmaceutical industry: Access and Outlook," Nova Science Publishers, Inc., New York, 2002, pp.87-100.

a Phase IV may be required for additional testing. Typically, 2 of 20 drugs tested survive all three phases.

<b>Phase</b>	<b># of Humans</b>	<b>Approximate Cost</b>	<b>Duration</b>
Phase I	100 – 150	\$10 million	1 – 2 Years
Phase II	50 – 500	\$20 million	2 - 3 Years
Phase III	1000+	\$30 million	3 – 5 Years

**Table 1-1 – Drug Discovery Phases<sup>8</sup>**

The role of IT in both preclinical and clinical development is equally important. IT is used for recruiting, data capture, and virtual trials. The Internet can serve as a powerful median in recruiting candidates for drug testing versus more primitive mechanisms such phone calls, conferences, or seminars. Similarly, using the Internet to capture candidate or patient data allows for faster and more efficient process in selecting the drugs candidate pools. Finally, virtual trials can be held over the Internet is order to ease the process and duration. In summary, IT and the Internet offer a variety of opportunities in the clinical phases of drug development.

The three phases in clinical trials are typically followed by the New Drug Application (NDA). The NDA is filed to the FDA while seeking approval to market the drug to consumers. This stage may take several months to several years. The duration is determined by the complexity of the drug and size of the NDA. Thus, we see that all three phases in clinical trails are time-consuming, expensive, require hundreds of drug candidates, and dependent on IT.

#### **1.2.4. Marketing**

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<sup>8</sup> Ibid.

Marketing is critical to the success of drug development. This phase consists of a process called ‘Detailing’ in which pharmaceutical companies establish and build relationships with physicians and other vendors in the pharmaceutical value chain for delivering the drug to consumers. According to Allison, eBusiness Strategy Director at one of the top 10 pharmaceutical company in the world, “you cannot eDetail all your products,”<sup>9</sup> because this can be extremely expensive and not a feasible option in terms of cost and time. Commonly, firms may spend the same amount on developing a drug as compared to marketing it. Detailing is practiced via doctor office visits, seminars, and conferences. IT is critical in this phase because items such as branding, product data, and online communities are created in this phase. Firms can establish websites where information for doctors and potential patients is readily available for review. Additionally, online communities can be created where forums related to drug information and related feedback can be shared freely.

The final phase of place / trace an order and SCM of the drug development process is related to eBusiness. This phase will be part of the focus of this research. Companies have developed both front-end and backend eBusiness infrastructures to sell their drugs to business partners, consumers, wholesalers, distributors, to effectively use the Internet and IT in completing their value chain. While custom software solutions have been developed, eBusiness package solutions have also been implemented to sell products over the Internet. Many trends and technologies have emerged in this phase of delivering products to the customers and that will be the focal point of this thesis.

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<sup>9</sup> Interview: Allison.

### **1.3. Key Factors**

Several key factors strongly influence the pharmaceutical industry. This includes prescription drugs, health insurance, online pharmacies, generic drugs, and the health care market. These factors collectively determine how eBusiness is conducted in the pharmaceutical industry.

#### **1.3.1. Prescription Drugs**

“Average drug industry profit margins range from 16% - 24 %...( and) in 2001 prescription drug spending in the US totaled \$141 billion, or 10% of national health expenditures, (of which) they are the fastest-growing segment.”<sup>10</sup> As these statistics prove, developing the right prescription drug is worth the cost and effort because the return on investment (ROI) is extremely high in the pharmaceutical industry. In terms of pricing, uninsured consumers are paying relatively higher amounts than insured consumers for prescription drugs. Medicare is an alternative for alleviating healthcare costs, however, it does not typically apply to prescription drugs. “PhRMA believes that a reformed Medicare would use the power of the marketplace to foster competition among private plans, resulting in more choices of high quality for Medicare beneficiaries...the right reforms would expand prescription drug access for all, provide special assistance to those in need, and deliver high quality care.”<sup>11</sup> The cost of prescription drugs is of concern to the US Congress and is being debated on many fronts.

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<sup>10</sup> Lambert van der Walde and Kristen Choi, “Health Care Industry Market Update: Pharmaceuticals, Centers for Medicare and Medicaid Services,” January 10, 2003, pp. 5-8.

<sup>11</sup> Pharmaceutical Research and Manufacturers of America, Annual Report 2001-2002: New Medicines New Hopes, p.11, [www.phRMA.org](http://www.phRMA.org)



Uninsured consumers are extremely price sensitive and they create a highly inelastic demand. On the contrary, industry consumers and insurers are price insensitive and they create a highly elastic demand for prescription drugs. Uninsured patients often pay full price for the products and this cost gets even higher for the elderly whose medication and prescription may be higher in quantity and cost, whereas the insured patients often pay a co-payment for buying their prescription drugs. It is evident that the cost of prescription drugs developed by pharmaceutical companies' impacts the market conditions and the overall pricing.

Custom software eBusiness solutions are effective when ordering drugs and medications that require extensive prescription data. Products such as a prescription contact lens, for example, are associated with extensive parametric data such as base curves, prescription strength, color, brand, and type, which can only be delivered by creating a custom user interface for the business partners in ordering that product. eBusiness sales, ordering, and checkout scenarios can be implemented using software that allows users to place complicated orders over the Internet.

### **1.3.2. Pharmacies**

Pharmacies, such as CVS, Walgreen's, or Eckerd, purchase and sell pharmaceuticals drugs. To the concern of consumers and lawmakers, pharmaceutical firms may be performing price discrimination, because they do not sell directly to consumers, and possibly charge different prices to wholesalers and distributors. Research shows that pharmaceutical companies can have so-called launch prices of their products; however, they cannot exercise a monopolistic status in this case. For instance, in case of Glakso-Smith-Kline developing the ulcer treatment product, Zantac®, they are competing

with existing over-the-counter (OTC) versions of Pepcid AC® developed by Johnson & Johnson and Merck.<sup>12</sup> It is clear that pharmaceutical firms can control the price used by the pharmacies to sell products they have developed.

### 1.3.3. Online Pharmacies

Online pharmacies have made a major impact on eBusiness in the pharmaceutical industry. Both cvs.com and drugstore.com are actively involved in partnerships with pharmaceutical companies in selling their products online. Tylenol, by Johnson & Johnson, is available at both these online pharmacies. **Exhibit 1-1** displays a snapshot of the cvs.com online pharmacy. This website allows users to compare drug prices, fill prescriptions, setup reminders for placing refill orders, and read drug-related literature. **Exhibit 1-2** displays the online pharmacy, drugstore.com. This website allows consumers to view data about drugs, seek online advice from pharmacists, check order status, and place order for refills. In review, the emergence of online pharmacies is impacting eBusiness in the pharmaceutical industry.

A major issue with online pharmacies is that many consumers are bypassing traditional handwritten pharmacies and placing orders for drugs from websites being operated in other countries where rules are less strict and prices are comparatively much cheaper. CanadaPharmacy.com, for example, bases its marketing strategy around the fact that they are more than 700,000 customers strong and they ship to the USA.<sup>13</sup> **Exhibit 1-3** displays a screen shot of CanadaPharmacy.com. Additionally, MyMeds.org, displayed in **Exhibit 1-4**, offers to sell prescription drugs from Mexico and Canada to consumers

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<sup>12</sup> Ethan Parvis, "The Pharmaceutical industry: Access and Outlook," Nova Science Publishers, Inc., New York, 2002, p. 37.

<sup>13</sup> [www.CanadaPharmacy.com](http://www.CanadaPharmacy.com), March 2003.

for less than 80% of price paid in the US.<sup>14</sup> Online pharmacies operating in neighboring Canada and Mexico offer substantially lower prices for prescription drugs and definitely impact eBusiness in the pharmaceutical industry.

#### **1.3.4. Drug Pricing**

Drug pricing is relatively high in the US when compared to its neighbors. This may be the reason for aforementioned firms such as CanadaPharmacy.com or MyMeds.org to thrive in the online pharmaceuticals business. In a survey of prices of 121 drug products, only 22 were cheaper in the US. The remaining 99 products were at least 10% more expensive than Canada. In 21 cases, these products were more than 100% expensive, while in 8 cases, more than 200% more expensive.<sup>15</sup> One reason for cheaper drug prices in Canada and Mexico is the fact that the governments in these countries are the primary ‘payers’ of drugs.

#### **1.3.5. Generic Drugs**

As generic drugs become more common, “the branded pharmaceutical industry faces increasing pricing pressure...(as) \$30 billion (2001 US sales) of branded drugs are losing patent protection over the next four years.”<sup>16</sup> Generic drugs can deeply impact branded pharmaceutical drugs in the next few years, because they can be developed after the original drug patent expires. Historically, the generic drugs market was only 2% in the ‘70s, due to fact that the government required manufacturers of generics to carry out the same tests as the original manufacturer, plus only ‘special permission’ had to be given

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<sup>14</sup> [www.MyMeds.org](http://www.MyMeds.org), March 2003.

<sup>15</sup> Ethan Parvis, “The Pharmaceutical industry: Access and Outlook,” Nova Science Publishers, Inc., New York, 2002, p.46.

<sup>16</sup> Lambert van der Walde and Kristen Choi, “Health Care Industry Market Update: Pharmaceuticals, Centers for Medicare and Medicaid Services,” January 10, 2003, p.6.

by physician to prescribe this. However, in the early '80s a new law was enacted that eventually led to buyers gaining power in buying prescription drugs. Today, the quality of generic drugs is equally good. "The generic drug industry saw average revenue growth spike from 14% in 2000 to 55% in 2001."<sup>17</sup> This growth was due to expirations of many patents on branded drugs. Additionally, it takes generic drugs six to eight weeks to take more than 50% of the market share from branded drugs (six months in the past). Thus, generic drugs are an important factor in the pharmaceutical industry.

### **1.3.6. Research & Development**

"Branded pharmaceuticals depend on innovative Research & Development (R&D) to produce new medical treatments that are key drivers for long-term growth, making R&D the most important expense item in the industry."<sup>18</sup> High costs related to R&D strongly impact the pharmaceutical industry. According to PhRMA, \$30 billion were spent on research in 2001. This amount was an increase of more than 16% from 2000. Of this, \$24 billion were spent on R&D in the US alone. Pharmaceutical R&D target areas are ordered in terms of priority and spending in the following list: nervous systems related diseases (depression, Alzheimer), cancer, diabetes, cardiovascular diseases, anti-viral, antibiotics, and respiratory system related disease (asthma, tuberculosis).

### **1.3.7. Healthcare Market**

The healthcare market has strong internal rivalries and the barriers to entry are quite high. Most drugs are sold by the pharmaceutical firms to wholesalers who then sell them to pharmacies, mail order, hospitals, health maintenance organizations (HMOs), and

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<sup>17</sup> Ibid.

<sup>18</sup> Ibid, p.13.

other health care organizations. This eBusiness aspect of this research will look at partnerships in this sector and market segment. The cost of discovering, developing, and manufacturing drugs is high and is encompassed by a rather risky and time-consuming process. Statistics show that 1 in 83,000 to 167,000 (deliver) positive net returns on investment.<sup>19</sup> It typically takes 12 years for a drug to evolve from an idea to a product for the consumer.

Finally, health expenditure is one of the key drivers that impact the pharmaceutical industry. Health expenditures were nearly \$1.4 trillion in the US in 2001. The Health Care Financing Administration (HCFA) mentions several components of the health care industry. These components include: health care (30%), physician service (22%), nursing homes (7%), and prescription drugs (8%).<sup>20</sup> Various components make up the tremendous costs that are incurred in the health care industry.

#### **1.4. Conclusion**

Pharmaceutical companies spend billions of dollars researching, developing, and manufacturing drugs for curing diseases in humans and animals. After a bird's eye view of the pharmaceutical industry, the following chapter will discuss who is who in this vast spectrum of pharmaceutical drug manufacturing companies. This chapter contains a list of many dominant players in the pharmaceutical industry, a brief history, products they develop, and business information such as sales, profits, and number of employees. eBusiness initiatives at these companies will be mentioned as well.

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<sup>19</sup> Ethan Parvis, "The Pharmaceutical industry: Access and Outlook," Nova Science Publishers, Inc., New York, 2002, p. 133.

<sup>20</sup> Ibid.

## 1.5. Exhibits

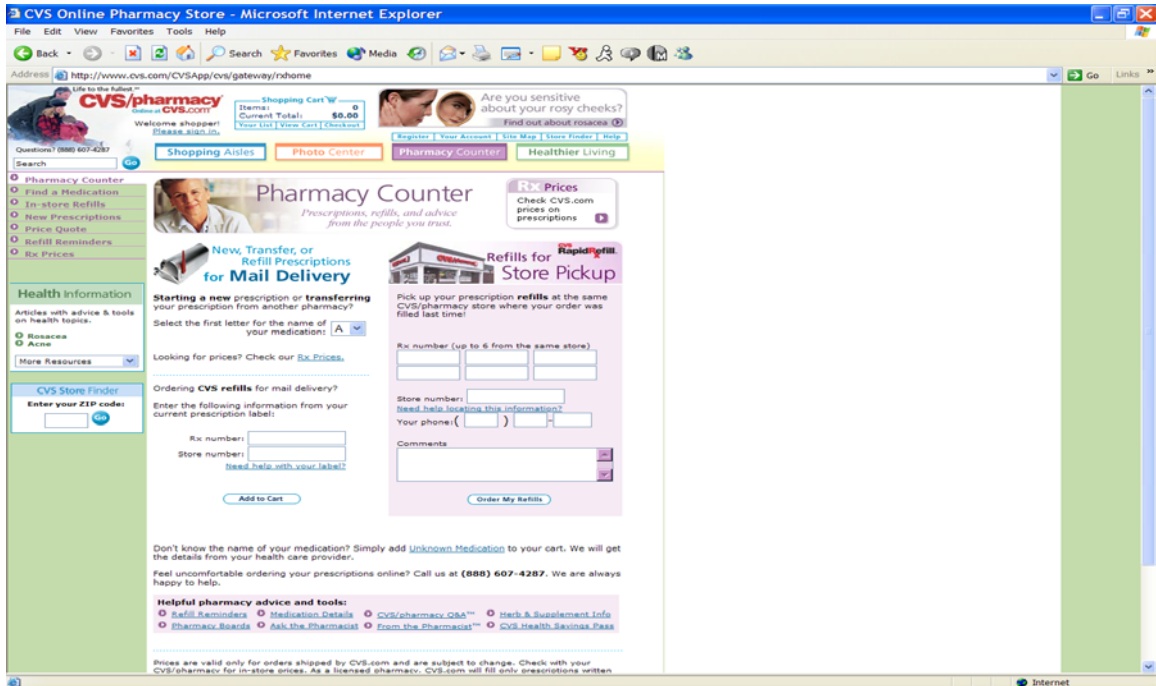


Exhibit 1-1 – CVS Online Pharmacy Store

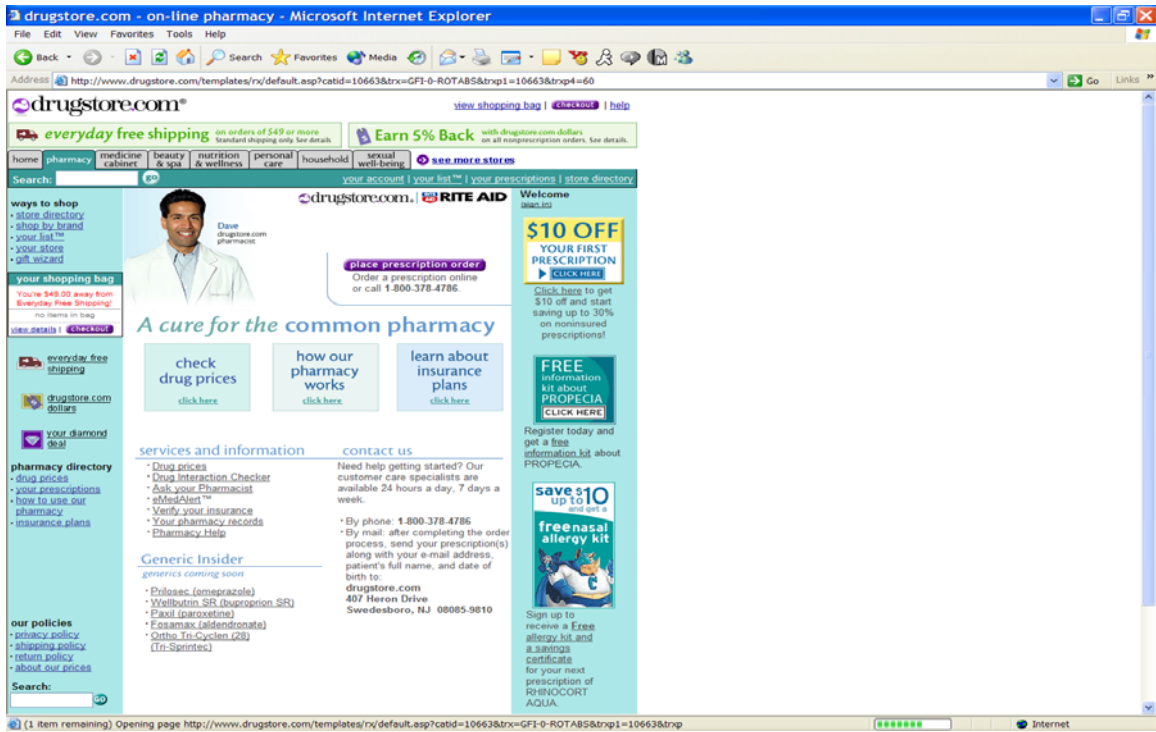


Exhibit 1-2 – DrugStore.com

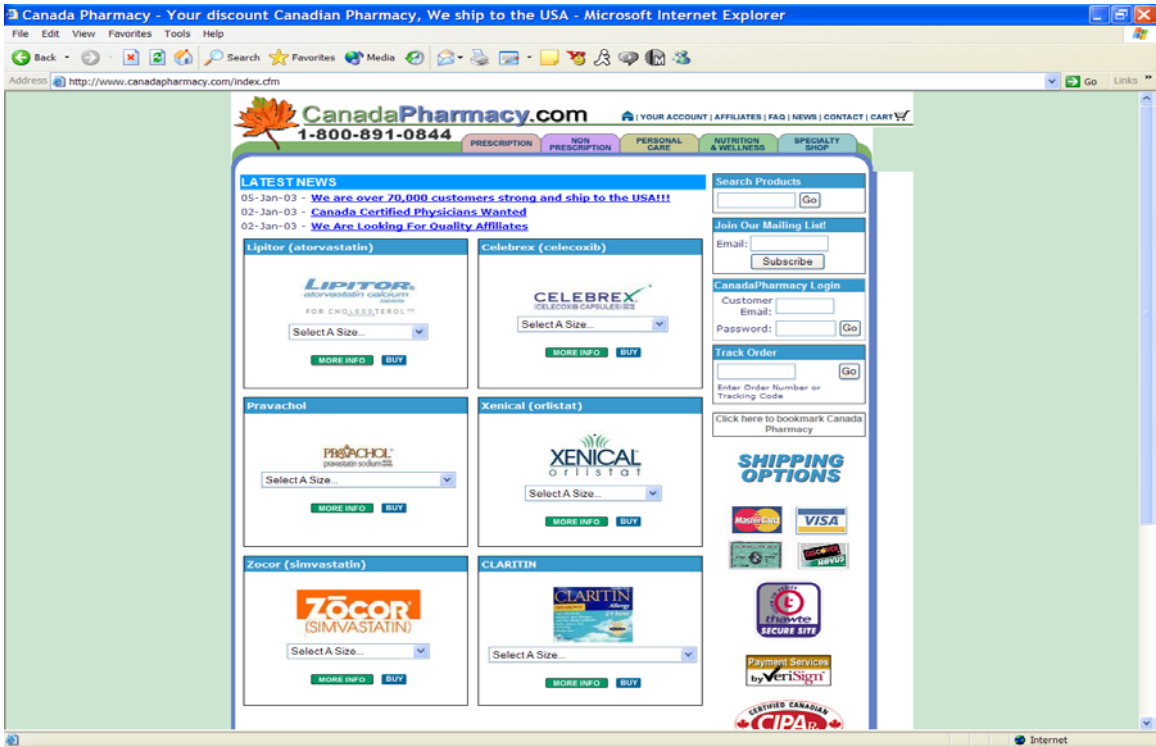


Exhibit 1-3 – CanadaPharmacy.com

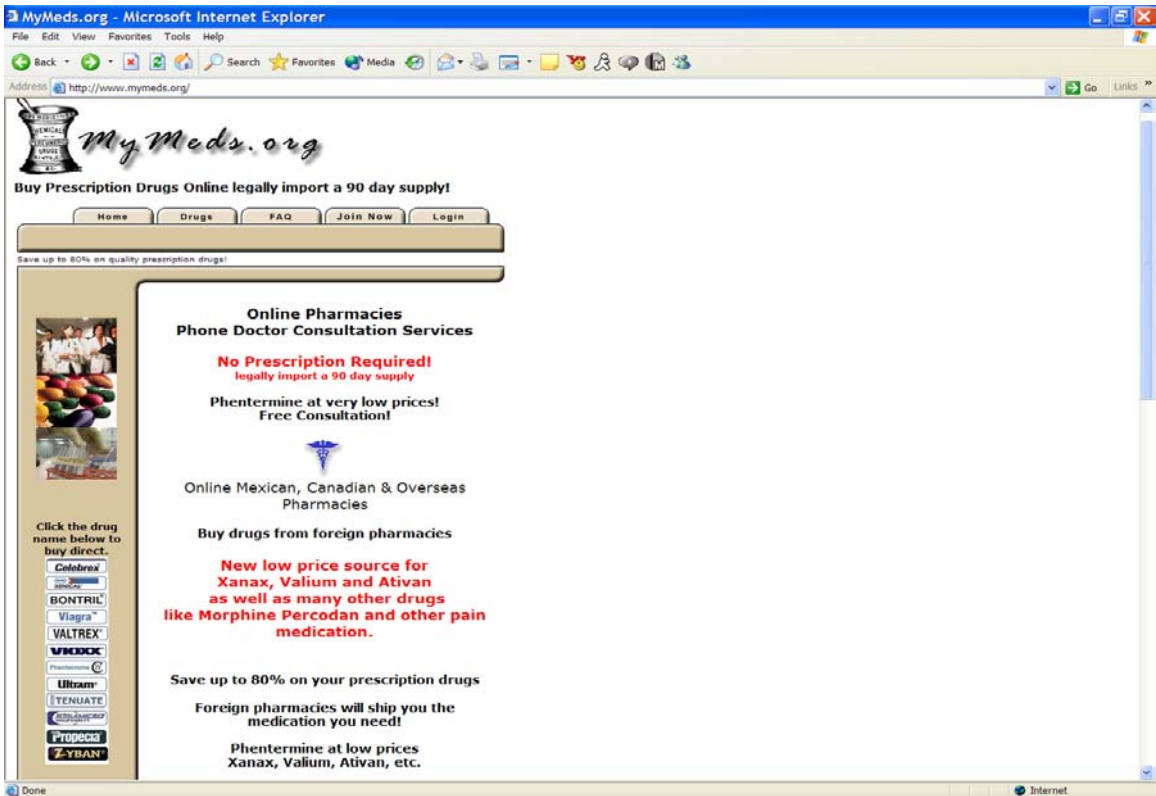


Exhibit 1-4 – MyMeds.org

## 2.0 Chapter Two: Who is Who in Pharmaceuticals

There are many players in the vast arena of pharmaceutical companies. This chapter provides a high-level overview of this industry before we begin a discussion about eBusiness trends within this playing field. Many consumer products and drugs we use in our daily lives are developed by pharmaceutical firms that have been around for decades. These companies spend billions of dollars annually while researching new drugs for providing treatment for diseases suffered by millions of humans and animals.

**Table 2-1** provides a selective list of companies in the pharmaceutical industry and offers useful data such as company size, famous brands, sales / profits figures, and the firm's competitive advantage. This list includes the top 10 manufacturers in the US by prescription sales.<sup>21</sup>

Company	Famous Brands and Affiliates	Sales / Profits / Employees (2001)	Competitive Advantage
Abbott Laboratories (ABT)	<ul style="list-style-type: none"> <li>➤ Biaxin® - Respiratory Illnesses</li> <li>➤ Depakote® - Epilepsy</li> <li>➤ Erythromycin® - Antibiotics</li> <li>➤ Norvir® - HIV / AIDS</li> <li>➤ Prevacid® - Gastrointestinal</li> <li>➤ Survanta® - Respiratory Diseases</li> <li>➤ Similac®, Pedialyte®</li> <li>➤ Tricor® - Cardiovascular Illnesses</li> </ul>	\$16 Billion / \$1.5 Billion / 70,000+	Heavy research, worldwide recognition, and leading producer of antibiotics.
AstraZeneca (AZN)	<ul style="list-style-type: none"> <li>➤ Accolate®, Faslodex®</li> <li>➤ Atacand® - Hypertension</li> <li>➤ Diprivan®,</li> <li>➤ Nexium® - Gastrointestinal</li> <li>➤ Prilosec®</li> <li>➤ Pulmicort Respules®</li> <li>➤ Seroquel® - Schizophrenia</li> <li>➤ Zomig® - Migraine</li> </ul>	\$16.5 Billion / \$1.1 Billion / 54,000+	One of top 5 leading R&D-based pharmaceutical company with revenues from more than 100 countries. Focus on cardiovascular, cancer, nervous

<sup>21</sup> Lambert van der Walde and Kristen Choi, "Health Care Industry Market Update: Pharmaceuticals, Centers for Medicare and Medicaid Services," January 10, 2003, p.9.



			system, and pain management.
Bayer (BAY)	<ul style="list-style-type: none"> <li>➤ Avelox® - Skin Infections</li> <li>➤ Bayer Aspirin</li> <li>➤ Cipro® - Antibiotics</li> <li>➤ Levitra™ - Erectile Dysfunction (GSK)</li> <li>➤ Precose® - Type 2 Diabetes</li> <li>➤ Viadur® - Prostate Cancer Treatment</li> </ul>	\$30 Billion / \$965 Million / 140,000+	International research-based firm that focuses on life sciences, polymers, chemicals, and pharmaceuticals.
Bristol-Myers Squibb (BMY)	<ul style="list-style-type: none"> <li>➤ Avapro® - Hypertension</li> <li>➤ Clairol®</li> <li>➤ DuPont Pharmaceuticals</li> <li>➤ Glucophage® - Type 2 Diabetes</li> <li>➤ Excedrin® - Migraine (1<sup>st</sup> OTC)</li> <li>➤ Nice n'Easy®</li> <li>➤ Plavix® - Anti-Platelet</li> <li>➤ Pravachol® Cardiovascular Diseases</li> <li>➤ Taxol® - Cancer injections</li> <li>➤ Videx® - HIV</li> </ul>	\$19.4 Billion / \$5.2 Billion / 46,000	One of the largest personal care and health companies in the world. Develop pharmaceutical products, over-the-counter medication, beauty aids, and nutritional products. Pharmaceuticals focus on cancer, diabetes, HIV/AIDS, and pain.
Eli Lilly (LLY)	<ul style="list-style-type: none"> <li>➤ Gemzar® - Lung Cancer</li> <li>➤ Humalog - Diabetes (Insulin)</li> <li>➤ Prozac® - Depression</li> <li>➤ Singapore Economic Development Board</li> <li>➤ Strattera™ - Attention-Deficit / Hyperactivity Disorder in Children</li> </ul>	\$11 Billion / \$2.8 Billion / 40,000+	Pharmaceuticals products are world famous. Products line treats ulcers, infections, and cardiovascular diseases.
Glakso-Smith-Kline (GSK)	<ul style="list-style-type: none"> <li>➤ Amoxil™ - Respiratory Infections</li> <li>➤ AquaFresh™ - Oral Healthcare</li> <li>➤ Avandia™ - Type 2 Diabetes</li> <li>➤ Citrucel™ - Gastrointestinal Disorder</li> <li>➤ Tums™ - Gastrointestinal Disorder</li> <li>➤ Glaxo Wellcome®</li> <li>➤ Horlicks™ and Ribena™ - Nutritional Healthcare</li> <li>➤ Lanoxin™ - Chronic Cardiac Failure</li> <li>➤ Macleans™ - Oral Healthcare</li> <li>➤ Neosporin™ - Eye Infections</li> <li>➤ Polyfax™ - Eye Infections</li> <li>➤ Nicorette™ - Nicotine Replacement</li> <li>➤ Oxy™ - Skin Care</li> <li>➤ SmithKline Beecham®</li> <li>➤ Tagamet™ / Zantac™ / Rantidine™ - Ulcer and Gastrointestinal Disorder</li> <li>➤ Zantac®</li> </ul>	\$30 Billion / -\$160,000 / 100,000+	World leading healthcare firm. One of the largest health care firms in UK. Pharmaceutical drugs treat epilepsy, ulcers, heart diseases, infections, and depression.
Hoffman La-Roche	<ul style="list-style-type: none"> <li>➤ Furtulon™ - Colon Cancer</li> <li>➤ Fuzeon™ - HIV</li> </ul>	\$21 Billion / \$2.3 Billion /	Established developers of drugs,

	<ul style="list-style-type: none"> <li>➤ Herceptin™ - Breast Cancer</li> <li>➤ Pegasis™ - Hepatitis C</li> <li>➤ Rapilysin™ - Heart Attack</li> <li>➤ Roaccutan™ - Skin Care</li> <li>➤ Xenical™ - Obesity,</li> </ul>	70,000+	pharmaceuticals, and vitamins that are used worldwide.
Johnson & Johnson (JNJ)	<ul style="list-style-type: none"> <li>➤ Acuvue® - Vision Correction</li> <li>➤ ALZA Corporation</li> <li>➤ Baby Center</li> <li>➤ Band-Aid® - Minor Cuts</li> <li>➤ Cypher® - Stents</li> <li>➤ Heartport</li> <li>➤ Janssen</li> <li>➤ Mylanta®, AcipHex® - Indigestion</li> <li>➤ Neutrogena® - Skin and Hair Care</li> <li>➤ ORTHO – Orthopedic Products</li> <li>➤ Pepcid® - Heartburn Treatment (Merck)</li> <li>➤ Prevacare®</li> <li>➤ Reach® - Oral Healthcare</li> <li>➤ Tylenol®, Motrin® - Pain Relief</li> </ul>	\$33 Billion / \$5.7 Billion / 101,000+	Largest manufacturer of health care products in the world. Delivered to consumers, pharmaceuticals, and professionals in the health care industry.
Merck (MRK)	<ul style="list-style-type: none"> <li>➤ Hyzaar® - High Blood Pressure</li> <li>➤ Merck-Medco Managed Care</li> <li>➤ Propecia® - Male-pattern Baldness</li> <li>➤ Singulair® - Asthma</li> <li>➤ Stocrin® - HIV</li> <li>➤ Vioxx® - Arthritis</li> <li>➤ Zocor® - High Cholesterol</li> </ul>	\$48 Billion / \$7 Billion / 78,000+	Delivers world class drugs and owns enormous research facilities.
Novartis (NVS)	<ul style="list-style-type: none"> <li>➤ CIBA-Geigy</li> <li>➤ CIBA® Vision - Vision Correction</li> <li>➤ Diovan® - Hypertension</li> <li>➤ Ex-Lax® - Laxative</li> <li>➤ Gerber® - Baby Formula</li> <li>➤ Gleevec™ - Leukemia</li> <li>➤ Grand Laboratories</li> <li>➤ ImmTech Biologics</li> <li>➤ Lamisil® - Anti-Fungal</li> <li>➤ Maalox® - Antacid</li> <li>➤ Theraflu® - Cold and Flu</li> <li>➤ Triaminic® - Cold and Flu</li> </ul>	\$19 Billion / \$4.1 Billion / 68,000+	One of the leading pharmaceutical companies of the future that has created a strong foundation via acquisitions and research. Products for humans, animals, and crops.
Pfizer (PFE)	<ul style="list-style-type: none"> <li>➤ Accupril®, Celebrex® - Arthritis</li> <li>➤ Actifed® - Cold and Sinus</li> <li>➤ Benadryl® - Cold and Sinus</li> <li>➤ BENGAY® - First Aid</li> <li>➤ Cortizone® - First Aid</li> <li>➤ Dentyne®, Bubblicious®, Trident® - Gum and Throat Drops</li> <li>➤ Halls® - Cough</li> <li>➤ Lipitor® - High Cholesterol</li> <li>➤ Listerine® and Plax® - Oral Care</li> <li>➤ Lubriderm® - Skin Care</li> </ul>	\$32 Billion / \$7.8 Billion / 90,000+	Products are sold in more than 150 countries and acquisition of Pharmacia is considered a plus.

	<ul style="list-style-type: none"> <li>➤ Pharmacia</li> <li>➤ Roloids® and Zantac® - Indigestion</li> <li>➤ Schick® - Shaving</li> <li>➤ Viagra® - Erectile Dysfunction</li> <li>➤ Viracept®</li> <li>➤ Visine® - Eye Care</li> <li>➤ Zyrtec® - Allergies</li> </ul>		
Wyeth (WYE)	<ul style="list-style-type: none"> <li>➤ Advil® - Pain Relief</li> <li>➤ Allesse® - Birth Control</li> <li>➤ American Home Products</li> <li>➤ Centrum® - Vitamins Supplement</li> <li>➤ Effexor® XR – Depression</li> <li>➤ FluShield® - Flu Vaccine</li> <li>➤ Fort Dodge</li> <li>➤ Phenergan® - Motion Sickness</li> <li>➤ Premanin®</li> <li>➤ Robitussin® - Cold and Flu</li> <li>➤ Sonata® - Sleep Therapy</li> <li>➤ Zosyn® - Antibiotic</li> </ul>	\$14 Billion / \$2.2 Billion / 52,000+	One of world's leaders in manufacturing health care products. Provider of human and animal disease treatment products. Many over-the- counter medication and prescription drug products.

**Table 2-1 - Health Care Industry Leaders<sup>22</sup>**

## **2.1. Pharmaceutical Companies**

The information provided in **Table 2-1** reveals relationships between some very well known products and famous pharmaceutical companies. Additionally, the business data such as sales, profits, and company size allows one to see the sheer strength of these firms in terms of the products they sell to their business partners. This research will soon discuss how eBusiness is helping these firms sell their products.

A brief history, products, research areas, divisions, and eBusiness initiatives of the companies mentioned in **Table 2-1** is necessary. The intent here is not to provide detailed information for all the players in the pharmaceutical industry, rather an attempt to provide the reader a flavor of the broad spectrum of who is who in this vast spectrum

<sup>22</sup> Jack W. Plunkett, "Plunkett's Health Care Industry Almanac, 2003," Plunkett Research Ltd, Houston, Texas.

of companies. Details include public information about these pharmaceutical companies that is related to a brief history, business segments, and eBusiness initiatives.

### **2.1.1 Abbott Laboratories**

Abbott Laboratories was founded in 1888 by Dr. Wallace Abbot, while producing small pellets in his Chicago, Illinois apartment. Within 40 years, this company's stock was trading on the Chicago Stock Exchange and through global and domestic acquisitions, joint-ventures, research-affiliations, and spin-offs over the subsequent decades, Abbott has become one of the world's leading pharmaceutical firms. Today, the company is headquartered in suburban Chicago, is represented in over 130 countries, and owns 130 real assets in manufacturing, distribution, and research and development. Abbott divisions include pharmaceuticals, nutritional, hospital products, diagnostics, and specialty. Abbott Laboratories pharmaceuticals research has focused on antibiotics, treatment of migraines, epilepsy, HIV, AIDS, and manic depression.

e-Abbott.com is Abbott's online initiative for selling products to their business partners. Abbot *Quick Link* is a free multi-vendor ordering system that allows business partners to submit electronic purchase orders and retrieve confirmation from more than 100 vendors. **Exhibit 2-1** shows the login screen for this online service. Based on information provided at Abbott's corporate website, *Quick Link* is using the EDI technology to exchange data. EDI is a form of electronic messaging and it "allows companies to send / receive business documents (such as purchase orders) in a standardized form to / from suppliers."<sup>23</sup> Abbot claims that their systems will integrate

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<sup>23</sup> Ravi Kalakota and Andrew Whinston, "Electronic Commerce, A Manager's Guide," Addison-Wesley Longman, Inc., 1997, p.6.

with most software packages that are EDI-enabled. This online service allows Business-to-Business (B2B) ordering and status-checking capabilities.

### **2.1.2. AstraZeneca**

AstraZeneca is one of the world's top five leading researchers and manufacturer of prescription pharmaceutical products. AstraZeneca corporate headquarter is located in the UK and their R&D headquarter is in Sweden. This company has established a strong presence in the US. AstraZeneca also owns an \$8 billion healthcare business in the US that consists of more than 10,000 employees. AstraZeneca focus is in the development of gastrointestinal, oncology, anesthesia, cardiovascular, nervous system, and respiratory products that are developed and used globally. These products are prescribed worldwide in more than 100 countries, of which 20 countries contain manufacturing plants, and R&D centers in another 5 countries.

According to a press release in AstraZeneca has both B2B and B2C models for eBusiness. They have established a Global eBusiness team that is involved with targeting new customers and improving marketing of AstraZeneca brands on the Internet. In terms of B2B initiatives, AstraZeneca is exploring opportunities to “streamline business processes and drive growth through new channels to existing and new customers.”<sup>24</sup> Hence, AstraZeneca is shifting to the Internet to improve eBusiness relationships with business partners.

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<sup>24</sup> AstraZeneca, “Press Release: AstraZeneca announces appointment of Global E-Business Vice President,” July 31, 2000, [www.astrazeneca.com/mainnav1/mediaoffice/s\\_press/c\\_press/idc\\_press29817/press-release-086.html](http://www.astrazeneca.com/mainnav1/mediaoffice/s_press/c_press/idc_press29817/press-release-086.html).

### 2.1.3. Bayer

Widely known throughout the world for Bayer Aspirin, Bayer is more than just a firm delivering this tiny tablet. Bayer US, headquartered in New Jersey, consists of the following four businesses: healthcare, polymers, cropscience, and chemicals. Healthcare consists of divisions in animal health, biologicals, consumer care, diagnostics, and pharmaceutical. Bayer Pharmaceuticals is headquartered in Pittsburgh, PA and it is a wholly-owned subsidiary of Bayer AG, which in turn is a \$30 billion company with nearly 140,000 employees working in almost 150 countries worldwide. Bayer AG was founded in 1863 in Germany when its founder, Friedr Bayer began developing dyestuff. The pharmaceutical business of Bayer was established in 1881 and in 1899 a drug called Aspirin, which later became known as the “drug of the century” was developed. Bayer Pharmaceuticals is involved with research and product development in the healthcare sector for prescription medication, biological products, biotechnology, and allergy-prevention.

Bayer has developed an extremely strong eBusiness infrastructure in their organization. Their goal for 2004 is to sell nearly \$5.5 billion worth of products on the Internet. Several Bayer divisions are planning on generating half their sales revenue from the web. Bayer’s online initiatives include eStrategy, eTransaction, eMarketplaces, and eProcurement. eStrategy consists of eBusiness initiatives at Bayer that include electronic marketplaces and electronic transaction portals for B2B order processing. **Exhibit 2-2** is a snapshot of the eBusiness focus at Bayer. In addition, Bayer offers business to consumer portals for customers to order their prescription medication. **Exhibit 2-3** is a

snapshot of this B2C portal. Hence, Bayer seems to highly leverage the Internet to maintain relationship with consumers and business partners.

#### **2.1.4. Bristol-Myers Squibb**

Squibb was founded in New York in 1856 as a developer of ‘pure’ medicines, while Bristol-Myers was founded in New York in 1887 as low-cost drug developer. The two companies merged more than a hundred later in 1989 to create the second largest pharmaceutical enterprise in the world – Bristol-Myers Squibb. More recently, in 2001, the company acquired DuPont Pharmaceuticals to further strengthen their business. Bristol-Myers Squibb owns a huge product portfolio that delivers treatment for diseases such as HIV, diabetes, hypertension, heart disease, and cancer.

#### **2.1.5. Eli Lilly**

Eli Lilly was founded in 1876 by Colonel Eli Lilly in Indianapolis, Indiana. The founder, a chemist by trade and veteran of the US Civil War, established this research-based firm after witnessing poor delivery of medical needs for patients in the Midwestern US. Today, Lilly’s products are represented in nearly 160 countries. Nearly 18% of Lilly’s employees are involved in research and development efforts.<sup>25</sup> Lilly’s divisions are split amongst research laboratories for drug discovery, clinical research, and product development. R&D therapeutic areas have been created at Lilly for curing urgent medical conditions such as diabetes, cancer, osteoporosis, and animal health. eLilly is Lilly’s subsidiary for implementing and managing eBusiness initiatives.

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<sup>25</sup> [www.lilly.com](http://www.lilly.com), March 2003.

### **2.1.6. GlaksoSmithKline**

GlaksoSmithKline (GSK), headquartered in the United Kingdom with major operations in the US, is a research-based pharmaceutical firm delivering products and drugs for therapeutic areas and consumer products. About 70% of 2002 sales of pharmaceuticals at GSK came from new products, hence demonstrating a strong commitment of this firm to product innovation and research. GSK owns operating units in 39 countries. Sales and marketing concerns at GSK factor for nearly 40% of the firm's employees and another 15% is involved with R&D efforts. GSKs products are categorized in consumer healthcare, prescription medication, and vaccines.

In 2001, the CIO of GSK was quoted as saying “we have made no grand organization commitment to e-Health...we have set up a small office to sense what the world is doing and to encapsulate those learning's and make sure we understand them...but at this stage we don't believe we'll gain those changes by bolting the Internet onto the company.”<sup>26</sup> Hence, GSKs strategy for embracing the Internet for any of the critical phases in drug development, marketing, or sales has been rather weak. That is the reason no eBusiness links were available for professional. Thus, firms such as GSK do exist out there with beliefs that the Internet and IT are not the cure all solution for their product development and delivery.

### **2.1.7. Hoffman-LaRoche**

Hoffman-LaRoche was founded in 1896 by Fritz Hoffman-LaRoche in Switzerland with the primary goal to establish a firm that manufactures drugs at an industrial scale for fighting and curing diseases common at that time. LaRoche has three

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<sup>26</sup> Pharmaceutical Executive, “What Chief Execs do know about the Internet,” August 2000.



main operating divisions: pharmaceuticals, diagnostics, and vitamins & fine chemicals. LaRoche Pharmaceuticals employs nearly half the work force of Hoffman-LaRoche and contributed nearly 2/3<sup>rd</sup> of the annual sales at approximately \$15 billion. Nearly half of LaRoche's employees are based in Europe. LaRoche develops a variety of products for treatment of cancer, obesity, and HIV.

LaRoche has a significant strategy for using the Internet for maintaining relationships with their customers. **Exhibit 2-4** shows the login screen for healthcare professionals. This website allows business partners to view information about products delivered by LaRoche, in addition to placing orders online. **Exhibit 2-5** is LaRoche's eBusiness and content website for Vitamins. This website allows business partners, namely wholesalers and distributors, to perform online transactions such as ordering, tracking, creating catalogs, and requesting price quotes.

### **2.1.8. Johnson & Johnson**

Johnson & Johnson was founded in the 1880s by Robert Wood Johnson and his brothers, who at that time were involved in providing antiseptic wound treatment in New Jersey. For over 100 years, the company has been headquartered in New Brunswick, New Jersey. Johnson & Johnson is known for its extremely decentralized structure and this firm has more than 200 operating companies in 54 countries. Thousands of Johnson & Johnson products are sold in more than 175 countries. Johnson & Johnson is composed of the following three main divisions: consumer, pharmaceuticals, and professional.<sup>27</sup> Johnson & Johnson probably has one of the broadest product portfolio

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<sup>27</sup> [www.jnj.com](http://www.jnj.com), February 2003.

and recognizable name brands. The firm produces products ranging from band-aids, contact lenses, pain relief tablets, shampoos, orthopedic products, and surgical devices.

Johnson & Johnson has been known to be an innovator in the pharmaceutical industry and their global vision has enforced this fact by implementing executive vision of using the Internet to improve relationship with business partners. JnJGATEWAY™, shown in **Exhibit 2-6** and **Exhibit 2-7**, is an example where business partners can order pharmaceuticals, surgical supplies, and other products from Johnson & Johnson. The goal of JnJGATEWAY® is to provide a single point of contact as well as a single online face to their rather diverse and independent subsidiaries. In addition, Johnson & Johnson has formed partnerships with pharmacies or wholesalers in selling their products online. **Exhibit 2-8** shows a link to CVS™ and COSTCO™ for selling Johnson & Johnson's famous pain killer, Tylenol®. Hence, Johnson & Johnson is using various effective strategies in using the Internet to perform eBusiness.

### **2.1.9. Merck**

Merck is a world-renowned pharmaceutical firm that thrives based on research used to discover, develop, and manufacture products to cure diseases in humans and animals. Merck is based out of Whitehouse station, New Jersey. This firm has achieved a lot of success by developing products independently and also via joint-ventures and acquisitions. The products at Merck can be separated into two categories: vaccines and medicine. Most of the vaccines are related to treating worldwide diseases in adults and children and range from polio vaccinations to strep throat treatment. Merck's products are geared towards treating serious diseases rather than developing consumer products.

In 2001, Merck launched their eBusiness initiative under the name, Merck-Medco. This subsidiary and its website allows Merck partners, namely physicians, clients, consumers, and pharmacists to access this website that was built using latest web-enabling technologies. The login for this website is shown in **Exhibit 2-9**. Functionality includes placing and monitoring online orders, viewing drug information, maintaining prescription information, and additional health care information.

#### **2.1.10. Novartis**

Novartis was created in 1996 after one of the largest mergers in history between two Swiss firms, Sandoz and Ciba-Geigy. Both Sandoz and Ciba-Geigy are known for developing chemicals and performing research in life sciences and their history dates back to the 1760s. Novartis businesses are categorized in pharmaceuticals and consumer health. The main business units consist of pharmaceuticals, generics, animal health, medical nutrition, infant and baby, and CIBA Vision. Novartis products for consumer health and pharmaceuticals are known throughout the world.

eBusiness at Novartis can be seen on their online B2B website for their vision care subsidiary, CIBA Vision®. **Exhibit 2-10** shows a snapshot of the eye care website where eye care physicians can place order for CIBA® contacts. Functionality includes vision care product information along with order capabilities in three European countries.

#### **2.1.11. Pfizer**

Pfizer Inc., headquartered in New York City, New York, was founded in 1849 by Charles Pfizer & Company as a fine-chemicals business. The company takes pride in its risk-taking strategy for developing new products, processes, and innovating to deliver

new products for humans and animals. Pfizer is composed of the following three business units: health care, consumer health, and animal health. Pfizer products include healthcare and consumer products. These are worldwide brand names that are available in more than 150 countries. Most consumer products can be differentiated between over-the-counter and prescription drugs. Pfizer's recent acquisition of Pharmacia has made headlines and added to an already diverse portfolio of pharmaceutical drugs and consumer products.

Pfizer seems to be using obsolete yet proven technologies such as EDI for their eBusiness transactions. **Exhibit 2-11** and **Exhibit 2-12** show Pfizer business units and EDI exchange capabilities with trading partners. This includes the ability of groups with Pfizer pharmaceuticals to perform electronic transactions such as generating purchase orders, generating invoices, and cataloging products. Additional usage of the Internet is prescribed by Pfizer to deliver account payable information to business partners as well as allowing vendors to perform business transactions with the IT group. Pfizer is actively using the Internet to maintain B2B relationships and EDI is most commonly used.

### **2.1.12. Wyeth**

Finally, Wyeth is another world-famous pharmaceutical company that uses significant research to discover, develop, and manufacture medicine for treating human diseases and is headquartered in Pennsylvania. This company was founded as a drug store in Philadelphia, Pennsylvania in the 1860s by John Wyeth & Brother. Wyeth is credited in history for developing the compressed pills (tablets) and gelatin capsules. The four divisions at Wyeth include pharmaceuticals, research, consumer healthcare, and

animal health. Wyeth develops a powerful range of OTC products and prescription medication sold in 140 countries, and they cure variety of diseases found in humans.

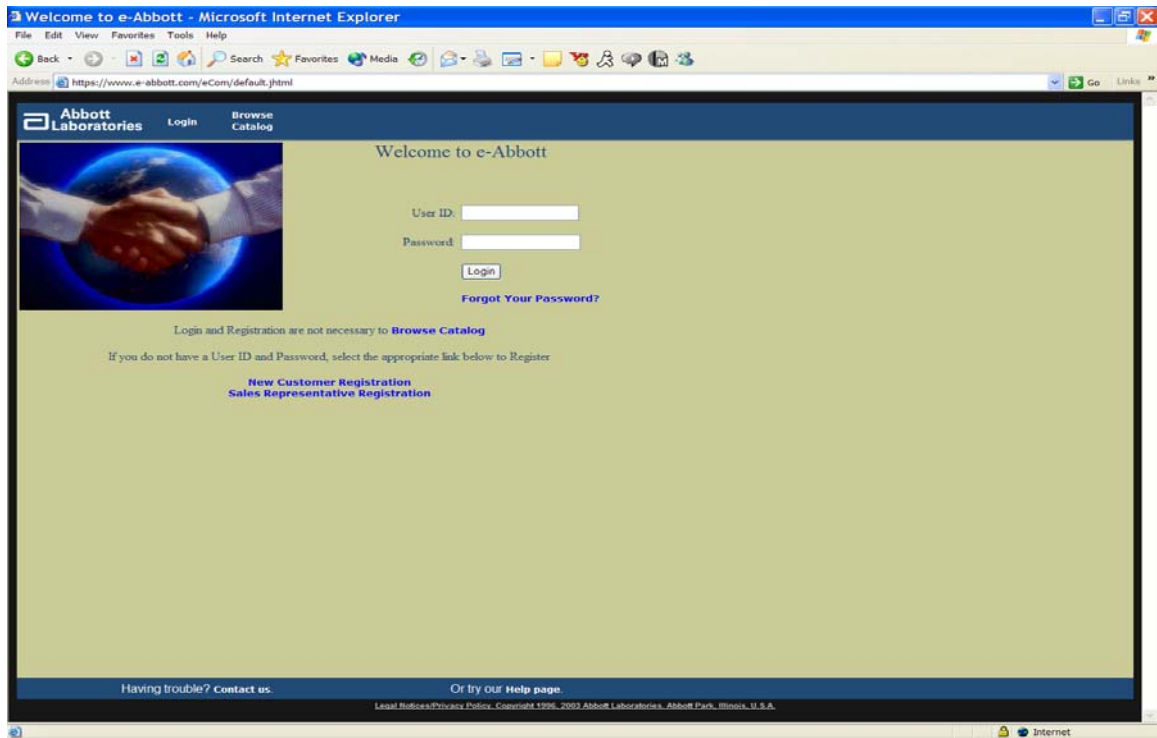
## **2.2. Conclusion**

It is clear that the major players in the pharmaceutical industry have been around for many decades (some even centuries) and they have a strong reputation for delivering OTC and prescription drugs used throughout the world. These companies employ tens of thousand of people worldwide and their sales are in the billions of dollars. These large players in the pharmaceuticals generally have several different divisions and rely heavily on R&D to deliver new health care products.

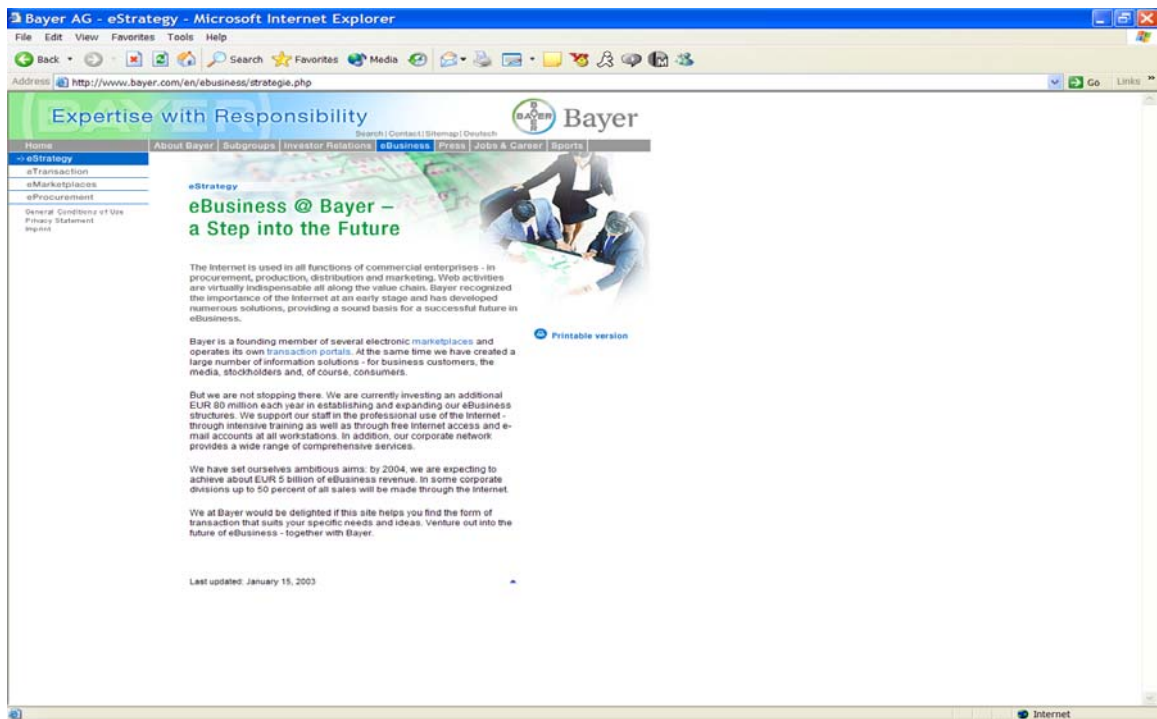
It is evident that eBusiness is heavily used by these prevailing companies in the pharmaceutical industry. Using the Internet to perform electronics transactions with business partners, consumers, physicians, vendors, wholesalers, and distributors seems to be the norm in this industry. Various models such as B2B, B2C, online partners, and gateways, are actively being pursued. Older and reliable technologies such as EDI versus leading-edge technologies are offered throughout this spectrum of pharmaceutical companies discussed in this chapter.

After discussing the dominant players in the pharmaceutical industry, this research transitions to eBusiness. In the following chapter, we begin by defining eBusiness and the various models it encompasses. Furthermore, we will discuss eBusiness phases and how they apply to the pharmaceutical industry.

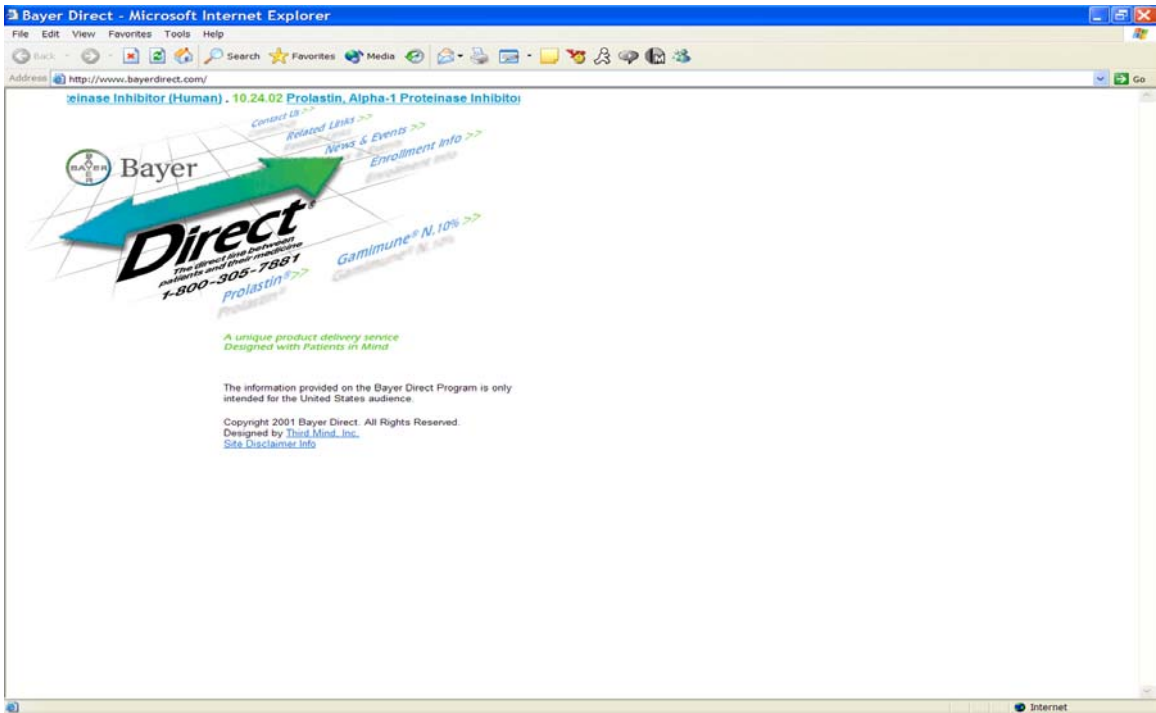
## 2.3. Exhibits



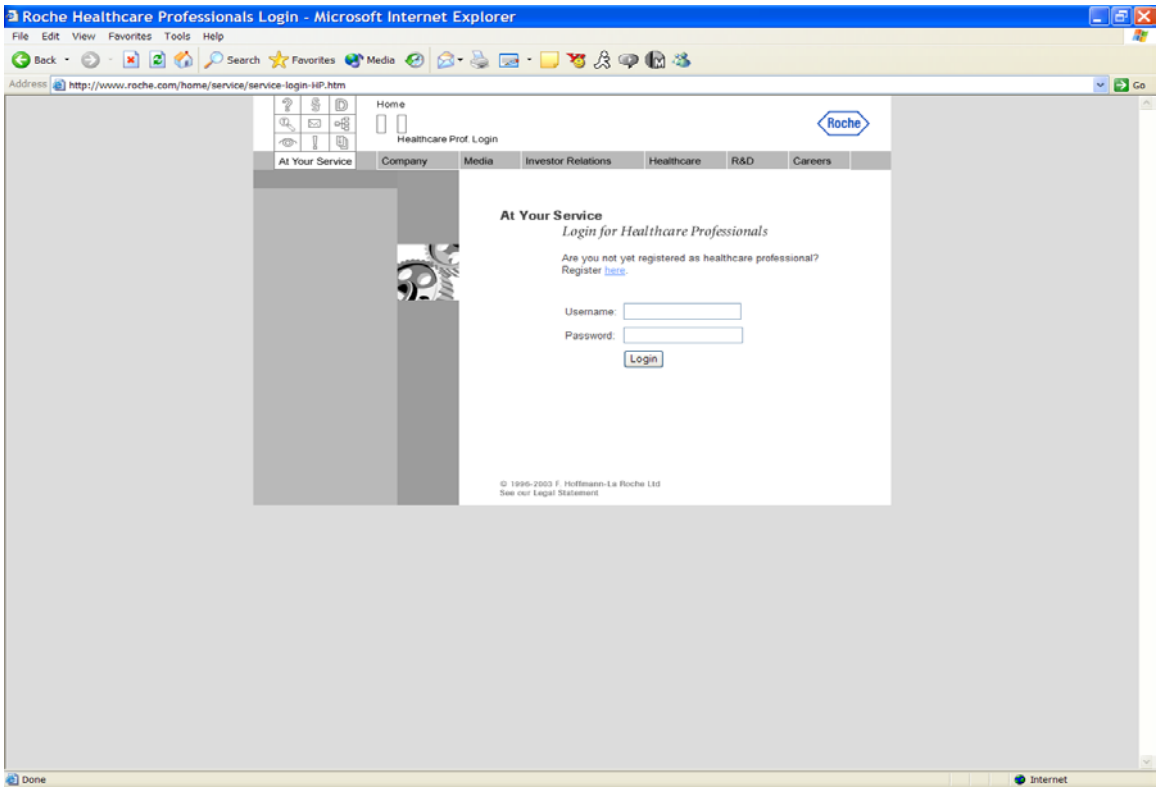
*Exhibit 2-1 – e-Abbott - Quick Link*



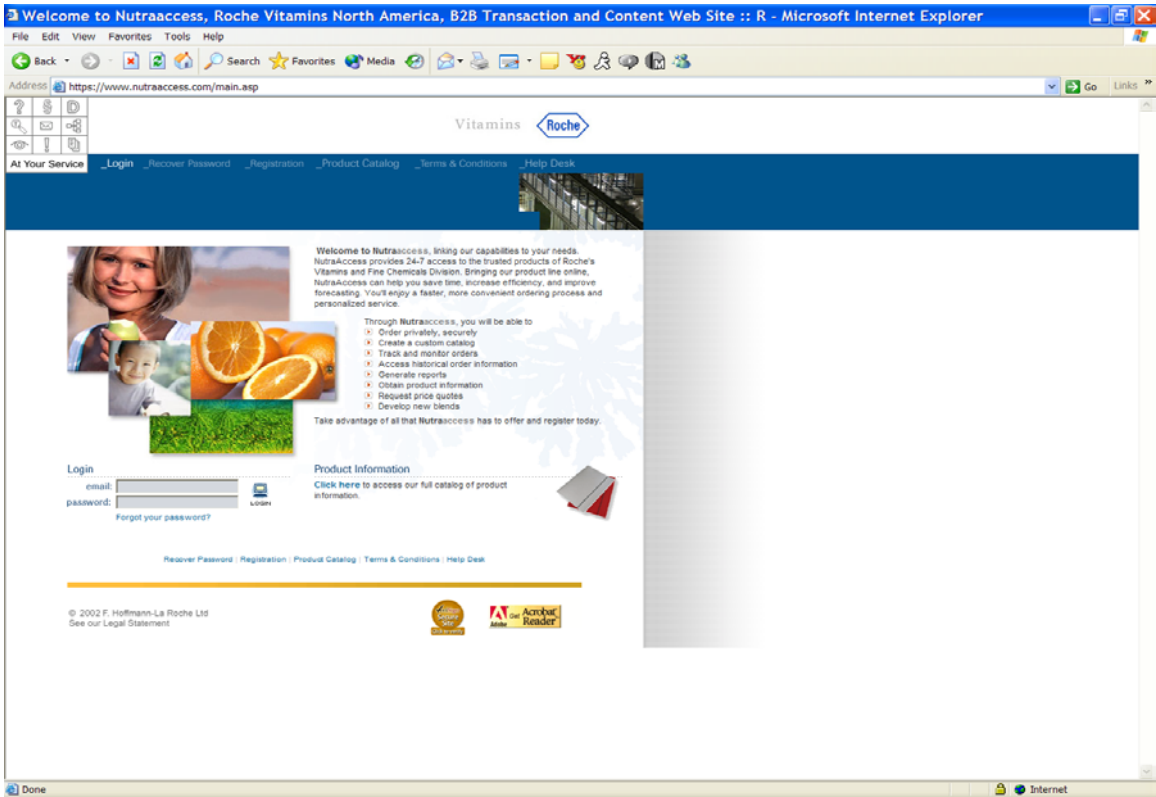
*Exhibit 2-2 – eBusiness at Bayer*



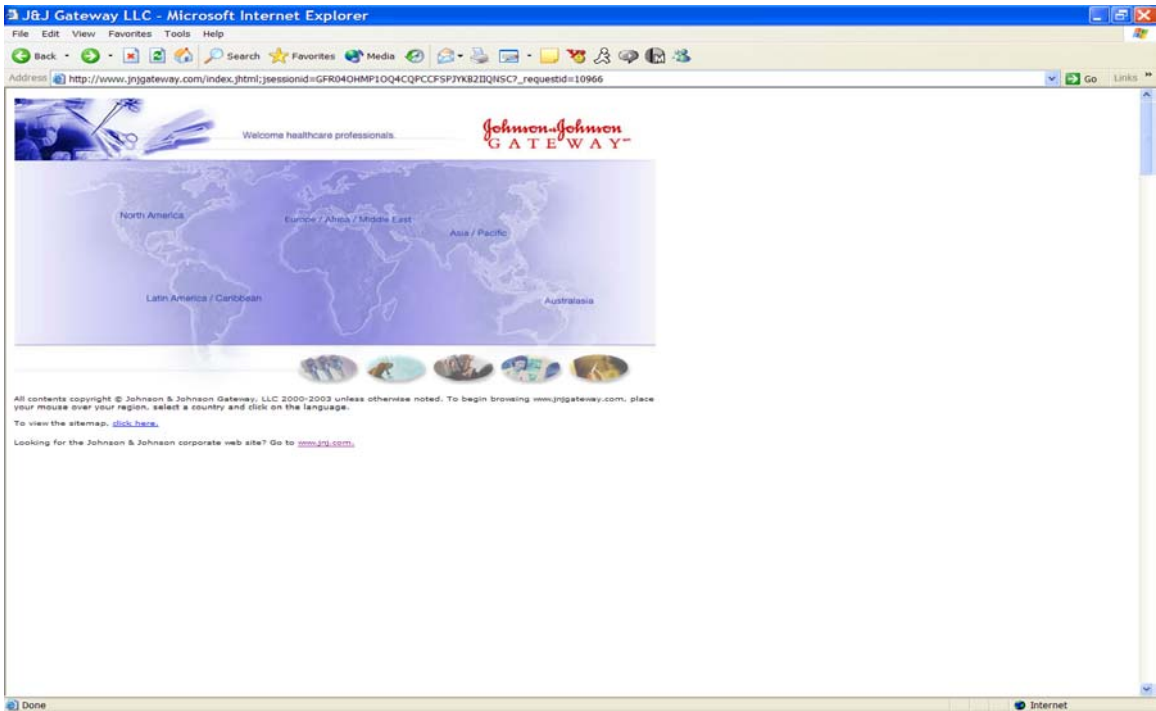
*Exhibit 2-3 – Bayer Direct*



*Exhibit 2-4 – Roche Healthcare Professional Login*

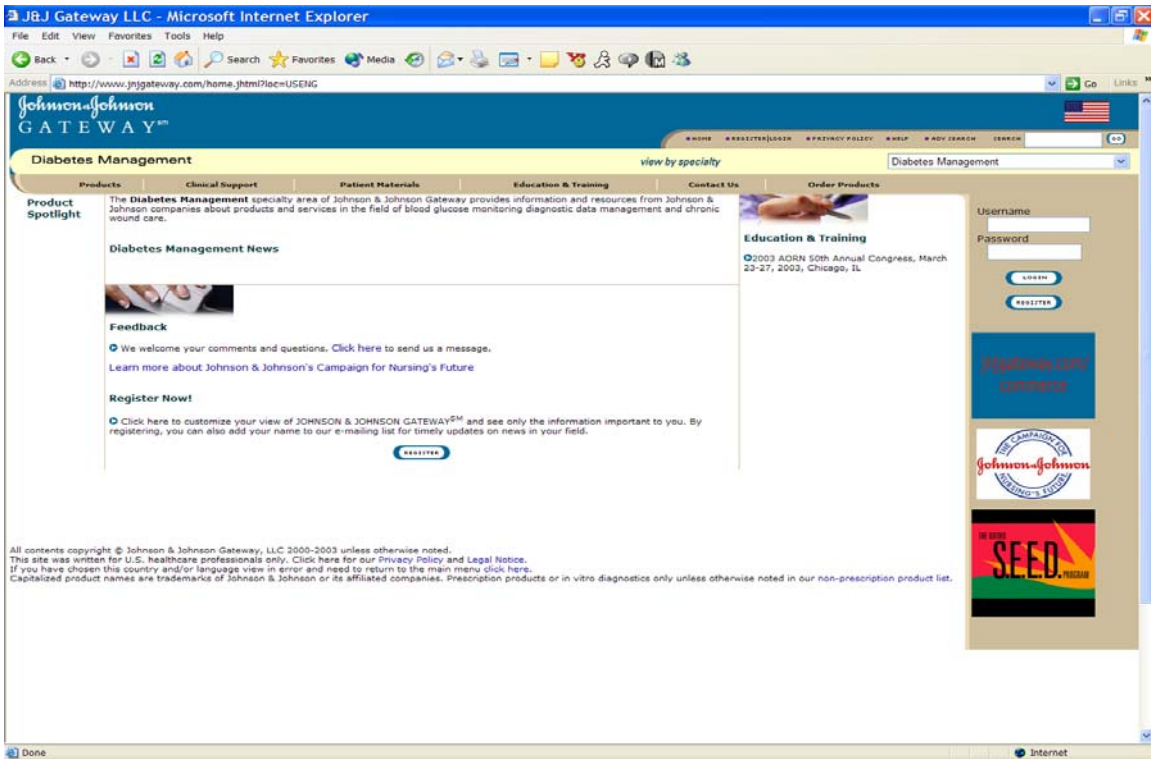


**Exhibit 2-5 – Roche eBusiness for B2B Ordering of Vitamins**

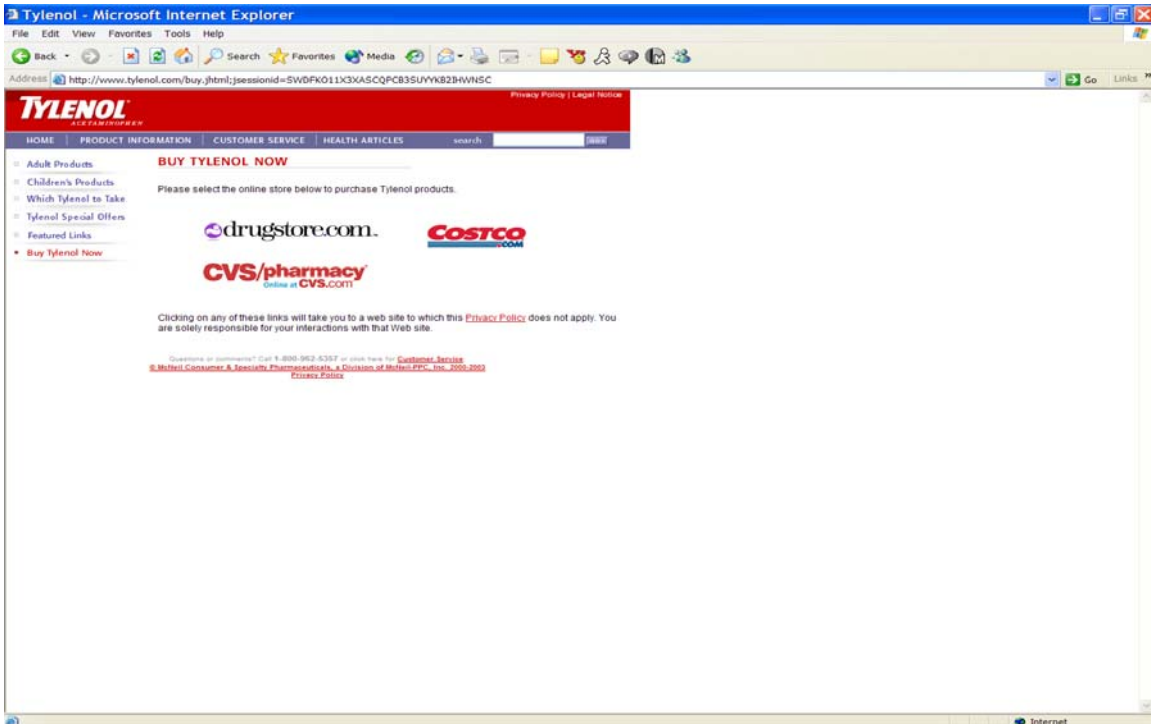


**Exhibit 2-6 – Johnson & Johnson GATEWAY™**

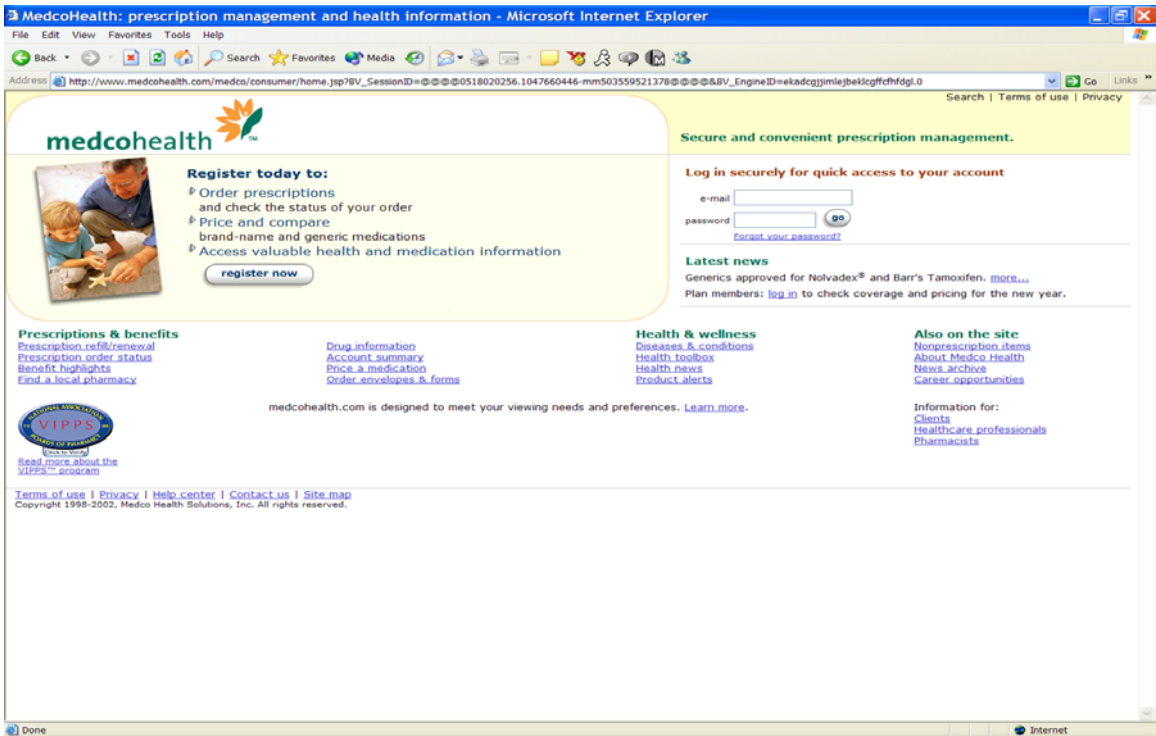




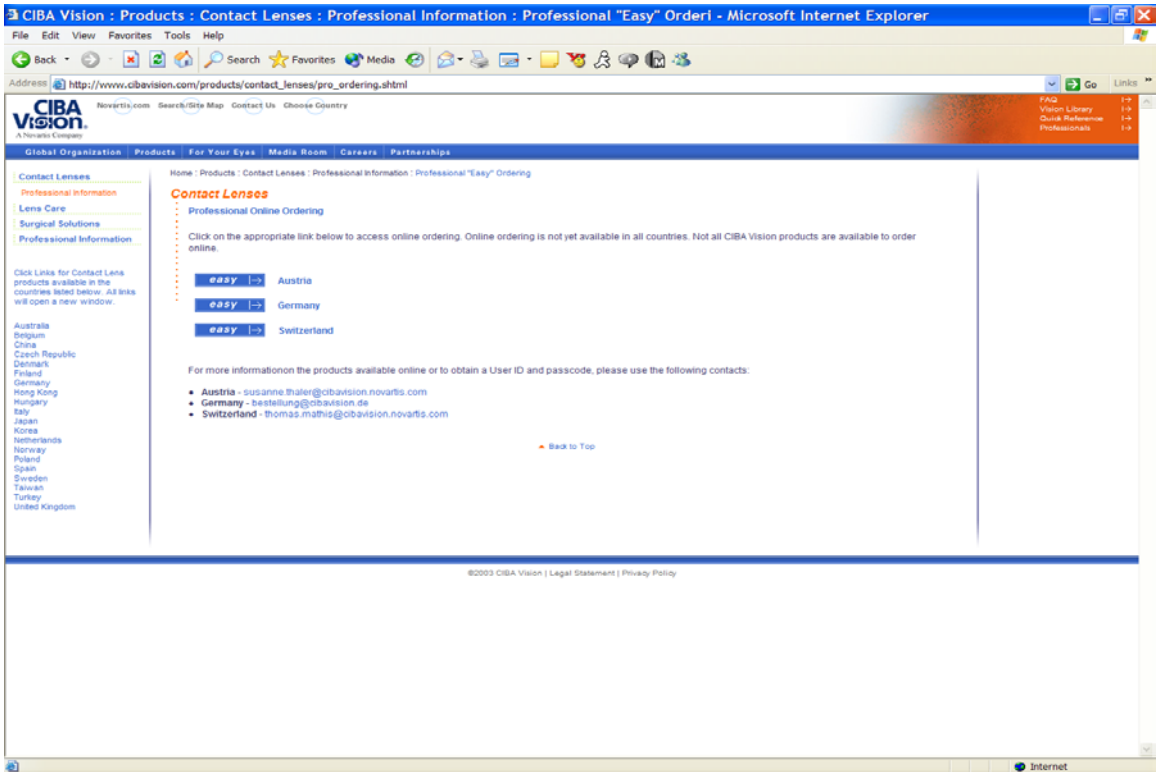
**Exhibit 2-7— Johnson & Johnson GATEWAY™ Login Screen**



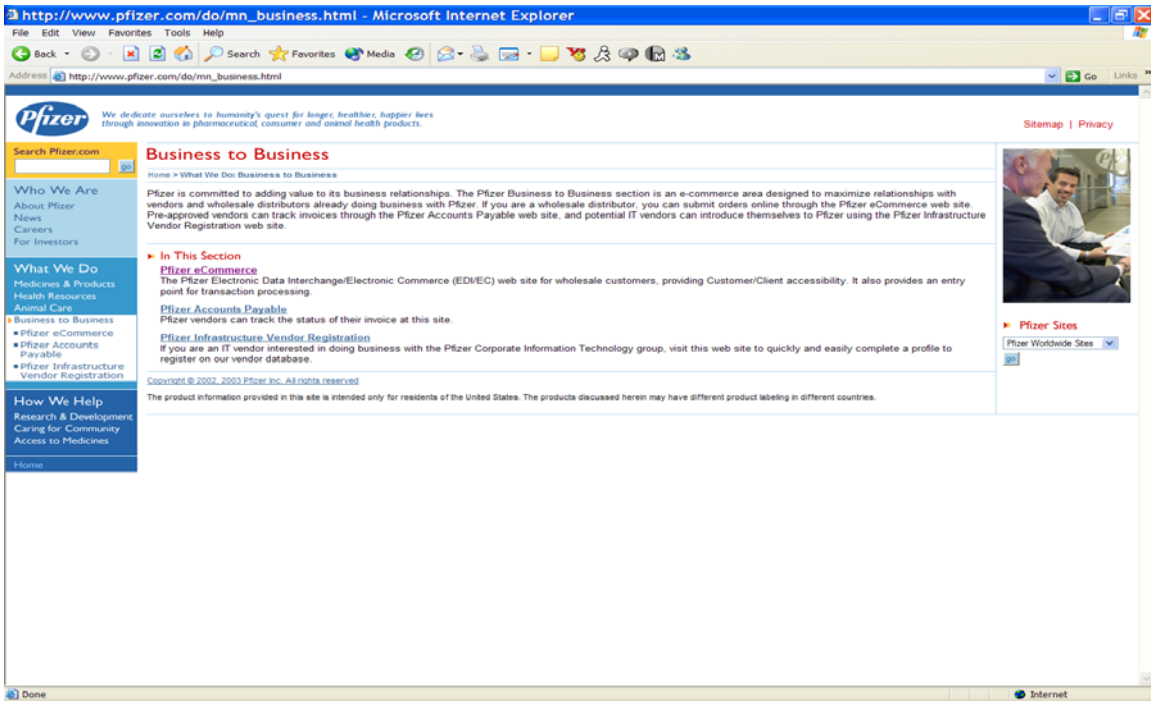
**Exhibit 2-8 – Johnson & Johnson - Buy Tylenol® Now**



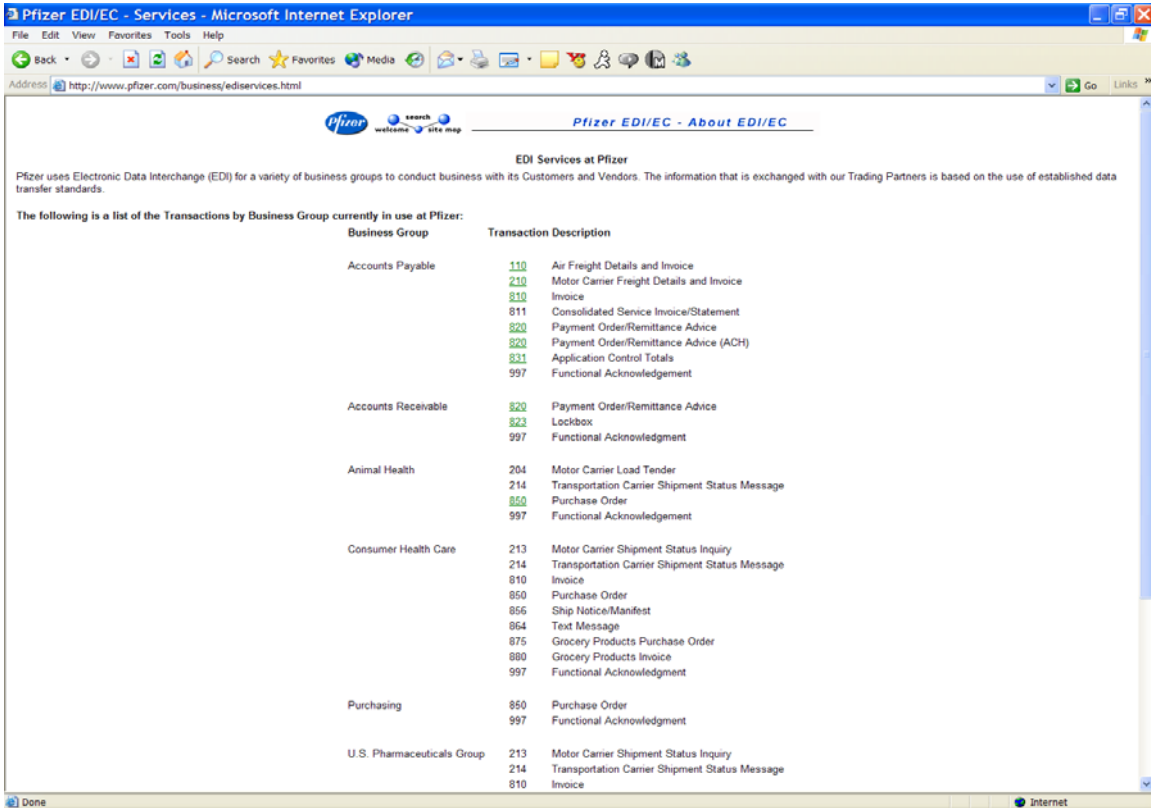
*Exhibit 2-9 – Merck-Medco*



*Exhibit 2-10 – CIBA Vision® at Novartis*



**Exhibit 2-11 – Pfizer Business to Business**



**Exhibit 2-12 – EDI Services at Pfizer**

### **3.0. Chapter Three: eBusiness Phases and Models**

Vitale and Weill define eBusiness as “marketing, buying, selling, delivering, servicing, and paying for products, services, and information across networking linking an enterprise and its prospects, customers, agents, suppliers, competitors, allies, and complementors.”<sup>28</sup> This statement captures the essence of eBusiness and applies directly to the pharmaceutical industry where firms can use the Internet and IT to establish relationships with organizations that perform business with them. Furthermore, eBusiness applies to all the pharmaceutical phases in chapter one.

#### **3.1. ‘True’ eBusiness**

Paul Stodden, President of Siemens Business Service, projected that “true eBusiness will emerge after 2005.”<sup>29</sup> Mr. Stodden further explained that by this time eBusiness interactions amongst firms will be wider, products will be more mature, firms’ IT competencies will be further improved, and faster bandwidth and improved IT infrastructure will make eBusiness closer to what it was meant to be. This statement by Mr. Stodden has great value and applies to many industries, in specific, pharmaceutical. Pharmaceutical companies are already expediting eBusiness and as this business model matures further in the next two years, it will be interesting to see which pharmaceuticals will be in positioning themselves correctly. This research delves on technologies and trends that pharmaceuticals will embrace in the next few years so that when ‘true’ eBusiness does arrive, who will be the winners and who will be the losers in that industry.

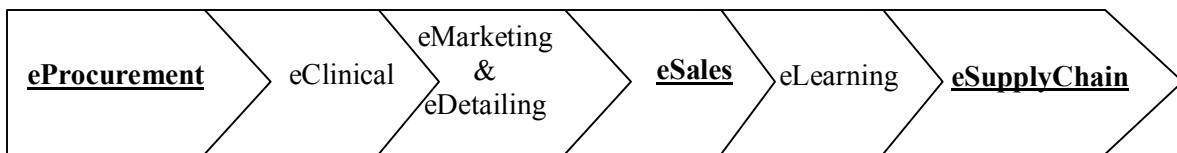
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<sup>28</sup> Peter Weill and Michael Vitale, “Place to Space: Migrating to eBusiness Models”, Harvard Business School Press, 2001, p. 5.

<sup>29</sup> MIT Sloan, Management of Technology Program (2003), International Trip, Siemens Visit (Munich, Germany), January 2003.

### 3.2. eBusiness Phases

eBusiness and IT play a major role in all aspects of a pharmaceutical company's value chain. eBusiness initiatives can be distinguished in various categories in terms of which phase of the formal work process it fits into the pharmaceutical firm strategy. The following e-initiatives in **Figure 3-1** encompass all aspects of the process a pharmaceutical firm has to follow to develop and deliver their drugs:



**Figure 1 - eBusiness Value Chain in Pharmaceutical industry<sup>30</sup>**

IT plays a crucial role in these eBusiness phases, where vendors and their products are critical. The focus of this research will be on the following phases: eProcurement, eSales, and eSupplyChain. The case studies in this research will analyze eBusiness technologies in these phases and see what the prevalent technologies and trends are in the pharmaceutical industry.

#### 3.2.1. eProcurement

eProcurement can be considered a subset of eSupplyChain. This generally involves buying products online from suppliers. This could be a one-to-one transaction between a supplier and the pharmaceutical firm or as big as an online auction for an entire vertical of the pharmaceutical industry. Michael Porter, a well-known professor at Harvard Business School (HBS), claims that “procurement using the Internet tends to

<sup>30</sup> Andrew McAfee, “eBusiness at Novartis”, Harvard Business School, August 2001, p.16.

raise bargaining power over suppliers, though it can also give suppliers access to more customers.”<sup>31</sup> Consequently, pharmaceutical firms seem to be adhering to this advice and are investing heavily in eProcurement initiatives. eProcurement is related to the process in which pharmaceutical firms can interact with suppliers in purchasing products needed to develop drugs. Various eProcurement models described by Kalakota include: EDI networks, business-to-employee requisitioning applications, corporate procurement portals, and Industry consortiums are being actively pursued in the pharmaceutical industry.<sup>32</sup>

### **3.2.2. eClinical**

eClinical is the process in which pharmaceutical firms use the Internet to support clinical trails. Recruiting, for example, is required for clinical trails, and pharmaceutical companies can build websites to recruit and filter candidates. The Internet can serve as a powerful media for companies to recruit candidates for their clinical trails.

### **3.2.3. eMarketing and eDetailing**

eMarketing and eDetailing are some of the strong points that technology offers to pharmaceutical companies. Firms can build their web presence and brand name to develop websites accessible to anyone on the Internet. Firms offer easy access to websites that doctors use for reviewing drugs and other products. Similarly, electronic media such as video conferencing can allow sales representatives to hold meetings with doctors while promoting drugs. Most major pharmaceutical companies have created

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<sup>31</sup> Michael Porter, “Strategy and the Internet,” Harvard Business Review, March 2001, p. 67.

<sup>32</sup> Ravi Kalakota and Marcia Robinson, “e-Business 2.0: Roadmap for Success,” Addison-Wesley, Boston, 2001, p. 310.

websites to market their drugs. Viagra.com and acuvue.com are examples of Pfizer and Johnson and Johnson, respectively, marketing their prescription drugs on the Internet.

#### **3.2.4. eSales**

eSales is used by pharmaceutical companies to sell their products to business partners such as doctors, physicians, wholesalers, distributors, and retailers. Websites offer sales capabilities for doctors who can potentially order 24 / 7 / 365. Additionally, pharmaceutical companies can offer promotions to doctors for using the Internet. eSales software can be custom built for certain drugs and products, as opposed to using custom software packages to make these sales. eSales entails providing customer service to online buyers as well as analyzing and forecasting their behavior.

#### **3.2.5. eLearning**

eLearning is the ability for doctors to access pharmaceutical companies over the Internet and pursue continued education capabilities. Many firms offer these capabilities to doctors and this creates the opportunity for better relationships between the two. eLearning allows the doctors to continue to build their expertise and research additional knowledge in their respective fields.

#### **3.2.6. eSupplyChain**

eSupplyChain allows pharmaceutical companies and their business partners to track products throughout the value chain. SCM is the process that “encompasses the coordination of order generation, order taking, and order fulfillment / distribution of

products, services, or information.”<sup>33</sup> Automating this process improves the relationships between firms and business partners and is a recurring trend in most industries when considering the success of companies such as FedEx or UPS. eSupplyChain integrates with suppliers in delivering raw material and other products to pharmaceutical companies. Two types of SCM models include ‘pull’ and ‘push’. “In the more traditional ‘push’ model, the merchandise is pushed into the customer’s hands ... in the ‘pull’ model, the customer actually initiates the supply chain.”<sup>34</sup> Hence, offering the ability for business partners to view inventory, orders, and financial data is a preferred eBusiness capability.

### **3.3. eBusiness Models**

Four main business models can be pursued by pharmaceutical companies on the Internet. These models are generic to other industries and are typical of most business aspiring for the true ‘e’ in their workflow. These models are B2C, B2B, Consumer-to-Consumer (C2C), and mBusiness.

#### **3.3.1. Business-to-Consumer**

B2C is one of the simplest models of eBusiness. Amazon.com is a prime example of this model where online buyers can shop from a wide array of products. This model is further enhanced by Amazon which offers customer-reviews of products to build trust and credibility of their website. In the pharmaceutical industry, an example would be the ability of consumers to buy from online pharmacies such as CVS.com or other companies that deliver OTC drugs to consumers. The user typically creates a profile on the website and enters personal information such as shipping, billing, payment, and address. This

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<sup>33</sup> Ravi Kalakota and Andrew Whinston, “Electronic Commerce: A Manager’s Guide,” Addison-Wesley Longman, Inc., 1997, p.287.

<sup>34</sup> Ibid, p.288.



transaction is strictly between the business and the consumer who is eventually delivered the products.

### **3.3.2. Business-to-Business**

Taylor reveals that B2B is much more complex than the simple B2C model because it entails additional complexity for handling activities such as payment handling, purchasing, fulfillment, and procurement. It is mentioned that security, trust, and privacy protection are key to building successful eBusinesses. The overall trend in the evolution of eCommerce is towards content management, logistics management, and trusted services.<sup>35</sup> Another form of B2B is the Enterprise-to-Enterprise (E2E) model which allows two or more enterprises to integrate seamlessly for eBusiness integration. New software is being developed to establish this niche and has future potential across many industries. Pharmaceuticals can utilize the B2B model to manage eBusiness with suppliers, wholesalers, doctors, physicians, and distributors. This model is much more complicated than the B2C and requires more complicated software, hardware, and systems integration.

### **3.3.3. Consumer-to-Consumer**

Vitale and Weill add an additional item to the list of eBusiness models with C2C. This model is pursued in the world-famous online auction site, eBay, which serves to connect buyers and sellers online and it charges a nominal fee to consumers. Yahoo! auctions has been successful in Japan, a market from which eBay withdrew last year, in building trust with consumers by charging both sellers and buyers and keeping each party

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<sup>35</sup> David Taylor, "Doing E-Business: Strategies for Thriving in an Electronic Marketplace," John Wiley and Sons, New York, 2001.

equally liable for product and payment delivery. This model is applicable to the pharmaceutical industry as connecting buyers and suppliers of pharmaceutical products could be a lucrative initiative. According to Vitale and Weill, successful auctioning between businesses has been achieved by FreeMarkets Online and may be a model for connecting B2B pharmaceutical companies for auctioning in the future.<sup>36</sup> Later case studies will reveal that FreeMarkets Online has been actively used by some pharmaceutical firms.

### **3.3.4. mBusiness**

mBusiness is an upcoming trend in eBusiness that is rapidly becoming popular in Europe and Asia. Companies such as Japanese NTT DoCoMo have established a suite of products and services with i-mode platform that connects mobile users to the Internet.<sup>37</sup> This market is expanding and eventually users worldwide will become comfortable buying from the Internet using their cell phones or other handheld devices. mBusiness has some practical applications and services in the pharmaceutical industry. Integrating mobile phones to send electronic prescriptions to patients, for example, is one application. Additionally, allowing doctors to be able to refill stock and inventory using handheld devices which connect to the pharmaceutical websites could be another example of mobile devices being used for eBusiness. Hence, mBusiness definitely has a future in the pharmaceutical industry.

“The wireless web is being optimized for transactions...pushing personalized...preferred information, as well as a variety of applications, to customers.”

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<sup>36</sup> Peter Weill and Michael Vitale, “Place to Space: Migrating to eBusiness Models”, Harvard Business School Press, 2001, p. 159.

<sup>37</sup> Harvard Business School Case, “NTT DoCoMo: Marketing i-mode”, Harvard Business School Publishing, Case # 090-502-31, 2002.

Furthermore, “as the number of mobile Internet users outnumbers PC users worldwide, there will be a concomitant shift in eCommerce from wired PCs to Internet-enabled mobile devices.”<sup>38</sup> According to Bergeron, enabling technologies of the wireless Internet and the mBusiness model will be:<sup>39</sup>

1. Wireless Networks
  - a. Global Systems for Mobile Communications – GSM.
  - b. Wideband Code Division Multiple Access – WCDMA.
  - c. General Packet Radio Services – GPRS.
2. Wireless Protocols
  - a. Wireless Application Protocol – WAP.
  - b. Sun Microsystems J2ME – Java 2 Micro Edition.
  - c. Short Messaging Service – SMS.
3. Symbian Alliance: non-proprietary operating system
  - a. EPOCH formed in alliance by major wireless carriers.
4. Bluetooth: standard / protocol for short-range wireless communications

It is clear that there seems to be major potential of the wireless Internet and mBusiness. This is due mainly to the powerful industry alliances and technology drivers supporting them.

B2C, B2B, C2C, and mBusiness are eBusiness models that can be used across all industries. Specifically, they all have useful applications in the pharmaceutical industry. It seems that with the exception of C2C, the other three eBusiness models have the most

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<sup>38</sup> Bryan Bergeron, “The Wireless Web: How to Develop and Execute a Winning Wireless Strategy,” McGraw Hill, 2001, p.40.

<sup>39</sup> Ibid, pp. 36-37.

traction in the pharmaceutical industry. Subsequent case studies in this research will determine which ones are being more actively pursued than others.

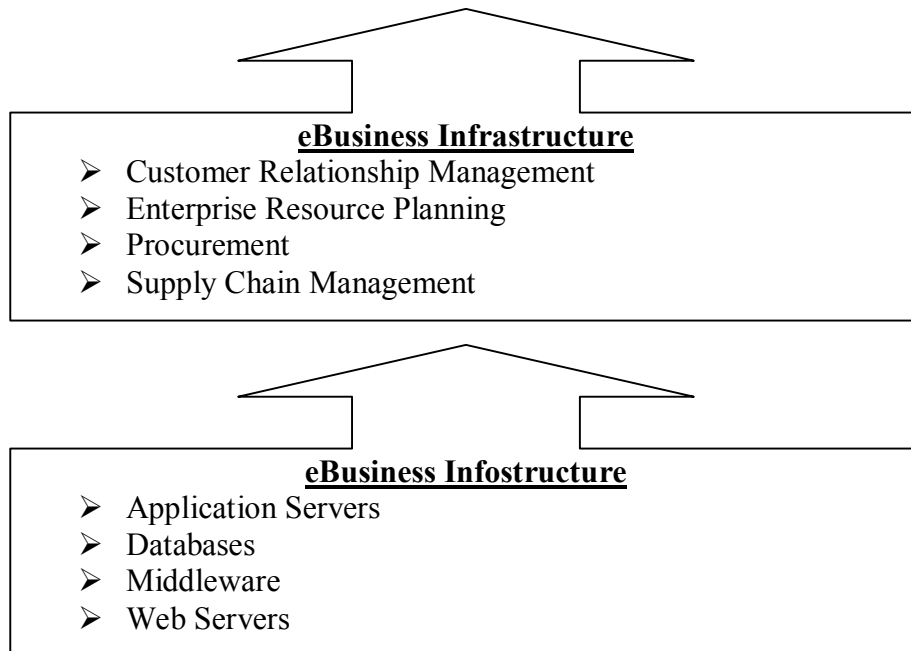
### **3.4. Conclusion**

There are many phases of eBusiness and how they pertain to the pharmaceutical industry. eBusiness phases in the pharmaceutical industry consist of eProcurement, eClinical, eMarketing, eSales, eLearning, and eSupplyChain. This research will focus on eProcurement, eSales, and eSupplyChain. eBusiness models include B2B, B2C, C2C, and mBusiness, all of which may be implemented at pharmaceutical companies.

After describing eBusiness phases and models in this chapter, the following chapter continues the discussion with eBusiness architecture and its components. eBusiness architecture consists of several components that are made up of software products. These software products have been developed by well-known vendors who are at the forefront of creating eBusiness technologies. Certain emerging technologies that may impact eBusiness in the near future will also be mentioned.

## 4.0. Chapter Four: eBusiness Architecture and Software

Kalakota describes eBusiness architecture in terms of Infrastructure and Infostructure. These so-called ‘interlocking’ layers create the eBusiness architecture. eBusiness Infostructure includes web servers, databases, middleware, and application servers. eBusiness Infrastructure contains customer relationship management (CRM), enterprise resource planning (ERP), procurement, and SCM. **Figure 4-1** contains an abridged version of Kalakota layers of eBusiness architecture.



**Figure 4-1 – eBusiness Layers**<sup>40</sup>

These two layers containing specific eBusiness components will be the focus of this chapter. Later cases studies in this research will discuss eBusiness technologies in context of Infostructure and Infrastructure.

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<sup>40</sup> Ravi Kalakota and Marcia Robinson, “e-Business 2.0: Roadmap for Success,” Addison-Wesley, Boston, 2001, p. 106.

## **4.1. eBusiness Vendors and Products**

Many vendors have developed products for the eBusiness platform that are being used in the pharmaceutical industry. These vendors will be discussed based on the following eBusiness architecture categories: Infostructure and Infrastructure. These vendors are the market-leaders in their respective segments of eBusiness products and technologies.

### **4.1.1. eBusiness Infostructure**

Components of the eBusiness Infostructure are the foundation of eBusiness implementations. As depicted in **Figure 4-1**, this category consists of application servers, databases, middleware, and web servers, each of which plays a major role in the eBusiness architecture.

#### **4.1.1.1. Application Servers**

Applications servers are the middle-tier of a distributed three-tier application. This is a server program that usually contains the business logic of an eBusiness application. The application server interfaces with the front-end (first-tier) of the application which is developed using a web-based graphical user interface. On the other side, application servers interface with the application backend (third-tier), which is usually a database server, an enterprise system, or a legacy system. The application server is commonly integrated with a web server and they communicate via the Hypertext Transfer Protocol (HTTP) or a common gateway interface (CGI).

Application servers are used by pharmaceutical companies for implementing web-based initiatives. Many pharmaceutical firms are building web applications that integrate

with enterprise backend systems such as manufacturing, ordering, and distribution. Most application servers have connector architectures for integration with legacy and enterprise systems and offer great value to pharmaceuticals looking to implement such initiatives.

#### 4.1.1.2. Application Server Vendors and Products

There are five main vendors in the application server category. According to Gartner Research, “two architectures – Sun Microsystems’ Java 2 Enterprise Edition (J2EE) and Microsoft’s COM+/.NET – will remain dominant...through 2006.”<sup>41</sup>

Application server vendors in **Table 4-1** conform to either the J2EE or .NET standards.

Application Server Vendor	Product
BEA	WebLogic
Sun / iPlanet	SunOne
IBM	Web Sphere
Microsoft	COM+ / .NET
Jboss	Jboss

**Table 4-1 – Application Server Vendors and Products**<sup>42</sup>

These vendors have a strong reputation of quality product development and their application servers deliver eBusiness solutions to numerous industries.

The BEA WebLogic Platform™ is a package product (BEA WebLogic Server™, BEA WebLogic Portal™, and BEA WebLogic Integration™) that offers a “single, unified, easy-to-use infrastructure platform for application development, deployment, and management.”<sup>43</sup> This platform allows organizations to develop custom J2EE-based applications using an enterprise architecture framework that is secure and easy to manage. According to ServerWatch, BEA led the J2EE application server market share at 37% in

<sup>41</sup> Y. Natis and M. Pezzini, Gartner Research, “App Server Vendors: The Magic Quadrant,” 26 Oct, 2001, p.1.

<sup>42</sup> ServerSide.com, “Application Server Matrix,” Apr.11, 2003, www.theserverside.com/reviews/matrix.jsp.

<sup>43</sup> Bea.com, March 2003, www.bea.com.

2001.<sup>44</sup> The BEA WebLogic Server is both an application server and web server and is used for both backend and front-end integration for customers.<sup>45</sup>

SunOne by Sun Microsystems is “a highly scalable and robust foundation for traditional software applications as well as current Web-based applications, while laying the foundation for the next-generation distributed computing models.”<sup>46</sup> The SunOne technical architecture is shown in **Exhibit 4-1**. The SunOne application server resides alongside the SunOne web server in the data, application, reports, and transactions layer of the SunOne platform. It communicates with the SunOne office productivity and mail / calendar services below, and the directory and portal servers above. This is an extremely robust platform that allows customers to leverage their data and assets as services.

The “IBM WebSphere Application Server is a high-performance and extremely scalable transaction engine for dynamic e-business applications.”<sup>47</sup> IBM WebSphere is a J2EE-enabled (Java Server Pages, Enterprise Java Beans, Servlets) application server that will be capable of deploying Web Services in the future. Capabilities include scalability, flexibility, rapid development and deployment. Other features of this application server include Java Database Connectivity (JDBC), Web Services support Simple Object Access Protocol (Soap), Web Services Definition Language (WSDL), and Universal Description Discovery and Integration (UDDI) client, Java Security, and Java Naming Directory Interface (JNDI).<sup>48</sup>

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<sup>44</sup> Natasha Gray, “BEA Holds Lions Share of J2EE App Server Market,” [www.serverwatch.com](http://www.serverwatch.com), September 2001.

<sup>45</sup> Bea.com, March 2003, [www.bea.com/framework.jsp?CNT=index.htm&FP=/content/products/platform/](http://www.bea.com/framework.jsp?CNT=index.htm&FP=/content/products/platform/)

<sup>46</sup> Sun.com, “Sun Open Net Environment (Sun ONE),” [www.sun.com/software/sunone/](http://www.sun.com/software/sunone/).

<sup>47</sup> IBM.com, January 2003, [www.ibm.com](http://www.ibm.com).

<sup>48</sup> IBM.com, “IBM Websphere software platform,” March 2003, [www-3.ibm.com/software/info1/websphere/index.jsp?tab=products/appserv](http://www-3.ibm.com/software/info1/websphere/index.jsp?tab=products/appserv).



The Microsoft .NET Enterprise Servers suite consists of a variety of products that can be used to deliver web-based applications and web services. These products include the application center for developing web application, the BizTalk Server for integration with businesses partners, and the Commerce Server for developing custom e-Commerce solutions. These servers communicate with other products in .NET Enterprise Server suites that include databases, email, mobile, portal, and network servers.

Jboss is a free application server that was originally developed in the Apache open source initiative. This application server is J2EE-compliant and was built by programmers in a community-wide setting. It has rapidly become popular and its scalable and robust architecture has made it an application server of choice in organizations with limited eBusiness and IT budgets. Jboss initiatives include future integration with other platforms such as Microsoft .NET.

It is clear that several players in the application server market include Sun, BEA, IBM, Microsoft, and the emerging Jboss. These application servers are being rapidly deployed in eBusiness architectures in the pharmaceutical industry and they all deliver the scalability and robustness that the systems require.

#### **4.1.1.3. Databases**

A database management system is defined as a collection of enterprise data that a firm organizes in a clear and concise manner so that it can be accessed, modified, and managed easily.<sup>49</sup> eBusiness data contains information related to products, prices, users, customers, and vendors. Databases are accessed using the Structured Query Language (SQL), which is a standard language for improvising interactive queries against the

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<sup>49</sup> WhatIs.com, April 2003, [www.whatis.com](http://www.whatis.com).

database to perform operations such as selects, updates, deletions, and insertions.

Perhaps the most commonly used database in the industry is the relational database in which data is stored in a tabular format so that it can be organized and accessed easily.

Pharmaceutical firms realize the inherent necessity and use of databases. Databases store critical business information. Pharmaceuticals use data for drug discovery, clinical trials, procurement, web-based initiatives, and other important components of their value chain. Furthermore, databases can store information related to products, suppliers, pricing, and vendors for eBusiness initiatives. Hence, databases add value to pharmaceuticals for numerous facets of their business.

#### **4.1.1.4. Database Vendors and Products**

Several vendors have dominated the database market. This is a mature product in a market that has been instrumental in delivering IT infrastructure. **Table 4-2** contains some of those vendors and their products. Vendors like IBM and Microsoft, for instance, have more than one database product, and that usually reflects the organizations business needs and size of data needed to be stored.

<b>Database Vendor</b>	<b>Product</b>
Oracle	Oracle
IBM	DB2, Informix
Microsoft	SQL Server, Access
Sybase	SQL Anywhere

**Table 4-2 – Database Vendors and Products**

Oracle is one of the market leaders when it comes to database products. According to CFO of Oracle, Todd Henley, the Oracle database still accounts for 60% of

their annual sales.<sup>50</sup> **Exhibit 4-2** depicts the Oracle 9i database architecture. The Oracle database is a reliable database platform that handles eBusiness transactions in a secure and manageable way. Moreover, this database is known for storing content information, data integration, and business intelligence.

IBM's original database product was DB2 that was used in mainframe applications, and their purchase of Informix has brought them another reputable database product. DB2 is IBM's reliable scalable, and high-performing database that is "built on open standards for ease of access and sharing of information for ... developing and deploying critical solutions...there are more than 60 million DB2 users from 400,000 companies worldwide relying on IBM DB2 Information Management technology."<sup>51</sup>

IBM has created an eBusiness suite based on DB2 and is "an enterprise whose business processes are integrated end-to-end across the company and with key partners, suppliers and customers. It is an enterprise that can respond with flexibility and speed to any customer demand, market opportunity or external threat."<sup>52</sup> IBM's Informix relational database offers "data management software for data warehousing, analysis and reporting, Web content delivery, and broadcasting from a digital media library."<sup>53</sup>

Microsoft develops two major database products including the industry-wide business database, SQL Server, and Access which is the less scalable database product. "Microsoft SQL Server 2000 Enterprise Edition is the complete database and analysis offering for rapidly delivering the next generation of scalable e-commerce, line-of-

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<sup>50</sup> MIT Sloan, MOT Program (2003), West Coast Trip, Oracle (Redwood Shores, CA), March 2003.

<sup>51</sup> IBM.com, March 2003, [www-3.ibm.com/software/data/db2/](http://www-3.ibm.com/software/data/db2/).

<sup>52</sup> IBM.com, March 2003, [www.ibm.com](http://www.ibm.com), <http://www-3.ibm.com/software/data/e-business/>.

<sup>53</sup> IBM.com, March 2003, [www.ibm.com](http://www.ibm.com), [www-3.ibm.com/software/data/Informix/](http://www-3.ibm.com/software/data/Informix/).

business and data warehousing solutions.”<sup>54</sup> Its benefits include scalability reliability, performance, and fast time-to-market. On the other hand, “whether users are creating a stand-alone desktop database for personal use, departmental use or for an entire organization, Access offers an easy-to-use database for managing and sharing data.”<sup>55</sup> Benefits of Microsoft Access include simple connectivity to information, web-enabled information sharing capabilities, and ease of use and deployment.

The Sybase database servers, include Sybase Adaptive Server which “is a powerful data management platform designed for transaction-intensive enterprise applications, with advanced capabilities to meet the evolving requirements of e-Business,”<sup>56</sup> and SQL Anywhere which “is a comprehensive package that provides data management and enterprise synchronization to enable the rapid development and deployment of distributed e-Business solutions.”<sup>57</sup> Both these products from Sybase deliver database management capabilities for eBusiness solutions that require rapid development and deployment.

In review, various database products developed by vendors like Oracle, IBM, Microsoft, and Sybase offer core functionality for eBusiness implementations. These products are all known for performance, scalability, reliability, and ease of use. Databases are a well-established market in terms of their role in IT infrastructure and they consist of several main players who own a majority of the market share.

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<sup>54</sup> Microsoft.com, “Microsoft SQL Server 2000,” April 2003, [www.microsoft.com/catalog/display.asp?subid=22&site=10145](http://www.microsoft.com/catalog/display.asp?subid=22&site=10145).

<sup>55</sup> Microsoft.com, “Microsoft Access 2000,” April 2003, [www.microsoft.com/catalog/display.asp?subid=22&site=769](http://www.microsoft.com/catalog/display.asp?subid=22&site=769)

<sup>56</sup> Sybase.com, “Products: Database Servers,” April 2003, [www.sybase.com/products/databaseservers](http://www.sybase.com/products/databaseservers).

<sup>57</sup> Ibid.

#### **4.1.1.5. Middleware**

Middleware “is used to refer to the underlying technologies that implement component-based-development...(using) the Common Object Request Broker Architecture (CORBA) specifications...by the Object Management Group (OMG).”<sup>58</sup> Basically, middleware is a set of programs that exist to connect or provide a link between two already existing applications. Middleware is often described as a so-called ‘glue-together’ of programs that may contain data which can be consolidated to provide useful information. Middleware provides messaging services between programs residing on different networks. Messaging models communicate with a messaging server and offers application the ability to interact with applications using standardized message codes as well as communicating across different programming environment. Messaging can be achieved using a publish / subscribe model or a point-to-point model. IBM with the MQ Series and Sun Microsystems with its Java Messaging Service (JMS) dominate the message exchange products market.

Middleware is sometimes referred to as the enterprise application integration (EAI) model because they connect distinct systems on the network. EAI is the “point-to-point integration...most often used to normalize data from a source to a destination.”<sup>59</sup> Although EAI and middleware are used to connect CRM and ERP packages, they do require complex programming and connector applications. Hence, middleware is a solution for connecting, upgrading, and coordinating business applications that the enterprise owns.

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<sup>58</sup> Alex Nghiem, “IT Web Services: A Roadmap for the Enterprise,” Prentice Hall, New Jersey, 2003, p. 17.

<sup>59</sup> Ibid, p. 26.

Since eBusiness solutions have not been implemented as rapidly in pharmaceuticals as say other industries like financial services or retail, many pharmaceutical firms still own disparate backend systems programmed in a variety of environments. These systems can be connected via the middleware architecture, and hence save the pharmaceutical firms the additional effort of rebuilding these systems from scratch. Hence, middleware technologies have potential in the pharmaceutical industry.

#### 4.1.1.6. Middleware Vendors and Products

Vendors in the middleware category of eBusiness Infostructure are shown in **Table 4-3**. Since there is tight integration between application servers and the middleware products, three of the four vendors mentioned in this **Table 4-3** are prominent members of the application server list as well.

Middleware Vendor	Product
BEA	Tuxedo and MessageQ
TIBCO	ActiveEnterprise
IBM	Eclipse
Sun	SunOne

**Table 4-3 – Middleware Vendors and Products**

The SunOne architecture is Sun Microsystems middleware product. This consists of the application server, web server, security, and directory server. **Exhibit 4-1** shows this architecture that allows seamless integration between clients and enterprise systems over distributed networks.

BEA Tuxedo is their middleware product that integrates with the enterprise legacy data and corporate applications to deliver a complete eBusiness solution. Another BEA middleware product is the BEA MessageQ, which is built on a queued messaging

technology that allows and guarantees communication amongst heterogeneous applications using messaging technologies. **Exhibit 4-3** and **Exhibit 4-4** show depictions of the BEA Tuxedo and BEA MessageQ Application Programming Interface (API), respectively. Both Tuxedo and MessageQ make BEA one of the leaders in the middleware market for developing eBusiness solutions.

Tibco offers B2B “integration (that) makes interactions between companies more efficient and cost-effective by enabling secure exchange of information over the Internet and streamlining business processes that involve multiple organizations.”<sup>60</sup> The Tibco ActiveEnterprise product offers a complete line up of eBusiness components that allows an organization to connect networks, databases, and other information stores. Components of the ActiveEnterprise include messaging, deployment, adapters, and content distribution capabilities. Other products include Business Activity Monitoring (BAM) which is the ability to monitor internal and external business activities of an organization. Tibco products offer data aggregation and analysis capabilities which pharmaceutical firms can enjoy. Finally, Tibco offers Business Process Management (BPM) which allows companies to manage resources and tasks which are the components of business processes. Tibco products support the J2EE platform and use the Java Connector Architecture, EJB integration, and JMS. These products provide integration of distributed applications that include mainframe and enterprise applications in the backend.

IBM’s released the Eclipse software that consists of “software for deploying, securing, integrating and managing e-business data and applications, including Web services. Specifically, the tools support WebSphere, Lotus Domino, CrossWorlds, DB2,

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<sup>60</sup> Tibco.com, “Business-to-Business Integration,” April 2003, [www.tibco.com/solutions/technology\\_solutions/b2b/default.jsp?m=c12](http://www.tibco.com/solutions/technology_solutions/b2b/default.jsp?m=c12).

Tivoli, MQ, and IBM eServer iSeries.”<sup>61</sup> Lotus Domino allows the connection to build front-end applications that connect with the WebSphere application server to retrieve data from the Domino database. CrossWorlds is a suite of products that allows business process integration and development of process collaborations. Tivoli allows administrators to monitor application running on different operating systems such as UNIX and Windows. MQ serves as a broker for integration between distributed applications. Finally, the iSeries product allows inexperienced web developers to create web-based applications using automated tools

#### **4.1.1.7. Web Servers**

A web server offers the capability to deliver files that compose web pages in eBusiness applications to be delivered to web browsers. Web pages often interact with application servers or databases via CGI and invoke queries on applications residing on multiple tiers. The CGI programs then parse the results of the queries and return a consolidated web page to the browser that invoked the original request. **Exhibit 4-5** shows the technical architecture of a Java-based web server. This diagram demonstrates the connections between the client that issues an HTTP request to the web server, which contains the Servlets engine as well as the JDBC drivers to connect to the database in the backend. The web server is responsible for handling the request, sending it to the backend database or data store, to finally sending the response back to the client.

Ever since the emergence of the Internet, web servers seem to have been utilized by many firms in the pharmaceutical industry. As shown in previous chapters, all major players in this industry have websites being rendered by web servers. Most of these

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<sup>61</sup> IBM.com, “WebSphere Software Platform”, March 2003, [www-3.ibm.com/software/info1/websphere/index.jsp?tab=news/ibmnews/pr020610a](http://www-3.ibm.com/software/info1/websphere/index.jsp?tab=news/ibmnews/pr020610a).



websites are strictly information and were developed to establish a web presence. Other pharmaceutical companies have taken web server to a higher level and integrated them to application servers in developing eBusiness initiatives. These concepts will be discussed in subsequent case studies in this research.

#### 4.1.1.8. Web Server Vendors and Products

Several vendors are prominent in the web servers market. **Table 4-4** contains a list of the major database products in the industry. These web servers integrate tightly with application servers and it seems the market space is being controlled by dominant players such as Microsoft, Sun, and BEA.

Web Server Vendor	Product
Microsoft	Internet Information Service (IIS)
Apache	Tomcat
Sun	SunOne Web Server (iPlanet)
BEA	BEA Web Logic

**Table 4-4 – Web Servers Vendors and Products**

Web Servers have evolved over the years and in certain cases, application servers and web servers are being bundled as one product. Microsoft IIS is a popular web server for rendering web application to clients on the Internet. This product has evolved over the years and is currently offering web-based interaction to other devices such as mobile phones and PDAs. BEA WebLogic Server serves as both the application server and the HTTP web server. This product is being deployed for many eBusiness solutions to integrate with databases and enterprise systems in the backend and handle requests from the front-end. The SunOne Web Server (formerly iPlanet / Netscape) is another high-performing web server that belongs to a powerfully architected product line.

The Tomcat web server is a free web server developed as part of the Apache open source initiative and is rapidly being deployed in organizations that need a web presence but are seeing shortfalls in their IT infrastructure budgets for web initiatives. The Apache Tomcat web server is described as “ a commercial-quality server solution based on the Java Platform that supports the Servlet and JSP specifications. Managed by the Apache Jakarta Project, it is developed in an open and cooperative fashion.”<sup>62</sup> Apache’s market share of web servers was 62% in 2002.<sup>63</sup> In summary, the Apache open source web server is a free and highly-utilized product on the Internet.

The concept of free software started at the Artificial Intelligence (AI) Labs at MIT in 1984 under the supervision of Richard Stallman as the GNU project which envisioned no one ever having to pay for software. This software was protected by the GNU General Public License (GPL). After more than a decade, in 1997 the concept of Open Source emerged and this allowed more mixing of proprietary and open source software and was protected by the Open Source license. Open Source offers the following criteria: free redistribution, availability of source code, and ability of derived works, and distribution of the Open Source license.<sup>64</sup>

In review, application servers, web servers, databases, and middleware are important components in establishing fundamental eBusiness in the pharmaceutical industry. Application servers serve as the middle tier between the user front-end and backend enterprise systems. Web servers render pages that make up the front end of the eBusiness solution to be viewed in browsers. Databases are extremely critical because

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<sup>62</sup> Java Guru, “Tomcat FAQ Home,” April 2003, [www.jguru.com/faq/Tomcat](http://www.jguru.com/faq/Tomcat).

<sup>63</sup> Server Watch, “Netcraft Survey Highlights,” [www.serverwatch.com](http://www.serverwatch.com), December 2002.

<sup>64</sup> Chris DiBona, “Open Sources: Voices from the Open Source Revolution, Sam Ockman,” O’Reilly, 1999, California, pp. 2-3, pp. 176-179.

they store eBusiness data of firms and they are a well-established technology. Finally, middleware allows disparate backend systems to be integrated. Case studies in this research will reveal that many of these eBusiness Infostructure components are being utilized in the pharmaceutical industry.

#### **4.1.2. eBusiness Infrastructure**

eBusiness Infrastructure exists above the aforementioned Infostructure layer and consists of the important components such as CRM, ERP, procurement, and SCM. Pharmaceutical firms use technology for all these phases of their business. eBusiness infrastructure is portrayed in **Exhibit 4-9** with regards to the relationship between the supply chain, traditional enterprise, and demand chain modules of enterprise software.

##### **4.1.2.1. CRM**

CRM is an industry-wide term used to describe the way an organization can manage relationships with their customers using web-based software and methodologies. Customers are one of the most important members of an organizations value chain and automating and handling their requests using technology can lead to success. Customer information is stored in databases so that salespeople, management, and customer service representatives can readily access it.

CRM offers critical benefits to employees and account managers related to marketing and knowledge-sharing. Customer data, for example, can be used by the marketing department to formulate a marketing campaign and segmenting the customers. Similarly, electronic knowledge-sharing amongst account managers, product manager, and sales representatives is equally valuable to the firm. CRM systems can be utilized

for analyzing customer data such as most profitable ones. In addition, CRM can streamline existing processes such as offering the ability for sales representatives to take orders using their mobile devices such as cell phones and personal digital assistants (PDAs). This data is also helpful for understanding customer needs and proactively improving relationships with them. As a result, CRM provides key benefits to the organizations that implement them as part of their eBusiness strategies.

Pharmaceuticals can find many benefits in CRM. Being able to handle relationships with business partners such as doctors, distributors, and retailers can improve these important relationships. Customer service representatives can use this software in pharmaceutical call centers and this data can be analyzed further by strategy and marketing groups, who can then determine what products customers are looking for. Finally, the ability for salespeople to place orders for doctors from mobile devices while they are on the road is a typical use of a CRM in the pharmaceutical industry.

#### 4.1.2.2. CRM Vendors and Products

According to Gartner Research, CRM market in 2002 was down nearly 20% from the previous year.<sup>65</sup> This is related to decreasing CRM budgets in organizations and declining new licenses. The following vendors in **Table 4-5** control of the CRM market.

CRM Vendor	Product
Siebel	Siebel eBusiness Applications
SAP	mySAP CRM Pharmaceuticals
PeopleSoft	PeopleSoft Customer Relationship Management
E.piphany	E.piphany CRM

**Table 4-5 – CRM Vendors and Products**

<sup>65</sup> Thomas Topolinski, “Prediction 2003: CRM Market Faces Tough Times,” Gartner Research.

Siebel is one of the market leaders of CRM software. Siebel software products are shown in **Exhibit 4-6**. Siebel products focus on sales, marketing, and customer service. These products include functionality such as sales, marketing, interactive selling, partner and employee relationship management, analytics, mid-market, universal application and market networks, and industry applications. These applications are available as web clients and this complete package offers many ways a pharmaceutical company can improve and manage their relationships with their clients.<sup>66</sup>

mySAP CRM is SAPs product that focuses on providing organizations the ability to deliver value to the customer and achieve profitable growth in that process. mySAP is a “solution (that) connects front- and back-office functions into a single, customer-centric operation. And enables collaboration among employees, partners, and customers by providing relevant, personalized information from multiple data sources and business processes.”<sup>67</sup> SAPs goal is to deliver a product that can connect business partners, employees, technology, and processes in an organization. The four dimensions covered by this product suite are connecting business to consumers, connecting employees to the business, collaboration between business and partners, and identifying industry-specific needs. The mySAP CRM pharmaceutical software allows companies to “maintain customer relationships, identify customer potentials and market share, provide superior customer service, and plan and execute sales and marketing campaigns.”<sup>68</sup> These are key benefits that CRM packages deliver to pharmaceuticals. In summary, mySAP provides

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<sup>66</sup> Siebel.com, “Employee Relationship Management,” April 2003, [www.siebel.com/products/erm/product\\_module\\_descr.shtml#total](http://www.siebel.com/products/erm/product_module_descr.shtml#total).

<sup>67</sup> SAP.com, “mySAP Customer Relationship Management,” April 2003, [www.sap.com/solutions/crm/](http://www.sap.com/solutions/crm/).

<sup>68</sup> SAP.com, “SAP for Pharmaceuticals,” April 2003, [www.sap.com/solutions/industry/pharm/keycapabilities/](http://www.sap.com/solutions/industry/pharm/keycapabilities/).

faster decision-making for customer service representatives and improved customer satisfaction.

A world-leading dental equipment manufacturer, Heraeus Kulzer GMBH, implemented a mySAP CRM system in less than a year to present a single face to its customers, namely 45,000 dentists and 9,000 dental technicians. Using mySAP CRM, Kulzer was able to make sure that “customer service is efficient and effective throughout all its channels...(using) informative customer profiles with detailed information on customer history, main points of interest, and service requests to build lasting customer relationships with new customers – and gain market share.”<sup>69</sup> It is evident that mySAP CRM provides numerous benefits related to improving customer relationships for pharmaceutical companies.

PeopleSoft CRM, of which the ‘Advisor’ product is depicted in **Exhibit 4-7**, is a complete suite of products that cover a broad spectrum such as sales, marketing, help desk, support, and telemarketing. The products of interest to pharmaceuticals in terms of their eBusiness phases include online marketing, order capture, sales, mobile sales, and multi-channel integration. All these products offer real-time intelligence for quick decision-making opportunities for customer service representatives and salespeople.<sup>70</sup>

E.piphany states that they are offering the next generation of CRM software that delivers marketing, sales, and services. This product is based on the J2EE platform and is designed in a modular fashion. This suite offers customers and their service representatives to undergo a personalized experience during their interaction.

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<sup>69</sup> SAP.com, “SAP for Pharmaceuticals: Customer Successes,” April 2003, [www.sap.com/solutions/industry/pharm/customersuccess/](http://www.sap.com/solutions/industry/pharm/customersuccess/)

<sup>70</sup> PeopleSoft.com, April 2003, [www.peoplesoft.com](http://www.peoplesoft.com).

E.piphany's strength is its ability to integrate with backend financials, legacy, or ERP systems. Front-end to E.piphany products can be kiosks, branches, Internet, or wireless.

#### **4.1.2.3. ERP**

ERP is a set of application software that consists of many modules related to business activities such as manufacturing, purchasing, inventory, customer service, order tracking, human resources, and financials. ERPs are “an integrated system that embodies the newly understood tight interdependencies among a firm's functional units.”<sup>71</sup> An ERP system is naturally coupled with a relational database that stores the enterprise data. In order to successfully implement an ERP system, organizations overhaul their business processes and mandate extensive staff-training to effectively use the new software.

Pharmaceutical firms can find ERP packages quite useful in storing information related to purchasing and financials. Most pharmaceutical firms own global operations and properly implemented ERP systems can deliver consolidated data related to suppliers, orders, revenues, and sales to management and executives. This data can be beneficial for reducing cost, consolidating suppliers, and tracking geographic sales.

There are several challenges related to ERP systems and their implementations in large enterprises. According to a Forrester Research, during an informal survey at a 2001 B2B technology leadership forum, “more than 500 participants indicated that only 6% consider their ERP systems to be very effecting at helping them collaborate with partners, while 79% said that their ERP systems were not effective or somewhat effective.”<sup>72</sup> Additional survey data revealed that more than half of the participants had already implemented an ERP and that many were not sharing ERP data with suppliers, and would

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<sup>71</sup> Jeanne Ross, “The ERP Revolution: Surviving Versus Thriving,” MIT, Research Paper, November 1998.

<sup>72</sup> Jennifer Chew, “Making ERP Work (Interviews),” Forrester Research, Inc., June 2001.

expect to do so by 2003. Other constraints of ERP systems included inability to locate orders, share status of inventory with suppliers, and capacity constraints. These constraints could be attributed to lack of an enterprise backbone / networks (Extranets) that included collaboration with suppliers, distributors, wholesalers, and other business partners.

Advantages of ERP systems, however, seem to dominate this discussion. ERP provides employees the ability to gather operational insights on their business, meeting production material requirements, establish contracts with suppliers, and view complete order status throughout the manufacturing and distribution process. Looking ahead, ERP implementations will enhance cross-enterprise collaboration, unification of ERP vendors (which currently has more than a dozen dominant players), and creation of enterprise backbones amongst business partners.<sup>73</sup>

#### 4.1.2.4. ERP Vendors and Products

Major vendors in the ERP market space are shown in **Table 4-6**.

ERP Vendor	Product
SAP	mySAP ERP
PeopleSoft	Enterprise Performance Management Enterprise Service Automation Financial Management Solutions Human Capital Management
J. D. Edwards	Financial Management Inventory Management Workforce Management Order Management
Oracle	Marketing Financials Human Resources Products Order Management

<sup>73</sup> Ibid.



#### **Table 4-6 – ERP Vendors and Products**

SAP AG is one of the leading vendors delivering ERP software. The mySAP ERP product offers a complete solution that allows the management of financials, human resources, and organizational resources. These solutions increase efficiency by leverage existing IT assets as well. According to an SAP press release, the mySAP ERP is “powered by SAP® NetWeaver™, the industry’s leading integration and application platform, ... (and it ) is fully interoperable with Microsoft .NET and IBM WebSphere and supports portal and mobile technology, business intelligence, and knowledge management.”<sup>74</sup> It is evident that the SAP ERP package is focused on seamless integration with other eBusiness platforms that are part of the eBusiness Infostructure. The relevant industry solution is called mySAP Pharmaceuticals. This product offers benefits to pharmaceuticals and includes functionality such as electronics signatures for audit trails, unit and recipe management, version and process control, and data approval.

PeopleSoft offers the following products that can be used for enterprise resource planning: enterprise performance management (EPM), enterprise service automation (ESA), financial management solutions (FMS), and accelerated human resources (AHR). EPM allows employees, customers, and suppliers to connect using portals and set organizational goals and create metrics and plans to measure them. EPM delivers the capability to optimize project investments of an organization. FMS offers the ability to create a pure Internet-based suite of financial applications. HCM includes human resource management functionality and allows an organization to manage and allocate

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<sup>74</sup> SAP.com, “SAP Extends ERP Offering, Defines Best-in-Class ERP Solution,” March 12, 2003, [www.sap.com/company/press/press.asp?pressID=2089](http://www.sap.com/company/press/press.asp?pressID=2089).

resources globally. In review, PeopleSoft's ERP software covers all major functionalities necessary for developing a pharmaceutical eBusiness solution.

A midsize pharmaceutical company, Millennium Inc., implemented a new human resources system using the PeopleSoft AHR package solution. This system replaced an outdated legacy system and was implemented in nearly 100 days. The new system was inevitable because Millennium's employee headcount had doubled in less than a year. The new PeopleSoft HR system reduced HR manager's overhead administrative tasks and automated activities such as payroll, visa processing, and vendor-relations. The success of this project is evident that for every 25% increase in employee population, HR staff would only need to be increased by 10%. Hence, PeopleSoft offers complete ERP package solutions that improve enterprise-wide business processes such as HR.<sup>75</sup>

J. D. Edwards offers a wide variety of ERP software, however, the ones most pertinent to pharmaceutical firms includes the following: financial management, inventory management, workforce management, and order management. These products cover the enterprise foundation, assets, people, and fulfillment categories, respectively. These components allow an organization to measure the value provided by assets, resources, and projects.

Grupo Framanova, a leading pharmaceutical company in Latin America, implemented a J.D. Edwards financial, distribution, and human resource ERP packages in the late 1990s. This Costa Rican company has developed more than 2,500 products and has nearly 500 active customers in that region. The key drivers for this decision were to reduce cost, improve profitability, and have real-time information available throughout

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<sup>75</sup> PeopleSoft.com, "Millennium Pharmaceuticals Supports Growth with PeopleSoft Accelerated Solution," [www.peoplesoft.com/corp/en/products/mid/case\\_studies/millennium.jsp](http://www.peoplesoft.com/corp/en/products/mid/case_studies/millennium.jsp), March 2003.

the organization. The two year implementation resulted in better management of customer data, integrated data throughout the organization, improved inventory-coordination, and improvement management of scientific information. Thus, J.D. Edwards ERP products provide a viable solution to pharmaceutical companies.<sup>76</sup>

The “Oracle E-Business Suite is a complete set of business applications that enable (organizations) to efficiently manage customer interactions, manufacture products, ship orders, collect payments and more - all from a business system that shares a single technology foundation.”<sup>77</sup> This platform can be implemented as a singular unit or multiple modules that seamlessly collaborate with each other. The overall benefit of this product suite is that it reduces cost and expenses, improves business processes, and allows the organization to make better enterprise decision for their business. According to research at Stanford University, Oracle is one of the top five ERP vendors in that market with about ½ the revenues of the leader, SAP.<sup>78</sup>

#### **4.1.2.5. SCM and Procurement**

SCM utilizes sophisticated software to manage the flow of product, information, and finances as they go from the suppliers to manufacturers, to distributors or retailers, and finally to consumers. The success of a SCM system is determined by the level at which inventory is controlled. Managing the flow of goods from the suppliers all the way to the customers is related to the information aspect of a SCM system. Information flows consists of information related to updating order and delivery status information as well

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<sup>76</sup> J.D.Edwards, “With J.D. Edwards, Grupo Framanova, Intermed Increases Sales and Improves Processes,” [www.jdedwards.com/content/enUS/Custom-Customers/GrupoFarmanova.pdf](http://www.jdedwards.com/content/enUS/Custom-Customers/GrupoFarmanova.pdf), April 2003.

<sup>77</sup> Oracle.com, “E-Business Suite,” [www.oracle.com/applications/index.html?content.html](http://www.oracle.com/applications/index.html?content.html), March 2003.

<sup>78</sup> Eric Marti, “SAP and the Online Procurement Market,” March 2000, Graduate School of Business Stanford University, Case Number: EC-5.

as the ability to track orders. The financial flow of a SCM system contains information related to payments, credits, and other financial data that is part to the value chain. Firms can differentiate the process of implementing a SCM system by delivering either a planning application or an execution application. While planning applications use sophisticated methodologies and techniques to fulfill orders, execution applications allow the users to track good over the various stages of the supply chain process. Hence, SCM systems can be quite useful for managing complex processes over the entire business value chain.

Pharmaceutical companies can see lots of opportunity in developing SCM systems. For instance, a SCM system at a pharmaceutical firm can allow the company and its suppliers to track the status of goods such as chemicals and whether they have been delivered or in transit. Additionally, pharmaceuticals can effectively manage their inventories with such systems. Finally, SCM systems allow the distributors, wholesalers, retailers, and internal customer services representatives to track orders after they have been shipped from the pharmaceutical company. Benefits of SCM systems to pharmaceuticals include order tracking, improved business relationships, and efficient inventory control.

#### **4.1.2.6. SCM and Procurement Vendors and Products**

The SCM market is expected to undergo major changes in the near future. According to the Yankee Group, this \$1.9 billion market will see a shakeout of vendors in which ERP vendors like PeopleSoft and Baan will emerge, and incumbent vendors

such as i2 and Manugistics will have to recreate their strategies and product offerings, otherwise they will continue to see a decline of their market share.<sup>79</sup>

Pharmaceuticals can use SCM and Procurement software to manage relationships with suppliers, manage their supply chain network, and improve relationships with customers. Major vendors in the SCM and Procurement market space are listed in **Table 4-7**.

SCM / Procurement Vendor	Product
SAP	mySAP SCM Pharmaceuticals
i2 Technologies	i2 SCM
Manugistics	Manugistics SCM
Ariba	Ariba Procurement Solution
Commerce One	Commerce One Procure
SAP	mySAP eProcurement

**Table 4-7 – SCM Vendors and Products<sup>80</sup>**

According to the Yankee Group, SAP is the dominant vendor of SCM software. Their product handles the planning, execution, and management of events that often interfere with supply chain excellence.<sup>81</sup> The mySAP SCM product line allows organizations to efficiently operate their supply chain and effectively deliver products to their customers. mySAP SCM for pharmaceuticals allows organization to integrate their “extended supply chain with features such as 24 / 7 manufacturing, collaborative transportation, supply and production planning, dangerous goods handling, and more.”<sup>82</sup> SAP declares the following three business benefits of their SCM products: reduced cost, increased revenue, and customer retention.

<sup>79</sup> Michael Dominy, “Supply Chain Management Software Shakeout to Speed Up,” Feb. 11, 2003, Yankee Group.

<sup>80</sup> Chad Eschinger, Gartner Group, “Prediction 2003: Supply Chain Management Realigning,” 11/02.

<sup>81</sup> SAP.com, “mySAP Supply Chain Management,” April 2003, [www.sap.com/solutions/scm/](http://www.sap.com/solutions/scm/)

<sup>82</sup> SAP.com, “SAP for Pharmaceuticals: Key Capabilities,” April 2003, [www.sap.com/solutions/industry/pharm/keycapabilities/](http://www.sap.com/solutions/industry/pharm/keycapabilities/)

Additionally, mySAP SCM offers collaborative procurement capabilities that allow pharmaceutical organization to streamline the “the entire procurement process for direct materials...(including) strategic sourcing agreements form the basis of highly automated procurement planning and execution...(such as) automated sourcing and scheduling are highly adaptable.”<sup>83</sup> In term of suppliers, organizations can use this product for automatic supplier’s selection as well as identifying new ones with new products. Bidding capabilities allows buyers to place bid invitations on services and materials. Moreover, collaborative procurement in mySAP SCM offers covers ordering, invoicing, and transportation. mySAP procurement is part of a “new e-Commerce strategy...for online procurement software and services – tools that enabled companies to automate and mange their purchases of ‘operating resources’ (i.e. goods and services such as office supplies, furniture, travel services, etc., which were not direct input into a company’s products).”<sup>84</sup> Hence, SAPs entry in the procurement market was to build its product portfolio of enterprise application software in the supply-chain module.

i2 Technologies delivers SCM products based on templates catered towards specific industries. The i2 products for pharmaceuticals offer improved customer services and quicker product launches in the market. The benefits provided by i2 products include improved sales through forecasting, improved utilization of assets, reduced inventory costs, reduced logistic expenses, and reduced transportation costs. The i2 SCM software allows companies to “plan and execute supply to meet customer

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<sup>83</sup> SAP.com, “mySAP Supply Chain Management: Collaborative Procurement,” April 2003, [www.sap.com/solutions/scm/keycapabilities/procurement.asp](http://www.sap.com/solutions/scm/keycapabilities/procurement.asp).

<sup>84</sup> Eric Marti, “SAP and the Online Procurement Market,” March 2000, Graduate School of Business Stanford University, Case Number: EC-5.

demand.”<sup>85</sup> i2 SCM allows organizations to design and validate the supply chain, understand and predict customer demand with channel partners, and forecast order delivery time through an efficient order fulfillment process.

Manugistics has been a market leader of SCM software for years. Its SCM products are installed in a wide base of verticals and their strength is collaboration and transportation management. Manugistics “SCM solutions include proven capabilities that address: network design and optimization, manufacturing planning and scheduling, sales and operations planning (S&OP), fulfillment management, collaborative VMI ... , private trading networks, and logistics management.”<sup>86</sup> In summary, the Manugistics SCM solutions offer the following benefits to organizations: real-time collaboration with the trading network, clearer view of the global supply chain, and optimized supply and demand initiatives.

The Ariba Procurement Solution (APS) connects buyers and sellers while seamlessly integration with ERP and legacy systems. Ariba’s two main products include: “Ariba ORMS (Operating Resource Management System)...(that) enabled employees throughout the organization to initiate OR purchases from their desktop computers, making the process highly automated...(and) the Ariba Network...a single global network serving all Ariba customers, over which they could purchase goods and services from any participating supplier.”<sup>87</sup> Ariba claims that these products can help organizations to rapidly deploy a procurement solution that has considerable ROI. The Ariba spend management solutions are portrayed in **Exhibit 4-8**. Since infrastructure is

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<sup>85</sup> i2.com, “Supply Chain Management,” [www.i2.com/solutionareas/scm/index.cfm](http://www.i2.com/solutionareas/scm/index.cfm), March 2003.

<sup>86</sup> Manugistics.com, “Supply Chain Management,” [www.manugistics.com/solutions/scm.asp](http://www.manugistics.com/solutions/scm.asp), April 2003.

<sup>87</sup> Eric Marti, “SAP and the Online Procurement Market,” March 2000, Graduate School of Business Stanford University, Case Number: EC-5, pp.11-12.

shared as part of an Extranet, APS allows efficient communications between buyers and suppliers. Other processes streamlined by APS include contracts creation and invoice management. APS delivers performance measurement using industry benchmarks.

The Commerce One product line consists of three main components: “BuySite: ...an intranet-based online procurement application (with web access for employees of buying organization)...MarketSite: ...a technology platform for developing business-to-business online marketplaces, (and) MarketSite.net: ...an online marketplace that Commerce One hosted and maintained, using its MarketSite platform.”<sup>88</sup> Furthermore, the Commerce One Supplier Relationship Management (SRM) software consists of the Commerce One Procure product. Benefits of Commerce One Procure include reduced number of purchasing transactions, improved enforcements of contracts, cost savings via volume purchases, and utilization of an inbuilt workflow engine that manages approvals, orders, and shipping-related information. This procurement software enables firms to create their own real-time auctioning capabilities as well. This product integrates with existing CRM, ERP, and legacy systems. A final offering of Commerce One is the ability of the organization to manage supplier catalogs and order information.<sup>89</sup>

In summary, eBusiness Infrastructure such as CRM, ERP, Procurement, and SCM play vital roles in the pharmaceutical industry. These components allow the firms to establish and maintain relationships with customers, suppliers, vendors, distributors, and retailers. These automations are critical to the success of pharmaceutical companies in the Internet Age and subsequent case studies will reveal how various firms have implemented them in their eBusiness solutions.

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<sup>88</sup> Ibid, pp. 12-13.

<sup>89</sup> Ariba.com, “Ariba Procurement Solution,” [www.ariba.com/solutions/procurement\\_overview.cfm](http://www.ariba.com/solutions/procurement_overview.cfm), April 2003.



## 4.2. eBusiness Technical Architecture

Technically speaking, eBusiness layers interact to provide a complete solution for a pharmaceutical company. **Figure 4-2** depicts the technical architecture of an eBusiness application that contains both Infostructure and Infrastructure components. A user (doctor, employee, supplier, wholesaler, and distributor) submits a transaction in the front-end via a browser. This request is made to the web server, which directs the request to the application server. The application server then propagates the request to the database, middleware, or legacy systems. The application server or middleware can communicate with enterprise systems (ERP or CRM) to process the request. The results are sent back to the browser in reverse order of the original request by the web server. This concludes a three-tier eBusiness transaction over the Internet, Intranet, or Extranet.

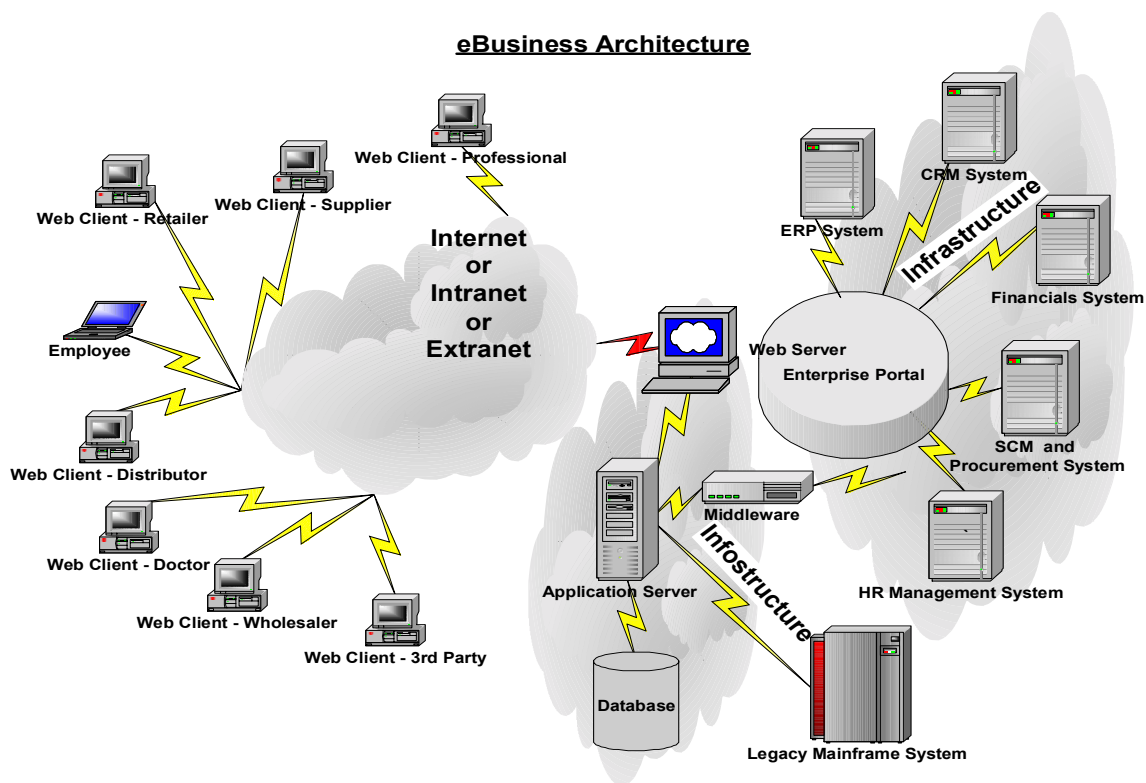


Figure 4-2 – eBusiness Infostructure and Infrastructure Architecture

### **4.3. Emerging Technology – Web Services**

Web services are an emerging technology that can potentially disrupt technologies such as middleware, CORBA, and replace existing applications such as CRM, ERP, or EAI. Web Services are “a programming paradigm for integrating heterogeneous information systems, offer significant advantages over the currently available set of ad-hoc method based on proprietary software tools...(they are) based on a new set of standards (e.g., XML, SOAP, WSDL, UDDI)...to enable data integration over corporate intranets...these standards are being widely adopted in the industry as evidenced by Microsoft’s .NET initiative and Sun’s...J2EE.”<sup>90</sup> Web Services standards include XML (eXtensible Markup Language) documents for data input and output, HTTP and Message Orientated Middleware (MOM) for the application protocols, SOAP – a standard for defining how the XML documents will be exchanged, and UDDI to register the Web Services.<sup>91</sup> Web services are built upon emerging standards and technologies.

The Web Services model is based on a component-based open architecture that allows businesses to seamlessly perform transactions over the Internet. According to Alex Nghiem, Web Services can disrupt the existing technologies by ‘democratizing integration’ and replacing middleware / EAI. Web services are an attempt to interoperability that could one day coexist with existing technologies via cleaner, human understandable data that provides seamless integration and adherence to standards. This model has not become main stream yet, however, there is lots of hype surrounding it.

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<sup>90</sup> Stuart Madnick and Mark Hansen, “Process Aggregation using Web Services,” February 2002, MIT Sloan.

<sup>91</sup> Ibid, p.19-9.

#### **4.4. Conclusion**

eBusiness architecture consists of components in both Infrastructure and Infostructure layers. These products include application servers, web servers, databases, middleware, CRM, ERP, SCM, and procurement software developed by leading vendors.

It is appropriate to begin evaluating real-world business cases in the pharmaceutical industry. We begin with the eProcurement phase, followed by eSales, and concluding with eSupplyChain. Some case studies are published and available to the public, while others that were interviewed desired to remain anonymous. The quality and information provided in each case is equally pertinent for this research.

## 4.5. Exhibits

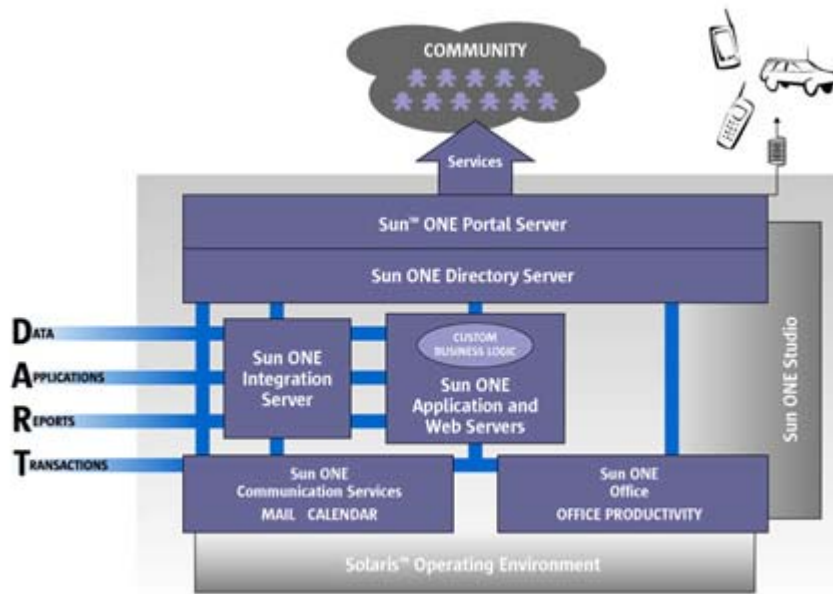


Exhibit 4-1 – SunOne Architecture<sup>92</sup>



Exhibit 4-2 – Oracle 9i Database Architecture<sup>93</sup>

<sup>92</sup> Sun.com, “Sun Open Net Environment (Sun ONE),” April 2003, [www.sun.com/software/sunone/](http://www.sun.com/software/sunone/).

<sup>93</sup> Oracle.com, “Oracle 9i, Database Features,” April 2003, [www.oracle.com/ip/deploy/database/oracle9i/index.html?oracle9idb\\_features2.html](http://www.oracle.com/ip/deploy/database/oracle9i/index.html?oracle9idb_features2.html).

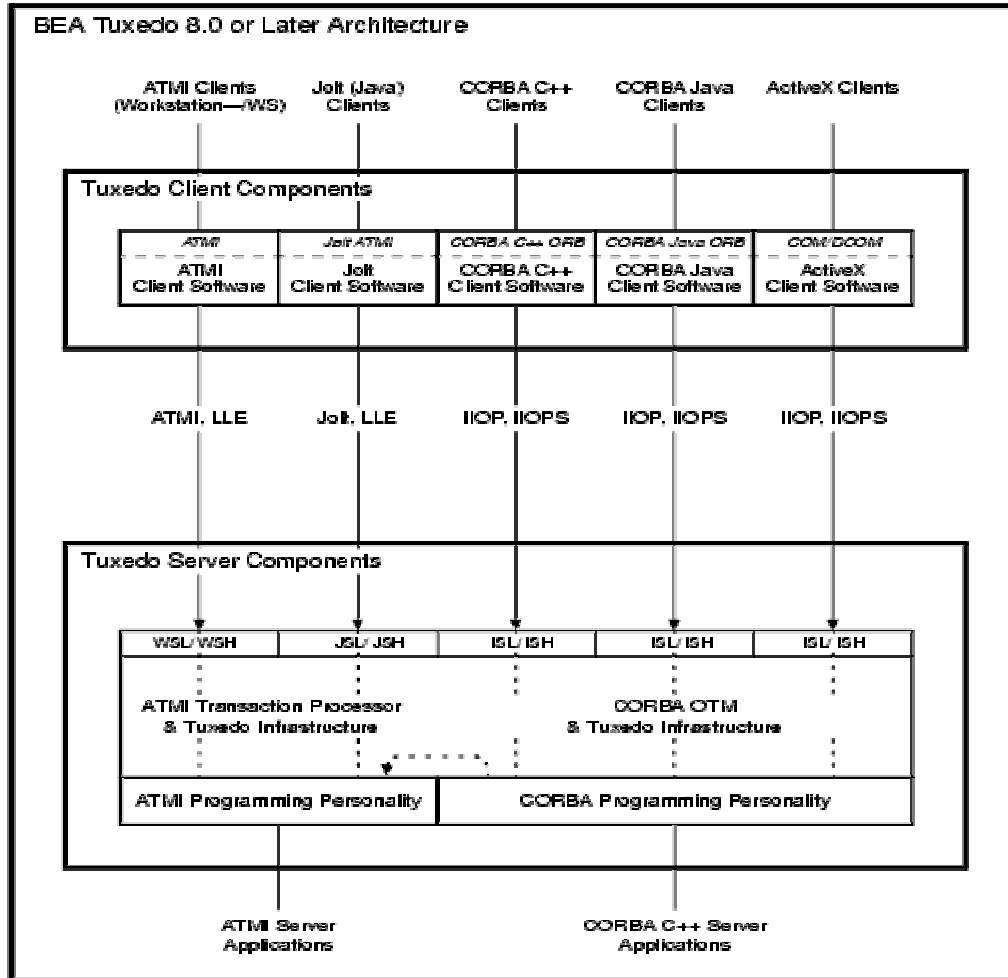


Exhibit 4-3 – BEA Tuxedo Architecture<sup>94</sup>



Exhibit 4-4 – BEA MessageQ API<sup>95</sup>

<sup>94</sup> BEA.com, “Introducing BEA Tuxedo,” e-docs.bea.com/tuxedo/tux81/overview/overviea.htm.

<sup>95</sup> BEA.com, “Products: MessageQ,” April 2003, [www.bea.com/framework.jsp?CNT=datasheet.htm&FP=/content/products/messageq/](http://www.bea.com/framework.jsp?CNT=datasheet.htm&FP=/content/products/messageq/).

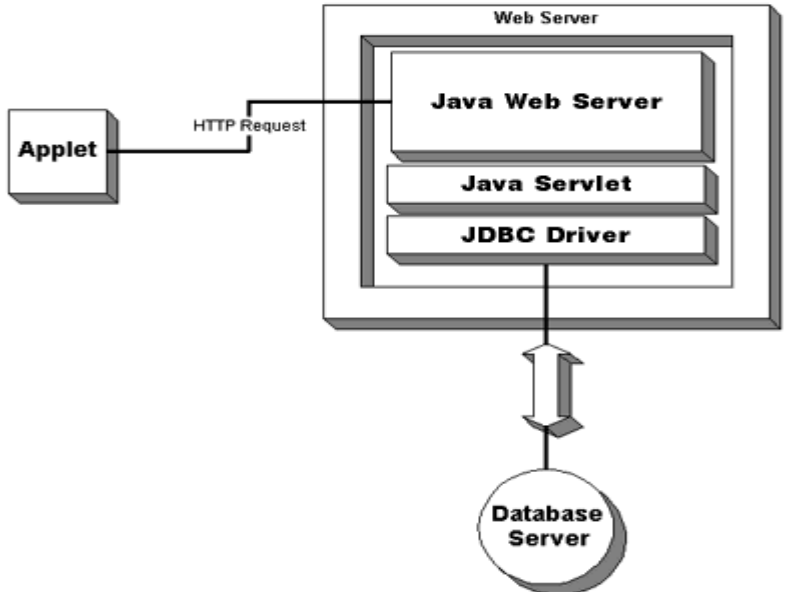


Exhibit 4-5 – Web Server Architecture<sup>96</sup>

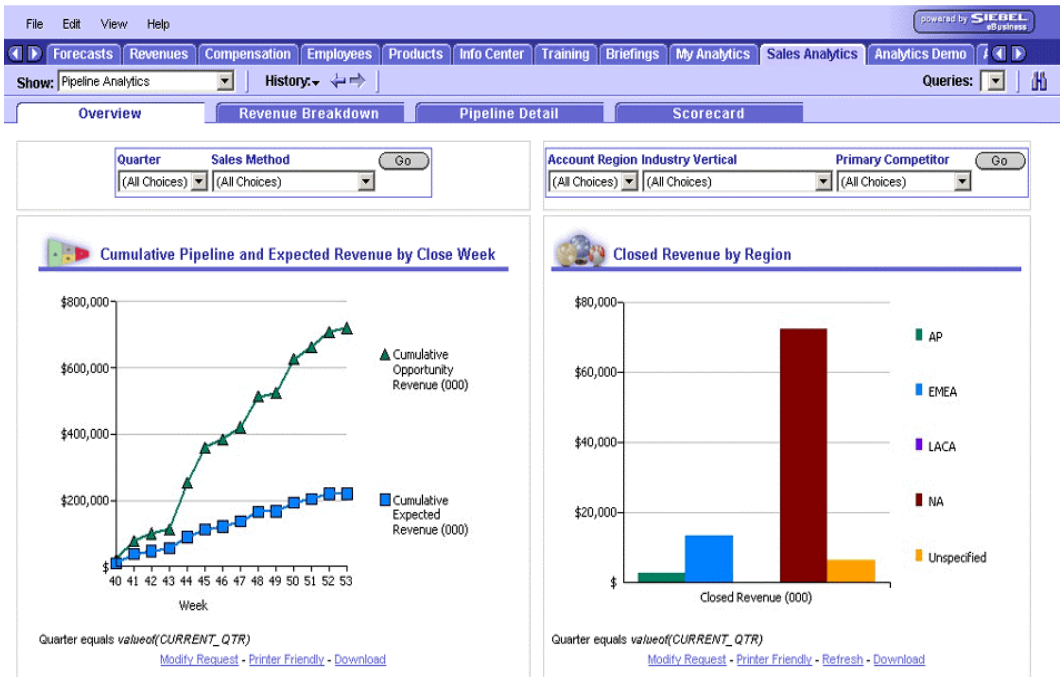


Exhibit 4-6 – Siebel CRM Products for Sales & Analytics<sup>97</sup>

<sup>96</sup> Sun.com, Phil Chang, "Inside the Java Web Server," August, 1997, java.sun.com/features/1997/aug/jws1.html.

## Step 1

**Find a Computer**  
**Needs Analysis**

Answer the following questions to help us recommend your mobile solution.

**Get Recommendations**

**Mobile Preferences**

Text or HTML Question explanation goes here.  
**How much do you typically travel?** [some icon for URL explanation goes here]

**How many hours a week do you use the computer while traveling?** [some icon for URL explanation goes here]

One to Five  
 Five to Ten  
 Ten to Fifty

Do you want a docking station?

**Interaction History**

Reason for Buying	
Personal or Business:	Business
Traveling Use?:	Yes
Mobility	
Travel Frequency:	5-10
Disconnected Hours:	Yes
Docking Station:	Yes

Exhibit 4-7 – PeopleSoft CRM Products for Advisor<sup>98</sup>

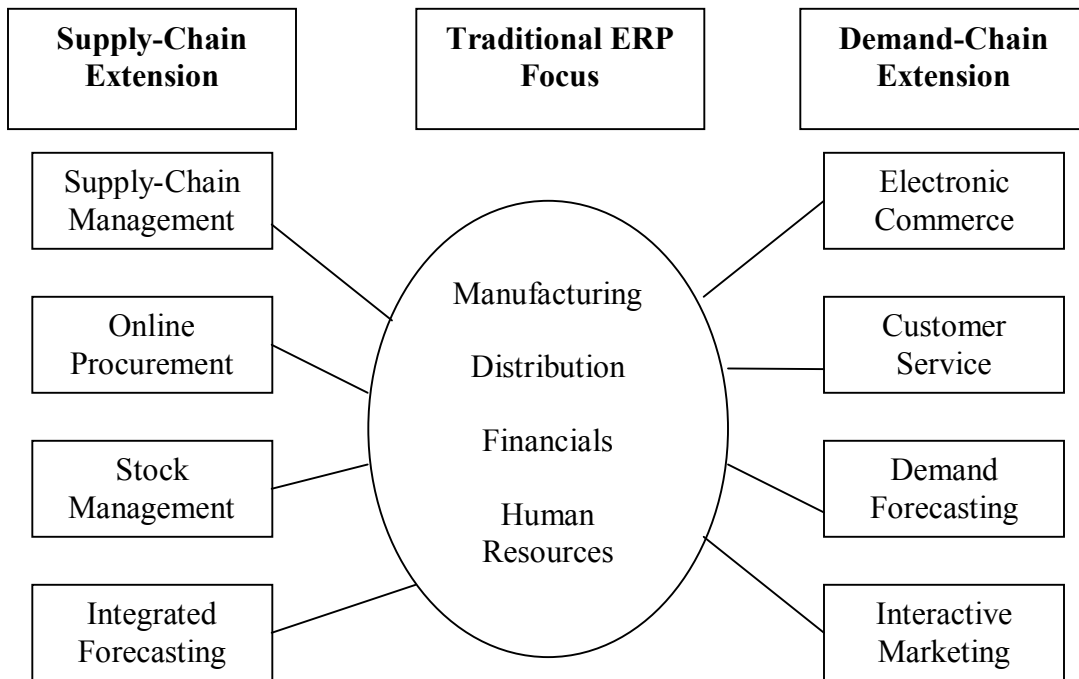


Exhibit 4-8 – Ariba Spend Management solutions<sup>99</sup>

<sup>97</sup> Siebel.com, "Sales: Product Description", April 2003, [www.siebel.com/products/sales/siebel\\_sales/product\\_module\\_desc.shtm](http://www.siebel.com/products/sales/siebel_sales/product_module_desc.shtm).

<sup>98</sup> PeopleSoft.com, "Product Module: Advisor," April 2003, [www.peoplesoft.com/corp/en/products/line/crm/advisor/features.jsp](http://www.peoplesoft.com/corp/en/products/line/crm/advisor/features.jsp).

<sup>99</sup> Ariba.com, "Ariba Procurement Solution", March 2003, [www.ariba.com/solutions/procurement\\_overview.cfm](http://www.ariba.com/solutions/procurement_overview.cfm).



**Exhibit 4-9 – PeopleSoft, Extending the Enterprise Information System<sup>100</sup>**

<sup>100</sup> Eric Marti, Diagram adopted from Stanford University Graduate Business School (March 2002, Case # EC-5), The Economist, 6/26/99.



## **5.0. Chapter Five: eProcurement Case Studies**

eProcurement is an important component of eBusiness and pharmaceutical companies utilize this phase to connect with suppliers to buy products that they can then use for manufacturing drugs and healthcare products. The following case studies evaluate eProcurement and related eBusiness technologies.

### **5.1. Case Study One: eProcurement at Novartis**

Since 2001, Novartis has implemented a global eProcurement systems based on the Ariba platform that covered the US, Europe, and Japan. The strategic discipline behind this project was to monitor direct and indirect spending on purchases that reached nearly \$8.7 billion annually. Most of this spending was based on eCatalogs that contained nearly 700,000 items supplied by hundreds of suppliers worldwide. Implementing an eProcurement system was new to most firms in the pharmaceutical industry, and this project allowed the Novartis to put a purchasing process in place. Novartis claims to be “the first pharmaceutical company in the world to implement e-procurement on a global basis and with all spend categories in scope.”<sup>101</sup> Thus, Novartis was one of the early adopters that implemented a global eProcurement solution for conducting eBusiness with suppliers.

The eProcurement project offered several major benefits to Novartis. Although, the pharmaceutical firm incurred significant cost on its global eProcurement project, it was worth the investment. The total amount spent by Novartis was nearly \$15 million, however, it was expecting a cost saving of annual \$220 million, annually on both direct

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<sup>101</sup> Andrew McAfee, “eBusiness at Novartis”, Harvard Business School, August 2001, p.11.

and indirect spending costs. Another benefit of the eProcurement project was that it forced suppliers to standardize their catalogs in the correct format to integrate with this new system at Novartis. Finally, eProcurement allowed Novartis to benchmark prices set forth by suppliers, because it now had an IT system in place that offered such functionality. Hence, eProcurement offered Novartis many benefits critical to its success in the pharmaceutical industry.

## **5.2. Case Study Two: eProcurement at Pharma2**

Pharma2 is one of the leading manufacturers of contacts lens in the Europe. This pharmaceutical company has invested heavily in IT infrastructure and focused most of its initiatives on eSales and eMarketing. More recently, Pharma2 is in the process of implementing a mySAP eProcurement platform to improve relationship with suppliers.

Pharma2 has launched a major initiative around developing an eProcurement platform in Europe. The firm has realized it has struggled in the past from consolidating information related to suppliers and vendors. The firm has partnered with a leading systems integrator based out of the US and is currently implementing an SAP-based procurement system that can deliver information related to suppliers, purchasing, and products. The new system will deliver functionality such as financials, purchasing, sales, and distribution. This new system will replace the existing IBM AS/400 manufacturing, ordering, and distribution system. Thus, Pharma2 is in the process of improving their eProcurement platform being delivered by SAP.

Pharma2 is currently lacking in the eProcurement space for their US operations. The firm has long-term plans for moving to a package-based solution, however, currently such information is stored in excel spreadsheets or other non-formal electronic media.

On a given day, according to Catherine, a senior manager involved in this new initiative, “we cannot tell you how much we have spent and how many suppliers we have... all this information is stored in excel spreadsheets.”<sup>102</sup> This is critical to Pharma2’s business and will need to be rectified as other pharmaceutical companies are forging ahead with eProcurement initiatives in the US.

### **5.3. Case Study Three: eProcurement at Pharma6**

Pharma6 is one of the largest pharmaceutical company in the world and it is composed of the following business units: health care, consumer health, and animal health. Pharma6 develops healthcare and consumer products that are available in more than 150 countries. This organization has been at the forefront of implementing global eSales, eMarketing, and eProcurement solutions.

In 2000, Pharma6 announced to standardize on the Ariba B2B eCommerce Platform™ to streamline their global eProcurement initiatives. The Ariba Buyer™ application was being used to develop an internal procurement system that allows refined management of operating supplies and services in corporate and research facilities. The Ariba Buyer™ allowed Pharma6 to consolidate 30,000 suppliers and has enabled global purchasing and direct spending capabilities from the desktop. Other Ariba products being implemented include Ariba Buyer™, Ariba Sourcing™, and Ariba Marketplace™, all of which have improved business processes and relationships with suppliers and other business partners. The functionality offered by the Ariba products include: seamless collaboration between buyers and suppliers, catalog services, and transaction management.

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<sup>102</sup> Interview: Catherine.

Pharma6 has implemented an eProcurement system that was originally based on Ariba. While discussing eProcurement at Pharma6, David (senior manager, Procurement), revealed that the original Ariba system integrated with general ledger and financial systems in the backend enterprise systems. Pharma6 has not standardized on any ERP systems as it continues to acquire smaller pharmaceutical companies and does not want to invest heavily in such software. Inventory orders at the manufacturing flow through the Ariba procurement system to the suppliers. The Ariba e-Invoice and e-Sourcing packages are used by Pharma6 business units at a global scale. Pharma6 has developed a computer maintenance management system (CMMS) for its procurement systems to interface with suppliers.

According to David, Pharma6 has used auctions at both large and small scales for eProcurement. FreeMarkets Online has been a reliable source that Pharma6 has used to buy products online and is usually related to 'large events'. For smaller purchases, Pharma6 has relied on small auctions setup by wholesalers and suppliers to buy products required for manufacturing drugs. eProcurement systems are used to buy raw and package materials, in addition to indirect materials (non-cost of goods) products. In the future, Pharma6 is considering developing its own eBusiness tools for eProcurement, which would provide self-service type of auctions with suppliers of their own choice.

#### **5.4. Case Study Four: eProcurement at AstraZeneca**

Based out of the UK, AstraZeneca is one of the world largest research-based pharmaceutical firms that implemented the mySAP E-Procurement in 2002. AstraZeneca spends nearly \$8 million daily on R&D efforts and has delivered a variety of healthcare products using innovative techniques.

Prior to implementing the B2B SAP E-Procurement system, AstraZeneca employees manually placed orders for supplies. The disadvantages of this approach included long ordering cycles, redundant data entry, and inefficient search capabilities of products and suppliers. In a three-month development effort, the core product of mySAP Enterprise Buyer was installed. AstraZeneca selected the mySAP E-Procurement platform because of existing implementations of SAP ERP products, existing implementation partnership with SAP, and the ability to ‘e’ their procurement process from the existing pen-based system.

There were numerous benefits of the new mySAP E-Procurement effort at AstraZeneca. First of all, the interface was extremely user-friendly. Secondly, using the Internet-based procurement business process templates allowed AstraZeneca to rapidly ‘e’ their procurement process. The new procurement system eliminated the need to verify and validate purchase ordering documents. Historic data related to orders was now available in a repository. Finally, this system allowed AstraZeneca to reduce cost related to so-called ‘maverick’ or spontaneous buying, because the firm could not analyze trends and forecast orders versus ordering each time products were needed from suppliers.

Moving forward, AstraZeneca, is looking at additional SAP software. In order to carefully analyze forecasting and buying in procurement, this firm is looking at mySAP Business Intelligence™ software package. Moreover, AstraZeneca is planning on developing an automated and integrated document flow system using XML. Hence, AstraZeneca has rapidly transformed its primitive procurement processed to an electronic package solution that has increased efficiency, productivity, and cost savings.

## **5.5. Conclusion**

In review, eProcurement systems have been developed in several major pharmaceutical companies worldwide. The original systems were legacy mainframe, AS/400, electronic spreadsheets, or even pen-based. The new systems include mySAP E-Procurement, Ariba Buyer, Ariba Sourcing, and Ariba Marketplace. Although, some of these pharmaceutical companies have used online auctioning websites such as Free Markets Online for large events, many are using Ariba software for smaller auctions.

The companies discussed in the eProcurement case studies have implemented various eBusiness technologies and pursued several trends. Novartis has successfully developed an Ariba-based procurement system for consolidating global operations. The eProcurement solution at Novartis has been rather expensive, but the overall cost being saved is phenomenal. Pharma2 is in the process implementing an eProcurement solution in Europe using mySAP Procurement that will be replacing traditional activities such as storing critical procurement data in electronic spreadsheets. Pharma6 has successfully implemented an Ariba-based system using several buying and purchasing modules. This firm has also used Ariba for small auction events. In several months, AstraZeneca has developed an eProcurement system using mySAP E-Procurement software package. This system has saved this pharmaceutical company extensive cost and fully optimized supply chain activities across the globe. Hence, eProcurement using several platforms has been successfully implemented in pharmaceutical companies analyzed in this chapter.

After discussing eProcurement, the next phase of interest is eSales. The following chapter consists of case studies that discuss how eBusiness and related technologies are impacting eSales in pharmaceutical companies.

## **6.0. Chapter Six: eSales Case Studies**

eSales is one of the most important constituents of eBusiness. eSales have been implemented across pharmaceutical companies in both custom and packaged solutions. eSales allows business partners to place orders online 24 / 7 / 365. This is an important reality of the Information Age and pharmaceuticals IT strategies are being modified to accommodate this certainty. The following case studies have been performed on firms throughout the world to determine what technologies and trends are emerging in the eSales phase of eBusiness in the pharmaceutical industry.

### **6.1. Case Study One: eSales at Novartis**

Novartis is the fourth largest pharmaceutical company in the world and this firm has established an extremely strong infrastructure for eBusiness and IT. Novartis, based out of Switzerland, has adopted various eBusiness models to enter the digital age. These decisions have been made at the senior executive level and this sponsorship has been a key to their success. Novartis has used eBusiness in all aspects of their drug development, marketing, sales, learning, supply chain, and procurement process.

In March 2000, Novartis partnered with iPhysicianNet to develop an eSales initiative. This firm specialized in providing Internet video conferencing that could connect doctors and pharmaceutical firms. To complement this, Novartis established eReps who began to compete with the existing field representatives. It is reported that eReps were fundamentally more productive than the field representatives in terms of numbers of calls made, delivering product presentations, selling the core marketing message, number of physicians reached, and attaining market share for new products. To

complement eSales, Novartis used eBusiness for additional purposes. Selling products that were coming off-patent or already off-patent using the Internet was a successful strategy. This allowed additional revenue stream from products that were declining in sales at the local pharmacies and other retail locations.

In summary, Novartis has successfully implemented eBusiness in all processes of their business. The firm created an e-Trial portal to conduct recruit drug candidates online with an incentive to reduce cost and time in clinical trial phase. Since the mid-90s, Novartis has created globally brand websites for marketing their products in addition to websites for common diseases as well as those targeting certain age groups such as the elderly. Novartis partnered with a high-tech video conferencing firm to develop an eDetailing offering. To supplement this, Novartis established several eSales channels to sell off-patent drugs online for additional revenue streams. Novartis partnered with Harvard University to develop eLearning initiatives for partnering physicians who were interested in continuing education. In the US, Novartis established a substantial network that allowed partners such as wholesalers and distributors to track their orders. The purpose of this project was to successfully implement an eSupplyChain application. Hence, Novartis can be considered a trend-setter in implementing eBusiness solutions in the pharmaceutical industry and their size and the time since which they have been involved with 'e' initiatives supports this claim.

## **6.2. Case Study Two: eSales at Pharma1**

Pharma1 is a leading manufacturer of contacts lens in the United States with additional operations in Asia, Europe, Middle East, and Latin America, and this billion dollar company has implemented eBusiness technologies in all facets of their business



processes. The firm has not yet implemented an eProcurement strategy. The firm has developed a strong online brand for their products. Additionally, eLearning at Pharma1 is based on offering web-based continuing education programs to doctors. Finally, Pharma1 has developed a B2B website where business partners can perform activities related to eSales and eSupplyChain.

Pharma1 developed their first eCommerce initiative in 1997 based on a Java Applet web application that faced limited user adoption based due to user connectivity bandwidth and performance issues. Since then, Pharma1 has established substantial eBusiness initiatives for eSales.

In 2000, Pharma1 launched a high-performing multi-user B2B website where business partners such as retailers, distributors, and doctors can purchase contact lens. The technical architecture of this exchange is depicted in **Figure 6-1**. This website is built on the J2EE platform. Most of the hardware is manufactured by Sun Microsystems. The development server and production servers both run the UNIX-based Sun Solaris or HP-UX operating systems. The web server is the high-performing Sun Microsystems iPlanet Web Server. The application server is the world-famous BEA WebLogic. Oracle 9i is the underlying database system for this website. The client-interface of this website is developed using Java Server Pages and Java Servlets. Integration with the backend systems is performed using the component-based Enterprise Java Beans. This web system integrates with an IBM AS/400 mid-range system that contains both ordering, manufacturing, and distribution capabilities. In its first year, this website sold nearly 5% of the annual sales of this pharmaceutical company and that number is in the 10s of

millions of dollars. Hence, the technical architecture established by Pharma1 is quite leading-edge and robust.

Since Pharma1 products have a large variety of prescription-related data associated with them, the firm saw the need to develop the front-end of their eBusiness applications using a custom software solution instead of a packaged one. In the contact lens industry, ordering the products requires the input of information such as base curve, prescription number, color, and product. Numerous combination of these variables resulted in the need to build a custom front-end for this eBusiness application.

For security reasons, Pharma1 relied heavily on the EDI technology. The firm felt that revealing the IBM AS/400 backend system to the web application would not be a feasible option, therefore all web transactions were converted to EDI formats that were then placed into a special directory on the UNIX server to be processed in batch every half hour. This allowed all transactions to be recorded on the web application in the Oracle 9i database, and then each transaction for further processing by the IBM AS/400 programs in the backend to initiate ordering or distribution calls. Finally, direct calls could be made to the IBM AS/400 when gathering read-only information such as order status or related tracking information. It is evident that EDI technologies are still utilized for performing eBusiness transactions because they are proven and secure.

In his research on eCommerce, Kalanidhi states that “the Internet is enabling businesses to experiment with new business models.”<sup>103</sup> Pharma1 has done just that with mBusiness initiatives in Japan. According to Randy, Pharma1 has invested in mBusiness in their Japanese operations using a B2C model. Customers of Pharma1, for example, in

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<sup>103</sup> Sanjeev Kalanidhi, “Thesis: E-Business Strategy: An Industry Clockspeed Perspective,” 2000, p. 30, MIT Thesis, MIT Engineering Systems Division.

Japan can receive an SMS notification on their cell phone that the eye doctor has filled their electronic prescription. The customer can pay for their supply of contact lens using a credit card, over the cell phone. This system is integrated with the Japanese subway system and when the payment is made, the customer can select which subway stop to have their package delivered to. Hence, upon leaving work or any other location, the customer can stop at the designated booth at the subway station to pick up their order.

Pharma1's parent company has implemented several eBusiness solutions in other companies. CRM technologies at other Pharma1 sister-companies include E.piphany. According to David (eBusiness Manager), the corporate headquarter of Pharma1 has standardized on two main ERP packages: SAP and J.D. Edwards. Application servers being used in other subsidiary companies include ATG Dynamo and SunOne Application Server.<sup>104</sup> Finally, middleware technologies at various companies include Tibco and BEA Tuxedo.

Thus, we see that Pharma1 has established significant e-Initiatives around their business in the eye care industry in the US. They are in the process of migrating their IBM AS/400-based manufacturing and distribution system to an SAP-based financials, sales, and distribution platform. The firm has used the Internet since the mid-90s to establish brand recognition, and in 2000 developed a world-famous product-based website for marketing purposes. For eSales, Pharma1 has developed a leading-edge website using latest J2EE technologies with integration with AS/400, Oracle 9i on the UNIX platform to allow business partners to place order 34/7/365.

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<sup>104</sup> Interview: David.

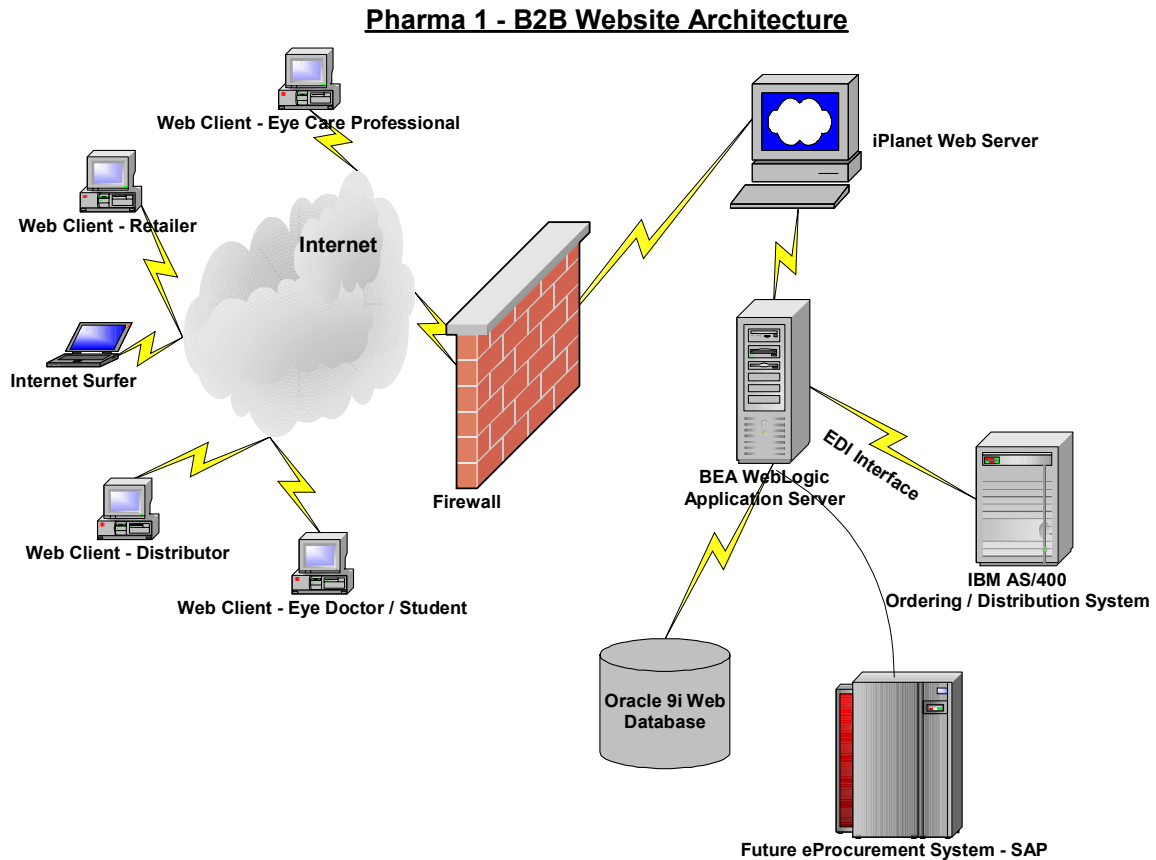


Figure 6-1 – Technical Architecture of Pharma1 B2B website

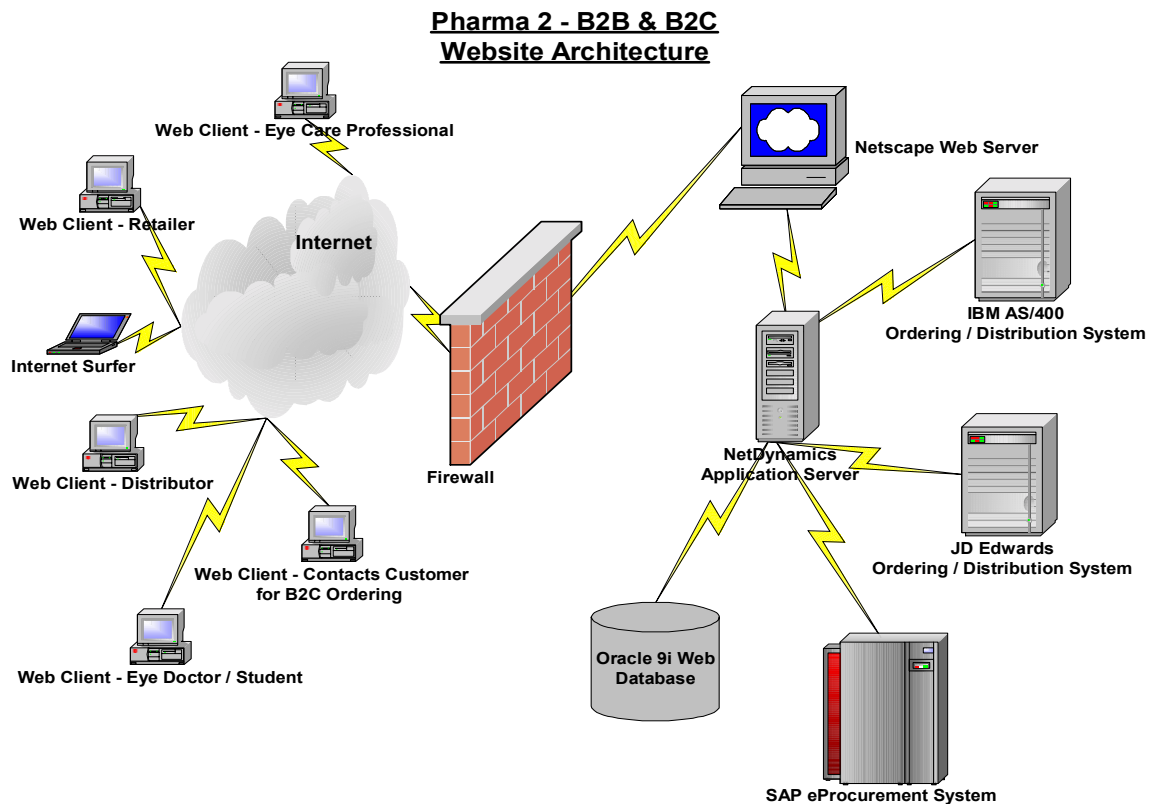
### 6.3. Case Study Three: eSales at Pharma2

Pharma2 is one of the leading manufacturers of contacts lens in the Europe. Pharma2 has developed a multi-lingual website for Germany, France, and the UK where business partners can perform eSales and eSupplyChain ventures.

Pharma2 has developed a B2B and B2C online order website for doctors, patients, retailers, distributors, and wholesalers in Europe. **Figure 6-2** depicts the technical architecture of Pharma2's eSales implementation. In terms of the Infostructure, this website is deployed on the Netscape Web Server, NetDynamics Application Server, and Oracle 9i Database. In terms of the Infrastructure, the regional enterprise systems include

an IBM AS/400 or J.D. Edwards ordering and distribution systems. Customer service representatives can take orders directly on the AS/400 or on the web application. The EDI interface is used to convert web orders into the AS/400 system. Infrastructure and Infrastructure components reside on a Sun Solaris UNIX operating system, and backend integration is possible due to EJB components deployed in the application server.

Additional features of this website include globalization and direct patient ordering. This site offers multi-lingual capabilities in that it can be rendered in multiple languages (English, French, and German). This capability was possible due to the Java Internationalization (I18N) feature. Additionally, patients can dial up and place orders for contacts and even authorize debit from their check cards. This application is directly integrated to European banks, so that withdrawals are real-time.



**Figure 6-2 – Technical Architecture of Pharma2 B2B and B2C website**

#### **6.4. Case Study Four: eSales at Pharma3**

Pharma3 is one of the leading manufacturer of spectacle lens in the US. This organization developed a 'pure' eBusiness strategy enabling direct integration from the Internet to manufacturing to distribution. This B2B website enabled eye care physicians, sales representatives, and customer service representatives to place orders for spectacles.

The technical architecture for Pharma3's B2B website was leading-edge with a highly innovating approach to eBusiness. First of all, this website required no need for human intervention after the initial order placement. The Infostructure consisted of an Oracle 9i database, Netscape Web Server, and a NetDynamics Application Server. The backend enterprise system was an SAP Manufacturing system that connected directly with a robotics-based spectacle lens manufacturing plant. The front-end of this application was developed using a NetDynamics-proprietary interface that rendered HTML pages using Java and an event-driven model. The backend integration was delivering using the EJBs and the Java Connector Architecture that integrate with SAP Business Application Programming Interfaces (BAPI) to the manufacturing system. After successful manufacturing, the product would be send directly to an automated distribution system also based on the SAP product line. The eBusiness application was available 24 / 7 / 365 and was developed using custom software, because of the high requirements for parametric data to construct the spectacle lens. Hence, Pharma3 integrated a Java-based web application with an automated SAP manufacturing system to deliver an eSales application for their spectacle lens products.

## **6.5. Case Study Five: eSales at Pharma4**

Pharma4 is one of the largest pharmaceutical companies in the world with products in health, consumer, and animal products sold in more than 150 countries. This multi-billion dollar company spends millions of dollars daily on R&D efforts and owns manufacturing facilities in more than 50 countries.

Although eSales at Pharma4 have continued to use traditional technologies while dealing with business partners, there are future plans for web portals. While discussing their B2B initiatives, Shane (senior manager, B2B eCommerce), mentioned that Pharma4 has traditionally used EDI to exchange ordering data with business partners. He believes EDI will not go away and dominates their ordering transactions with 86% of revenue in his group. Additionally, all of Pharma4's top 50 business partners use EDI to exchange their data for ordering. The sales of products cover both direct and indirect sales.

Pharma4 has a significant strategy for moving to the Internet for eSales initiatives in the future. The firm is currently piloting a B2B customer portal. The move to the Internet is motivated by the following factors:

1. Cost reduction.
2. Security.
3. Order management.

Web systems save cost, because EDI investments and maintenance can be high, especially for large systems like the one at Pharma4. Web systems are secure using firewall technologies and encrypting data with SSL. Orders placed on the Internet can be tracked a lot easier by business partners, who no longer need to call and get assistance after, for example, an EDI upload.

Shane believes that Pharma4 has invested heavily in the EDI infrastructure and the maintenance continues on it. He feels that moving to the Internet with 'clean' data while designing a web portal will offer Pharma4 a more flexible ordering system in which users will be able to place orders using typical Internet scenarios such as shopping cart applications and order status checking. Defining the data will be an important factor for the success of the web portal. Pharma4 faces the challenge of consolidating data definition with business partners so that correct products are ordered. XML will be used for definition of data standards.

Advantages of the online system include order tracking that can be used for forecasting sales and increased sales because the system will be available 24 / 7 / 365 versus customer service representatives who have finite hours of availability during the week. Pharma4 is evaluating bar code technology as mandated by the uniform code council (UCC). Basically bar code numbers are assigned by the UCC and stored in a registry in cyberspace to create global standards for ordering using this technology. Pharma4 is researching radio frequency identification (RFID), a standard being developed at MIT, for uses such as ordering. Pharma4 plans on setting up a public portal that can allow business partners to scan products labeled with bar codes or RFIDs over the Internet to allow partners to fill their stock and inventory of Pharma4 products.

Pharma4 pharmaceutical and consumers groups are both using the same technologies for their eSales. Their support is common and their goal is to seek 'alignment' with their customers. Pharmaceutical sales are rigid because of a smaller client base worth billions, as opposed to consumer sales which are more dynamic with a



much larger client base worth only millions. Pharma4 has standardized on both IT support and EDI for both consumers and pharmaceutical groups.

## **6.6. Case Study Six: eSales at Roche<sup>105</sup>**

In the summer of 2001, Shanghai Roche Pharmaceuticals announced that it will build a sales and marketing platform using Siebel's eBusiness platform, ePharma. Shanghai Roche is the biggest pharmaceutical company in China where it serves drug stores and hospitals in almost fifty cities. The ePharma is a single information system that provides multi-channel capabilities to sales and marketing representatives. This platform allows Roche to promote new drugs as well and monitor sales and forecast future demand.

Prior to implementing Siebel ePharma, Roche was using a paper-based system for sales and marketing data across numerous departments. The new system will provide Roche a centralized data repository for sales and marketing data that could be accessed in real-time across the organization in China. The sales data could be used by the sales representatives who can then analyze customer ordering data and trends before making a sales call. This enables streamlining of the sales cycle at Shanghai Roche. This data will also allow the firm to measure performance and sales data at a national scale, something that was impossible in the past. Hence, implementing Seibel ePharma at Shanghai Roche is a major improvement of past IT systems.

According to Michael Xu (sales development manager, Shanghai Roche), "Siebel ePharma will bring us closer to our customers and enhance our relationships with them

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<sup>105</sup> Siebel.com, "Press Release: Shanghai Roche Standardizes on Siebel eBusiness Platform," July 2, 2001, [www.siebel.com/about/news\\_events/press\\_releases/2001/010702\\_shanghai.shtm](http://www.siebel.com/about/news_events/press_releases/2001/010702_shanghai.shtm).

across all points of contact.”<sup>106</sup> Thus, Siebel ePharma delivers CRM functionality to improve relations with business partners in the Chinese pharmaceutical industry. Furthermore, the ePharma system is flexible and scalable to meet Roche’s needs in their industry. In conclusion, implementing the ePharma system at Roche has been a success for this pharmaceutical company in terms of sales and marketing.

### **6.7. Case Study Seven: eSales at Boehringer Ingelheim<sup>107</sup>**

Based out of Germany, Boehringer Ingelheim, is one of the top 20 largest pharmaceutical companies in the world that in 2002 standardized on the Siebel eBusiness platform with the ePharma 7-a portfolio. This global system was deployed to address the needs for sales representatives in improving relationship with physicians. Typically, physicians and doctors were responsible for prescribing Ingelheim products to patients who then bought them from pharmacies. This eSales system also evaluated physician prescription habits.

Historically, data related to physician activity was stored in intra-business unit systems that could not be shared by sales representative in other practices of Boehringer Ingelheim. The new Siebel ePharma 7-a system integrated seamlessly with other sales and marketing systems and this centralized data repository could be accessed real-time by whoever found it valuable. Furthermore, sales professionals could use this system to plan sales call with physicians while managing their sales territories. Hence, the new Siebel ePharma system at Boehringer Ingelheim improved relationships between sales and marketing and their most important customers – the physicians.

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<sup>106</sup> Ibid.

<sup>107</sup> Siebel.com, “Press Release: Boehringer Ingelheim Standardizes on Siebel eBusiness Applications Worldwide,” Feb. 12, 2002, [www.siebel.com/about/news\\_events/press\\_releases/2002/020212\\_boehringer.shtm](http://www.siebel.com/about/news_events/press_releases/2002/020212_boehringer.shtm).

According to Dr. Bert Tjeenk-Willink (corporate marketing director, Boehringer Ingelheim) the new system enabled them to "streamline the day-to-day management of the sales process and maximize efficiency ... the extensive tailored functionality of Siebel ePharma 7-a made it the ideal choice for this 'best practice' strategy."<sup>108</sup> Hence, Siebel ePharma 7-a improved the processes related to enhancing sales with physicians based on historic prescription data and sales patterns of physicians in a real-time fashion.

## **6.8. Conclusion**

After analyzing eSales case studies of in the pharmaceutical industry, it is evident that numerous eBusiness technologies and models are being pursued. Most of the eBusiness models being pursued are B2B, while there are isolated instances of B2C and mBusiness abroad. Many eSales implementations are being developed on J2EE-based application servers that integrate with legacy or mid-range backend systems. Several firms have used the Siebel eSales and eMarketing custom software platform for eBusiness to automate this phase in their organization.

The pharmaceutical companies discussed in this chapter have successfully implemented eBusiness solutions for the eSales phase in their value chain. Novartis, has used the iPhysicianNet for selling products to business partners. Pharma2 has developed a B2B website based on the J2EE platform for selling their products to business partners. This company is using EDI technologies as well. Pharma2 has developed an Internationalized B2B website in Europe based on the proprietary NetDynamics platform that integrates with IBM AS/400 enterprise distribution and manufacturing systems. Pharma3 has developed an innovative NetDynamics-based B2B website that integrates

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<sup>108</sup> Ibid.

directly with an SAP manufacturing system that is processed by robotics. Pharma4 is in the process of migrating from EDI technologies to web portals based on the Java platform and is also considering using late auto-id technologies such as RFID. Roche has successfully implemented Siebel sales and marketing application in China to improve relationships with doctors. Finally, Boehringer Ingelheim has built a sales application using Siebel e-Pharma 7 platform to optimize relationships with doctors and other business partners. Hence, diverse eSales solutions have been developed at pharmaceutical companies across the globe.

After discussing eSales, it is now time for our final case study segment that evaluates eSupplyChain. This process is linked to eProcurement and is very critical to performing successful eBusiness in the pharmaceutical industry.

## **7.0. Chapter Seven: eSupplyChain Case Studies**

eSupplyChain is one of the most important components of eBusiness and pharmaceuticals utilize this phase to connect with suppliers, vendors, distributors, wholesalers, doctors, physicians, and retailers to deliver drugs and other products across the value chain. Simple truth is that the more efficient the supply chain, the more productive and successful a firm is in delivering products to the market.

### **7.1. Case Study One: eSupplyChain at Novartis**

Novartis established eSupply chain activities in the United States under a proprietary Extranet called Novartis customer connection (NCC). Basically, business partners such as suppliers, distributors, retailers, and physicians who are interested in accessing data related to product delivery are authorized to be part of this Extranet system. This in-house project, considered one of the earlier for supply chain management, was aimed at improving relationship with business partners such as wholesalers and distributors. The website offered partners to track orders online. The main purpose was to move away from traditional method of calling to customer service representatives to get order tracking information. Novartis does not consider eSupplyChain to be a strategic activity in their formal work stream and has not implemented this in Europe thus far.

### **7.2. Study Two: eSupplyChain at Pharma1**

Pharma1 is a leading manufacturer of contacts lens in the United States revenues of more than a billion dollars and global operations. Pharma1 has developed a B2B website where business partners can perform activities related to eSupplyChain

Pharma1's B2B website offers critical supply chain information to business partners. Wholesalers, distributors, retailers, and doctors can log in to the website to check order status information. According to Director of eBusiness at Pharma1, Randy, the firm is now in the process of delivering this information 24 / 7 / 365 where the users do not need a customer service representative to provide them this data.<sup>109</sup> This encompasses additional functionality such as the partners being able to check account balance with Pharma1 on weekends, days on which currently no customer service representatives are available by phone. The website also contains links to FedEx for order tracking, once it has left the distribution facilities at Pharma1. Pharma1's website offers both eSales and eSupplyChain capabilities that allow business partners to track orders online.

### **7.3. Case Study Three: eSupplyChain at Bristol-Myers Squibb<sup>110</sup>**

Bristol-Myers Squibb is a \$20 billion company that produces a wide variety of drugs and consumer products that treat serious illnesses. This company has been around since the mid-19<sup>th</sup> century and operates globally.

In 2002, Bristol-Myers Squibb implemented an i2 SCM system based on the i2 Supply Chain Planner™ product line. Fluctuating demands and improving operations are common issues in the pharmaceutical industry that were also faced by Bristol-Myers Squibb. After a recent acquisition, this pharmaceutical company was faced with the

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<sup>109</sup> Interview: Randy.

<sup>110</sup> i2.com, "Success Story: Reducing Planning Cycle Time at Bristol-Myers Squibb," March 2003, [w.i2.com/assets/pdf/3F05754C-1786-4D82-89CC04D7BCB3CD42.pdf](http://w.i2.com/assets/pdf/3F05754C-1786-4D82-89CC04D7BCB3CD42.pdf).

challenge of optimizing networks across various business units. Bristol-Myers Squibb decided to automate their SCM system using the i2 Supply Chain Planner™.

The motivations for implementing i2 Supply Chain Planner™ were to reduce cost by lowering inventory and decreasing the supply chain planning cycle times. Benefits of the i2 Supply Chain Planner™ include:

1. Collaborate on demand across business units.
2. Optimization of Manufacturing supply chain.
3. Reduce Transportation costs.
4. Standardize a consensus-based forecasting model.

Perhaps the biggest benefit of the i2 Supply Chain Planner™ product line to Bristol-Myers Squibb was that the company could consolidate the manufacturing and distribution networks as one supply chain network based on an Extranet-enabled architecture.

There were many benefits in implementing i2 at Bristol-Myers Squibb. The supply chain planning cycle was reduced from 2-3 months to a few hours. The amount of effort was minimized and reducing the inventory with the new system allowed for better results in other efforts as well. Using i2 Supply Chain Planner™, Bristol-Myers Squibb was able to plan on a weekly basis to balance the supply and demand across their value chain. The i2 implementation also offered Intra-enterprise collaboration for supply chain management in that real-time data was accessible to all business units across this global pharmaceutical manufacturing and distribution groups. Another shortfall before the i2 implementation was that supply chain data was not available real-time and nor was it accurate, since it was stored in electronic spreadsheets that were hard to manage and consolidate across different plants. Better collaboration led to improved communications

amongst disparate groups that in the past did not speak very often, although they were on the same product value chain.

#### **7.4. Case Study Four: eSupplyChain at Pfizer<sup>111</sup>**

Pfizer is one of the largest and most famous pharmaceutical companies in the world that products drugs and products sold in more than 150 countries. With revenues of more than \$30 billion, this pharmaceutical company relies heavily on IT for supply chain initiatives. Pfizer made the decision to develop a global system was to integrate the supply chain amongst its three main focuses: pharmaceuticals, consumer, and animal. In the spring of 2002, Pfizer announced that it has implemented a Manugistics-based fulfillment management solution.

There are many advantages of the new Manugistics supply chain management systems developed at Pfizer. Benefits include the following:

1. Efficient inventory management.
2. Improved customer service.
3. Reduction of certain inventory levels.
4. Reduction of logistics costs.
5. Improved manufacturing capabilities.

These are all important rewards of implementing a global supply chain management system. Many of these benefits can be attributed to the Manugistics software. First of all, the Manugistics solution for supply chain has seamlessly integrated with Pfizer's' order entry system and material resource planning system, that are functional in more than 50 manufacturing sites worldwide. Increased visibility of the supply chain allows better

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<sup>111</sup> Manugistics.com, "Press Release: Pfizer Selects Manugistics' Global Fulfillment Management System," March 13, 2002, [www.manugistics.com/news/detail.asp?id=228](http://www.manugistics.com/news/detail.asp?id=228).



management of the supply chain and also allows tracking of material and supplies so that improved relationships could be accomplished with customers. Finally, Pfizer sees this system in assisting in the move from a supply-to-order system to a supply chain replacement system of used and out-of-date inventory. Thus, implementing a Manugistics SCM system has allowed Pfizer to improve its inventory management, customer service, and integrations with manufacturing systems.

### **7.5. Case Study Five: eSupplyChain at AstraZeneca<sup>112</sup>**

AstraZeneca is one of the top 20 pharmaceutical companies in the world and one of the top 5 in terms of R&D. In 2001, AstraZeneca developed a Manugistics NETWORK™ supply chain management system to create a receptive and efficient supply chain. The two salient reasons for this implementation were to reduce cost (related to almost expired inventory) and to reduce the total finished goods inventory.

Historically, AstraZeneca supply chain management system consisted of several in-house systems integrated with a legacy automated system in the US business units. This system features inventory and capacity planning. The new system that was based on a Manugistics NETWORK™ enabled AstraZeneca with the following advantages:

1. Improve the existing fulfillment network.
2. Develop new distribution centers.
3. Model alternative supply chain scenarios.
4. Improved customer service.

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<sup>112</sup> Manugistics.com, “Press Release: AstraZeneca Implementing Broad Suite of Manugistics Supply Chain Solutions, November 6, 2001, [www.manugistics.com/news/detail.asp?id=192](http://www.manugistics.com/news/detail.asp?id=192).

One can consider the Manugistics NETWORK™ to be an evolution of Extranet SCM system developed in the mid-90's. Basically, all business partners and internal staff are authorized to use this system for performing supply chain monitoring activities. All the aforementioned advantages were made possible using web-based analytics and forecasting tools that are part of the Manugistics suite of supply chain management products. According to Grace DiCecco (project manager of operations capability planning at AstraZeneca), "by using Manugistics solutions to improve the visibility and effectiveness of our fulfillment network, we expect to enhance our commitment to customer service."<sup>113</sup> Since the new system provided a better view of the entire supply chain, customer service was enhanced as well. Additional benefits of the new system consist of inventory-optimization while considering product shelf-life. Also, distribution of products to business partners such as wholesalers was another benefit of the Manugistics NETWORK™ solution at AstraZeneca. A final and perhaps the most important benefit is the ability to effectively manage the supply chain as new AstraZeneca products are launched in the market with important considerations of customer demand in the industry.

## **7.6. Conclusion**

In terms of implementing eSupplyChain solutions, firms in these case studies show a mix of custom software and packaged solutions. Manugistics seems to be the dominant SCM software in the industry, although firms have developed custom software on the J2EE platform that integrates with backend manufacturing and distribution

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<sup>113</sup> Ibid.

systems to allow business partners to track orders and check other order status information.

The pharmaceutical companies analyzed in this case have diversely implemented eSupplyChain solutions. Novartis is considered to be on the leading companies in implementing the proprietary Extranet SCM, Novartis Customer Connection, for business partners. Pharma2 implemented a custom eSupplyChain solution using the J2EE platform to allow business partners to track orders of eye care products. Bristol-Myers Squibb developed a SCM system using the popular i2 SCM product line that offered clear benefits such as an optimized supply chain and reduced transportation costs. Pfizer developed a Manugistics-based SCM system that consolidated inventory, logistics, and supply throughout the value chain. Lastly, AstraZeneca also implemented an Extranet SCM solution using Manugistics for consolidating distribution, inventory, and modeling the supply chain. Hence, a variety of software solutions were generally utilized in the pharmaceutical industry to develop eSupplyChain systems.

## **8.0. Chapter Eight: Conclusion**

It is time to reiterate the findings of this research, and analyze what eBusiness technologies and trends are being commonly pursued in a very diverse pharmaceutical industry.

### **8.1. *Pharmaceutical industry***

This is a very well-established industry with lots of potential of growth in the upcoming decades. There are at least a dozen main players in this industry, many of which have been around for decades, some even centuries...JnJ, Merck, Pfizer, Novartis, GSK, Bayer, Bristol-Myers Squibb, Hoffman-LaRoche – to name a few. These companies employ tens of thousands of employees worldwide, and many were originally founded in the 19<sup>th</sup> century by inventors, chemists, or doctors, who wanted to provide better medical products for humans. These companies invest heavily in R&D and they are slowly moving to new technologies for implementing eBusiness solutions across their value chain. R&D investments are in the millions and the revenues earned by these companies are in the billions. Pharmaceutical companies mainly have divisions consisting of human, animal, and chemical products. Finally, the drugs they produce are either prescription or OTC products.

### **8.2. *eBusiness***

There is no doubt that eBusiness will be an integral part of every pharmaceutical company's future strategies. Many eBusiness phases and models are available to be pursued. B2C is not as common in the pharmaceuticals, and it seems B2B is the most

widely used. mBusiness is becoming popular in countries such as Japan. C2C in terms of auctions is being used by pharmaceuticals for large events on websites like Free Markets Online, while some have implemented internal auctioning systems for suppliers and distributors.

eBusiness technologies are all being effectively utilized in the pharmaceutical industry. Web servers such as Microsoft IIS, Sun One Web Server, and BEA WebLogic are hosting numerous eBusiness websites for eSales an eMarketing and eDetailing. Partnerships have been formed with iPhysican.net for eDetailing. Databases for many implementations include Oracle as the most common one. Several firms have implemented middleware solutions with BEA Tuxedo and e.Piphany to integrate disparate distributed systems across global locations. The most common application server being used is the J2EE based BEA WebLogic, followed by the SunOne and NetDynamics application servers. Although open source application servers such as Jboss were mentioned in the eBusiness Infostructure section, none of the case studies actually revealed any pharmaceutical company deploying this product.

The CRM market is begin dominated by Siebel, which has been replaced traditional manual and legacy systems with newly automated capabilities for forecasting, marketing, and sales. ERP vendors have implemented their software in the pharmaceutical companies. SAP is common for financials and human resources, followed by J.D. Edwards and PeopleSoft, which have also captured their fair share in the industry. In terms of Procurement software, Ariba seems to be the most widely used. The SCM market is dominated by Manugistics and i2, while SAP is emerging as a contestant.

Emerging technologies such as Web Services were also mentioned in this research. This technology was brought up in many interviews with executives in the pharmaceutical industry. The common impression was that this technology does have value and prospects in the future, however, as we speak, not one of the companies was actually implementing them. Similarly, open source Infostructure products such as Jboss or Apache Tomcat were not deployed in any production eBusiness applications in the pharmaceutical companies that were researched.

### **8.3. eProcurement Analysis**

Several eBusiness technologies have emerged in the eProcurement phase of pharmaceutical companies. These products and vendors include:

1. Ariba B2B eCommerce.
2. SAP E-Procurement.

These products have been successfully implemented in pharmaceutical companies such as Novartis, AstraZeneca, and other global companies. These new eBusiness procurement systems replaced manual processes that consisted of handwritten, fax, or spreadsheets for previous implementations. Both these companies develop a powerful suite of eBusiness products and remain the leaders in this market space.

### **8.4. eSales Analysis**

Numerous eBusiness technologies have emerged in the eSales phase of the pharmaceutical companies.

1. Database: Oracle.

2. J2EE Application Servers: BEA WebLogic, SunOne Application Server, NetDynamics, and ATG Dynamo.
3. Web Servers: BEA WebLogic and SunOne Web Server.
4. CRM: Siebel Sales and Marketing.

These products are being implemented in both custom and packaged eBusiness solutions.

Most of the sales models being pursued are B2B, while there are some indications of mBusiness in Asia and some B2C in Asia and Europe.

### **8.5. eSupplyChain Analysis**

The eSupplyChain phase is being dominated by the two main players and one new entrant:

1. i2 SCM.
2. Manugistics SCM.
3. mySAP SCM.

All three of these packaged solutions for SCM are being implemented in the pharmaceutical industry. Similar to eProcurement, these new systems have replaced traditionally manual or obsolete technologies. These systems offer a new array of products that allow pharmaceutical companies to successfully monitor product throughout all phases of their value chain.

It is clear that there are main players in the three eBusiness phases we discussed in this research. SAP and Ariba dominate the procurement software; Sun, BEA, and Siebel seem to contend in the eSales solutions sector; finally, i2, Manugistics, and SAP are the contenders in developing SCM software. Several companies have implemented

SCM systems that can be considered Extranet system of some sorts that are enabled using new package solutions such as Manugistics or other proprietary networks.

In our quest to discover what is common in the pharmaceutical industry in terms of eBusiness, we have only discovered that this is a very diverse industry in terms of implementing eBusiness technologies and trends. While some firms are implementing latest eBusiness technologies, others are still using EDI to perform B2B transactions for legacy backend systems. This is a concerning thought, because EDI has been around for decades, and the fact that it works, does not necessarily mean it should be around forever. Hence, although pharmaceutical companies are on the right track with implementing eBusiness solutions across numerous phases of their value chain, obsolete technologies can still be found, not to mention those that have more recently replaced manual processes.



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## Interviewee List

Organization	Title	Name
Pharma1	Director eBusiness	Randy
Pharma1	Manager, Procurement	Catherine
Pharma1	Manager, Corporate eBusiness	David
Pharma2	Senior Manager, eBusiness, European Operations	Althea
Pharma4	Senior Manager, B2B Customer eCommerce	Shane
Pharma4	Business Development and eBusiness Strategist	Allison
Pharma4	Senior Manager, Procurement	David
Pharma5	Senior Manager, R&D	Ted
Pharma9	Manager, eMarketing	James
Pharma10	Senior Manager, eBusiness	Bryan