Examining the Flows of Information in Supply Chains: A Study of Pharmaceutical Companies in the Egyptian Market

by

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Abstract

A great deal of attention in the supply chain management literature is devoted to study material and demand information flows and their coordination. But in many situations, supply chains may convey information from different nature; they may be an important channel companies have to deliver knowledge, or specifically, technical information to the market. This paper studies the technical flow and highlights its particular requirements. Drawing upon a qualitative field research, it studies pharmaceutical companies, since those companies face a very specific challenge: consumers do not have discretion over their choices, ethical drugs must be prescribed by physicians to be bought and used by final consumers. Technical information flow is rich, and must be redundant and early delivered at multiple points. Thus, apart from the regular material channel where products and order information flow, those companies build a specialized information channel, developed to communicate to those who need it to create demand. Conclusions can be extended to supply chains where products and services are complex and decision makers must be clearly informed about technology- related information.

Keywords: Supply Chain Management, Information Flow, Pharmaceutical Companies

1. Introduction

Manufacturers are the leading the force in supply chains and distribution channels. They designed, produced, promoted and distributed their products. Vendors/suppliers, wholesalers, distributors and retailers were smaller in size and depended upon the leadership of large manufacturers (X. Yu *et al*., 2010). At that time, not much attention was given to distribution and logistics system as product development and promotion. The concept of supply chain management has evolved from a narrow perspective, it can be viewed as a pipeline or conduit for the efficient and effective flow of products/materials, services, information, and financials from the supplier's suppliers through the various intermediate organizations/companies out to the customer's customers or the system of connected logistics networks between the original vendors and the ultimate final consumer (Bard and Langley, 2003) and (Salam, 2011).

Pedroso and Nakano (2009) mentioned that demand information and material flows are intrinsically connected: demand information has to travel upstream the chain in order to create material

or service flows, which are delivered to fulfil market needs. Thus, speed and accuracy are among the major concerns on managing information (Viswanathan *et al*., 2006).

Gibson *et al*., (2005) stated that Supply Chain Management (SCM) has been increasingly viewed as a cross functional effort, concerned on activities starting from demand creation up to its fulfilment. Market oriented activities, as demand creation, are currently considered part of supply chain management (Arshider and Deshmukh, 2008). Also, integration and coordination between marketing and logistics is recognised as a significant organisational capability (Murphy and Wood, 2011). That is even more important when supply chain management constitute a key channel for companies to deliver technical information to the market, and to receive feedback, related to quality and performance of their services and products, from other companies and customers (Pedroso and Nakano, 2009).

Furthermore, Supply chain and logistics managers are impacted greatly and more directly by their consumers and stakeholders (Arshider and Deshmukh, 2008). Supply chain members in today's market are enlightened by the information they have access to from the internet, catalogues and other media. Consumers and stakeholders have the opportunity to compare prices, quality and service (Kaikati and Kaikati, 2006). As a result, they demand competitive prices, appropriate quality, customised products, convenience, flexibility and responsiveness. Therefore, a greater responsibility is put on supply chain and logistics managers to achieve their customers' demands (Childerhouse *et al.,* 2003). These challenges even intensify with strategic products such as the pharmaceutical products which require more efficient logistics management.

Several researches in supply chain were focused on studying the upstream flow of demand information and its effects on material flows. Chen and Paulraj (2004), Min and Mentzer (2004), Tracey *et al.* (2004), Burgess *et al.* (2006) and Rahimzadeh *et al.* (2011) have reviewed the central concepts in supply chain management, but they did not consider any applications of the new role of technology related information flows. That may due to the fact that technical information, in many cases, flows alongside order information, giving hazy boundaries to each other (Kaikati and Kaikati, 2006). It is usual practice in some industries to assign engineers as sales representatives, to perform the so called 'technical sales' function, which includes both delivering technical information to help customers' decision making and also selling and collecting order information (Pedroso and Nakano, 2009). However, it seems reasonable to argue that, given the differences in nature, requirements for good management of technical information flows would be diverse from those for order information flows.

This research aims at studying the technical information flows in the supply chains of pharmaceutical companies working in the Egyptian market. The pharmaceutical industry was chosen for investigation as it is considered the second-largest drug market in the region and Egypt acts as a gateway to other emerging and less penetrable Middle Eastern, Asian and African markets. By highlighting the significance role of supply chain management in pharmaceutical companies and examining the role of technology in managing the supply chain of pharmaceutical companies in Egypt. Furthermore, in some industries that flow needs to be managed apart from order information, using a specially designed path. That is the case of pharmaceutical companies: since customers do not have the involvement over their purchasing decisions, depending on physicians' prescriptions, pharmaceutical companies need to keep physicians well informed about drug development, in order to create demand. Thus they have to manage two paths in their outbound supply chain: the main path, where goods and order information flow to and from the market, and a secondary path, where technical information flows to create demand. Therefore,

by using qualitative field data from four large companies working in the Egyptian market, this research explores how those companies manage, organise and structure their information channels among their supply chains.

2. Literature Review

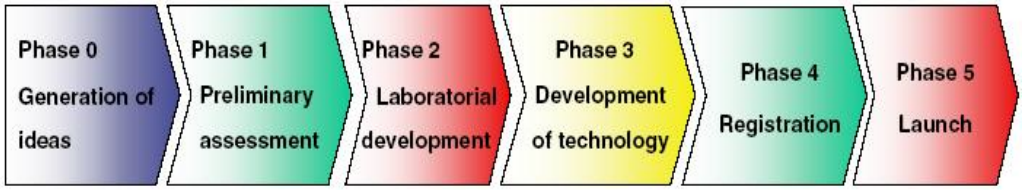
2.1 Pharmaceutical supply chains

The supply chain in the pharmaceutical industry is a chain of companies delivering pharmaceuticals by transformation of information about needs, from the chemist to upstream companies i.e. wholesalers, manufacturers and suppliers of raw materials (Christiansen, 2003). The goal of logistics is to satisfy customer service, such as demand for drugs with regard to quantity, quality, time and utility to lowest cost (Pazirandeh, 2011). The pharmaceutical industry is subject to Intellectual Property Rights, i.e., the pharmaceutical industry in any country is primarily affected by the degree of protection provided for intellectual property (Kumar, *et al.*, 2008).

In a developed market, after a drug is developed and approved only the company that developed the drug can manufacture it for a specified period of time. Therefore for that period of time the manufacturer would be earning substantial profits (Meijboom, *et al.*, 2011). This kind of profit is justified by the amount of research and development costs that went into developing the drug (Prasnikar and Skerlj, 2006) and (Wong *et al.,* 2005).

Pharmaceutical products are protected by patents in a number of ways, which are the most salient of which include two main stages: ***process patents,*** whereby only the method by which the product is produced is protected. Therefore if someone can make the same product but using a different process, the holder of the process patent cannot prevent the reproduction of the product (Richey, *et al.*, 2011). It is usually the case that emerging markets recognise process patents and not product patents. And ***product patents***, whereby the patent protects the molecular structure, thus no one except for the developer of the product can manufacture a product with the same molecular structure. Markets such as the United States, Canada and the United Kingdom recognise product patents (Atilgan and McCullen, 2011). The life cycle of the pharmaceutical product is illustrated as following:

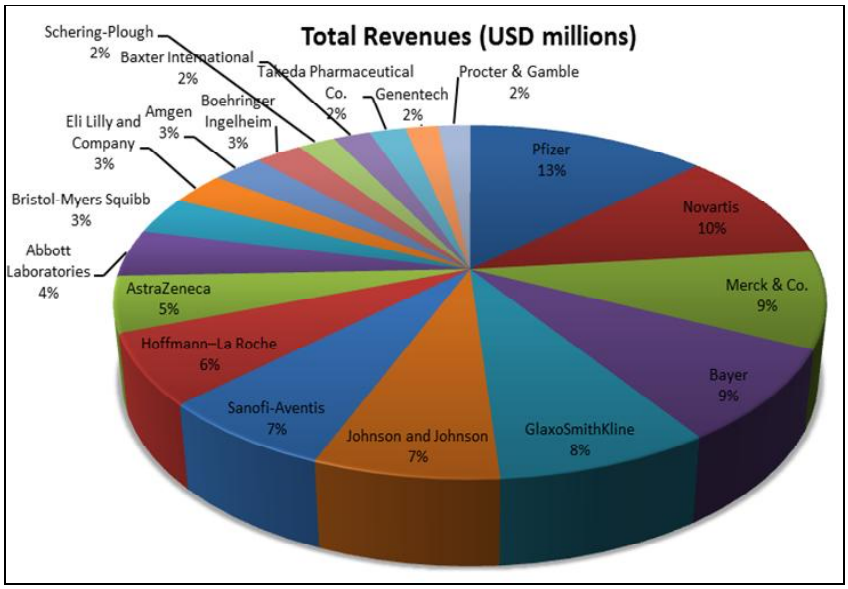
- **Discovery:** New drugs are discovered in scientific laboratories. The process is long and laborious, with the vast majority of attempts unsuccessful.
- **Bringing the drug to market:** Before a drug can he brought to market, it must undergo years of testing and receive government approval from the Food and Drug Administration (FDA). It takes *several years* of sales build up in major markets in the U.S. and abroad before a drug reaches its full commercial potential. At that point, new competition of drugs similar in action may enter the market.
- **Going generic:** Drug's patent expires, typically after *eight years* on the market. Generic competition usually appears immediately after it, and prices begin to fall. Branded prescription drugs typically have about *10 years* before generic competition erodes their profitability. Figure (1) illustrates the stages of the new product development process for generic pharmaceutical companies.



Source: Prasnikar and Skerlj (2006)

Figure 1 New Product Development Process for Generic Pharmaceutical Companies

- **Going OTC:** Companies sometimes switch a patent-expired product from prescription-only status to over-the-counter (OTC) status to broaden its market and extend its economic life. Competition in the market of OTC products is more straightforward. Margins on products switched to OTC status are lower than those on the prescription products they replace, but popular consumer medications can have almost infinite shelf lives. Figure (2) illustrates the market shares of leading pharmaceutical companies.

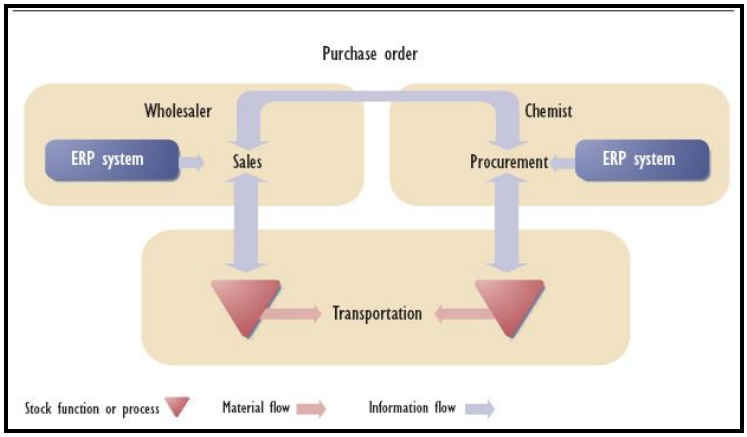


Source: author based on Moynihan, R. (2009)

Figure 2 The Market Shares of Leading Pharmaceutical Companies

2.2 The pharmaceutical logistics systems

Traditional replenishment of drugs between partners in the supply chain is based on '*arm's length*' relationships and is managed by the customer (Mabaga *et al.*, 2011), as shown in Figure (3) A buyer in the procurement department at a private chemist uses an Enterprise Resource Planning (ERP) system (Wong *et al.,* 2005). The ERP system calculates that the chemist needs a certain amount of a specific drug. The buyer then places a purchase order to the wholesaler (Pazirandeh, 2011). The sales representative at the wholesaler checks their ERP system and, if the drugs are in stock, releases a picking list. The drugs are then packed and transported to the chemist, where the order is controlled before being placed on stock (Atilgan and McCullen, 2011). This logistics system has two organisations administrating the system, separate information systems, redundant inventories and redundant quality control (Kumar, *et al.*, 2008) and (Aronsson *et al.* 2011).



Source: Christiansen, (2003)

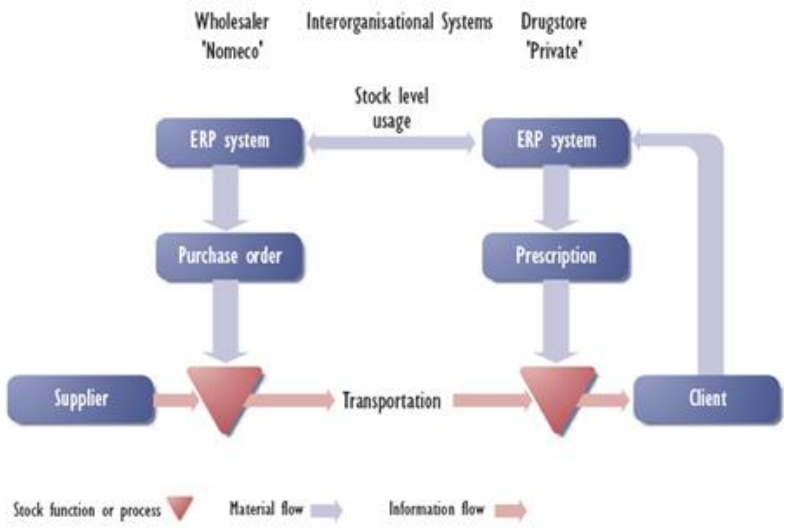
Figure 3 Pharmaceutical Logistics System

The customer (buyer) alone is responsible for the system and both parties have to secure delivery service through safety stocks. In this relationship, logistics costs are high and there is no guarantee that the supplier can support the right service level. There is a dependence on the ability to make forecasts (Meijboom, *et al.*, 2011).

2.3 Collaborative Logistics Planning

Effective flow of information across the supply chain can improve the flow of materials (Atilgan and McCullen, 2011). Therefore, electronic flow of information, such as interorganisational systems across supply chains, is an important driver for improving supply chain performance. The argument is that if suppliers in the supply chain can obtain information about the need for pharmaceuticals from the customers, they do not have to make forecasts (Meijboom, *et al.*, 2011). The issue here is how fast real demand is made visible upstream and how feedback can have a beneficial impact on reducing upstream amplification and distortion of demand (Wong *et al.,* 2005). The purpose is to achieve a flexible and lean supply chain based on actual information on demand instead of forecast (Mabaga *et al.*, 2011).

Figure (3) shows the benefits of establishing collaborative planning logistics systems in private supply chains.



Source: Christiansen, (2003)

Figure 3 Benefits of Establishing Collaborative Planning Logistics Systems in Private Supply Chains

The main information that is shared and used as a decision support tool between the partners is the forecast, stock level, production plans and different parameters such as maximum/minimum inventory level, reorder point and order quantity (Richey, *et al.*, 2011). Based on this information, the supplier takes over the responsibility for replenishment of goods to the customer in the supply chain (Mabaga *et al.*, 2011). The beneficial impact is that the pharmaceutical companies can improve their logistics performance, e.g. improved responsiveness, reduced delivery time, reduced double buffering, reduced administrative costs; and improved capacity planning (Wong *et al.,* 2005). Therefore, the main issue in supply chain management is integration of processes across companies in the chain, such as product development, order fulfilment and procurement, etc. Instead of having many suppliers, companies cooperate closely and integrate logistics activities with only one or a few vendors (Atilgan and McCullen, 2011). Therefore, building up relationships with few partners is a key issue in supply chain management.

2.4 Information flows in global pharmaceutical supply chains

Global supply chains are a relatively recent concept and are not to be confused with multinational supply chains. The latter involved either multiple production sites for local consumption, or the manufacture of some components in low-cost countries (Booth, 1996). The hallmark of genuine global supply chains is centralization of master scheduling, capacity planning, purchasing and distribution planning (Wong *et al.,* 2005). Components are produced in a variety of locations for

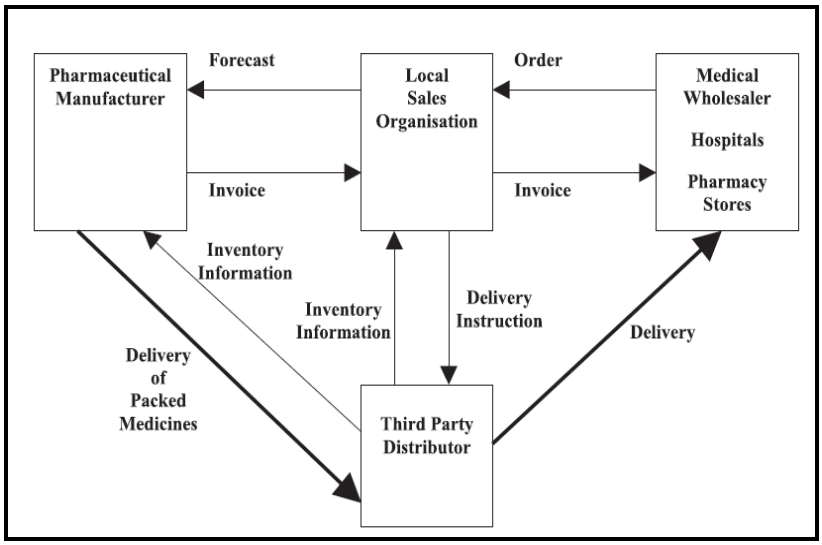
international markets in a way that ensures service levels at minimum cost. For the pharmaceutical industry, this has to be achieved despite the fact that distribution, regulatory and customer requirements differ widely. The cost advantages of global supply chains come through improved efficiency from manufacturing in the most appropriate location, better capacity management and economies of scale, which relate directly to the strategies of the pharmaceutical industry to build market share and improve economic efficiency (Meijboom, *et al.*, 2011).

However, as supply chains become more extended, the consequences of loose integration become more severe (Olson, 2010). One such consequence is the "Forrester effect". The supply chain, like other control systems, becomes unstable as delays are introduced into it. The result is that a minor perturbation in demand at the customer end results in immense swings in demand further up the supply chain (Wong *et al.,* 2005). In elongated supply chains, visibility of the actual customer demand is clouded by inventory adjustments within the supply chain and a series of planning delays (Pazirandeh, 2011). The result is excess inventory held within the supply chain, "just-in-case" and even investments and divestments of capacity as companies react to phantom increases and decreases in demand (Eriksson, 2010). For obvious reasons the demand pattern for colostomy bags is remarkably constant: the user population is fortunately relatively stable (few entrants and exit by mortality only) and so is the daily demand (Atilgan and McCullen, 2011). Despite this the effect of poor co-ordination along the supply chain has led to large swings in the utilisation of productive capacity. To avoid this instability, tight integration of information along the supply chain is needed (Kumar, *et al.*, 2008).

Moreover, according to Egerstrand and Wester (2009) the key to integration of the supply chain is information. Most current systems do not support the functionality for global supply chain management (Kros, *et al.,* 2011). In particular there is a need for global visibility of sales order load, bills of material and routings that go beyond listing components and lead-times but include multiple sources, timing, yields etc., scenario analysis to examine options for production at different sites, the ability to accommodate international constraints (e.g. a legal requirement to produce with a minimum proportion of local labour), global supplier evaluation, global tracking of all inventories (Meijboom, *et al.*, 2011). Even if the system has this functionality, it is of little use without common standards on part numbers, documentation and quality (Aronsson *et al.* 2011).

2.5 Outsourcing Pharmaceutical Logistics

With the remarkable growth of the pharmaceutical industry and the increasing pressures on companies to deliver their products timely to the worldwide market, major logistics service providers (LSPs) offer special services for the pharmaceutical industry (Banomyong and Supatn, 2011). LSPs are providing integrated supply chain services for the pharmaceutical, biotechnology, medical device industries and most of the other industries (Bourlakis and Melewar, 2011). They have been providing highly customised logistics solutions for a broad range of clients (Liu and Lyons, 2011). Figure (4) shows the distribution process of a pharmaceutical company using a third party logistics provider.



Source: Strijbosch, *et al.* (2002)

Figure 4 Distribution Process with Outsourcing

On the other hand, there are major challenges that pharmaceutical companies are facing in addition to reviewing several solutions that LSPs provide to overcome these challenges as highlighted in some studies (Lerer and Piper, 2003); (Liu and Lyons ,2011); (Ron, *et al*. 2011); (Salam, 2011) and (Xing*, et al.* 2011). First major pharmaceutical company challenge presented in managing inventory in a complex and heavily regulated industry, where millions in inventory could be jeopardised by careless product handling or compliance violations.

Therefore, the *LSP solution:* Having extensive experience running both multi-client and dedicated warehousing facilities, as well as managing in-country distribution. As well as providing: s*pecialised transportation management services:* leveraging "*best in class*" carriers while optimising total logistics cost; s*amples and literature distribution*: efficient, regulatory-compliant handling of samples and literature fulfilment, both in the warehouse and in the field; *service logistics:* supporting the post-installation requirements of customers, including storage and delivery of critical spare parts that keep life-savings equipment up and running. The second major pharmaceutical company challenge is presented in managing the efficient, regulatory compliant handling of samples and literature fulfillment. Distribution of this non-revenue product consumes time and resources and turns sales representatives into unproductive inventory managers. Therefore, the *LSP solution: a*n automated, turnkey solution for order management, fulfillment, product tracking and proof of delivery for samples and literature. By leveraging the Web-based order management system and local, secure, climate-controlled stocking locations fitted with state-of-the-art product tracking technology, reps can initiate orders any time from any place. They can have the product shipped direct to the doctor or they can pick it up themselves. Translation: More time for sales reps to drive revenue, as well as reduced turnover and increased productivity as Kuehne + Nagel manages inventory, order flow, transportation and reporting (Egerstrand and Wester,2009).

2.6 The Implementation of RFID in Pharmaceutical Companies

The race is on to secure the pharmaceutical industry's supply chain using Radio Frequency Identification (RFID), but obstacles are slowing the pace of implementation (Wong *et al.,* 2005). The technology is new, the price tag is reasonable, and the mandates keep coming (Mabaga *et al.*, 2011). To understand why supply chain security in the pharmaceutical industry is a hot button now, it helps to consider how the industry has evolved (Kros, *et al.,* 2011). In general, pharmaceutical companies do a credible job keeping their supply chains safe. Only 10 percent of drugs worldwide are counterfeit, and Food and Drug Administration (FDA) counterfeit drug investigations have increased to more than 20 per year since 2002 (Balocco, *et al.*, 2011). However, this is an industry that has seen tremendous global growth and change. For instance, more drugs are moving around the world than ever before, U.S. pharmaceutical imports have nearly quadrupled from $ 8.7 billion in 1995 to $ 80.7 billion in 2010 (Karagiannaki, *et al.* 2011).

As more drugs are being transported across borders, security becomes a greater challenge. The potential for tampering increases. In a post-Sept. 11 environment, terrorist scares are real (Zimerman, 2011). Now factor in the economic incentives provided by an increased volume of high-cost drugs, the ability of consumers to purchase drugs over the Internet, and advanced technologies available to create counterfeit drugs (Mabaga *et al.*, 2011). The number-one question in pharmaceutical logistics now is: how do companies know where our product is at all times? Most pharmaceutical companies are involved in some kind of preliminary Radio Frequency Identification (RFID) program, but don't feel free to talk about it because the information is so proprietary and the topic is so sensitive (Ip, 2011).

The RFID device consists of an 1/8 inch square tag with an antenna printed in copper, the tag contains a chip with a unique identifier, which, when excited by RF energy, basically wakes up and announces itself (Bhakoo and Chan, 2011). A tag is commissioned from the manufacturer's site with lot and batch number, and expiration date. That physical item stores all this information. As it moves through the supply chain, the tag builds a history or "*pedigree*." For example, the tag can tell a reader which dock doors the product moved out of, which aisle it came down and whether or not it arrived at a facility. "In the drug industry, when a product reaches the point of dispensing e.g. the retail pharmacy, and anything is amiss, you can automatically presume the product is counterfeit, if the product doesn't meet requirements, it will trigger an alert (Mabaga *et al.*, 2011).

RFID technology offers more than bar coding because of its track-and-trace ability and the pedigree it creates for a drug (Mabaga *et al.*, 2011). This pedigree will help secure the integrity of the drug supply chain, according to the FDA, and some states have already begun mandating a paper pedigree for drugs (Richey, *et al.*, 2011). RFID brings two additional advantages. First, it is a ready means for mass serialisation (Balocco, *et al.*, 2011). A bar code contains a Stock Keeping Unit (SKU) and some other information, but it is static. The idea behind RFID's Electronic Product Code (EPC) is that it acts as a unique identifier for each item or serial number, with no two numbers the same. In the pharmaceutical industry, the bar code on a bottle of tablets contains a SKU and a national drug code. That bar code contains information about the drug, but not about the specific bottle of tablets because the same bar code is used on every bottle (Karagiannaki, *et al.* 2011). The second advantage of RFID is that you don't need line of sight to read an EPC. While a bar code has to be visible to a reader, an RFID tag need only be within the antenna and reader scanner range, which is between two and eight feet. When dealing with high-value prescription drugs, RFID frees pharmaceutical companies from having to

inspect all the cases and bottles to verify they are there; every single bottle tagged gets recorded within minutes of being received. There is less handling, built-in distribution integrity, and increased order accuracy (Bhakoo and Chan, 2011).

2.7 Reverse Logistics in the Pharmaceutical Industry

The pharmaceutical returns business is a fragmented, confusing, and often frustrating section of the overall pharmaceutical supply chain (Atilgan and McCullen, 2011). The logistics involved with returning and disposing recalled and outdated drug products from dispensers and distributors have mushroomed into big business (Kros, *et al.,* 2011). Reverse logistics costs alone account for nearly 1% of the Gross Domestic Product (GDP) (Richey, *et al.*, 2011). This figure is bloated by redundant return costs; pharmacies and wholesalers use one group of processors while vendors may use another set, which can mean handling returns two to four times (Wong *et al.,* 2005). Expired returns are the most common aspect of reverse logistics, a market valued at roughly $2.5 billion and growing by more than 10% a year, according to industry estimates (Richey, *et al.*, 2011).

The additional volume, however, makes the returns process increasingly complicated and difficult for supply chain members to manage internally. Further complicating matters is the dizzying array of manufacturer return policies, addresses, logistics methods, product waste streams for non creditable product, and governing regulatory agencies (Mabaga *et al.*, 2011). Most pharmaceutical companies do not handle returns well because they are not part of their core competencies. As a result, many works closely with third-party logistics providers while others are still considering the best way to handle reverse logistics (Richey, *et al.*, 2011). The birth of reverse distributors has led to an education on how to better manage your return goods flow, credits that come back from manufacturers, and the destruction of product. If the returned materials have expired, they are forwarded to a disposal site where they are taken care of according to the material's requirements (Eriksson, 2010).

Some of the third-party logistics providers maintain regional or nationwide sites for safe pharmaceutical product disposal, and the sites are certified for destruction services (Mabaga *et al.*, 2011) and (Aronsson *et al.* 2011). Reverse distributors offer a "*closed-loop*" approach that helps pharmaceutical companies manage their returns from the initial return authorisation to the final disposition. They help clients reduce costs and offer value-added solutions, minimising the regulatory burden for customers and allowing them to focus on core competencies (Richey, *et al.*, 2011). Cost studies have repeatedly demonstrated that reverse logistics firms translate to cost savings while providing superior services. These operations are said to provide numerous value-added services for customers, from collection of outdated, unwanted, or damaged products and packaging to counterfeit detection programs and facilitating reimbursement processing (Viswanathan, *et al.*, 2006). The reverse distributor's core focus is on the whole reverse distribution process, which helps the entire industry reduce costs associated with returns. It does that because it's streamlining the flow of the product, the documentation and destruction of product (Kumar, *et al.*, 2008). Reverse logistics firms offer pharmacies and hospitals the added services of disposing of all their critical goods, whether they have a credit value with manufacturers or a potential liability with state and federal regulators (Mabaga *et al.*, 2011). Manufacturers have also chosen to outsource their reverse logistics, including the management of information, funds, and goods to third-party specialists (Meijboom, *et al.*, 2011).

3. Research Methodology

A qualitative and exploratory study, based on in-depth interviews, was designed to further understand how pharmaceutical companies manage their technical information flows. Branches of four large multinational pharmaceutical companies operating in Egypt were contacted and in each, one professional, usually the manager in charge of delivering technical information to physicians, was selected for interviewing. Interviews were conducted between March 2011 and July 2011, lasted from 1 h to 1.30 h and were fully tape recorded. The author was present at all the interviews, took hand notes and collected documents. Interviews were later transcribed verbatim. Also, to help analysis, from hand notes, documents and transcriptions, a description case was written, validated by informants and discussed by the author. Although the number of informants was limited, data saturation was clearly reached, as no new concept emerged as interviews were performed, giving assurance about findings.

4. Findings: The Egyptian Pharmaceutical Industry

4.1 An overview

Egypt's total pharmaceutical spending, which reached EGP13.75bn (US$2.48bn) in 2009, is expected to continue growing steadily. It is expect the market value, as measured at consumer prices, will reach EGP20.57bn (US$4.47bn) by 2014, posting a respectable 8.39% compound annual growth rate (CAGR) in local currency terms. Although the rate of growth will slow to 7.96% in the 2009-2019 period under pressure from higher generics usage, pricing reforms, lower inflation and patent expirations, Egypt will continue to be viewed as a promising pharmaceutical market as well as a foreign direct investment (FDI) destination (Business Monitor, 2010). The private sector plays an increasingly important role in healthcare provision, emerging largely as a result of the declining standards of public sector care (Gad, 2008).

Moreover, there are several features have solidified the pharmaceuticals sector in Egypt. The domestic demand is forming the driver for sales growth. Although per-capita spending on medicines is low – US$32 in 2010 as a result of high unemployment – the large and rising population – approximately 84.5mn people in 2010 – however, the support growing demand for generic medicines (CAPMAS, 2010). The total pharmaceutical market value will reach EGP20.57bn (US$4.47bn) by 2014 at a reasonable CAGR of 8.4% in local currency terms and 12.5% in US dollar terms (WHO, 2010). While Egypt features as part of the Middle Eastern epidemiological trend for hypertension, diabetes, thalassaemia and cardiovascular diseases, the large proportion of young people should provide an ample market for OTC and essential medicines (Festel and Schicker, 2010). Real private consumption is expected to rise by 4% in 2010, bolstered by a strengthening consumer base which points to growing potential in sectors where spending patterns are price-determined, such as pharmaceuticals (CAPMAS, 2010).

The most recent reforms in the sector include price reductions on all prescription medicines, which are expected to boost spending. Despite challenges by the local industry regarding the feasibility of the pricing policies, the government appears determined to widen access to healthcare and promote a more competitive business environment for much-needed FDI in this sector. However, the reform has

been put on hold, while the government realigns reference countries to more accurately reflect Egypt's purchasing power (Gad, 2008) and (Egerstrand and Wester, 2009). Therefore, in order to give a clear picture of the healthcare industry in Egypt, a SWOT analysis is undertaken to highlight the strengths, weaknesses, opportunities and threats that face the industry. Table (1) presents the SWOT of Egyptian healthcare industry.

Table 1 SWOT of Egyptian Healthcare Industry

Strengths	**Weaknesses**
▪ Well-established manufacturing industry comprised of many privately-owned local companies, focusing on high-volume basic medicines. ▪ Local production accounts for about two-thirds of the drug market. ▪ The government is committed to expanding access to medicines through better healthcare coverage. ▪ Low labour costs and a large pool of highly trained doctors, pharmacists, engineers and skilled technicians.	▪ Per capita drug spending in Egypt is among the lowest in the Middle East. ▪ Little adherence to over the counter (OTC) and prescription distinction. ▪ The regulatory regime is difficult for foreign firms. ▪ Access to healthcare is still low for many people and high unemployment limits the uptake of private insurance. ▪ Patent laws remain notably below international standards, with data protection and enforcement being major concerns. ▪ The market is reliant on imports for hi-tech products. ▪ Reliance on imported raw materials. ▪ The most recent pricing policy has received much criticism from Egyptian and multinational companies operating in the country, leading to the programme being suspended until purchasing power parity is better reflected.
Opportunities	**Threats**
▪ Sector modernisation, with plans to increase healthcare insurance coverage still on the agenda, although this will only play out in the long term. ▪ Potential for generic sector growth as the government becomes increasingly cost conscious. ▪ Potential liberalisation of the retail pharmacy sector is still under	▪ Continued government resistance towards fully aligning domestic patent law with international norms. ▪ Higher fees for registration of imports, including all medicines and medical devices, will negatively impact some categories of drugs. ▪ Multinationals remain wary of large investment in the country due to data

discussion. ▪ Implementation of a new, faster drug registration process. ▪ A growing number of free trade agreements. ▪ A much needed entrance by an API manufacturer would cut the import bill significantly and allow the domestic drug makers to thrive and ultimately, boost economic growth in this sector.	protection situation and are likely to be attracted to rival Arab markets such as Jordan, the UAE and Saudi Arabia. ▪ The reluctance of the government fully to privatise the drug industry. ▪ Rapid and unchecked population growth could derail government's plans to improve healthcare insurance and provision. ▪ Universal insurance coverage is unlikely to be implemented smoothly, judging by previous delays in forming legislation.

Source: the Author based on Business monitor (2010)

It is also imperative to assess the Egyptian economic environment to see how it can impact the pharmaceutical industry in Egypt. Table (2) presents Egypt Economic SWOT

Table 2 Egypt Economic SWOT

Strengths	**Weaknesses**
▪ ! Exposure to the liquidity story in the Gulf should insulate Egypt against external shocks to some degree and keep growth positive, assuming a relatively quick recovery for the region from the current turmoil. ▪ Relative political stability and low wages in global terms are advantages for foreign investors. ▪ The largest market in the Arab world.	▪ ! Unemployment is high, which subdues demand. ▪ ! Egypt has a widening fiscal deficit owing to a surging subsidies bill and rising ▪ public wage costs. ▪ ! There are relatively high levels of corruption and bureaucracy
Opportunities	**Threats**
▪ The Egyptian government, introduced in July 2004, has impressed investors with its policy activism so far. ▪ Recent tax and tariff cuts will stimulate economic activity.	▪ The widening fiscal deficit is adding to the costs of servicing debt (most of which is held domestically). ▪ High unemployment may lead to political resistance to privatisation plans. ▪ The stock market has lost nearly half its value and the recovery in global risk appetite in March 2009 may not last. ▪ Militant attacks on tourist sites pose a downside risk to revenues from the

	key tourist sector, although increased security spending appears to have been successful in this regard. ▪ Piracy in the Gulf of Aden has resulted in large numbers of shipping companies opting for alternative routes which do not use the Suez Canal. If the situation is not resolved, this key geo-strategic advantage will be lost.

Source: the Author based on Business monitor (2010)

The business environment is a crucial factor that determines the ability to encourage or repel foreign or local investment. Thus, Table (3) presents a SWOT analysis has also been undertaken for Egypt's business environment.

Table 3 Egypt Business Environment SWOT

Strengths	**Weaknesses**
▪ The geographical location is good for trade, as Egypt has access to both the Mediterranean and the Red Sea, not to mention the key Suez Canal route, which connects Europe with Asia. ▪ The legal system has issued adjudications in favour of foreign firms, although there are frequent procedural delays, and it is closely connected to the executive branch of government..	▪ Egypt ranks 111th out of 180 states surveyed in Transparency International's ▪ Corruption Perceptions Index 2009, comparing unfavourably with regional peers. ▪ The labour market is relatively inflexible, with Egypt performing markedly worse than the OECD average, and also inferior to the regional average on the World ▪ Bank's Hiring and Firing Workers index.
Opportunities	**Threats**
▪ Efforts towards banking sector consolidation should bring down the cost of private sector credit and fuel small business growth. ▪ A free trade zone between all littoral Mediterranean states and the EU is expected to be in place by 2010.	▪ Patronage networks impede attempts at fighting corruption and cutting bureaucracy. ▪ Although levels of education are relatively high, there is a considerable mismatch between the skills taught in schools and those required by most employers.

Source: the Author based on Business monitor (2010)

Therefore, the Egyptian pharmaceutical market is the second largest market in the region, after Turkey, and has about 74 pharmaceutical factories. The Egyptian drug industry is drug formulation rather than research based. The main growth drivers for pharmaceuticals in Egypt are population and

GDP growth. Healthcare expenditure is reported to be about 3.6% of GDP and pharmaceutical expenditure was 1.5% of GDP in 2010. Per capita spending, however, is among the region's lowest at about US$30 in 2010, of which government spending amounted to US$20. About 90% of private healthcare expenditure is out-of pocket spending; pre-paid plans make up less than 1% of private spending. Up to two-thirds of primary healthcare visits are in the private sector, despite the cheap, heavily subsidised healthcare services offered by the state sector (CAPMAS, 2010).

The drug market growth is expected to continue in the short term, with the market reaching US$2.4bn at retail prices by 2010 (Business Monitor, 2010). Along with basic social factors such as population growth, availability of cheap healthcare is also likely to drive the growth in the market. Spending levels are expected to increase due to improvement in health awareness and greater access to medicines. Furthermore, the gradual alignment of domestic sector procedures with international norms should benefit market growth. Prescription drugs accounted for 85% with OTC medicines accounting for the remaining 15% of sales. In the prescription drug market, the two leading segments were antibiotics and alimentary tract/metabolism drugs each reaching sales of US$462mn and US$273mn, respectively. Central nervous system and oncology drug sales contributed the lowest to the overall prescription market, with sales at US$142.8mn and US$89.3mn, respectively. Furthermore, generics represent about 16% of the total market (Business Monitor, 2010).

4.2 Pharmaceutical Companies in Egypt

Pharmaceutical companies in Egypt fall into three categories: public sector companies that are subsidiaries to the Holding Company for Pharmaceuticals, private sector companies and multinational companies (CAPMAS, 2010). There are about 40 pharmaceutical manufacturers in Egypt, the majority of which are privately owned. A significant proportion of local production is focused on exports. Leading local producers include Egyptian International Pharmaceutical Industries (EIPICO), El Amriya, El Nasr, Minapharm, October Pharma and the South Egypt Drug Industries (SEDICO). Most of the multinationals are active on the Egyptian pharmaceutical market. Not all, however, have a direct manufacturing presence, with many importing drugs or licensing production to local manufacturers. Multinational companies supply about 65% of the market through direct local manufacturing or through licensing agreements. Leading players with production facilities include Bristol-Myers Squibb (BMS), Novartis and Glaxo SmithKline (GSK) claims to be the domestic market leader, with a share of about 8.6%. About 90% of the subsidiary's production is sold in Egypt, with the remaining 10% being exported to other Middle East and North African markets (Business Monitor, 2010).

On the other hand, Egypt maintains a price control system that does not allow for price increases to compensate for inflation (CAPMAS, 2010). Also, many regulations regarding manufacturing and registration are opaque and vague. According to foreign pharmaceutical companies based in Egypt, prices are tied to an old foreign-exchange rate and the authorities are not making adequate effort to control the production of generic medicines based on their products (WHO, 2010). The process requires the pharmaceutical firms to file a list of their expenses, which includes cost of raw material, overheads, production cost, sales cost and desired profit margin. The data is reviewed by the pricing committee and either approved or rejected. If rejected, the company representatives should negotiate the price with the committee. The MOHP restricts the import of some of the finished pharmaceutical products into the country. According to the Ministry's regulations, natural products, vitamins and food supplements are prohibited from import into Egypt in their finished form. The only way these can be marketed in Egypt

is by local manufacturing under licence, or by sending ingredients and premixes to a local pharmaceutical firm to be prepared and packed in accordance with specifications of the MOHP. Otherwise, only local factories have the right to produce food supplements, and import raw materials to be used in the manufacturing process (FEI, 2011).

These requirements violate Egypt's WTO commitments regarding national treatment of foreign investors. However, given its location and large population, if Egypt were to adopt a modern patent law and market based pricing, it could become a likely regional centre for multinational pharmaceutical production (Gad, 2008) and (WHO, 2010). Currently, pharmaceutical prices remain controlled, although the government has decontrolled prices of other industrial products. Drug prices in Egypt are among the lowest in the region due to the government's control over pricing policies. A further reason for the low prices is the strong local pharmaceutical industry, which produces generic drugs at a fraction of the cost of imported brands (FDA, 2010).

4.3 Industry Developments

Egypt's Minister of Foreign Trade and Industry has asserted that the pharmaceutical and healthcare industry in Egypt faces many challenges – the most important one being that of striking a balance between the cost and the citizen's needs and income. The MOHP also outlined plans to develop the local industry in an attempt to keep pace with international competition.

4.3.1 Healthcare Sector

The state healthcare system suffers from under-funding, poor management, obsolete equipment and the increasing pressures on account of population growth, which is about 2% per annum (CAPMAS, 2010). At present, very little medical equipment is manufactured in Egypt. Though the use of sophisticated medical equipment is growing, total expenditures are still small for a country with a population of nearly 70mn people (FEI, 2011). The government has outlined plans to further upgrade more than 60 general hospitals, clinics and laboratories in rural areas. It also plans to build eight new hospitals during the period 2007-2012. The most promising sub-sectors for further development include dialysis equipment and lasers, medical, and laboratory equipment (Business Monitor, 2010).

Privatisation is a growing trend within the Egyptian healthcare sector and thus, the sector is undergoing considerable change (CAPMAS, 2010). Prior to the 1990s, the sector was predominantly state-controlled, with the private sector playing only a minimal role in the provision of healthcare. The private sector now plays an increasingly important role in healthcare provision, emerging largely as a result of the declining standard of public sector care (FEI, 2011). The inefficiency and poor quality of primary healthcare services has led Egyptians to seek primary care in the private sector and leaves the population with a large burden of healthcare costs. Therefore, in order to overcome these problems, US Agency for International Development (USAID) outlined plans to invest a considerable amount for healthcare and family planning projects in Egypt (FEI, 2011).

Furthermore, the government, in its current five-year plan (2007-2012), has allocated about US$1.5bn for upgrading medical facilities and healthcare services, which includes the construction of new hospitals, enhancing medical services in urban and remote areas, broadening the training of physicians, increasing the number of nurses, supplying hospitals and medical centres with modern

equipment, and increasing the budget for research and development (R&D) at universities and research centres. Medical imports into the country are expected to grow at a rate of 15% and the modernisation of the heath sector has been able to generate high demand for medical items such as laboratory and testing equipment. However, despite the problems with the healthcare system, Egypt's health indicators have improved. Female life expectancy at birth rose from 70.5 to 72.8 years between 1999 and 2009, while male life expectancy rose from 66.3 to 68.4 years in the same period. The infant mortality rate for under-fives declined from 36.9 per 1,000 in 1999 to 28.6 in 2009 (FEI, 2011). This was largely due to immunisation and other programmes such as rural healthcare schemes funded by foreign donors (FDA, 2010).

Egypt's success in the public health system is measured by its ability to satisfy local demands and to respond efficiently in crisis. In 2002, the government initiated a rapid local development of recombinant human insulin and treated about 75% of the diabetic population. The local firms in the country have the ability to manufacture sufficient quantities of insulin by importing insulin crystals, which are used in their production. Earlier, more than 90% of the country's total insulin requirements were being imported from Novo Nordisk at a cost of US$35mn per annum (Business Monitor, 2010).

Egypt has witnessed a similar success in the production, diagnostics and treatment for hepatitis B and C, with hepatitis C being the fastest growing disease in the country (FEI, 2011). Furthermore, schistosomiasis is a parasitic infection, which is most common in the rural population of the country and is a leading cause of death among men aged between 24–44 years. A project named Schistosomiasis Research Vaccine Development was outlined in co-operation with US partners in order to control the spread of the disease. It included the development of two vaccines called, paramyosin and the synthetic peptide called microtubule-associated proteins 4 (MAP4), identified by the WHO. Egypt has been rapidly making progress in the field of health biotechnology. Several local firms have been entering this market, with most of them importing in bulk and then packaging the products. Local companies such as EIPICO, SEDICO, El Nil Pharmaceutical and the Vaccine and Inoculation Authority (VACSERA) have been manufacturing biotechnology products locally (FEI, 2011).

4.3.2 Pharmaceuticals Sector

In 1950, the pharmaceuticals industry in Egypt consisted of about 50 small national producers of drugs. Leading multinationals supplied 10% share of the local market. In the 1960s, three foreign firms, namely Hoechst, Pfizer and Swiss Pharma, had established joint venture operations, helping the industry become nationalised (FEI, 2011). By 1970, 11 local producers contributed 90% of the domestic market. With this open door policy, the market opened up to foreign and domestic new-comers and by 1996, the industry had nine multinationals, eight private and 11 public sector companies, employing about 60,000 people (CAPMAS, 2010). In the mid-1980s, the share of public firms stood at 80% of the domestic production (WHO, 2010). Due to the great diversity of products, companies tend to specialise, thereby making the Egyptian pharmaceutical market highly fragmented. Multinationals tend to specialise in non-OTC healthcare medications, as they are less likely to be produced from unlicensed generics. In doing so, they also avoid the unfair competition with local producers, which are backed by government support and unequal treatment when it comes to importing raw materials (Gad, 2008). Low wages in Egypt is one of the benefits available to pharmaceuticals production in the country. At less than 15% of production costs, intermediates account for about 50%, wages are extremely competitive in what is essentially a labour and technology intensive industry (WHO, 2010). Another major asset of the

pharmaceuticals industry is the large pool of highly trained doctors, pharmacists, engineers and skilled technicians whose experience in the sector has given Egyptian pharmaceutical products a distinguished reputation in the entire region. Some of the highlights of the sector include: the private sector has over three-quarters of the local market; the five largest pharmaceutical companies control about one-third of the market; there are eight multinational corporations operating in the industry, which account for over one third of total private sector sales; Egypt is the largest producer and consumer of pharmaceuticals in the MENA (Middle East and North Africa) region; the US plays an active role in the industry through its contribution to investment and imports; local production of pharmaceutical satisfies 93% of the domestic consumption, with imports being limited to high-technology products such as interferon α-2b and anticancer monoclonal antibodies and small molecules; Europe supplies the majority of Egypt's pharmaceutical imports; and Exports comprise about 6% of pharmaceutical production (Business Monitor, 2010) and (CAPMAS, 2010).

In the latest developments, members of the Egyptian-Russian Business Council recently held several rounds of negotiations on the pharmaceutical industry with a number of Russian pharmaceutical companies (WHO, 2010). Negotiations were aimed at helping realise several agreements on joint co-operation in the manufacture of medicines and related technology transfer, especially with regard to raw materials required for developing vaccines.

Russian expertise is being sought by Egypt to develop the raw materials for pharmaceutical products inside Egypt itself. This should not only lead to the achievement of self-sufficiency at a local level, but should also help Egypt export these materials to several African countries and other countries neighbouring Russia (Business Monitor, 2010). US-based Pfizer has also outlined plans to expand its production facility worth US$18mn situated at Al- Maza near Cairo. The decision is significant as it represents a long-term commitment to the country by Pfizer (FDA, 2010). The US research-based company has been planning to modernise its Cairo facility for several years but has held back because of poor trading conditions in the country. For, despite having the largest pharmaceuticals market in the region by population, tight price controls imposed by the MOHP and the devaluation of the Egyptian pound has left the country's pharmaceuticals manufacturers unable to recover their costs. Under these conditions, Pfizer had decided not to sanction further investment in the country (Gad, 2008). However, with the appointment of a new cabinet assigned with the task of liberalising the country's economy, Pfizer has given the go-ahead to its modernisation project, although not with a plan to build a new factory (FEI, 2011).

4.3.3 Research & Development (R&D) Sector

Low spending on R&D continues to be a problem faced by the industry. R&D activities are considered key to the development of any pharmaceutical industry, but the Egyptian industry cannot afford this due to the enforcement of the pricing system which lacks the provision of R&D expenditure (CAPMAS, 2010). The industry is thus based on the formulation of legal and illegal generics and the production of under-licence products. With the application of the agreement on TRIPS in January 2005, local companies are only to be allowed to produce legal generics (out-of-patent), which are likely to limit their production levels (Festel and Schicker, 2010).

4. Industry Forecast Scenario

Current levels of modest drug market growth can be expected to continue in the short term, with the market reaching US$2.4bn at retail prices by 2010. The depreciation of the Egyptian pound is likely to play a major role in negating much growth in US dollar terms. Growth should largely be driven by basic social factors, such as population growth. Any improvement in economic conditions could benefit spending growth (Business Monitor, 2010). However, at present the climate remains depressed. The delivery of healthcare is expected to undergo extensive modernisation, aimed at reducing regional disparities and waste. There are also moves aimed at preventive healthcare in order to restrain overall expenditure in the long term. However, the modernisation programme is unlikely to be accompanied by a substantial increase in state healthcare expenditure. Consequently, the private sector is expected to become increasingly important, although growth is likely to be limited by the high incidence of poverty (FEI, 2011).

4.1 Key Growth Factors - Industry

Modernisation of the healthcare sector is expected to play a part in market development. Spending levels should be positively impacted by an improvement in health awareness and greater access to medicines (Festel and Schicker, 2010). In terms of direct pharmaceutical sector development, the gradual alignment of domestic sector procedures with international norms should benefit market growth. However, recent government sector policy development does not suggest rapid progress on this front, with state-owned pharmaceutical companies likely to be excluded from the next phase of privatisation (FDA, 2010). A further contributory factor to market development should be the country's growing reputation as a source of cheap healthcare, with other Middle Eastern, Asian and African countries importing drugs from Egypt (FEI, 2011).

The development of the pharmaceutical industry in Egypt is unlikely to progress until the government changes its policies (WHO, 2010). It has to formulate a policy of cost-based pricing combined with targeted subsidies and ensure proper access to medication for the needy population. It is further required to reform the system so that the pharmaceutical industry does not have to bear the cost of low drug prices (FEI, 2011).

4.2 Prescription Market Forecast

The prescription market, which accounts for about 85% of drug spending, should continue to grow steadily in Egypt as hospitals remain the primary point of access to healthcare, with doctors' consultation increasing as a result of a greater awareness of healthcare issues (FDA, 2010). The market can be expected to reach US$2bn at retail prices in 2010 (CAPMAS, 2010).

4.3 OTC Market Forecast

Most of the OTC market's growth is hindered by a lack of awareness among Egyptian consumers. Egypt has a very high illiteracy rate and almost all medications have foreign names. Selection of brand names is not common to the Egyptian society and is therefore an obstacle hindering the development of brand loyalty, leaving market share dependent only on price-related issues rather than brand loyalty (Business Monitor, 2010). The OTC healthcare market, despite its large size, suffers

from a lack of advertising and consumer oriented marketing. Marketing campaigns remain exclusive, targeting only physicians and pharmacists, and leaving the customer uninformed. Given this early development of self-treatment, sales are expected to remain largely unchanged at about US$ 400mn in 2010 (CAPMAS, 2010).

4.4 Export/Import Market Forecast

Exports can be expected to grow steadily in the short term as producers become increasingly aware of the potential of export trade following the continued modernisation of the sector. Egypt's low-cost status could also help to increase export trade, with domestically-produced drugs being increasingly shipped to other emerging markets in the Middle East, Asia and Africa. Egypt should target its traditional markets of Eastern Europe and the former Soviet Union, the EU (with about 40% of world imports and a growth rate of 18%), Africa (12% growth rate) and the Middle East (9% growth rate) (Festel and Schicker, 2010). Egypt currently exports pharmaceuticals to a number of countries of which the most important are Saudi Arabia, Yemen, Kuwait, UAE, Iraq, Sudan, Nigeria, Zambia, the Philippines, Korea, Sri Lanka and the EU (CAPMAS, 2010).

Egypt is a leading supplier to Arab, African and Asian countries. Twenty Egyptian-made medicines were registered in Russia in 2004, making Russia an important country for exports. Private sector activity has increased considerably over the last 25 years as the government has steadily reduced its control of the industry (FDA, 2010). A number of state-owned pharmaceutical companies, however, remain Egyptian drugs, especially in the generic range, are reported to be superior to those from other middle income industrialised countries. A further key factor to export strength is Egypt's highly competitive prices, by international standards, and the fact that tariff and non-tariff protection has been negligible in this sector (FEI, 2011). The range of pharmaceutical exports should also widen so as to reduce a dependence on generics such as antibiotics, vitamins and analgesics. To ensure a growing share of the export market, local pharmaceutical companies are required to step up their marketing efforts, integrate within the global sourcing network to supply immediate orders in neighbouring markets, raise their expenditure on R&D and reinforce their quality image by obtaining ISO 9000 certification (WHO, 2010).

In addition, imports should also follow a steady upward trend as the market remains reliant on imported drugs, especially for more sophisticated medicines. An improvement in regulatory conditions could also lead to a rise in imports, as multinationals are increasingly willing to expand operations. Local manufacturers import their ingredients and raw materials or final products from France, Switzerland, India, Belgium, Germany, and the UK (CAPMAS, 2010).

5. Findings: Interviews

There are common factors regarding all pharmaceutical companies that have been interviewed. All companies are conducting a preparatory technical information analysis to the market long before the delivering the product to the drug stores. As long as a new investigation reveals to be a possibly feasible for new commercial product and experimental trials reach the final stage, the pharmaceutical companies start working to build their technical information pipelines. It is vary from company to another to deal with advertising campaign, as long as all the flow of information associated within all the supply chain

processes due to legal restrictions and professional ethical norms which belongs to the protecting the competition law in Egypt. The early delivery of technical information flows constitutes one of the important processes to ensure a successful product launch, and starts during the new product development process.

Pharmaceutical companies build multiple technical information pipelines. Collaborative efforts are integrated between sales team and a specialised team of physicians to sustain the technical information analysis within the pre-launch phase of drugs products, their main task is to precisely manage all information flows to the market and to advise the new drug. The physicians team duty is to assemble a task force team of experts, physicians, researchers and professionals to assure all the stages within their task. This consulting committee is getting involved and advice to the new product development stakeholders. The task force team processed to identify key opinion leaders, chief physicians at large and well known hospitals and professors at respected medical faculties and research centres, especially during the pre-launch and launch phases, by updating them with the new drug development process. The team is collecting the feedbacks and opinions, and organise workshops and conferences to assure a meaningful results for their task. The previous process has to be done before the drug is close to reach the market, as the physicians and the sales teams are collaborating their joint efforts based on their clear tasks, by helping the communication process within the pre-launch stage. Therefore, after the drug is launched in the market, physicians team keep working to feed information to consulting committee. Pharmaceutical companies start to advertising and strengthen the customers' relations aimed to physicians, containing technical and general information. After the launch phase, sales representatives are conducting regular visits to physicians, hospitals and drug stores to keep effective information flows, while physicians' team keep their support role to sales and continue to visit consulting committee.

Physicians create ethical drugs demand by prescribing them to those under their care. It stresses the role of pharmaceutical companies. Therefore, another connection is not considered within the technical information flow. It only included in the ethical drug flows, since non-prescription drugs flows are different, like the consumer goods. Pharmaceutical companies deliver technical information strait forward to physicians; which is not focus on the intermediate stages of the supply chain. Their strategy is focused and directed to those who influence sales, such as: distributors and retail stores which playing a trivial role in the demand management process. Nevertheless, if intermediate stages have decision power in demand, and their decision is based on technical issues, they also must be included in the communication strategy.

Since technical information is massive, and effectively delivering it implies interacting, discussing and clarifying questions, it requires high capacity channels and it is much more effectively delivered by personal contact. Therefore, Information and Communication Technologies (ICT) based systems play only a limited, supporting role in delivering technical information, and managing those flows does not imply, directly, increased requirements to ICT systems. However, as personal communication in general is more and more dependent on them, as new tools and systems include rich information delivery capacity at lower costs, it can be expected that their use will be more and more frequent in delivering technical information.

Law and regulations are varying between countries, therefore, it is highly expected that the management of technical information flows would differ as well between regions e.g. there are legal

restrictions over the advertising of health products to final consumers in UAE and Saudi Arabia. Consequently, the information and knowledge flows are focusing on hospitals, clinics, drug stores and physicians, and chief nurses. While in the UK and US, there is also mass media advertising. Finally, the main leading role in the process is performed by the technology developing player. It stays with it the burden of informing key players about new technologies and their related products and services. However, leading technology development does not mean keeping governance over the supply chain: as drug distribution is, in Egypt, increasingly dominated by few large distributors at the gross market, and by few large drugstores chains at retail, control over the supply chain is progressively split between technology developers and distributors and retailers. Despite pharmaceutical companies keep monopolistic power due to patents, their ability to set prices has been somehow diminished.

6. Summary and Recommendation

The pharmaceutical industry is considered one of the major industrial sectors for many countries. One of the important issues affecting the pharmaceutical industry performance is the management of the supply chains involved as the pharmaceutical industry implies its unique characteristics on its reliable and precise information flows management. Lately the issue of pharmaceutical supply chain management has got the attention of both researchers and specialised supply chain personnel as the pharmaceutical industry is expanding and becoming a global industry. Therefore, the Egyptian pharmaceutical companies should allocate more capital for research and development for the sake of gaining competitive advantages in certain medications. In addition, applying and analysing the supply chains involved in the pharmaceutical industry is a prerequisite for the pharmaceutical company's success locally and globally, by encouraging foreign investment by giving more attention to patent laws and conducting a benchmarking procedure with multinational pharmaceutical companies to allocate the points of strengths and weaknesses within the supply chain. In addition, the particular situation of pharmaceutical companies market, where final customers don't have the power of purchasing decision provides a distinctive configuration to their supply chains and supports certain characteristics of technic their supply chains information flows. Thus, pharmaceutical companies are developing integrated technical information flows systems, since they are essential for generating demand and gaining profits.

Technical information is massive and detailed which targeting a diversity of customers and market in the same country. Therefore, using ICT systems and several technological applications could reduce the drawbacks and increase efficiency in the overall supply chains performance. Therefore, the effective integrated information management flows is related to the success in the pharmaceutical business, especially in the ethical drug market, and practices can be extended to other technology-driven markets. Since information requirements are very different, companies must clearly understand and even, as pharmaceutical companies do, managed it separately from sales management.

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