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ARAŞTIRMA MAKALESİ / RESEARCH ARTICLE

SUPPLY CHAIN RISK MANAGEMENT: MOROCCAN PHARMACEUTICAL SECTOR CASE

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Abstract

Pharmaceutical systems are care settings characterized by the wide range of activities and scenarios with which they would be challenged. This causes interactions that result in unexpected scenarios associated with a variety of dangers such as variations in demand, risks associated with supplier relationships, and so on…. As a result, risk management appears to be a major issue for decision-makers. Today supply chain management needs to be dynamic and responsive to create added value, and mitigates these risks by using flexibility strategies to respond to change while remaining competitive. The goal of this research is to look into the supply and demand strategies used by pharmaceutical companies to respond to disruptions and avoid medicine interruptions for consumers. In this thesis the supply chain risk management strategies are basically connected to an empirical study done in 32 Moroccan pharmaceutical enterprises. Following that, the participants' responses were based on a questionnaire structured through the literature seeks to bring more detailed information about these strategies. Accordingly, the results showed that Moroccan pharmaceutical firms focus on some crucial activities such as supplier selection, flexible control, supplier control, vendor verification, and inventory management to account for supply and demand risk. Empirical studies in the field of pharmaceutical risk management are rare. Thus, the goal of this work is address the scarcity of empirical studies in this field by outlining several key risk management strategies used by pharmaceutical supply chain laboratories in the context of Morocco which are putting more resources into these vital strategies. Most of the supply and demand techniques of these firms are found to be proactive

Keywords: Supply chain risk management, Supply, Demand, Pharmaceutical firms.

TEDARİK ZİNCİRİ RİSK YÖNETİMİ: FAS İLAÇ SEKTÖRÜ DURUMU

Özet

Farmasötik sistemler, zorlanabilecekleri çok çeşitli faaliyetler ve senaryolar ile karakterize edilen bakım ortamlarıdır. Bu, talepteki değişiklikler, tedarikçi ilişkileriyle ilişkili riskler ve benzeri gibi çeşitli tehlikelerle ilişkili beklenmedik senaryolarla sonuçlanan etkileşimlere neden olur. Sonuç olarak, risk yönetimi karar vericiler için önemli bir konu olarak görünmektedir. Bugün tedarik zinciri yönetiminin, katma değer yaratmak için dinamik ve duyarlı olması gerekiyor ve rekabetçi kalırken değişime yanıt vermek için esneklik stratejileri kullanarak bu riskleri azaltıyor. Bu araştırmanın amacı, ilaç şirketlerinin kesintilere yanıt vermek ve tüketiciler için ilaç kesintilerini önlemek için kullandıkları arz ve talep stratejilerini incelemektir. Bu tezde, tedarik zinciri risk yönetimi stratejileri temel olarak 32 Fas ilaç işletmesinde yapılan ampirik bir çalışma ile bağlantılıdır. Bunu takiben, katılımcıların yanıtları, bu stratejiler hakkında daha ayrıntılı bilgi getirmeyi amaçlayan literatür aracılığıyla yapılandırılmış bir ankete dayanmaktadır. Buna göre, sonuçlar Faslı ilaç firmalarının arz ve talep riskini hesaba katmak için tedarikçi seçimi, esnek kontrol, tedarikçi kontrolü, satıcı doğrulaması ve envanter yönetimi gibi bazı önemli faaliyetlere odaklandığını gösterdi. Farmasötik risk yönetimi alanındaki ampirik çalışmalar nadirdir. Bu nedenle, bu çalışmanın amacı, Fas bağlamında farmasötik tedarik zinciri laboratuvarları tarafından kullanılan ve bu hayati stratejilere daha fazla kaynak ayıran birkaç kilit risk yönetimi stratejisinin ana hatlarını çizerek bu alandaki ampirik çalışmaların kıtlığını ele almaktır. Bu firmaların arz ve talep tekniklerinin çoğunun proaktif olduğu tespit edilmiştir.

Anahtar Kelimeler: Tedarik zinciri risk yönetimi, Arz, Talep, İlaç firmaları.

1. INTRODUCTION

Customer demands and requirements for quality and delivery in a fast and fierce global rivalry and fluctuations in demand have increased the risk sensitivity of the supply chain. Due to the obvious market environment's dynamism, businesses are more vulnerable to turmoil. The supply chain is subjected to different types of disruptions in terms of supply, procedures, changes in customer preferences, and governmental, economical, and technical variables, all of which have a negative effect on the organisation and the sustainability of movements. These interruptions get a serious influence on a company's capacity to keep operating and ship completed goods to markets. As a result, successful supply chain risk management has become a necessity for businesses seeking to reduce the impact of risks on their results and ensure the reliability of material flows across the supply chain. Managers would need to be aware of the dangers in order to devise strategies to reduce or minimize the disruption. Through interviews with medicine manufacturers, an essential part in the supply chain, this research attempts to present a viewpoint of supply chain risk management in the Moroccan pharmaceutical sector. Regardless of the fact that pharmaceutical manufacturers confront a variety of risk management measures that have not been explored, research on them is almost non-existent. The purpose of this work is to investigate the supply and demand tactics implemented by pharmaceutical businesses in order to adapt to disturbances and avoid medication interruptions for patients. At the same time, reduced disorders reduce business expenses and increase both price and quality requirements, as well as the happiness of customers, due to the continuous supply of medicines. Pharmaceutical companies employ a variety of risk management strategies, including

supplier selection, multi-sourcing, quality, communication with suppliers and consumers, raw material confirmation, inventory control, demand adjustment and forecasting. In conclusion, here are the questions we focused on answering:

- What are the risk sources in the pharmaceutical industry?
- What supply and demand management measures are pharmaceutical firms doing throughout the supply chain to limit the possibility and effect of risks?
- How do businesses put supplier management techniques into action? Customers demand? inventories? What strategies do they use when it comes to planning?

2. RESEARCH METHODOLOGY

Although risk occurs at many levels of an organization, in many roles, and at almost every hierarchical level, our research will concentrate on supply chain risks. Our research aims to better understand and assess how businesses are structured and organized in order to deal with such risks. This work is written to investigate how pharmaceutical firms adopt supply chain risk management in order to reduce the occurance of risks in the supply chain. The case might employ a variety of ways to acquire data and gather information. As a result, the research went with two means for data collection: semi-structured interviews with pharmaceutical businesses, and the distribution of a questionnaire to laboratories. Case studies are intended for a complicated and exploratory occurance that need a comprehensive and in-depth examination. Supply chain risk management methods are nevertheless withinside the investigation segment, and there's a significant shortage of studies on this field to reduce the effect at the business. One of the reasons why the research have selected a qualitative technique to take a look at the shortage of studies withinside the sector of supply chain risk management, especially research on SCRM is substantially weak. Thus, in order to provide and give a great deal of information and data, and to get the response of (how) and (why) questions, a case study looks more appropriate for this topic. Under this research method, an interview schedule was created to utilize in order to acquire information associated with the key research issue. The interviews contained questions derived from a thorough review of the literature. Meetings were scheduled and conducted with managers who are knowledgeable on the subject, and who have been selected accordingly to their awareness with and around the problem. In terms of the questionnaire, it is also seen as a tool for collecting information about the company. It is well-known for its benefits in terms of gathering huge numbers of people in a quick duration of time, with much less fees and with confined impact at the accuracy and consistency of questionnaire results. Additionally, some questions were offered to the respondents to gather information on topics such as : understanding of the idea of SCRM, import and export raw materials and medicines, and the roles of responders in the organization and their majors of operation validate the data's credibility. When data gets repeated and managers provide equal information, the interview was concluded.

The list of laboratories for this study was acquired from a database maintained on the website of Morocco's " Pharmacy and medicinal products directorate ". The database contains information about

40 Moroccan pharmaceutical labs. The 40 companies were contacted by phone for an appointment and only 32 companies were reached. Face to face interviews were arranged with 12 companies and 20 remote phone interviews with the other companies. In order to gather relevant information, we interviewed supply chain managers who were chosen based on their experiences and knowledge on the area of risk management. Managers have a strategic and operational understanding of the company's supply chain, interruptions, and plans. Before beginning the interview or answering the questionnaire, we clarify the aim and research question and assure the respondents that the company's identity as well as manager's will be kept secret and confidential. On average, the interview lasted 1 hour.

3. RESULTS AND DISCUSSION

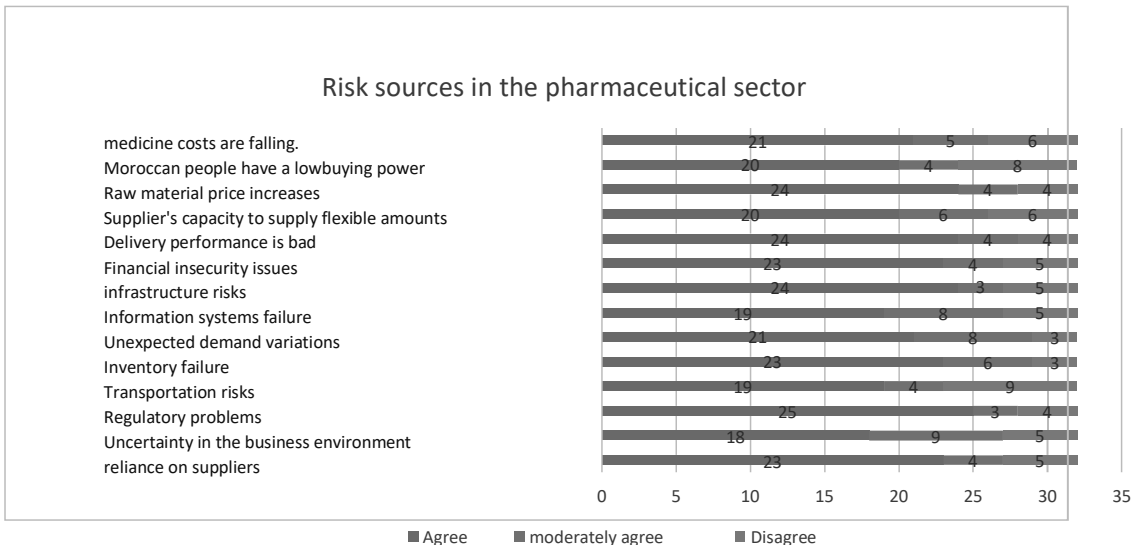
3.1. Risk Sources in The Pharmaceutical Sector

There are several sources of supply chain risk related to supply risks (related to raw material flows), demand risks (inaccuracy of forecasts, change in customer preferences), delivery risk, production risks (production capacity, employee risks), natural disaster risks and technological risks. Several authors have recognized that risks negatively affect the performance of the supply chain, whether at the financial, strategic or operational level.

In order to determine the risks affecting the pharmaceutical industry, we asked respondents to indicate in the questionnaire the level of criticality of the risks based on the three-point Likert scale: "Agree"; "Moderately agree"; "Disagree". The table and the figure below show the answers. The following risks are the most cited in the literature, and have a strong relationship with the pharmaceutical sector.

Table 0.1: Risk Sources in the Pharmaceutical Sector

Risk Sources	Agree	Moderately agree	Disagree
Medicine costs are falling	21	5	6
People have a low buying power	20	4	8
Raw material price increases	24	4	4
Supplier's capacity to supply flexible amounts	20	6	6
Delivery performance is bad	24	4	4
Financial insecurity issues	23	4	5
Infrastructure risks	24	3	5
Information systems failure	19	8	5
Unexpected demand variations	21	8	3
Inventory failure	23	6	3
transportation risks	19	4	9
Regulatory problems	25	3	4
Uncertainty in the business environment	18	9	5
Reliance in suppliers	23	4	5



The table as well as the figure show that the all risks mentioned constitute critical risks for pharmaceutical companies in Morocco. Risk analysis shows that this industry faces different types of risk. Thus, the risks that have a high number of "Agree" responses are: regulatory problems, risks of infrastructure failure, lead time for delivery of raw materials, increase in raw material prices, dependence on suppliers, stock-outs and financial instability issues. Therefore, pharmaceutical companies will need to pay more attention to these risks by putting in place compliant plans and strategies to address these risks.

Respondents also "agree" that the two risks of "falling medicine prices" and "low purchasing power of citizens" have a negative impact on pharmaceutical companies. Moroccan households support and finance a significant portion of medicine expenses, ie a rate of 40% of medicine expenses.

Therefore, the "National Pharmaceutical Policy" exposed by the Ministry of Health seeks to reduce the costly medical expenses of households for medicine by lowering their price. In addition, the 2025 plan claims to develop the "compulsory health insurance" (CHI) system and to create the "Medical Assistance Regime" (MAR) system as well as to address the lack of human resources (Ministry of health, 2018). The medical coverage plans (Compulsory Health Insurance or Medical Assistance Plan) aim to increase the number of target population. Less than 65% of the population is covered between CHI and MAR.

In order to compare the risk sources identified above, various articles were searched for pharmaceutical supply chain risk management in the bibliographic databases such as Google Scholar and Web of Science.... As a result, a survey paper was found addressing the similar subject and covering 9 articles relevant to this work interest. A table detailed the characteristics of chosen articles is given below. The total number of risks was 50, and they were derived from all selected articles and classified into seven categories based on expert opinions (supply and supplier issues, organization and strategy issues, financial logistic, political, market, and regulatory issues), as shown in the Table 4 below.

Table 0.2: Sources of risk in the literature

Risks	Category	Total/9
Supply and supplier issue		6
Partnership with supplier		3
Raw material quality		2
Ordering cycle time		2
Contract & agreements		2
Customization of supplier		2
Certificate of GMP		2
Flexibility of supplier		2
Fragmentation		1
Delivery reliability	Supply and Supplier issues	1
Environmental assessment		1
Technology level		1
Information systems		1
Good will		1
Technology development		1
Flexibility in delivering		1
Flexible quantities		1
Flexibility in product variety		1
Timely delivery		1
Quality management system		1
Customer services disruption		1
Inventory management		4
Operation issues		3
R & D		2
Skill of workers		2
Strategy		2
Planning issues		3
Information flow		1
Visibility on stock	Organization and Strategies issues	1
Organization & process		2
Mergers and acquisition		1
Time to market		1
Waste management		1
Production cost		1
Tax payable change		1
Currency rate		3
Financial risks		2
Tariff policies changes	Financial	1
Costs related to supply		1
Cash flow		1
Interest rate		1
Counterfeit		4
Transportation	Logistic	3
Market		2
Consumers taste	Market	2
Demand		2
Natural disasters and terrorism		3
Political issues	Political	1
Sanction		1
Regulation	Regulatory	6

According to this sample of articles and the table above, the most critical factors addressed were supply and supplier risks, additionally to the regulatory risks. It was also noticed the focus on inventory management, planning issues, counterfeit operation issues, partnership with supplier and natural disasters and terrorism. On the other hand, in the Moroccan pharmaceutical supply chain risks case, the respondents identified the most critical 14 risk sources, as the table 3 shows for pharmaceutical industry in Morocco. There appears that the regulatory problems, infrastructure failure, increase in raw material prices, dependence on suppliers and inventory failure are the most important risks that deserve attention. As a result, and by comparing the risks have mentioned in the both table 3 and table 4 above, the multiplicity of "sources of risk" found in the literature and in this work has been observed. However, it appears that the most common important elements on the topic of "source of risk", are supply side issues, regulation and inventory management issues. These are the most commonly seen descriptors in the literature on supply chain risk management, as recognized by respondents in the Moroccan pharmaceutical business. This remains a large number of risk sources that have not been appropriately treated.

3.2. Risk Management In The Pharmaceutical Supply Chain

Firms that do not have the capacity to prepare for and mitigate disruptions suffer in performance. Risk management strategies among manufacturers are similar to those described in the literature.

Companies, in fact, do not have the capacity to handle all risks; instead, they focus on the most important ones. As a consequence, pharmaceutical manufacturers efficiently deploy their resources in initiatives that play an important part in strengthening the supply chain's competitiveness. We asked respondents how they thought the supply chain would handle environmental disruptions.

One respondent specified that: "the fight against disruptions is characterized by a series of measures such as traceability, the choice of the right suppliers, the minimization of the dependence on the supplier, the control of the constraints of the supply chain such as regulations and documentation (import authorization issued by the Ministry of Health), working with carriers who have resources such as insulated boxes and who follow traceability, and the use of recorders for control the temperatures of the materials". Indeed, another respondent stated that the return of the business to its initial operating state depends on its size and presence in the market. Because, huge companies have the means to fight against disruptions.

3.2.1. Supply Management

This part discusses techniques for pharmaceutical companies to handle supply risks. We asked managers what techniques and strategies they employ for supply chain risk management and how they put these strategies in a practical way in the business. We also recommended some ways to assist them in answering the question.

3.2.1.1. The Selection of Suppliers

Moroccan regulation 17-04 relating to the medicine and pharmacy code requires that medicine be manufactured by laboratories in compliance with the requirements of Good Manufacturing Practices

(GMP) and Good Distribution Practices (GDP) which govern operations. of production and control to ensure the quality of a product. Thus, GMP demands that raw materials be obtained and regulated from certified and approved sources. Furthermore, in the pharmaceutical business, raw materials must meet the standards listed in the pharmaceutical product's marketing authorisation (MA) file. This file is submitted to the Ministry of Health in order to validate or deny the medicine's market launch. Compliance with these guidelines is an important aspect of ensuring the quality of medications.

The disruptions created by unreliability of suppliers have a significant influence on the pharmaceutical industry, which will cease production of the medicine. Furthermore, a company's performance is affected by the performance of its supply chain partners. The selection of the partner who will provide the producer with raw materials and components is a strategic decision in the pharmaceutical business since the medicine requires certified components. Supplier selection is viewed as a complex process based on several variables and is viewed as a proactive step to get excellent products. Respondents clarify that suppliers must fulfill Moroccan laboratories' requirements and criteria, and they emphasize the importance of supplier selection. Respondents frequently reported that they prioritize main supplier factors such as quality performance, pricing, and lead time. According to one respondent, "suppliers are chosen in priority for their quality according to the European and American pharmacopoeia, followed by price, commercial conditions, and the entourage of the suppliers (that is to say knowing the supplier's relations, its weight in the market, quality, if it works with recognized companies, it has no problems in terms of compliance with the laws)". He continues, "The suppliers are chosen in accordance with ISO and GMP (Good Manufacturing Practices)." The suppliers who are known for their performance in the industry and who work with well-known pharmaceutical manufacturers are chosen implicitly by other pharmaceutical manufacturers, as explained by the respondent: "we conduct a supplier prospection, we examine their dossier, and we send them a preliminary supplier approval questionnaire to learn about their process". The supplier must have the necessary accreditations and licenses from the pharmaceutical industry to demonstrate compliance with industry standards. Following that, he must have certificates proving the conformity of his installations, as explained by one respondent: "Before selecting a supplier, we evaluate the certifications of his foctories, installations, processes, and lines that must be certified". The suppliers of Moroccan laboratories accredit their suppliers. As an example, the supplier of the second tier, who is a material manufacturer, is approved by the supplier of the first tier of the Moroccan laboratory. One respondent explains, "There are agents who are our suppliers that provide approval to their material suppliers." The second-tier supplier is overseen by these agents in whom we have faith; if the material manufacturers are qualified by these agents, they are thus qualified by us; and these agents guarantee us of the supplier's quality. We have suppliers who are EHF (environment, hygiene, and quality) certified.

Some managers pointed out that suppliers are selected based on a procedure of selection contains : the first stage is prospecting with multiple suppliers. The second stage is pre-selection to select suppliers eligible for the specifications of the lab. The third stage of selection process is selection which entails selecting according to three standards : quality, time, and low cost. The lab will then keep going to monitor its suppliers, because following only this process is not enough to ensure supplier efficiency. Other companies are bidding to select efficient supppliers based on quality and price criteria.

3.2.1.2. Multi-Sourcing

Organization must sustain redundancy through resilient supply chain strategies that cannot prevent harmful events throughout the supply chain. Multisourcing is considered as a redundancy technique as well as a preventative method for avoiding supply risk. To minimize raw material losses, all respondents emphasized the necessity of supplier diversity. Some authors also emphasize the significance of multisourcing. Respondants, stated that it's necessary to maintain numerous suppliers for a single item. The risk of raw material availability is that it can result from the risk of supplier machine outages or long distance transportation. There is often a risk that the supplier is really the only source of the market and that there are no other option. In this scenario an interviewee indicated that the firm has five months in stock for this item and informs the supplier of the needs of the previous month in order to give the delivery and shipping time deadline for the raw materials to avoid breaking this item.

3.2.1.3. Supplier Collaboration

Furthermore, collaboration between supply chain partners enhances risk response time by exchanging information and knowledge. Respondents also emphasized the necessity of collaborating with suppliers in risk management. The supplier shares information with the product's procedures regarding rising raw material prices, official requirements, raw material shortages at the supplier's supplier, and so on. Another type of inter-industrial partnership in Morocco consists of "contracting" or "training" the production of medicine. Although, there is rivalry between these laboratories to lower high production costs and leverage the capabilities of producers, a laboratory may outsource its production to other laboratories known as formers or shapers.

3.2.1.4. Lead Time for Importing Raw Materials and Finished Products

Companies may be capable of trying to find their provider base across several nations in order to source raw materials that fulfill their standards and reap the advantages of cheaper prices, better flexibility, and high-satisfactory throughout nations, as well as open up new markets. Additionally, variables such as extensive distances and varying general market circumstances raise insecurity, impacting supply continuity owing to extended lead times and the likelihood of shipping interruption.

Excipients providers are available in Morocco, however active ingredients must be imported considering the fact that they're now no longer manufactured locally. Companies get their supplies via providers (representatives of their suppliers), who get their raw materials from their producers in other countries. Due to the lack of a domestic chemical sector capable of producing active compounds, the Moroccan industry is reliant on imported raw ingredients and packaging, which might cause problems in the case of delivery delays or broken stock. Other contributors indicated that representatives of providers are positioned right here in Morocco in order that they may be closer to Moroccan industrialists: "Before there were suppliers who are positioned internationally, but now the suppliers have representatives who are assembled here in Morocco who may be able to deliver raw materials and perform the function of middleman providers among us as a pharmaceutical laboratory and the producer of raw materials. It is useful for them for the reason that they'll be capable of marketplace amount in bulk and for ordinary objects and it's also useful for us in phrases of proximity, delivery prices and lead time".

Concerning imports and exports, according to our research, we discovered that imports seem to be more essential than exports. Imports of raw materials, packaging, semi-finished goods, and final goods are substantial (Figure 5). This reflects Moroccan industries' reliance on raw resources. Despite the domination of imports, there is a certain dynamic of national laboratories (Cooper, Galenica, Polymedic, Pharma 5, Laprophan, Genpharma, etc.) for exports that are starting to broaden their network towards African nations and certain European markets. According to economic studies on Morocco's pharmaceutical industry, the trade balance has recently indicated a deficit of 4.7 billion dirhams For the benefit of imports.

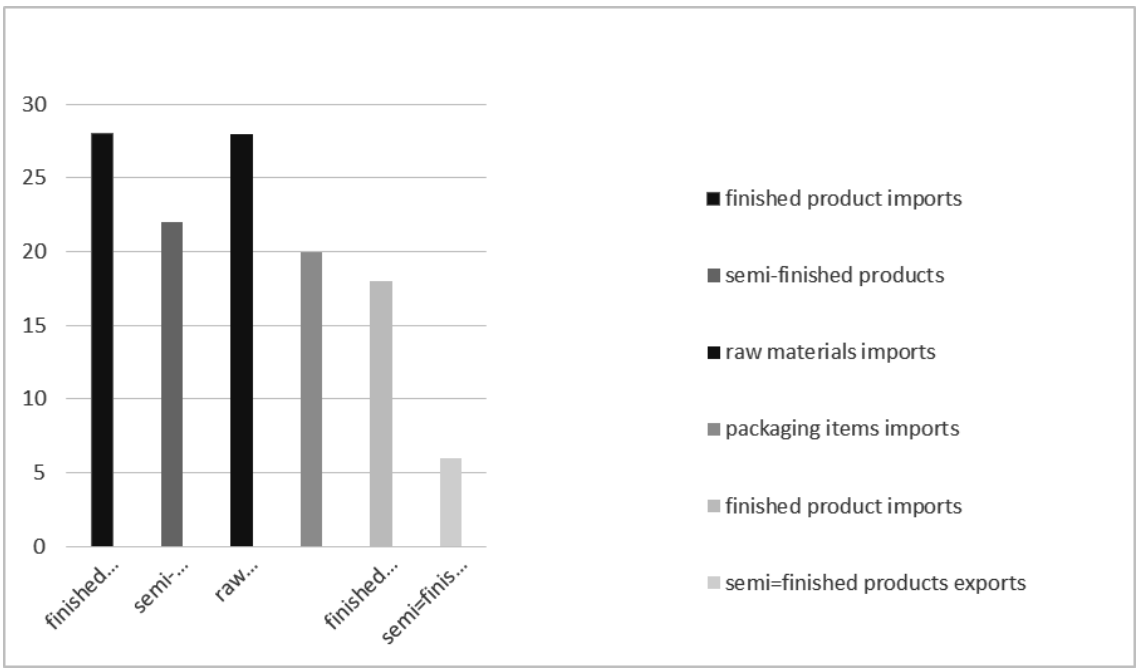


Figure 0.2:number of firms perform imports/exports

3.2.1.5. Supplier Control

In the pharmaceutical industry, supplier control is performed by frequent supplier audits and assists management in minimizing supplier risk.

Once raw materials are received, they are placed in quarantine, where samples are taken, inspected, tested, and released for use. Validation includes checking suitability of the supplier's material and packaging analysis report With the tests required by European pharmacopoeia industry standards. Then, when the tests described by the supplier match the results of the lab tests, the raw materials go into the manufacturing process for mixing and manufacturing of industrial batches. Finally numerous experts agree with the fact that risk control as the fourth step in the risk management process, is critical and significance. One of the respondents explain that the lab calculates performance metrics related to the delivery times on a quarterly basic, and that the company accommodates acceptable delivery time differences. Pharmaceutical laboratories subsequently provide these performance indicators to their suppliers to encourage them to improve their performance, and whenever they ask the laboratory to respond to complaints.

3.3. Customer Demand Management

Demand satisfaction parameter differ from one industry to the next. Pharmaceutical firms must consistently address the requirements of their consumers while also adopting to a changing environment. In fact, we cannot sell the product without the permission of our pharmacist. There are several ways available to meet the demands of customers. Variety of consumer demand planning, medication modification tactics, inventory management, company customer complaint resolution, reliability of delivery times, customer trust, and promotional approaches are used to control changes in demand in the pharmaceutical industry.

Laboratories are distinguished by complicated procedures, they don't follow the same procedures as their clients (wholesalers and pharmacists). They are an important link in the supply chain that perform multiple steps to meet customer needs, they are in charge of medication discovery, production, warehousing, distribution (from the site of manufacture to the wholesalers), and raw material supply. Their clients just manage inventory, collect, and ship customer orders, and do not face as many risks as pharmaceutical firms. The last one face a variety of internal and external risks, including transport-related risks, supply-related issues, information flow, shipping reliability, raw material labeling errors and risk, customer service concerns, research and development issues,production cost management, planning, medicine temperature control, and inventory management. In terms of new product development, this industry needs to react rapidly and cost-effectively to patient needs and requirements. Furthermore, substaintial research and development resources and costs are required in order to address or acheive the patient requirements for new medicines. Therefore, it must assure inventory management of raw materials and products to minimize warehouse stock and enhance forcasting. This supply chain delays not only harms pharmaceutical companies, but also affects consumers (wholesalers and pharmacies), which in turn can affect patients access to medicines and put their health at risk. Additionally, the industryaccomplishesa GRCL procedure, which consists of risk identification, assessment, and control due to the difficulty of the process. It carries out numerous supply chain operations in connection to other supply chain partners, including, supplier audits, product improvement, quality control, supplier qualifications and resolve clients complaints.

3.3.1. Demand Planning

Companies create demand calendars to suit shifting client requirements in order to be more flexible. Furthermore, the forcast information customers provide to their suppliers allows them to calculate their production capacity and expectations, as well as satisfy the manufacturing lead time. The majority of respondents say that planning is done over a longthy period of time through cooperation amongst the company's departments (internal pharmacist, production managers, planners,… etc). Simetimes, you forcast four years and then devide it into four months. The sales forcasting plan is converted into a manufacturing forcasting plan, and finally into a purchasing forcasting plan.

3.3.2. Medicines Adaptation to Customer Demand

Angkiriwang, Pujawan, and Santosa (2014) defined flexibility as "the capacity to adjust to unanticipated changes in the environment to accommodate a wide range of consumer demands while preserving client satisfaction at a low cost ". As a result, the corporation should be capable of addressing the

expectations of consumers through product diversification, the development of lower-cost medicines, the customization of medicines depending on patient segmentation, and the launch of innovative goods. Enhancing medication for patients is a method to assist the business environment's transformation. As a result, medications are supplied to pharmacists, distributors, and doctors for prescription to patients. Medical representatives or wholesalers play an important and cooperative responsibility for the provision of medication information to laboratories, and their aim is to market medicines. The information that pharmacists, sales representatives, or patients provide back to the lab is connected to adverse reactions in order to identify continual improvements for the medicine. Furthermore, based on the facts, the pharmaceutical business may anticipate the dosage forms of the goods (effervescent tablets or capsules, for example), the dose of the medicine (take the medicine once a day rather than twice or three times a day by the patient). Concerning doctors, according to one responder saying, a doctor recommends pharmaceuticals for patients based on their quality, efficacy, and efficiency (patient buying power or if the medicine is reimbursed).

Pharmaceutical businesses also are choosing a business coverage for the salling of their products via way of means of applying: **- The policy of verbal exchange** with medical doctors as one respondent explains: "The medical representatives provide an explanation for to the medical doctor the warning signs of the product, its advantages, its effects, they display him medical information (diagrams, medical pictures, drug check outcomes), innovations ". The verbal exchange policy additionally includes sporting out medical promotions, organizing congresses, supplying samples, merchandising, communication via the media, exhibits and fairs. **- The Distribution policy**, Relying on its plan, the laboratory may select between a direct circuit in which it sells directly to pharmacies and an indirect "Laboratory-wholesaler-pharmacy" circuit in which it supplies wholesale distributors who in turn provide pharmacies. **- The price policy**, for example, consists on sustaining bulk discounts. . **- Product policy**, include determining a product's packaging, the proper galenic shape of the medicine (liquid, spray, ointment, etc.), and so on. Pharmaceutical laboratories also have a customer service "after-sale" that is necessary and complies with GMP (Good Manufacturing Practices) requirements, allowing them to detect medication quality defects and implement remedial steps in response to customer quality complaints. In reality, one person indicated that there is a pharmacovigilance service that handles side effect reports. In addition, the product's life cycle and storage conditions can be enhanced. Similarly, the laboratory utilizes the medicine personalisation method at the trade name and package levels.

3.3.3. Inventory Management

Inventory is essential for customer service that requires products to be available. Inventory is calculated based on critical supply chain factors in order to create appropriate inventory and meet delivery dates. " What are the requirements for maintaining inventories ?" we questioned, based on the respondents experiences, the inventory is essential to avoid shortages and also noted that inventory represented extra expense and additional waste that had to be decreased. Furthermore, the legislation mandates pharmaceutical companies to hold inventory for three months in order to own appropriate supplies of medicines.

Respondents agree to the same response on essential inventory holding criteria. Numerous variables are found to obtain optimum quality of inventories, including inventories are also expensive, we shouldn't store them more, we must sell them, we keep budgets for stocks containing high-selling products, and we keep medicine inventories based on storage conditions such as temperature, financial condition, predictability of products, expiration date, seasonality of medicine sales, … etc. For example, we hold stock for items that are completely sold, and keep low inventories of items with low sales. Companies calculate the quantity to be ordered depending on last year's inventories. Inventory management systems differ from an organization to the next and based on replenishment on a set or variable date, and in a fixed or variable amount.

Two respondents indicated that inventories is handled using a first-in first-out (FIFO) technique. Orders are likewise handled sequentially, with the initial orders being produced earliest. The order includes the total amount, the order number, and the EDP system automatically advises the lots to create. According to one respondent: " In order to optimally handle demand uncertainty, orders are handled differently in different market types. "Make to stock" for the commercial sector (pharmacy and wholesaler) and "make to order" for the public sector (hospital) and export ".. Many persons handle the inventories, including the warehouse stock manager, the responsible pharmacist, the procurement manager, and the supply chain manager.

Information about orders is collected by the sales departments of wholesalers, pharmacies, public and private hospital laboratories and passed on to supply chain managers.

3.4. Supply Chain Risk Management Process

We asked professionals how they handle risk identification, evaluation, and management in general. In conclusion, interviewees confirmed that they need to meet regularly to discuss and plan issues (delays with supplies, manufacturing issues). According to one interviewee, managers are mindful of the risks discovered through exchanging data (emails, phones, … etc). Briefly, among the methods mentioned by interviewees for identifiying and evaluating information is the self-audit performed by a quality manager or another responsible for ensuring a quality audit by conducting a guided tour of a workshop to make observations and develop action plans. It has also been found that tools such as internet audit are widely utilized by pharmaceutical companies. Other techniques utilized include brainstorming, the GMP- mandated 5M approach (for quality control), benchmarking, DMAIC (define, measure, analyse, improve, and control), Ishikawa, FMECA, and (CAPA: corrective and preventive actions). Issues are also noted in order to keep track of previous incidents.

3.5. The Government's Involvement In Supply Chain Risk Management

In order to assure the public health safety, the ministry of health regulates medicines and pharmacies. The ministry should assure the regular supply of important items, as well as the quality and the safety of medicines with traceability. Furthermore, the ministry of health makes sure:

a. They set medicine prices.
b. Control inventory and tackles medicine problem stocks in clinics, hospitals,... etc.

c. The establishment of a pharmacovigilance center. The purpose of which is to gather information about the risks related with side effects after medication usage.

d. They organize an inspection that is a part of the pharmacy section of the department of medicine and pharmacy of the ministry of health. This examination is intended to ensure that the pharmaceutical industry is enforcing the requirements govering the production of pharmaceuticals, from the presentation on the creation of industrial projects to the pharmaceutical laboratory tests.

e. They make laws to prevent unwanted effects of medicines. They provide an advisory board on national pharmacovigilance for withdrawal of medicines that may pose toxic risks to the pharmaceutical sector.

Additionnaly, due to the unwanted consequences of some medicines, health authorities are starting to enforce risk management strategies on the production laboratory. Internationally, there is the international committee of harmonization (ICH) steering committee, and in November 2005, a handbook named " ICH Q9: Quality risk management " was published to organize quality risk management in the pharmaceutical sector. CIH Q9 recommends a guidance and explains a quality risk management methodology related to risk treatment and risk evaluation. The ICH Q9 goal is to provide a standardized and harmonized quality risk management program to simplify the international trading among businesses using ICH Q9 (OMS 2000).

4. CONCLUSION

This work's purpose was to examine the supply and demand risk management tactics implemented by Moroccan pharmaceutical producers.

According to the case studies, pharmaceutical firms are mostly adopting proactive tactics to reduce medicines quality issues and attach a high value to all procedures. According to our research, supply and demand risk management plans in Morocco are equivalent to the ones mentioned in the literature and described in the preceding paragraph, but the detailed explanations to answer the questions how and why about these techniques and practices don't generally exist, not only in the literature but also in the pharmaceutical field. According to the research, we can sum up that moroccan pharmaceutical companies focus on certain critical functions which including selection of suppliers, versatile control, supplier control, vendor verification and inventory management to take into account the risk of supply and risk of demand.

This research focused to clarify supply and demand strategies in Morocco's pharmaceutical industry, but it has been observed that a pharmaceutical company has other strategies for supply chain risk management such as quality control, preventive maintenance, production process management, new product development, etc.

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APPENDIX

THE QUESTIONNAIRE

1- What are your risk management strategies for the supply chain? (visibility, action plan, etc....)
2- How do you choose your suppliers ?
3- How do you carry out a supplier audit ? do you meet the requirements ?
4- Is it better to have several suppliers or to go with single sourcing ?
5- How do you keep coordination and communication with clients up to date ?
6- Do you plan? How do you handle time-sensitive orders ?
7- Do you keep stocks ?
8- Can the medication be improved ?
9- Do you have a risk management process in place ? what is an example ?
10- What steps do you take to manage risks ? what risk management precautions do you take ?
11- How do you choose risk management strategies (is it based on the effect and longevity of the risks) ?
12- How do you detect disruptions quickly (performance indicators, etc.) ? How can these disturbances be overcome in order to achieve stability ?
13- What actions are taken when an occurrence has been materializ