

# **A QUALITATIVE ANALYSIS OF PRODUCT INNOVATION IN JORDAN'S PHARMACEUTICAL SECTOR**

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## **Abstract**

Product Innovation, especially New Product Development (NPD) is critical for the continued success, development, and long-term growth of a company. Despite extensive research on how to achieve NPD success, NPD process remains a difficult and a highly risky venture. The research was conducted to investigate factors that affect NPD in the Jordanian pharmaceutical sector. Five factors were conceptually identified from past literature as initial factors. They include senior management support (SMS), cross-functional teams (CFT), customer involvement (CI), supplier integration (SI), and time to market (TTM). These five factors were used to build the basic research model as independent variables; whereas NPD was the dependent variable for the research model.

A qualitative research methodology was designed and used to achieve the research objectives. The needed data for this study was captured through personal interviews, and a survey that targeted all Jordanian pharmaceutical companies. The population from which respondents was chosen included research and development managers, marketing managers, and other personnel involved in NPD process in Jordanian pharmaceutical producing companies.

Through conducting a number of personal interviews and using Content Analytical Technique (CAT) for data analysis, the results of the research show the existence of a number of factors that affect NPD process in Jordanian pharmaceutical sector such as: SMS, TTM, CFT, R&R, Knowledge, and Technology. In addition, a number of factors were

identified as NPD challenges and constraints. These factors include the toughness and lack of clarity in R&R related to NPD process, the lack of financial and human resources, as well as addition to increasing DC.

This paper suggests several recommendations. Firstly, senior managements need to provide enough support to NPD process whether as financial, moral or any other kind of support. Secondly, companies have to take the necessary actions to speed up NPD process in order to get the benefits of introducing products earlier into the market. Thirdly, companies have to work hard to ensure higher levels of knowledge among their staff, especially those who are involved in NPD process by providing continued periodic training to them.

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**Keywords:** New Product Development (NPD), Product Innovation, Cross Functional team, Senior management Support.

## 1. Introduction

New Product Development (NPD) is a potential source of firms' competitive advantage particularly in a fast-paced or competitive market (Cooper, 2001; Trott, 2008). However, having an effective NPD processes is one of the most competitive tools that a company can acquire (Olson and Bake, 2001). On the other hand, the NPD process is recognized to be costly, complex, time sensitive, and risky. The harsh reality is that the majority of new products never make it to the launch stage, and those that experience failure rate are about twenty-five to forty-five percent (Crawford, 1987; Cooper, 2001). Booz et al. (1982) argue that for every new seven product ideas, about four go into development, one and half are launched, and only one succeeds. Given the importance of the NPD process for the success and development of companies and judging from the fact that new products have high failure rates, there are numerous examples of literature that investigate the NPD process, as well as the factors that influence it. While most of the literature is developed based on economics, this research is interested in extracting the most important factors that affect NPD process in the context of a developing country. More specifically, the research aims to establish the foundation of studying NPD in Jordanian pharmaceutical sector through highlighting a number of important factors within the firms that influence NPD. It also seeks to determine the main internal challenges and constraints facing Jordanian companies developing new products, and the limits in their ability to invent and develop. Moreover, the research suggests a number of needed recommendations based on research findings; these recommendations are related to the ways of enhancing NPD level in Jordanian pharmaceutical sector. It aims to provide a clearer picture of the

most appropriate internal work environment for NPD in Jordanian pharmaceutical industry.

The research is an exploratory qualitative research. It highlights some specialized pharmaceuticals factors such as pharmaceutical rules and regulations, including patency and registration requirements, and their expected effects on the NPD process. Also, it is one of the first studies that specialize in studying NPD in the Jordanian pharmaceutical sector. With regard to methodology, the study applies a qualitative research method to study NPD in this targeted sector.

The paper is organized as follows. After introducing the research problem, the research objectives and the research importance, the proceeding section gives an overview about the theoretical framework of the research. More specifically, section two introduces the literature review on NPD and some important factors that theoretically affect NPD. Section three shows the research methodology and data collection methods that were appropriately designed to collect the necessary data to meet the research objectives and criteria. Furthermore, additional explanations on the research type and the rationale behind using qualitative research, the research population, research sample, data collection method (personal interviews), interviews description and data analysis techniques were provided in this section. Moreover, the Operational definitions for research variables were presented in this section in addition to the research model. Section four presents the analysis and discussion of the collected data. Section five summarizes the paper and provides an overview of the main research findings, research recommendations, research limitations, and a prospect for future research.

### Literature Review

Previous research defines New Product Development (NPD) in slightly different ways (Ebrahim et al., 2010). Generally, NPD is the process that covers the design of the product and production system, introducing new product and start of production (Johnson, 2007). Griffin and Somermeyer (2007) stated that NPD involves "the overall process of strategy, organization, concept generation, product and marketing plan creation and evaluation, and commercialization of a new product" (p.488). Krishnan and Ulrich (2001, p.1) define NPD as "the transformation of a market opportunity and a set of assumptions about product technology into a product available for sale". In the handbook of "New Product Development", Loch and Kavadias (2008) describe the NPD to consist of the activities of the firm that lead to a stream of new or changed product offerings over time. This includes the generation of opportunities, selecting and transforming them into artifacts (manufactured products), activities (services) offered to customers, and the institutionalization of improvements in the NPD activities

themselves. Crawford (1987) identifies five stages of NPD process which includes opportunity identification and selection, concept generation, concept and project evaluation, the development stage, and final launching of the product. Although the literature provides a set of important factors that affect NPD, there are other factors that are effective. They include Senior Management Support (SMS), Cross-Functional Teams (CFT), Supplier Integration (SI), Customer Involvement (CI), and Time to Market (TTM) (Esteves and Pastor, 2001; Markus, 1981; Holland et al., 2000).

### **2.1 Senior Management Support (SMS) and NPD**

SMS consists of sufficient labor and physical resources, which are allocated with a clear empowerment given by the senior management to the development team for ensuring successful implementation of NPD project. SMS help to gain new products, projects, goals, and objectives; however, NPD properly integrates SMS to achieve strategic business goals (Esteves and Pastor, 2001). SMS is critical for gaining new product project consent to go ahead to earn the needed resources for enhancing the development process. Welti (1999) noted that senior management involvement and participation is critical to quicken firm-broad acceptance of development projects, in making rapid decisions, and getting sufficient resources for the project. In addition, it helps in building an effective relationship between R&D and marketing department (Gupta et al., 1986; Gupta and Wilemon, 1990). Thus, this is because R&D and Marketing Departments tend to have more concern about the project when they see senior management's involvement in NPD process (Swink, 2000). Therefore, SMS is determined as substantial for productive and fast NPD. SMS can create a conducive environment for creativity and innovativeness because it helps to overcome the functional obstacles, by allocating the necessary resources with the commitment spirit it could create (Jiang et al., 1996). Therefore, it is expected that Senior Management Support (SMS) is an important factor that leads to a successful NPD.

### **2.2 Cross-Functional Teams (CFT) and NPD**

A Cross-Functional Team (CFT) is defined as “a group of people with a clear purpose representing a variety of functions or disciplines in the organization whose combined efforts are necessary for achieving the team's purpose” (Zikmund, 2003). A number of scholars noted that building a CFT and credence of departmental joint responsibilities is positively related to a new product performance (Urban and Hauser, 1993). Customers' preferences should be deeply understood using a CFT, because it is essential for better performance of the new product (Joshi and Sharma, 2004). Coordination between functions are expected to be higher in NPD projects with cross-

functional structures (Griffin and Hauser, 1996). This is also expected to increase development efficiency, speed, and adherence to the budget (Gebert et al., 2006). Involving members with different experiential background and knowledge foundation is useful to gain a wide range of creative and useful ideas (Jehn et al. 1999). Furthermore, CFT may better help in overcoming any differences among functions by creating a shared environment of work, especially when focusing on a single goal (Griffin and Hauser, 1996; Olson et al., 1995) and adequate resources are available (Cooper and Edgett, 2008). A high quality NPD team is noted as adequate resource. Investing in education and training the cross functional team members is an effective way to obtain the needed knowledge and skills, and facilitate decentralizing decision-making (Krupat, 2011). Wang and Lee (2011) suggest several potential advantages of using CFT in NPD process. This process include controlling complexity, enhancing efficiency through avoiding time consuming, and costly revisions and stimulating creative ideas and solutions. Thus, it is expected that Cross-functional teams and how it is built is an important factor that leads to a successful NPD.

### **2.3 Customer Involvement (CI) and NPD**

Customer Involvement (CI) in NPD helps companies to better understand customer needs and desires, and it provides products that fulfill defined needs and desires (Zirger and Maidique, 1990). This helps in enhancing the concept of effectiveness of the developed product, and provides more ideas about new potential opportunities (Brown and Eisenhardt, 1995; Bilgram et al., 2008; Hippel, 1986). Yeung et al. (2007) argue that taking a customer into consideration during the design and development of a new products, gives an assurance that the product will be sold. Furthermore, more customers' involvement in NPD process may decrease adoption barriers of the new product. Hippel (1988) argues that customers often served as the idea generators and developers of products that would later become commercially significant. Cooper and Edgett (2008) argue that the voice of the customer represents the process that integrates customer into the development process starting at the very beginning of a project. In addition, CI can also encourage more intensive communication between persons involved in NPD process. Another benefit of CI in NPD is the facilitation of cross functional relations such as between R&D and marketing, where customer can play a mediating role in stimulating communication and reducing conflict (Li and Calantone, 1998). Cooper and Edgett (2008) suggest several methods of capturing the customer's voice. These methods include in-depth interviews, focus groups, ethnographic observation, brain storming, and information technology approaches. Previous research suggest several benefits of CI in NPD including some

operational benefits such as enhancing cost efficiency (Auh et al. 2007), reducing the cost of developing and marketing the new product, reducing lead-times, decreasing cycle time (Kristensson et al., 2002), enhancing customer satisfaction (Bendapudi and Leone, 2003), influencing originality of ideas (Kristensson et al., 2002), and improving service innovation. Thus, it is expected that Customer involvement (CI) is an important factor that leads to successful NPD.

## **2.4 Supplier Integration (SI) and NPD**

The supplier's role in the NPD process is also becoming increasingly important because of the wide range of knowledge and ideas that suppliers are able to share with manufacturers (Al-Zu'bi et al., 2012). Vertical integration is important in dominating products that are identified by ongoing radical innovation. According to Brown and Eisenhardt (1995), SI into NPD is one of the factors that affect the success of a project. The impact of the SI variables on project performance is clearly mediated by the degree of the component change (Hartley et al., 1997). However, effective integration supplies into NPD can help in reducing cost, improving the quality of purchased materials, reducing time to market, and improving the application of Technology. Strategic suppliers can determine the operating performance of the buyer, and play a pivotal role in the introduction of new technologies and new products (Womack et al., 1990). Close supplier relationships also have a positive impact on knowledge sharing and organizational learning (Dyer and Nobeoka, 2000; Sobrero and Roberts, 2001). High levels of integration and supplier involvement in NPD processes can therefore determine the competitive advantage of the buying firms (Bonaccorsi and Lipparini, 1994). The outsourcing of design and development activities is a strategic choice based on the availability and cost of engineering resources, in terms of competencies and skills. SI in NPD is one type of development outsourcing. An important element of outsourcing development for suppliers is to make good decisions about the type of supplier involvement in product development. Also, this is based on the content and timing of the involvement (Harbi et al., 2002).

Kessler and Chakrabarti (1996) suggest several benefits of supplier integration in NPD. These include: Firstly, SI in the development team provides more expertise and information regarding ideas and Technology of new products (Chakrabarti et al., 1989), and helps in identifying expected problems and in resolving them early (Wasti and liker, 1999). Secondly, the internal complexities of a product could be reduced by outsourcing and external acquisition, which is provided by SI (Brown and Eisenhardt, 1995). Thirdly, it helps in coordinating communication and exchanging information, and this result in reducing delays (Sikora and Shaw, 1998). Fourthly, SI

eliminates rework, because of accessibility; and production of parts can be considered early (Combs and Ketchen, 1999). Fifthly, it enhances suppliers' relationships by directing suppliers to internalize (Boerner, 2002). Although, there is an increasing evidence of the importance of SI in NPD process, not all efforts are successful. However, it is expected that Supplier integration (SI) is an important factor that leads to a successful NPD.

## **2.5 Time to Market (TTM) and NPD**

Time-To-Market (TTM) in NPD process can be described as the length of the needed time to get a product from an idea into the marketplace (Crow, 2004). It is considered as a critical competitive advantage for the firms especially in fast cycle industries (Stalk, 1988 and Stalk and Haut, 1990). A product's life cycle is decreasing every year, which is problematic when the customer demand is increasing dramatically (Chang et al., 2010). This makes responding quickly to customer requirements important, especially with increased complexity of product design and rapidly changing technologies (Chen et al., 2008). Moreover, the increasing number of competitors in the market, as well as a product's dependence on rapidly changing technologies, makes it a necessity to pay more attention to TTM, and to find the right way to optimize TTM probability. Going to market early, increases market dominance. It also increases the firm's long-term competitive strength (Kessler and Chakrabarti, 1996; Ford and Sterman, 2003; Carbonell and Rodriguez, 2006). Being first in the market is an important competitive advantage, especially for some pharmaceutical companies when a patent on an original product passes a way (Lieberman and Montgomery, 1988). However, more tolerance may be available for longer TTM when the corporate business base is strong (Christensen and Raynor, 2003). In addition, TTM becomes a key issue when the company growth slows down. Thus, it is expected that Time to Market (TTM) is an important factor that leads to a successful NPD.

## **3.0 Research Design**

The research is exploratory in nature, which aims at investigating factors that affects NPD in the Jordanian pharmaceutical industry. Zikmund (2003) argues that exploratory research is an "initial research conducted to clarify and define the nature of a problem". In order to investigate the aim of this research, a qualitative research method was used. However, the qualitative research method refers to "an unstructured, exploratory research methodology based on small samples that provides insights and understanding of the problem setting" (Malhotra, 2003). Rossman and Rallis (1998) argue that qualitative research occurs in the natural setting. The researcher often goes to the participants' place to conduct the study. Thus,

this enables him to develop bias towards an individual or place, and he inadvertently becomes involved in the actual experience of the participants. According to them, qualitative research uses multiple humanistic, interactive, and data collection methods in order to involve active participation by including open-ended observations, interviews, focus groups, documents, e-mails, scrapbooks, sound, and other forms. A qualitative research method was recommended in this research instead of using quantitative research methods for many reasons (Malhotra, 2003). Firstly, it is not always possible to use fully structured or formal methods to collect information from respondents. Secondly, people may be unable to provide accurate answers to questions that tap their subconscious. Thirdly, it is better to use qualitative research in conducting a study with small research population – like in this study where there are just twelve pharmaceutical companies, and a small number of respondents were expected to participate.

### **3.1 Research Population and Sample**

The research population represents all Jordanian pharmaceutical organizations that produce new products as mentioned in table 1. The targeted population encompasses all people who are involved in NPD process, such as the research and development (R&D), managers, and marketing managers. According to the Jordanian Association for Pharmaceutical Manufacturers (JAPM), there are twelve pharmaceutical manufacturing companies in Jordan. All of these companies were targeted in this research. Therefore, the research sample included research and development managers, marketing managers, and any persons involved in the NPD process of the companies as shown in Appendix 2. Five pharmaceutical producing companies were excluded from the study sample for different reasons such as acquisition, reconstructing, and non-response. Consequently, the study included seven pharmaceutical companies to get the required data as shown in Appendix 4.

### **3.2 Data Collection Method**

In this study, the in-depth interview method was chosen to collect the desired data. Interviewing is a systematic way to collect data and gain knowledge from individuals through conversation. This allows the respondents be involved and speak from their point of view. Malhotra (2003) identifies several advantages and disadvantages of in-depth interviews in comparison to focus group. He argues that interviews can uncover a greater depth of insight than a focus group. A free exchange of information from in-depth interviews may not be possible in focus groups. However, in-depth interviews require skilled interviewers who are expensive and difficult to find. The lack of structure of the in-depth interviews makes the results



susceptible to the interviewers influence, and the completeness and quality of the results depends on the interviewers' skills. The data obtained can also be difficult to analyze and interpret.

Semi-structured in-depth interviews are widely used in research. Hence, it gives the researchers more freedom than conducting structured one. The interviews conducted were between 30 minutes to more than one hour. It began with general questions that encouraged the respondents to talk freely about their attitudes toward the issue at hand. The interviews conducted in this study are individual (personal) interviews. Hence, the standardized open-ended interviews approach was chosen to conduct research interviews where a set of open-ended questions were prepared, carefully worded, and arranged to minimize variation in the questions posed to the interviewees.

Regarding the participant's selection process and the type of participants chosen to conduct the interviews, interview participants were chosen from people involved in NPD in targeted firms, either those working in R&D department, or those working in marketing or manufacturing departments. All identified managers and employees were contacted formally by e-mail after contacting the HR department in their companies. An electronic formal letter was sent through e-mails. Twenty six (26) potential respondents were contacted in order to interview them, but only fifteen (15) respondents were approved to conduct an interview. Furthermore, thirteen interviews were conducted successfully with managers in different positions such as: research and development manager, formulation manager, analytical research manager, registration officer, senior project manager, marketing manager, and sales manager.

Interview questions as shown in Appendix 1, were open-ended questions that allowed respondents to participate freely and describe their opinions using their own words and statements. The number of questions was carefully considered to prevent participants from becoming tired or disinterested. The first set of questions was concerned with the variables related to the company and its strategies, in addition to reflecting the personality and functional specifications of the respondent; also, it forms a prelude to the investigative variables that affect the dependent variables of the study. The second set of questions was designed to investigate the effect of a group of independent variables including SMS, CFT, SI, CI and TTM on NPD. The third set of questions aimed to investigate the most important challenges and constraints that NPD faces from the participant's point of view. This was conducted in order to construct a clear picture about the appropriate environment of NPD. A few simple rules were applied to insure that the questions were easily understood, for example, questions were designed to be short using simple language, which leads to a clear answer. Face and content validity test were conducted on the research questions by

showing them to a number of scholars, and then to some practitioners involved in R&D by means of an arbitration form. This form explains the research objective, and also, the objective of each group of questions chosen to collect research primary data. A digital recorder was used to record interviews, discussions, and answers. The recordings were copied later to a computer to facilitate coding and analysis of the collected data. After finishing all questions, the researcher asked the respondents if they wanted to add anything, and thanked them for their interest and the dedication of their valuable time.

Appendix 2 discusses the descriptions of the interviews, including the conditions of the interviews i.e. the respondent's position, interview time and place, the length of the interviews, and the most important issues discussed, as well as any additional circumstances during the conduction of the interviews.

### **3.3 Data Analysis Techniques**

Qualitative data analysis is the most challenging aspect of using the qualitative research method. Qualitative data consists of words and observations, but not numbers. However, using numbers requires creativity, discipline, and a systematic approach for the analysis. There is no single or best way to analyze qualitative data. Content analysis, by which texts is converted into numerical variables for quantitative analysis is a formal technique for analyzing qualitative data. According to Mostyn (1985), content analysis refers to "the diagnostic tool of qualitative researchers, which they use when faced with mass of open ended material to make sense of". According to Hsieh and Shannon (2005), there are three distinct approaches of content analysis: firstly, conventional content analysis, in which coding categories is derived directly from the text data. Secondly is the directed content analysis approach, which starts the analysis with a theory or relevant research findings as guidance for initial codes. Thirdly, the summative content analysis approach involves counting and comparisons of content or keywords, and also the interpretation of underlying context.

The directed content analysis approach has been chosen to analyze the collected data. Such analysis approach is convenient to the study, which already depends on an existing theory. This approach helps to focus on the research question; it may also provide predictions about the variables of interest, or about the relationships among variables (Hsieh and Shannon, 2005). This approach is guided by a more structured process than by conventional approach (Hickey and Kipping, 1996). The process begins by identifying the key variables as initial coding categories (Potter and Donnerstein, 1999). Then, operational definitions for each variable were determined using the theory or the related researches. An open-ended

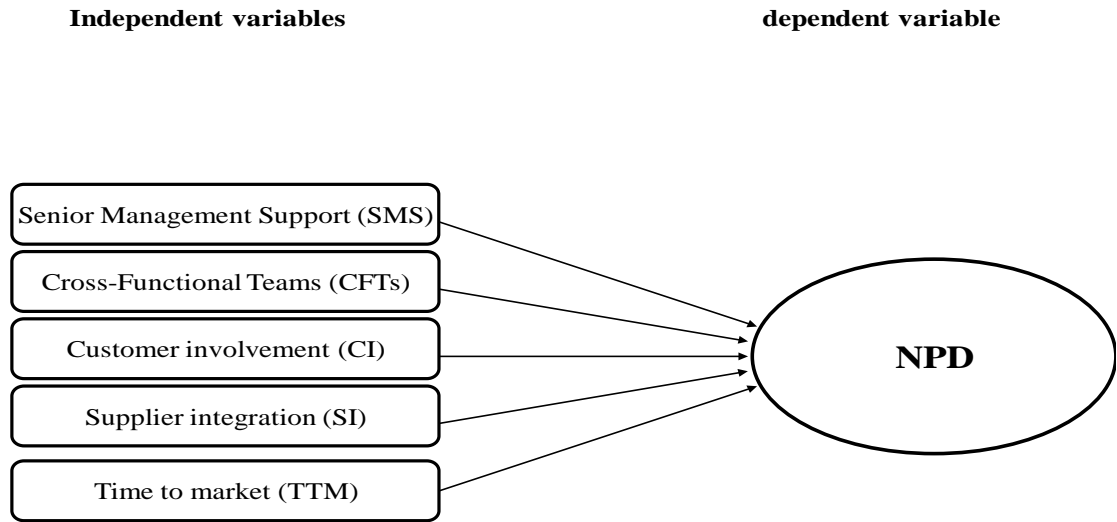
question was used, followed by a group of targeted questions for each predetermined category.

Editing is the first step in data processing; it aims to find and correct errors, which ensures that the data is correct and complete, and helps to reduce the biases as well. The interviewer should carry out editing for the first time as soon as possible after the interview. After that, office editing can be completed, either through “interview by interview” or “question by question”.

According to Jolliff (1986), coding describes the process of allocating codes to the collected data. This step can be conducted manually, and must be kept simple. Consequently, coding is dependent on the research questions. Firstly, various coding units such as particular words are normally constructed by the researcher which classifies the analyzed material. Then coding framework was constructed as a list of coding units vertically. Secondly, is the process of converting texts into symbols which is defined by the researcher or coder. The transcript had a way to highlight all text that appeared at first to represent an affective variable on NPD. All highlighted passages were coded using the predetermined codes. However, any text that could not be coded by the initial coding scheme had to be given a new code. Thirdly, the transcript validity test was conducted. The interviews transcripts were rechecked by another scholar to insure more validity. Fourthly, the process of scale construction was executed by grouping subset of symbols together. Fifthly, the qualitative data was quantified by counting each occurrence and evidence pertaining to each category using numerical data. However, the categorized data was summarized in the contingency table. All collected data were studied and analyzed in order to achieve the research findings.

### **Theoretical Model**

Depending on a number of studies in the literature, five factors were conceptually identified as initial factors, which are SMS, CFT, CI, SI, and TTM. These five factors were used to build the basic research model as independent variables; and NPD was the dependent variable for the research model. The basic research model is shown in figure 1 as follows:



**Figure 2: Basic Research Model- Note: the refined research model is introduced based on the research findings**

#### 4.0 Research Results & Discussion

The research results are shown in the contingency table; see Appendix 3. The Pearson chi-square goodness-of-fit test was used to analyze the contingency table. It is used to test initially, whether the row classification factor and the column classification factor are dependent. The test calculates the counted frequencies for studied factors to compare expected and observed frequencies for each factor, and then sums up their differences (Everitt, 1992; Beasley and Schumaker, 1995; Agresti, 2007). The chi-square test for all study constructs is ( $X^2=159.610$ ,  $p<.0001$ ,  $DF=11$ ). As the computed p-value ( $p<.0001$ ) is lower than the significance level  $\alpha=0.05$ , it is found that there is a significant correlation among variables which gives significant differences between the counted and expected value. A significant result for this measure means that its worth to use cells of contingency table which discovered some real effects, and which can be interpreted.

Inconsequentiality, the research results reveals significant differences in the frequency counts of participants' positive and negative views, experienced through their involvement in NPD. The number of total incidents for each variable is important to find the relative importance of these variables. The relative importance of the variables can be calculated by

dividing the number of variable total incidents by the total number of incidents of all variables. For example, SMS relative importance =  $248/594 = 0.418$

The balance between positive and negative counted values is helpful in detecting the influence of each variable on NPD, either positively or negatively. For example, the balance between positive and negative counted CI related incidents is 38. Therefore, CI affects NPD positively. Also, the expected values are considered as an indicator of the extent to which the counted values are statistically logical. For example, the balance between positive and negative expected values that is related to TTM variable is 54.88. However, this means that the statistically expected effect of TTM on NPD is positive. This is consistent with the investigated result depending on the counted values of 48 (positive influence). Therefore, these expected values support and increase the result credibility.

Contingency table results show that the biggest factor affecting NPD is SMS. The count was around 198 positive, and it was around 31 higher than expected. Positive and negative occurrences of SMS were both important from the respondents' point of view with 223 and 25 repetitions respectively. Respondent (8) states that *"SMS is a very important factor that helps in gaining project goals and objectives and properly integrates it into achieving strategic business goals..... New products with a strong management orientation, have management commitment and a strategic focus, and are more successful than others"*. Respondent (4) argues that *".....In general, senior management support comes in the form of sufficient resources allocated in terms of both labor and the physical resources. It also includes clear authority and power given by the top management to the project leader and team members for ensuring the success of project implementation. The main elements of SMS highlighted by participants were financial resources, human resources, employee training and motivation, empowerment, in addition to financial and moral support....."*

The research results are consistent with the previous research findings that address the importance of SMS in NPD success (Cooper and Kleinschmidt, 1994; Gupta and Wilemon, 1990; Zirger and Maidique, 1990). Therefore, this is because senior management involvement and participation is critical to foster firm's broad acceptance of the development project, to make decisions quicker, and to get sufficient resources for the project (Welti, 1999). Also, it helps in building effective relationships between R&D and the marketing departments (Gupta et al., 1986; Gupta and Wilemon, 1990), as they tend to show more concern about the project when they perceive senior managements' involvement in the NPD process (Swink, 2000). So, SMS is considered substantial for a productive and fast NPD.

The second factor affecting NPD is Time to Market (TTM) factor. There is a balance of 48 positive occurrences of TTM, which is around 4 less than expected. From the participant's perspective, both positive and negative elements are important, which counted at 74 and 26 repetitions, respectively. Statistically, results show that TTM has a positive effect on NPD process. Respondent (8) argues that *"Responding quickly to customer requirements is very important, especially with the increased complexity of product design and rapidly changing technologies, so that building the right set of NPD is critical to the long-term success of the firm"*. Respondent (13) said that *"The increasing..... number of competitors in the market for market share, and increasing products dependence on rapidly changing technologies provides a necessary need to take care of TTM, and also find the right way to optimize this factor probably"*. He added, *"TTM is important for the new product development from marketing issues ...companies always strive to be the first generic in the market, which has a positive impact on the market share of the product. Also, there is a legislation relating to pricing....The former in the market have a price higher than the rest, and so "*. Respondent (3) stated that *"all companies are racing during NPD process time.....This issue is important for success in New Product Development ...That depends on your ability to configure the product and be the first in the market..... time is a critical factor."*

The research results are consistent with the previous research findings that address that TTM is considered a critical competitive advantage for the firms (Sanchez and Perez, 2006) especially in (fast cycle) industries (Stalk, 1988, Stalk and Haut, 1990). This is because of the fact that going to market early will increase market dominance, which also increases a firm's long-term competitive strength (Kessler and Chakrabarti, 1996; Ford and Sterman, 2003). However, companies can become more successful by providing high quality products within shorter product development times than their competitors (Meyer and Utterback, 1995).

The third factor positively affecting NPD process is using Cross Functional Team (CFT). There is a balance of 44 positive occurrences of (CFT) around 4, more than expected. Both positive and negative views were counted at 54 and 10 respectively. Results showed that using CFT has a positive effect on NPD process. This is because using CFT shows a higher level of communication between different divisions, which will increase efficiency while solving issues at hand. This idea was explained by respondent (11) who said: *"Yes, it is important to use the (CFT), because the work done by the R & D department will be translated later into products which will be linked to the nature of the case with the work of other departments; however, it must involve them, but in a certain way, and it will be better when the company's business is divided by projects"*. NPD needs

the involvement of different units in a multi disciplinary process (Olson et al., 1995) to allow share of information, and proper interaction and cooperation (Griffin and Hauser, 1996). A number of scholars noted that the use of CFT and the adoption of departmental joint responsibilities is related positively to new product performance, including the time of development and marketing of the new product (e.g. Cooper and Kleinschmidt, 1994; Griffin and Hauser, 1996). Coordination between functions is expected to increase in projects with cross-functional structures (Griffin and Hauser, 1996). This is also expected to increase development efficiency, speed, and adherence to budget (Gebert et al., 2006). Nevertheless, involving members with different experiential background and knowledge foundation is useful in gaining a wide range of creative and useful ideas (Sethi et al., 2001). In addition, CFT may better assist in overcoming differences among different functions by creating a shared environment for work, especially when focusing on a single goal (Griffin and Hauser, 1996; Olson et al., 1995). A number of respondents confirmed these ideas, as respondent (4) said: *"The existence of CFT is an essential element in the success of any new product, it facilitates a high coordination among several departments...it helps to employ control in advance and the upcoming new product development becomes easier because each stage is arranged in advance, which saves time and effort in our company"*. Respondent (1) mentioned that: *"These teams are working to save time, and therefore, early access to the market"*. Consequently, Eisenhardt and Tabrizi (1995) argue that the potential advantages of using CFT can be summarized by: first, controlling complexity, that when expertise in CFT is combined to simplify the achievement of the task at hand, the task is expected to create more success than working individually or in functional groups. A second advantage is the efficiency that CFT enables, by integrating development steps and avoiding time consuming and costly revisions. Third, CFT can stimulate creative ideas and solutions.

The fourth factor affecting NPD positively is CI. There is a balance of 38 positive occurrences of (CI), 3 more than expected. Positive and negative occurrences of (CI) counted at 48 and 10 repetitions respectively. Statistically, results show that CI has a positive effect on NPD process. This is because consumers are able and willing to provide ideas for new goods or services that may fulfill needs that have not yet been met by the market, or might improve on existing offerings. This is confirmed by participant (12) who mentioned that: *"The customers' feedback is usually considered as an important factor for introducing new product...this includes the proposals and ideas for new products, and that is usually taken into account ....."*. According to Yeung et al. (2007), taking the customer into consideration while designing and producing the products for them, provides

an assurance for the manufacturer that the products will sell. Involving users more in the process may also lower barriers to adopt new innovations, as well as gaining benefits in marketing and customer relationship areas. This was confirmed by participant (2), who mentioned that: *"Involving clients in new product development process is considered as a type of partnership that facilitates the adoption of the product when it is put on the shelf"*.

There is a lot of literature that argues that CI has a positive effect on new product success by enabling the company to explore additional creative opportunities. Li and Calantone (1998) argue that CI also enhances product fitness to the market (Brown and Eisenhardt, 1995). Respondent (9) said: *"through CI, it is possible to take advantage of customers' feedback to see the market trends and the demand for the product, and this is done at the stage of choosing the pharmaceutical product to be developed"*.

The fifth factor affecting NPD positively is SI, which averaged 11 positive occurrences, 11 less than expected. The research results demonstrate 36 positive and 25 negative notions concerning SI. Statistically, the research results show that SI has a positive effect on NPD. Products that are characterized by continuous radical innovations should be governed by vertical integration. Thus, SI into NPD process is considered one of the factors affecting the success of the project (Brown and Eisenhardt, 1995). Respondent (5) mentioned that: *"I see that suppliers' experience is really necessary in developing new products especially regarding the availability of the raw material that is required in the new product....."*.

The sixth factor affecting NPD is the Team Work Spirit (TWS) which averaged 8 positive occurrences, around 2 more than expected. There were 8 positive and 0 negative statements. The research results show that there is a positive effect of TWS on NPD process. One participant (3) said: *"There is also the administrative environment that characterized our company....I always tries to permeate the team spirit within our company. Every employee contributes to his role in the development process....the environment should be characterized by fairness and equity, and that broadcast steam spirit..... their contribution has a good effect on NPD success "*. In addition, another three respondents recognized TWS as an important element for the appropriate environment for NPD.

The last two factors that affect NPD positively are Knowledge and Technology, with balance counts more than expected. Five positive occurrences and zero negative for both knowledge and technology. Respondent (3) mentioned that: *" All R&D works are based on information and knowledge.....Our work is cognitive rather than a compilation of scattered data... through our department, we have to prove experimentally that the product is consistent and efficient .....there is a difference between knowledge and information; information can be presented in the form of*



*articles and figures, but the important thing is knowledge, it is the basis for research and development.* "Another respondent said: "We can excel when we have new technology". Therefore, there is a positive effect of Knowledge and Technology on NPD process.

Moreover, contingency table 3 shows that one of the factors that affect NPD negatively is the Rules & Regulations (R&R) factor. There is a balance of 26 negative occurrences of R&R factor, 21 more than expected. There were 2 positive and 28 negative statement concerning R&R factor. Statistically, results show that there is a negative effect of R&R factor on NPD process. This result was confirmed by respondent (11) who said that, *"The most important challenges that hinders the development of new products is the difficulty of laws and health legislation.....the lack of clarity sometimes in some markets are also considered....intellectual property rights that we recognize and respect is also considered as one of the challenges that works in the development of new products"*.

The last two factors affecting NPD negatively are the Cost of the development process and the market Competition, which averaged -5 and -4 occurrences count, respectively. From respondent's point of view, cost of equipment, raw material, Technology and labor will decrease the overall product profit, which will affect a company's goal and ability to spend on NPD. Respondent (8) confirmed that, *"the development cost is also considered one of the challenges of new product development"*. Another one said *"Other factors that affect the development of new products are the competing pharmaceutical companies in the Gulf area ...most of the Jordanian expertise prefer to work abroad for competitive salaries."*

Research findings show that there are other factors that are identified by research respondents as challenges and constraints. They include the difficulty and lack of clarity regarding rules and regulations, lack of necessary human resources, lack of adequate financial support, lack of needed Technology, lack of moral support for the staffs, rising development cost, high degree of product complexity, lack of job stability, delay in the deciding on development, and fluctuations in the markets. The appropriate environment (AE) for NPD can be described from respondents' point of view to include the following requirements: Providing the appropriate administrative environment; presence of management aware of the importance of NPD and having a vision that supports R&D, as well as promote team work spirit; dissemination of positive culture at work, in addition to appreciation and respect for employees and follow up employee stability; enough work knowledge within each department and finding specialized teams for tasks; the availability of needed financial resources, motivating employees, supporting them financially and morally, and making them feel they are important; enough care about HR through providing

needed experience and training; providing appropriate technical environment for development like providing needed equipment, communication tools, good work conditions, appropriate work place, and enough work space. Moreover, the availability of good markets and enough market size is also important.

Depending on the research findings, research model was restructured to represent factors that affect NPD in the pharmaceutical sector in Jordan. The refined research model shown in figure 2 is as follows:

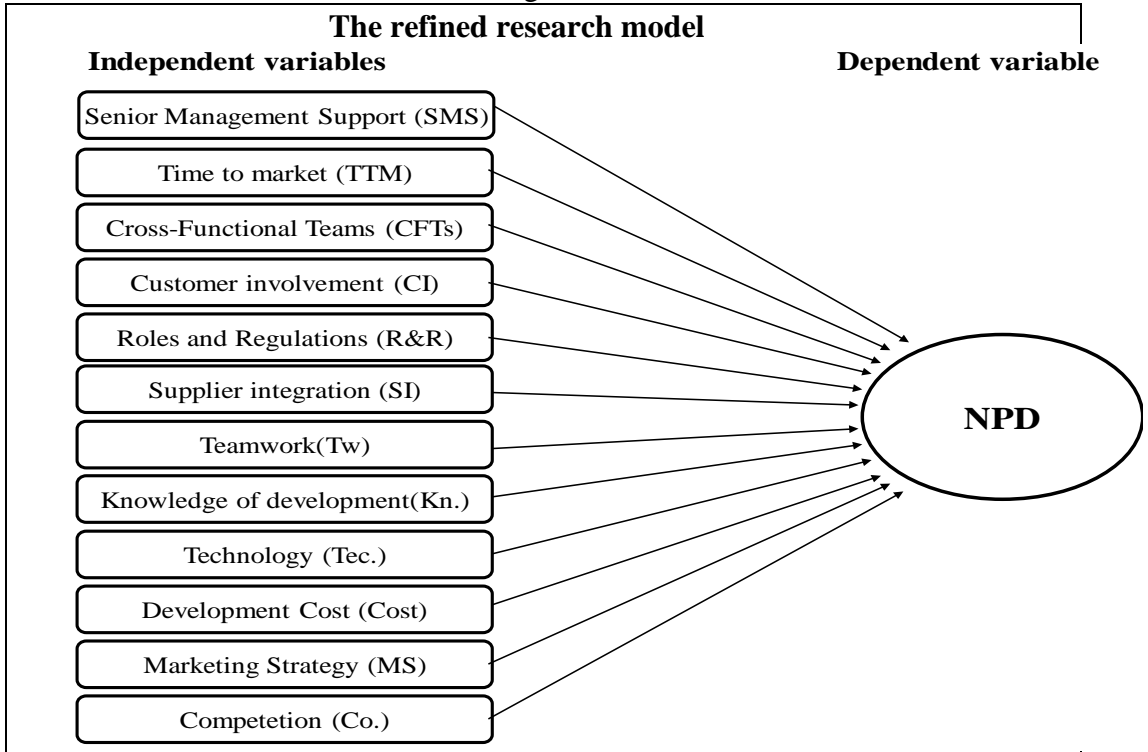


Figure 3: **Refined Research Model.**

### 5. Conclusion, Recommendations, Limitation, and Prospects for Future Research

The research investigated the most important factors that affect NPD in Jordanian pharmaceutical industry. The research results show several positive and negative factors that influence NPD process at Jordanian Pharmaceutical companies. More specifically, the research results illustrates that the main positive factor affecting NPD is the Senior Management Support factor, which includes financial resources, the human resources, employee training and motivation, empowerment, in addition to financial and moral support. The Second factor affecting NPD is TTM. Statistically, the research results show that taking the due diligence on TTM factor has a

positive effect on NPD. The third positive factor affecting NPD is performing CFT in NPD process. The fourth positive factor affecting NPD is customers' involvement especially at the ideas generation stage in NPD process. The fifth factor is R&R that statistically affects the NPD process negatively. The sixth factor is SI that has a positive effect on NPD. The seventh factor affecting NPD is the team work spirit, and was considered as an important element of the appropriate environment for NPD process. In the eighth rank, there are three factors affecting NPD as follows: Knowledge which affects NPD positively, Technology which affects NPD positively, and development cost which affects NPD negatively. Marketing strategy and Competition comes in the ninth rank. Marketing strategy was found to be affecting NPD positively, while market competition has a negative effect on NPD.

Moreover, the research findings show that there are several key factors that are identified by research respondents as challenges and constraints, including the toughness and lack of clarity of R&R, lack of necessary human resources, lack of adequate financial support, lack of needed Technology, lack of moral support to the staff, rising development cost, the high degree of product complexity, and the lack of job stability.

As a result of the finding of the research, the study comes out with a few recommendations to enhance the process of new products development. First, referring to the study findings, SMS was determined as the most important NPD driver, so it is important to afford enough support from senior management to enhance NPD processes. Firms can offer SMS in several forms like financial support, moral support, human resources, motivation, and empowerment. Therefore, companies have to provide the appropriate administrative environment, including management consciousness about NPD importance, a managerial vision that support NPD, positive work culture, job stability, and employee appreciation, respect, and follow up.

In addition, companies have to show enough care to human resources through providing them with the needed experience and training. Moreover, companies have to insure enough work knowledge within each department and find specialized teams for work. Moreover, companies have to provide the appropriate technical environment for development, like providing the needed equipment, communication tools, good work conditions, appropriate work place, and enough space. The second issue that is important to take into consideration is TTM. Companies have to speed up NPD processes in order to get the benefit of going early to the market. Some important issues can help to reduce TTM like doing some work stages in parallel way, not delaying in making the development decision, and in choosing the appropriate suppliers. Thirdly, companies have to use CFT, which helps in

influencing NPD process and increasing their speed of development. This may be by insuring a higher level of interaction and coordination between deferent functions while conducting NPD stages. Fourthly, companies have to "listen to the customers' voice" by involving them in NPD, especially in the stage of idea generation, and also when choosing a new product to develop. Fifthly, health authorities have to ensure more clarity and flexibility of R&R which is imposed on the companies working in the Jordanian pharmaceutical sector in order to facilitate and accelerate the process of NPD. Sixthly, companies have to choose the appropriate suppliers more carefully because of their effect on NPD process from the beginning of development. Therefore, it is important to ensure that the selected supplier has the needed documents to fulfill health authorities' requirements, to facilitate the registration of the new product. Furthermore, firms have to ensure the supplier's ability to provide the needed quality support and technical support, in order to prevent the loss of development efforts. Seventhly, top management has to promote a teamwork spirit in the firm to facilitate and enhance the NPD process. This is due to the positive effect of team work spirit on development team performance.

Eighthly, companies have to work hard to achieve and maintain a high level of knowledge especially within research and development teams. This can be insured by implementing periodic training programs for NPD teams, maintaining the available competencies in the companies, and also using external expertise if needed. Ninthly, recognizing the high importance of Technology, companies must afford the appropriate technological tools that are needed for NPD. This can facilitate most stages of the NPD process, and upgrade the level of outcomes. Tenthly, companies have to work hard to reduce NPD cost. There are many ways to reduce DC like making the right choice to develop and choose the appropriate supplier that can afford the needed materials, with high quality and low prices. Using CFT can increase the level of communication, interaction, and coordination between employees; and accordingly, reduce mistakes and DC. Moreover, marketing management has to set the appropriate MS that takes into consideration the customer needs, research and development capabilities, and the capacity to be smart enough to beat competitors.

On the other hand, there are many limitations to this study and it is useful to mention them in order to help future researchers. The first issue is that there is only one research method used in this study to collect the needed data, which is qualitative research method. Therefore, it is worth it, to use additional method of data collection (quantitative data collection method). This is because triangulation helps to avoid any weakness in one method using an additional method of data collection. The second issue is the lack of previous literature conducted, especially about new pharmaceutical products,

pharmaceuticals products, and Technology and pharmaceuticals R&R. The third limitation of the study is that there was limited access to managers and employees working in Jordanian pharmaceutical companies, and so, only just a few of them confirmed participating in this study. A small number of interviews were conducted to investigate factors affecting NPD. Conducting interviews with a larger number of employees could give more comprehensive picture of NPD in Jordanian pharmaceutical sector.

There are a number of issues that have emerged for future researches. These issues can be summarized as follow: Firstly, a similar study can be conducted using the compound research methodology by implementing a quantitative research method in addition to the qualitative research methodology. This can help to increase meaningful interpretations of the findings (Hartley and Chatsworth, 2000). Secondly, future researchers can implement this study on other pharmaceutical markets, such as Saudi Arabia. It would also be useful to conduct a comparative study between two markets. Thirdly, looking for another area of future research in light of the limited access to Jordanian pharmaceutical industry, it is beneficial to study NPD influential factors in different industry with different kind of products. This may provide a larger access to the needed respondents. Thus, it also helps to draw a clearer picture of NPD. Fourthly, according to the high relative importance of SMS as an influential factor affecting NPD, it is valuable to conduct a study that focuses on SMS affect on NPD. This can be done through investigating the most influential factors of SMS and the relative importance for each factor influencing NPD. Moreover, there are several additional factors that were investigated in this study to affect NPD. These factors include R&R, TW, Knowledge, DC, MS, Technology, and Competition. Therefore, there is an opportunity for future researchers to conduct studies that focus in depth on the effect of these factors on NPD.

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## Appendix 1: The research Interview Questions

<b>The Research Interview Questions</b>	
<b>#</b>	<b>Company Related Questions</b>
1.	Please introduce yourself.
2.	Could you talk briefly about the company, please?
3.	Are you involved in NPD process?
4.	Does the company have an independent department for NPD or R&D?
5.	How much is the company interested in NPD?
6.	Which kind of new products the company usually develops, and are they completely new, or modifications of existing products?
7.	What are the most important sources of information that the company depends on to get new product ideas?
8.	What are the most important factors that affect NPD process?
<b>Senior Management Support</b>	
1.	To which extent is senior management support important to new product development process?
2.	How can senior management support affect NPD process?
3.	To which extent does management in company adopt NPD concept?
4.	Which kind of support usually delivered by senior management for NPD, material, moral, monetary, labor, external experiences or motivation?
5.	Does senior management allocate a specific percentage of money to spend on NPD process?
6.	Does senior management involve directly in NPD process, and in which stages?
<b>Cross Functional Teams</b>	
1.	What does CFT means to you?
2.	What are the main teams or units that are usually involved in CFTs?
3.	Is having CFT important to NPD process?
4.	What kind of effect does CFT have on NPD?
<b>Supplier Integration</b>	
1.	Is it important to integrate suppliers in NPD process?
2.	How can suppliers affect NPD?
3.	What type of suppliers that usually get involved in NPD process?
4.	In which development stages do suppliers usually get involved?
<b>Customer Involvement</b>	
1.	Is it important to involve customers in NPD process?
2.	Do customers usually get involved in NPD process?
3.	In which stages it is useful to increase customer involvement in NPD?
4.	How can customers affect NPD?
<b>Time to Market</b>	
1.	What does TTM mean to you?
2.	Is TTM factor important for NPD?
3.	How can TTM affect NPD?
4.	Is TTM factor important to be planned for?
5.	What are the main advantages and disadvantages of TTM factor?
1.	What are the most important challenges and constraints for NPD?
2.	How can you describe the appropriate environment for NPD?

## Appendix 2: Interviews Description Summary

Number	Company	Respondent Position	Date	Time	Length of Interview	The Raised Issues
1	A	Sales and Marketing Manager	3/5/2013	1:00 PM	28 Min.	<p>A number of issues were discussed, like to which extent is the company interested in NPD; what are the most important information sources that company depends on to get new product ideas, the different kinds of new products; the most important factors that affect NPD; the importance of the knowledge and experience for NPD, in addition , the most important challenges and constraints for NPD. Moreover, the respondents gave a description of the appropriate environment for NPD. HR department in the participating companies confirmed the interview after sending the approval request with interview questions by e-mail.</p>
2	B	R&D Manager	3/6/2013	11:00 PM	50 Min.	
3	C	Marketing Manager	3/13/2013	11:00 PM	45 Min.	
4	D	R&D Manager	3/20/2013	11:00 PM	40 Min.	
5	E	Formulation Manager	4/9/2013	11:00 PM	47 Min.	
6	F	R&D Manager	4/9/2013	3:00 PM	76 Min.	
7	D	R&D Laboratory Manager	4/14/2013	11:00	45 Min.	
8	A	R&D Manager	4/14/2013	1:00	40 Min.	
9	G	Registration Officer	4/15/2013	12:30	16 Min.	
10	G	Senior project manager	4/30/2013	10:00 PM	40 Min.	
11	G	R&D Manager (Oncology)	5/6/2013	11:30 AM	50 Min.	
12	G	Marketing Manager	5/19/2013	1:00 PM	41 Min.	
13	G	R&D Manager	6/17/2013	1:30 PM	27 Min.	

Appendix 3: Contingency table of incidents frequency of interviewed participants' views.

Contingency Table							
#	Factor	Expected and counted values	Incident			Balance between positive and negative values	Contribution ratio
			Positive	Negative	Total		
1	Senior Management Support	Count	223.00	25.00	248	<b>198.00</b>	0.418
		Expected Count	192.05	55.95		136.11	
Balance between counted and expected values			30.95	-30.95		61.89	
2	Cross Functional Team	Count	54.00	10.00		<b>44</b>	0.108
		Expected Count	49.56	14.44		35.12	
Balance between counted and expected values			4.44	-4.44		8.88	
3	Supplier Involvement	Count	36.00	25.00	61	<b>11</b>	0.103
		Expected Count	47.24	13.76		33.48	
Balance between counted and expected values			-11.24	11.24		-22.48	
4	Customer Involvement	Count	48.00	10.00	58	<b>38</b>	0.098
		Expected Count	44.92	13.08		31.83	
Balance between counted and expected values			3.08	-3.08		6.17	
5	Time to Market	Count	74.00	26.00	100	<b>48</b>	0.168
		Expected Count	77.44	22.56		54.88	
Balance between counted and expected values			-3.44	3.44		-6.88	
6	Rules & Regulations	Count	2.00	28.00	30	<b>-26</b>	0.051
		Expected Count	23.23	6.77		16.46	
Balance between counted and expected values			-21.23	21.23		-42.46	
7	Team work spirit	Count	8.00	0.00	8	<b>8</b>	0.013
		Expected Count	6.20	1.80		4.39	
Balance between counted and expected values			1.80	-1.80		3.61	
8	MS	Count	5.00	1.00	6	<b>4</b>	0.010
		Expected Count	4.65	1.35		3.29	
Balance between counted and expected values			0.35	-0.35		0.71	
9	Competition	Count	0.00	4.00	4	<b>-4</b>	0.007

		Expected Count	3.10	0.90		2.20	
Balance between counted and expected values			-3.10	3.10		-6.20	
10	Knowledge	Count	5.00	0.00	5	<b>5</b>	0.008
		Expected Count	3.87	1.13		2.74	
Balance between counted and expected values			1.13	-1.13		2.26	
11	technology	Count	5.00	0.00	5	<b>5</b>	
		Expected Count	3.87	1.13		2.74	
Balance between counted and expected values			1.13	-1.13		2.26	
12	Cost of development	Count	0.00	5.00	5	<b>-5</b>	0.008
		Expected Count	3.87	1.13		2.74	
Balance between counted and expected values			-3.87	3.87		-7.74	
	Total		460	134	594		

Appendix 4: The Main Jordanian Pharmaceutical companies that were targeted in this research.

<b>Company</b>
1. Arab center for pharmaceutical manufacturing Co.
2. Dar Aldawa Development & Investment Co.
3. Hayat Pharmaceutical Industries Co.
4. Hikma Pharmaceutical
5. Jordanian Pharmaceutical Manufacturing Co.
6. Jordan Sweden Medical & Sterilization
7. Pharma International Co.