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Pharmaceutical Error Detection as a Mediator of the Relationship between pharmaceutical information systems and pharmaceutical errors Prevention: A Case Study in Bagdad-Iraq

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Abstract

Pharmaceutical information systems (PIS) contribute an active role in making and rationalization of decisions related to the management of pharmaceutical enterprises. At the forefront of these decisions prevent pharmaceutical errors. This study examines the relationship between pharmaceutical information systems and pharmaceutical error prevention, and whether pharmaceutical errors detection (identifying factors that cause pharmacy errors) has mediating effects in this relationship. It was hypothesized that the pharmaceutical information systems would prevent pharmaceutical errors and pharmaceutical errors detection would serve as mediators in this relationship. These relationships will be tested in a sample of (160) Pharmacist from public and private hospitals in Bagdad-Iraq.

Keywords: Pharmaceutical information systems (PIS), prevent pharmaceutical errors, pharmaceutical errors detection, Pharmacist

ملخص

تسهم نظم المعلومات الصيدلانية (PIS) بدور فاعل في صنع وترشيد القرارات المتعلقة بإدارة الشركات الصيدلانية. في مقدمة هذه القرارات، تلك الخاصة بمنع الأخطاء الصيدلانية. تبحث هذه الدراسة العلاقة بين نظم المعلومات الصيدلانية وتفادي الأخطاء الصيدلانية، وما إذا كان الكشف عن الأخطاء الصيدلانية (تحديد العوامل التي تسبب الأخطاء الصيدلانية) يتوسط هذه العلاقة. من هنا سعت هذه الدراسة الى إختبار هذه العلاقات في عينة مكونة من (160) صيدلي من المستشفيات العامة والخاصة في بغداد – العراق. وتوصلت الدراسة الى وجود أثر ذو دلالة معنوية بين نظم المعلومات الصيدلانية وبين منع حدوث الاخطاء الصيدلانية ، كما توصلت الى أن الكشف عن الأخطاء الصيدلانية يتوسط جزئياً وليس كلياً العلاقة بين نظم المعلومات الصيدلانية

وبين منع حدوث الاخطاء الصيدلانية . وأوصت الدراسة بضرورة تعزيز تطبيقات نظـم المعلومـات الصيدلانية في إدارة الصيدليات.

Introduction

Although pharmacists are professionals who have high skills in delivering basic health care, but the errors of pharmacists and other healthcare professionals can occur at high rates. While errors by pharmacists are an important part of medical errors, these observations suggest the possibility that greater participation by pharmacists in the drug treatment review may also contribute to reducing the total number of prescription errors.

A study conducted at Brigham and Women's Hospital found that the ADE rate in its intensive care unit (ICU) was reduced from 33.0 per 1,000 patient days to 11.6 per 1,000 patient days, through active participation of pharmacists in patients' rounds with the ICU Medicare care team.

Statistics indicate that the Food and Drug Administration has received nearly 30,000 reports of drug errors since 1992. These reports are mostly voluntary reports, so the number of pharmacological errors that actually occur and which have not been reported is thought to be much higher than the reported figures (US Food and Drug Administration).

In 1996 a nationwide survey conducted for a sample of 1,000 community pharmacists, found the following results: (Ukens, 1997)

-more than half of the pharmacists admitted that they had made a dispensing error in the previous 60 days, and that they had dispend the wrong dose. More than 25% reported that they had dispended the wrong drugs. About one in four pharmacists believes that the rate of error he has committed has increased over the previous year. Workload and/or setting appeared to have an influence 47% of pharmacists dispensing fewer than 100 prescriptions per day reported making an error, while 60% of those dispensing 100 or more prescriptions per day were aware of an error.

-The typical retail pharmacist admitted that they had committed an average of 2.5 errors over the past two months, and 8% thought they had made more than six errors during this period.

-In spite of failure to catch drug interactions and contraindications or warn of potential hazards was much less common (reported by only about 2% of the respondents), among chain of store pharmacists, only

26% caught the pharmaceutical error themselves, in contrast 68% of these pharmaceutical errors were detected by the patient.

In the Arab countries (including Iraq) there are no statistics related to the rate of medical errors. This is due to the multiplicity of medical departments and lack of information exchange among them and the absence of a unified center for medical error reports or an organization concerned. Most of the cases declared in the Iraq are cases submitted to the judiciary by the victim or one of his families for consideration by one of the forensic medical committees that have been appointed to deal with these cases in a number of parts of the Iraq or stories published in local media sources.

This study examines whether the Pharmaceutical errors detection mediate the relationship between pharmaceutical information systems and pharmaceutical errors prevention, through four parts: the first deals with the methodology of the study. The second presents the theoretical framework. The third focuses on hypothesis testing and analysis of results. The fourth and last discusses the research findings and recommendations

1. Study Methodology

The methodology of the study focuses on clarifying the problem of the study, study objectives and importance, study model and hypotheses, data collection method and statistical analysis tools

1.1 **Study problem**

The bulletin prepared by the Dubai Chamber of Commerce and Industry in cooperation with the Department of Ports and Customs in Dubai in 2004 pointed out that the world consumption of pharmaceutical industries amounts to more than 300 billion dollars annually. The UAE has the highest annual per capita consumption of medicine in the Gulf States. The average per capita consumption of the drug in the Arab Gulf countries is about $ 52 per year, in Iraq it is $ 63 and in the UAE it is about $ 80. No one has information or figures about the mistakes of dispensing prescription drugs in the country or even in our Arab countries, although there are thousands of patients taking alternative medicines other than those prescribed by doctors. The errors may be made by the doctor, such as blurred writing. The pharmacist may use alternative medicine or may take similar medications due to the great closeness of the medicine packages and the victim in both cases is the patient.

The misuse of the pharmacist for his work plays an important role in the therapeutic process since he is the final stop before handing over the treatment to the patient. According to the law, he is responsible for filling, installing, dispensing and giving instructions about medicines. Pharmaceutical errors include (alkhaleej.ae/supplements) :

- Difficulty reading the prescription, especially when there is a similarity in names.
- Similarity in drug packaging, inability to read or calculate the appropriate dose with body weight, especially when dealing with micrograms.
- The difficulty of reading some similar Latin symbols such as (s .d) and is meant once a day - and (.i .d) which means four times a day.
- Failure to recognize the drug interactions between drugs prescribed with the drugs that the patient takes in advance that should not be taken together.
- The pharmacist does not take precautions with caution, especially when his goal is to sell medicine and not treat the patient.

According to a survey conducted by the " National Patient Safety Foundation" , 42% of respondents were affected by a medical error either personally or through a friend or relative, 32% of respondents indicated that the medical error had a lasting negative impact on the patient's health and well-being (www.ahrq.gov/qual/errback., 2008).

This result reflects the big gap between what can be achieved through applications of pharmaceutical information systems and what is already in place, with little knowledge and experience on how to fully and correctly use pharmaceutical information systems to improve the health and well-being of the population by reducing medical errors as much as possible.

From here, understanding the challenges to the effective use and application of pharmaceutical information systems in the management of health institutions, and taking into account the wider extent of the economic implications of such use, is critical to achieving the potential benefits of adoption of these systems. From the above, the problem of the study requires answering the following questions:

-Why does the health institutions manager need to use "pharmaceutical information systems (PIS)"?

-Can "pharmaceutical information systems (PIS)". Contribute in Pharmaceutical errors detection and then pharmaceutical errors prevention?

- Dose Pharmaceutical errors detection mediates the relationship between pharmaceutical information systems and pharmaceutical errors prevention?
- What are the pharmaceutical errors that “pharmaceutical information systems (PIS)”? Can detect and prevent ?

1.2 Study Objectives.

The study attempts to reach the following objectives:
- Provide a theoretical framework to clarify the pharmaceutical errors, pharmaceutical errors prevention, pharmaceutical errors detection and pharmaceutical information systems pharmaceutical errors concepts.
-Analyze and explain the relationship between pharmaceutical information systems (PIS) and pharmaceutical errors prevention and the mediate role of pharmaceutical errors detection.
-Proposing some future studies related to the applications of "pharmaceutical information systems" and their impact on reducing medical errors in health care institutions

1.3 Study Importance.

Studies have found that 20% of the doses of drugs given to the patient are done wrongly and that there are 7000 deaths in America resulted from errors in the treatment of medicines, some of them resulted from poor handwriting, which doctors prescribe prescriptions for patients (nshrs.com/index).

Studies confirm that the medical error leading to a serious injury to a patient or to his death is the worst nightmare of a doctor, pharmacist or nurse. From here, although best efforts may be made by doctor, pharmacist or nurse, some errors are inevitable. The solution here is not to hide errors or to find incorrect arguments to justify their occurrence. On the contrary, attempts to hide or ignore mistakes may lead to more serious consequences.

However, pharmacists must be able to identify stress in the workplace and identify other factors that may lead to errors, and then take appropriate steps to reduce the occurrence of these errors, develop and adoption of systems that help them achieve this, among the most important of these systems are pharmaceutical information systems.

On the other hand, pharmacists should keep up with changes in policies that can affect reporting, documentation and error prevention, as well as keeping up with potential changes in the work environment. Because they are under increasing pressure in dealing with an increasing number

of prescriptions, pharmacists must remember that the consequences of medical errors do not only lead to legal complications involving substantial harm compensation to patients at risk, as well as disciplinary actions. The consequences of medical errors also include poor patient well-being, low satisfaction with medical services, loss of life, and increased medical care costs.

Pharmacists must keep pace with changes in regulations and instructions that can affect reporting, documentation and error prevention, as well as potential changes in the work environment. Because they are pressing to fill an increasing number of prescriptions, pharmacists must remember that the consequences of errors lead not only to legal complications involving substantial damage compensation and disciplinary action, but also to the loss of well-being of patients, loss of life and increased health care costs.

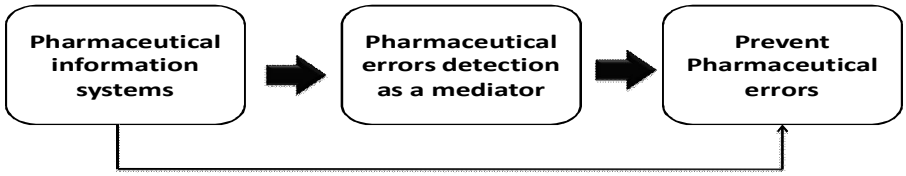
This importance is compounded in Arab countries in general and in Iraq in particular, if health care institutions managers understand the weakness of the availability of information necessary to determine the extent of "pharmaceutical information systems" applications, the amount and size of applications and their constituent subsystems, the benefits they achieve, as well as the amount of effort and cost involved in the design, construction and application of these systems and other related aspects, are all sufficient justification for the attention and study of the applications of these systems.

Hence, despite this importance, attention to this subject in the Arab environment is still below the level of ambition, both at the level of literature, and at the level of application, and researches on this subject very scarce. Therefore the academic importance of this study stems from the consideration this study is the leading research in this field. . While the practical importance is the attempt to reflect the intellectual framework adopted by the study in the study population included all PISs authorities and users in all public hospitals (seven hospitals situated in the city of in Bagdad). As well as, raise attention of academics and practitioners in the fields of medicine, business administration, information and communication technology, professional associations, insurance companies, medical associations, patient associations, human rights associations, environmental protection, forensics, courts and other related institutions on the importance of adopting applications of pharmaceutical information systems as a basis for pharmaceutical errors detection and prevention.

1.4 Study model.

This study adopted a virtual model, shown in Figure 1, which confirms the presence of three variables, independent variables (pharmaceutical information systems (PIS)), and the dependent variable (pharmaceutical errors prevention), and the mediate variable of pharmaceutical errors detection. The study assumes a one-way relationship from the independent variable to the mediate variable and then from the mediate variable to the dependent variable.

Figure 1. Study virtual model



Source: Prepared by the researchers.

1.5 Study hypothesis.

Pharmaceutical errors detection will mediate the relationship between Pharmaceutical information systems (PIS) and pharmaceutical errors prevention.

1.6-Data collection and analysis method

This study is an empirical and descriptive analytical study conducted cross sectional. As well as with exploratory visits, interview and look at the report issued by the Iraqi Ministry of Health. The research population included all PISs authorities and users in all public hospitals, seven hospitals situated in the city of in Bagdad, Three hospitals from "Karkh Health Department", three hospitals from the "Rusafa Health Department" and one Hospital from "Medicine City Health Department". The reasons for choosing these Iraqi hospitals are:

1-These hospitals are counted as a large hospitals establishment in Bagdad.
2- Administrations of these hospitals seek to reduce medical errors and improve the performance of healthcare.
3- These hospitals were established more than ten years ago.
To obtain data from the study sample, a questionnaire containing 36 closed questions was designed for restricted responses. Respondents were asked to sort the options listed for each paragraph of the questionnaire depending on the five-dimensional Likert scale (scales ratings ranging from "1," no effect, to "5", strong effect for the dependent and mediate variable, and "1,"not agree, to "5", strongly agree for the independent variable).
The formulation of this instrument was based on (Evans, et al., 1994) (Isfahani, et al., 1994) (Raschke, et al., 1998)studies.
The content validity of the questionnaire was assessed using research literature reviews and views collected from the advisor professors and other experts and professionals in the management Information system field in general as well as professors in the health information management and pharmacists' field.

2. Literature review

2.1 Pharmaceutical information systems (PIS).

(PIS) refers to the integrated computer systems and information technologies and automated systems that are used for drug dosage distribution unit, encrypted drug control tape and prescriptions that constitute a computerized division used for prescription control resulting in safer storage and distribution of drugs.
(Chapuis et. al, 2010) confirms that these computer systems can have positive effects on drug errors, omission at the time of prescription and dispensing, as well as promoting the optimal use of drugs in the health care system.

A Pharmaceutical information systems (PIS) Helps the practitioners aware of the non-safety coefficient of the drug, to give the correct doses to patients and alert at different doses or change, estimated overdose. As well as make sure to give the correct treatment of the patient, especially in the drugs of venous, which is the error in giving it fatal, such as confirmation of the blood group given to the patient is the right group by

two nurses or potential effect of prescription by two doctors at the same time (Manno et. al, 2006).

The report of the American Medical Institute (2006) on drug risk prevention confirms that, more than 500,000 side effects occur in US hospitals each year with proper prescription knowledge or prescribing drugs that are considered the key effective parameter underlying prevention of drug side effects in normal cases. (Manno et.al, 2006). In the same vein, (Chang & Mark, 2011) confirms that about 1,500,000 people are suffering from drug errors and the death rate is 70,000 patients in the United States each year.

Reducing drug errors is an important goal for all stakeholders, but it seems that a complete omission of these errors is very difficult if not impossible. Usually, after the diagnosis of the disease, the patient is referred by the doctor to the pharmacist to dispense it, but it is not without errors, whether in the prescribed treatment, or the amount of dose increase or decrease, or choose the wrong alternative, and so on. For example, a 600-bed teaching hospital with a 99.9% confidence level in a precise prescription, yet about 400 drug errors are reported each year (Chang & Mark, 2011).

(Katz, 2005) points out with an average 2.2 million patients due to drug side effects, so (Grootheest et. al 2005) argued that the hospital pharmacy department plays a significant role in reporting the drugs side effects. In the same direction (Burgess et.al 2011) confirms that reporting of drug side effects is one of the main capabilities of pharmaceutical information systems

Accordingly, Experts in the field of health care, doctors and pharmacists are aware of the importance of using the advanced technology to reduce the rates of drug errors, and the idea of the use of computerized Pharmaceutical information systems in the delivery of drugs to reduce the writing of the recipe by hand to avoid confusion between prescriptions, and enable the pharmacist to read the recipe clearly. Studies show that 20% of the world's pharmaceutical errors occur as a result of doctors' prescription, not by pharmacists or nursing staff in hospitals. (Abedelhak et. al 2002)

The great development in the communications network has provided the possibility of handling a large amount of information, and calculations to determine the amount of doses and the system of prescription e is a technology revolution, which allows the doctor to seek medical

prescription and sent within an internal network to the computer system of the pharmacist, for the pharmacist reviewed and compliance with the file Patient, before making it available to the patient.
Pharmaceutical information systems include a database of medicines available in state pharmacies, to serve as a scientific reference for physicians, pharmacists and anyone involved in patient care. It includes the scientific name of each medicine, its uses, its composition, its doses and pricing in the Department of Health and Medical Services, and the professional title of the authorized doctor to refer to the various advantages of this Constitution, which helps the doctor to make his decision regarding the type of medication and the amount of dosage and alternatives available to the drug by allocating a full page for each drug available in the Department Health and medical services. It also includes details on drug uses, doses, and price information (including the price per unit plus the cost of treatment), as well as the labeling of most high-risk and expensive drugs (Drug use evaluation).

2.2 Pharmaceutical Errors Detection

Medical errors - according to health experts - can be in many forms, among the most common errors, those errors related to drug. The US National Council for Coordinating and Recording Drug error define the drug error as: “Is any avoidable event that may cause or result in inappropriate use of the medicine or cause harm to the patient while the medicine is under the control of health care officials, the patient or the consumer. This type of accident is related to all medication of trading may be related to professional practice, health care services, products, procedures or regulations. (Prescription, medication, etc.), labels on packaging, packaging, and names, as well as the method of preparing, dispensing, distributing, giving to the patient, and teaching Patient, control, and use, giving the patient the wrong medicine, or giving the patient the right medication but at the wrong time, or giving him an unlicensed medicine, also includes neglecting to give the patient the medicine he needs.
It is noteworthy that many studies on drug errors reported the existence of several problems resulting from these errors. Global statistics indicate that drug errors are among the most frequent medical errors when providing medical services that affect at least 1.5 million people

annually, as well as financial losses to address the damage caused by these errors.

This has led many academies and international organizations concerned with patient safety and drug safety to recognize the importance of this issue and support the programs of prevention of drug errors. Accidental errors associated with medication may induce, with all members of the medical team, including doctors, pharmacists, nurses, technicians and other assistants who are involved in the provision of medical services to patients. So Drug errors can occur at any stage of drug use, starting with prescribing the medication by the treating physician, then checking and reviewing the prescription, and preparation of the drug by the pharmacists until the drug is given to the patient by the nurse. Drug errors often occur without being detected, reported, documented, obscured or covered (Hisham , Shorouk ,2015).

Dr. Badran explained that some drug errors arise due to the lack of clarity of the prescription written by the doctor or lack of commitment to global abbreviations and not to specify the quantities of medication or writing the type of patient, especially that there are common names between males and females, and not determine the patient's age or weight, especially among children (Badran, 2013).

There are other reasons why the patient is exposed at any moment to death is to be diagnosed by a doctor medication for treatment and the drug is not in accordance with the specifications or not in line with the state of treatment Perhaps this is indeed the way taken by one of the major American companies in the manufacture of drugs “Pfizer", which was fined billions of dollars as a result of its deliberate promotion of non-compliant drugs (Lassetter & Warnick, 2010).

Press sources quoted officials in the ministries of justice, health and human services to say that the world's largest pharmaceutical company "Pfizer" promoted four drugs to treat pain, or dealt with quantities not approved by the US Food and Drug Administration.The US Department of Justice announced that US pharmaceutical company Pfizer agreed to pay $ 2.3 billion in the largest settlement of a criminal offense and civil liability after the illegal promotion of certain drugs. One such drug is "Bextra,”an anti-inflammatory drug Pfizer has withdrawn from the market after being confirmed to be associated with an increased risk of heart attacks and stroke, the network said."Pfizer promoted the sale of "Bextra"for multiple uses and doses that the Food and Drug

Administration refused to approve," the Justice Department issued a statement.
Pfizer's Parmesia End Apjon agreed to acknowledge the allegation of violating the Food, Drug and Beauty Act by "falsely promoting Bexstra for fraud or disinformation."Prosecutor Tom Perelli told reporters that recommending drugs that were not approved for use by the Food and Drug Administration creates a situation that "threatens public health."
"There is a real risk for patients when drug providers do not provide accurate and accurate information about the risks and benefits of the drug," Pirelli said.
Communication errors and information exchange are among the most common causes of medication errors. It may occur at all levels between the medical team or the different departments, such as a treatment for a name similar to the actual patient's name or a double dose due to unclear dosage, unclear information between the ambulance department and hypnosis departments, mixing patients' files and similar patient names or giving an incorrect diagnosis of the patient based on a result of an untreated or registered patient second (Eharles, et. al., 2007).
The Pharmaceutical Information System contributes to the detection of drug errors by assisting in (Mavet, et al., 2002):
-Continuing awareness of pharmacological errors and presentation to practitioners.
-Encouraging the reporting of serious pharmacological errors and to ensure that such information reaches the competent authorities through find an easy way to report.
-Develop an effective system to check for deadly drugs due to errors.
-Stress that drug error is a shared responsibility of all relevant parties

2.3 Pharmaceutical Errors Prevention.
There is no doubt that the medical errors in prescriptions differ from one country to another. The number of cases of errors in countries that are based on electronic prescriptions is lower than in others. The names of medicines are clearly written and printed. Therefore, there is no way to write the medicine wrongly. In addition, continuous monitoring of pharmacies contributes to successful control of prescription errors. Global statistics indicate that more than 20% of prescriptions in the world are misread, and that wrong medications are administered to patients, but it is certain that these rates vary from country to country (WHO, 2016).

Rob Darkot, chief executive of the British Pharmacists' Association, explains that nearly half of the wrong prescriptions submitted to pharmacies which involving serious errors are attributed to the doctor

There are many cases that have been treated with false prescriptions such as a patient who has a drop of the eye that has a very high acidity causing blindness and another received treatment with penicillin despite the suffering of allergy to antibiotics, which led to his death immediately (Darracott, 2013).

A study conducted in the State of Qatar revealed the existence of prescriptions containing about 900 medical errors, 40% of which are incompatible with the diagnosis, 30% repeated medication and errors of safety of the patient and 50% for errors in doses of excess or less of the need, And that most of these medical errors can be overcome (Ministry of Health - State of Qatar, 2014).

To prevent medical errors, the World Health Organization (WHO), in a May 2007 report, identified nine conditions- four of which were linked to drug errors- as solutions to prevent medical errors (WHO, 2007):

- Avoid mixing similar medicines, in terms of form and pronunciation,.
- Identification of patients, providing all patient information when referred.
-Monitoring the concentration of solutions.
-Ensure that medicines at all stages of health care are appropriate.

The Department of Pharmaceuticals and Pharmacies in the Ministry of Health must adopt all international standards for pharmaceutical treatments and pharmaceutical care and harness all possibilities and resources to provide high quality pharmaceutical services in all pharmaceutical sectors in all hospitals and medical centers distributed in the cities of the Kingdom.

From the point of view of the U.S. Food and Drug Administration “Bar codes” as a technology contain unique drug identifiers. Based on this, when these barcodes are used with bar code scanners and computerized medical information systems, it can avoid many drug errors, including, for example, errors related to drug administration , misdiagnosis, or giving medication to a patient suffering from known allergies to this drug (U.S. Food and Drug Administration).

The Pharmaceutical Information System contributes to the drug errors prevention by assisting in (Eharles, et. al., 2007) (Sabanovic & Masic, 2001):

- Adopt a strict standard of medical error rate and strive to reach this standard.
-Recognize and deal with drug errors objectively.
-Consider medication errors positively to solve them.
-Dealing with pharmacological errors using a systematic method based on analysis.
-Facilitating the use of ICTs and the electronic prescription system.
-Enhancing cooperation and integration between the various parties involved in providing the pharmaceutical service.
-Provide evidence about who is actually responsible for the drug error.
-Establish a mechanism for non-repetition of pharmacological errors
-Assisting medical and nursing staff in solving the problems of complex pharmaceutical treatments and making wise decisions regarding drug treatment to ensure safety and effectiveness of drugs.

-Assisting in the application of the single drug unit dosage system by reviewing the patient's medication register to monitor allergies, check doses and follow up adverse reactions to medications, as well as therapeutic errors. It also allows the identification of drug interactions and monitoring adherence to the best use of drugs to ensure the safety and effectiveness of drugs.

-facilitate the control of pharmacies to know the medicines spent and contained in view of the seriousness of some that prevent circulation among the public, where there are medicines cannot be spent only by prescription and be codified and monitored.

-Provide the patient's medical record (history) that includes important information, such as chronic diseases such as kidney disease, liver disease or some genetic diseases, as well as the possibility of the sensitivity of some drugs. In addition to the statement of the drugs that are taken at the time of review to avoid any possibility of drug overlap between them and the treatments that the doctor intends to write.

-Facilitate the development of mechanisms to deal with medicines, especially those that are about to expire, through coordination with the manufacturers or the local agent regarding the recovery of these drugs after expiry and to replace them with other drugs of the same class or other varieties. In addition to strengthening coordination with the

competent companies in dealing with medical waste, expired medicines that are close to international standards are destroyed.

-Be ensure that the customers continue to provide medicines correctly, continuously, safely and effectively through the application of modern computer systems and reliable pharmaceutical information software, in a way that enhances pharmacy functions from mere "drug handling" to providing clinically relevant information and direct care to the patient.

4. Results

4.1 Validity-Reliability

The researchers tested the reliability of the questionnaire by distributing it on specialists and experts. The researcher goes in for their observations in terms of clarity, the relevance of paragraph, and whether it measures relevant areas of the questionnaire. In addition, the researcher used (Test-Retest) method by distributing the questionnaire to (20) of study sample, and re-test after three weeks from the date of the first test. The correlation coefficient for the relationship between Pharmaceutical information systems (PIS) variables was (0.81). And for the relationship between the pharmaceutical errors detection variables was (0.84). And for the relationship between the pharmaceutical errors prevention variables was (0.80). The total reliability coefficient for the entire tool was (0.87). Thus it can be concluded that the instrument used in this study was valid and reliable.

4.2 Descriptive Statistics and Correlations

The means, standard deviations and correlations of pharmaceutical information systems (PIS), pharmaceutical errors detection and pharmaceutical errors prevention scores are illustrated in Table-1, which reveals that pharmaceutical information systems (PIS), pharmaceutical errors detection and pharmaceutical errors prevention are statistically meaningful correlations for pharmacists. Moreover, interactive relationships between the three variables (independent, depended and intermediate) were evaluated using Pearson correlation coefficients. The relationship between pharmaceutical information systems (PIS) and pharmaceutical errors detection was strongly positive and significant ($r= 0.807$, $p<.00$). Pharmaceutical information systems (PIS) and pharmaceutical errors prevention were also strongly positive and significantly correlated ($r = 0.751$, $p< .00$). There was also a strongly positive and significant relationship between pharmaceutical errors detection and pharmaceutical errors prevention ($r=.0.726$, $p<.00$).

Table 1: Descriptive Statistics and Correlations

Variables	Mean	SD	1	2
pharmaceutical information systems (PIS)	3.65	0.86		
pharmaceutical errors detection	3.77	0.95	0.807**	
pharmaceutical errors prevention	3.61	1.05	0.751**	0.726**

**Correlation is significant at the 0.01 level (2-tailed)

* Correlation is significant at the 0.05 level (2-tailed)

Source: Prepared by the researchers.

4.3 Regression Analysis: Measuring Mediating Effect

In order to measure the mediating effect of the pharmaceutical errors detection variable, a regression analysis was applied in three steps depending on the approach proposed by (Baron & Kenney, 1986). As shown in Table-2, according to this approach, to test the mediation in the first step, it appears that pharmaceutical information systems (PIS) and pharmaceutical errors prevention were significantly related. For the second step, pharmaceutical information systems (PIS) and Pharmaceutical errors detection were significantly related. For the third step, pharmaceutical errors detection and pharmaceutical errors prevention were significantly related, and the relationship between pharmaceutical information systems (PIS) and pharmaceutical errors prevention reduced in strength under the presence of pharmaceutical errors detection. In other words, the effect of pharmaceutical information systems (PIS) in pharmaceutical errors prevention, when controlling for pharmaceutical errors detection is reduced (β in step-3 which equals 0,215 is less than β in step-1 which equals 0,765), then study hypothesis is supported and pharmaceutical errors detection is not absolutely mediator, but rather is a partial mediator of the relationship between pharmaceutical information systems (PIS) and pharmaceutical errors prevention.

Table 2: Hypotheses test Analysis

Regression Analysis : First Step			
Dependent Variable: pharmaceutical errors detection			
Independent Variable	Beta	t	p
Pharmaceutical	0.765	10.682	0.000

information systems(PIS)			
R= 0.807 AdjustedR2=0. 651			
Regression Analysis : Second Step			
Dependent Variable: pharmaceutical errors prevention			
Independent Variable	Beta	t	p
Pharmaceutical information systems(PIS)	0.475	8.051	0.000
R=0.751 AdjustedR2 = 0.553			
Regression Analysis : Third Step			
Dependent Variable: pharmaceutical errors prevention			
Independent Variable	Beta	t	p
Pharmaceutical information systems(PIS)	0.215	4.820	0.000
Pharmaceutical errors detection	0.261	4.491	0.000
R=0.520 Adjusted R2=0.2.704			

Source: Prepared by the researchers.

5. Conclusion and Recommendations.

In the light of the researcher's scientific follow-up, the errors in medicine in Iraq are not subject to accurate statistics because we do not have a clear proportion of our drug errors and must find a precise and clear mechanism to monitor these errors. The purpose of this study was to find out whether the pharmaceutical errors detection mediates the relationship between pharmaceutical information systems (PIS) and pharmaceutical errors prevention. It was founded that there is a medium level positive relationship between pharmaceutical information systems (PIS) and pharmaceutical errors prevention, which means that pharmaceutical errors prevention for pharmacists' increases when pharmaceutical information systems (PIS) applications are used properly. Another result of this study demonstrates that Pharmaceutical errors detection has a strong positive effect on pharmaceutical errors prevention. In other words, pharmaceutical errors prevention increases when pharmaceutical errors detection is enhanced. Furthermore, the results revealed that there

is a strongly positive relationship between pharmaceutical information systems (PIS) and pharmaceutical errors detection, which means that as the pharmaceutical information systems (PIS) applications by the pharmacists' increases, pharmaceutical errors detection is enhanced.

In this study, it was founded that pharmaceutical errors detection contributes a partial role in mediating the relationship between the relationship between pharmaceutical information systems (PIS) and pharmaceutical errors prevention. In other words, this study provides evidence that pharmaceutical information systems (PIS) and pharmaceutical errors detection influence pharmaceutical errors prevention for pharmacists. The result of this study shows that pharmaceutical errors detection is a significant variable in the pharmaceutical information systems (PIS) pharmaceutical errors prevention relationship.

If Ministry of Health besides public and private hospitals wants to decrease pharmaceutical errors, it would be better for them to adopt pharmaceutical information systems (PIS) applications through which they can detect pharmaceutical errors. The design and application of good pharmaceutical information systems will contribute to enhancing the quality of pharmaceutical services, such as providing accurate and timely information that is critical to helping pharmacies capture and detect errors before they reach patients, as well as improvement the quality of communication and cooperation between dealers with pharmacies and the institution of health care providers. At the same time, encourage pharmacists to be aware of the allegations filed against them in cases of malpractice, so that they can know the risks of their practices for their daily operations and then to help manage these risks effectively. Pharmaceutical information systems (PIS) should also help to know the causes of dispensing errors, the distinction between mechanical and judgmental errors, explaining how the courts deal differently with them, list of elements that must be proven in order to prove negligence, the traditional judicial view of the pharmacist's duty to the patient, and how this proposal changes . The efficient solution to these and other problems is to compare / contrast professional and corporate responsibility to dispense with errors; discuss the role of state pharmacy boards in disciplinary actions for unprofessional conduct.

Finally, the medical decision is supported by providing doctors with automatic alerts of drug interactions and providing them with guidance on dosages and comparison of different drugs, reminding them of

medical analyzes associated with drug treatments and dosage control for kidney and liver patients, pregnant women and lactating women and calculating newborn doses automatically.

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Main Difficulties

perseverance

MOLDOVA STATE UNIVERSITY

ZRIKAT AWNY

THE MODEL OF QUALITY MANAGEMENT SYSTEM IN PUBLIC ORGANIZATIONS OF CONSTRUCTIONS

Difficulties in the Implementation Process

Specialty: 521.03. Economics and Management in the field of activity (In Quality Management)

Scientific:

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Doctor, associate professor (docent),

Chisinau, 2018

Difficulties in the Implementation Process

Major Difficulties in the Implementation Process: The implementation of a quality guide is often accompanied by difficulties and resistance from many parties. Quality managers responded that, for the most part, it was a request from upper management that resulted in these procedures. Others indicated that it was good that there was debate about every procedure and section. A large number of the changes involved some procedures that were cancelled and replaced out of concern they would create problems in the long run.

Some managers started small with minimum inspections and reviews, and with time, expanded these inspections and reviews. Other managers indicated that the standard is not suitable for engineering departments in local authorities, and that it was difficult to apply it for managing engineering projects. Another problem was the existing procedures themselves. Some partners in the engineering projects have already prepared procedures and forms, and have an interest in applying the material they prepared in the Local Authority, thus the problem of coordination between various procedures.

Resistance to Implementing a Quality Guide: Employers, which are providers of work, are usually differentiated in industrial relations systems depending upon whether they are in the private or the public sector. Historically, trade unionism and collective bargaining developed first in the private sector, but in recent years these phenomena have spread to many public sector settings as well. [1, p. 1]. [2, p. 6]. One of the most problematic issues in organizational changes is resistance to change. This issue was widely reviewed in the research literature. Humans by their nature need a sense of security. Stability and maintaining the status quo contribute, often in a misleading manner, to such a sense. Therefore, organizational changes create resistance, which finds expression in active ways, in protest and direct confrontation, and/or in lack of cooperation.

Implementing a quality guide in the engineering departments also produces resistance. In the research, an attempt was made to map

the major objectors, the level of objection, the major reasons for the objection and ways to deal with them.

The Various Forms of Resistance: Resistance to establishing a quality guide of any type is expressed through protest or non-performance of procedures. Almost all quality managers indicated that the resistance issue was the main difficulty to establishing a quality guide, with resistance taking the following forms, as the managers noted:

- There was no reporting on incompatibility issues,
- Service suppliers did not collaborate, [3, p. 51].
- There was a conceptual difficulty to always go from the office to the site with checklist paperwork,
- Process control was not performed as required,
- Forms were filled out in a retroactive manner,
- There was a problem of not completing forms,
- Workers and officers claimed the system was not applicable and not suitable for the engineering branch, and
- Project managers and supervisors requested instructions.

Main Opponents to Change: Table 1. Presents the distribution of resistance by group. The questionnaire had a question about who in the engineering department objected to quality procedures. The responses revealed a number of opponents as shown in the table below.

Table 1. Distribution of Resistance by Group in Engineering Departments

Opposing Group	Workers	Inspectors / Planners	Project Managers	Consultants & Other
% in Authorities	40%	20%	30%	10%

Source: Author's research

Resistance from engineering department workers is almost self-explanatory. This owes to the fact that these department workers are the primary bearers of the workload related to implementation. Inspectors and project planners come next in this regard as they are the secondary bearers of the workload. In a conversation, one authority engineer noted that one planner quit the project upon knowing that the quality guide would obligate him to meet the authority's schedules. Further, a number of planners requested that the quality procedures of the authority matched the planner's quality procedures.

Looking into the objectors' experience, it became clear that it carries significant weight, as demonstrated in the pursuant table showing breakdown in percentages of the resistance component by experience in the authority. [4, p. S469].

Table 2. Distribution of Resistance by Group in Engineering Departments

Resistance Group	Yes	No
Resistance percentage of workers / managers **with** experience	77%	23%
Resistance percentage of workers / managers **without** experience	54%	46%

Source: Author's research

From the table, it can be seen that the resistance of experienced workers or managers is much higher than that of inexperienced workers or managers. The reason for this is clear; experienced workers or managers have the power to object. Inexperienced workers or managers simply want to integrate and perform what is required from them, as they are interested in satisfying their supervisors else they get fired. [4, p. S469].

Resistance to procedures becomes evident in non-cooperation, which is their main form of objection to the implementation of a quality guide. The various suppliers object to the quality procedures, as stated earlier, since they have their own internal procedures, and the quality procedures of the authority impose an additional burden on the supplier.

Reasons for Resistance and Ways to Deal with Them

In interviews with authority engineers, and in response to an open question, they provided the followings as reasons for resistance, along with ways to deal with these reasons.

First the reasons:

- Non-involvement in writing procedures results in more objection,

- A conceptual difficulty in making the documentation turnaround,
- Laziness,
- Old habits,
- Fear of bureaucracy, and
- Change itself produces objection.

Now the ways to deal with them:

- Much more involvement in procedure writing by those in the project management process,
- Pressure and enforcement by the management,
- Creating a healthy competitive atmosphere,
- Changing and cancelling procedures accordance to the requirements and feedback from the site,
- Clear definition in contracts that the various contractors must have accreditation, and
- Writing concise procedures that are easy to apply.

Two tables follow, one providing a summary of the reasons for resistance and the other of ways to deal with them.

Table 3. Reasons for Resistance

Item	Reason	Workers	Managers	Inspectors / Suppliers	Planners
a.	Status and power	20 %	35%	10%	30 %
b.	Ideology, do not believe in change	35 %	33%	25%	31 %
c.	Not understanding the process and its results	55 %	72%	66%	15 %
d.	Fear of not being up to the task	56 %	26%	44%	65 %
e.	Other	10 %	15%	22%	20 %

Source: Author's research

It is discernable from examining the above table for resistance reasons that "not understanding the process and its results" is the central component for objection. Workers, project managers and also planners indicated this in high numbers. In addition, the "fear of not being up to the task" and the pursuant reviews was another motivation for resistance. Planners fear they will not receive additional work, while workers and project managers fear they will be reprimanded.

The "status and power" component received low results, which percentage in the author's opinion, is not accurate. It is possible that they did not emphasize this so that it does not appear as "capitulation" on their part. [5, p. 153].

Table 4. Ways to Deal with Resistance

Item	Way	Workers	Managers	Inspectors / Suppliers	Planners
a.	Guidance and explanation	90%	85%	80%	60%
b.	Participation and involvement	80%	70%	80%	65%
c.	Providing support and assistance	65%	45%	25%	27%
d.	Pressure and enforcement	40%	20%	46%	40%
e.	Other	5%	14%	25%	22%

Source: Author's research

It is evident that dealing with resistance through “guidance and explanation” greatly softens the resistance. Authority engineers and quality managers responded in high percentages that guidance and explanation resolves a large portion of the resistance, and that is what they plan to do. In second place came “participation and involvement”. The workers screamed “give us pride”, and rightfully so, after all, as noted in the literature survey, the involvement of the workers in procedure preparation has significant weight. Here too, “pressure and enforcement” were not a solution to soften resistance, but in fact leads to implementation failure of the quality guide at the local authorities. In another research by Donaldson Gay: [6, p. 35]. “Staff are highly motivated, meaningfully involved in the development of the service and enjoy a high level of professional satisfaction. Staff are well prepared for future leadership responsibilities through their involvement in secondments, projects and programmes. They have good opportunities for career development and access to a clearly understood continuing professional development (CPD) programme. They consider that the opportunities for development support their performance effectively and contribute to developing their professional competence. Staff report positively about the quality of support provided by central services and external agencies. Staff are confident in their ability to carry out their duties and engage in effective teamwork at all levels. They are deployed appropriately and feel engaged and valued within the authority”.

Summary: The above two tables show that non-involvement of the workers and managers in the implementation process brings about resistance to working under the guide. It was preferred to involve them in the guide preparation and of course in the guide implementation. Guidance and involvement are the solution to softening resistance to the quality guide. [4, p. S470].

Main Difficulties in Working to a Quality Guide: A quality guide is based on procedures, and work according to procedures requires a change in working patterns and expertise in a new area. Interviewees were asked if there were difficulties in working to procedures and if so, what they were. [7, p. 47].

Another question was who, outside of engineering department workers and managers, resisted procedures. Interviews aimed to answer who these were and why they resisted.

Most local authorities indicated that it was indeed difficult to work according to procedures, the main claim being time consumption and difficulty handling paperwork. In other words, the essence of working with procedures and the essence of working with a quality guide are onerous. The quality system includes about 50 primary forms, and about another 20 secondary forms. As well, there are about 30 internal procedures and on average another 15 procedures for projects. Further, there are checklists and inspection forms, which add significant work for the staff. The table below details the number of

authorities which pointed out difficulties whatsoever in working with a quality guide.

Table 5. Authorities and Difficulties Working with a Quality System

	Minor Difficulties	Partial Difficulties	Many Difficulties	Too Difficult
Local Authorities with Full Certification (10)	2	3	7	3
Local Authorities with Partial Procedures (8)	4	2	2	0

Source: Author's research

According to the table, most authorities have difficulty working with a quality guide. Although only 3 authorities noted the difficulties as minor, checking another response about the extent of using the quality guide, it was revealed that 2 local authorities used the procedures very little. Therefore, these local authorities either chose to use those procedures applicable to them, leaving the ones not applicable, or they used the procedures whenever it suited them.

Table 6. Combination of Difficulties Working with a Quality System with Frequency of Use

	Minor Difficulties	Partial Difficulties	Many Difficulties	Too Difficult
Difficulty Working with Procedures	3	6	8	6
Frequency of Using Procedures	Daily	Weekly	Monthly	Individual projects

Source: Author's research

The distribution of responses is particularly interesting. When the frequency of using procedures increased, the degree of difficulty grew. It can be summarized that working with a quality guide in local authorities is particularly difficult.

Who Generally Resists Working to a Quality Guide in Local Authorities: Questions 16 and 19 asked who in authorities resisted working according to the quality guide of the engineering department. Question 16 related to the workers, and question 19 to senior officers.

Table 7. Who Resists Working with a Quality System

Answers to Question 19	Department Managers (2)	Authority Workers (8)	Consultants (4)	-	-
Answers to Question 16	Authority Heads (4)	Elected Officials (2)	Suppliers (2)	Treasury (8)	Department Managers (4)

Source: Author's research

Analyzing this table, it is clear that there is resistance to work to a quality guide among the workers of the local authorities. Among the lower ranks, 8 authority workers (in various departments) answered that Local Authority workers resisted the quality guide of the engineering department, while 4 answered that it was actually the consultants of the authorities who resisted the Local Authority's quality guide. However, in the second row, it is revealed that there is resistance even among the senior ranks to the quality guide of the engineering department. 8 interviewees indicated that it was the treasury department was the worst offender with respect to the quality guide of the engineering department, while 4 indicated that actually it was the head of the authority who resisted. It is not clear why the authority's treasury would resist and attempt to interfere with the engineering department doing its job as this department requires to work. Is there something not clear to the engineering department, possibly budget approvals and reporting to the various government offices providing funding? In Depth clarifications during interviews show that there indeed is something to say about the treasury department, and every time it is something new. Once they claimed that a project needed to be done this way and not like the previous project. They attribute the answers and connect the new requirements to an external policy, which is not related to the authority itself but to the body to which the reports will eventually be submitted. [8, p.1].

In addition to this, elected officials and the authority head intervene in the work of the engineering department, and here too,

there was an explanation for why they do. The answer was “politics”, as elected officials and the authority head want to please their voters and associates – a purely political commitment that has no place in quality procedures.

Summary: To summarize this section, there is no lack of problems to implement quality guides in local governments, both internal (engineering department disgruntled workers because of the extra work) and external (elected officials, treasury department for various reasons).

Main Problems in Working to a Quality Guide: In addition to basic difficulties stemming from changes to the work schedule brought about by the activation of the quality management system, there are also problems, part of them specific to the quality guide itself, and part likely applicable to any quality management system. [9, p. 14].

In 10 local authorities, interviewees claimed that it was “difficult to work by dictation from above”. Project managers and field staff are used to independence in their work, and to relative freedom in their considerations and resultant decisions. Work procedures dictate a manner of operation for different activities, which naturally varied from project to project. For the sake of quality and also uniformity, quality procedures mandate a uniform work for all projects. Furthermore, the management team has to perform activities that it did not before, also by dictation from above. The claim of

"dictation from above" can be overcome through involving the management staff in procedure writing. [10, p. 49].

Another claim that came up in interviewee responses was it was difficult to implement the quality guide to a project in its start up stages. In most cases, the quality guide is implemented in its advanced stages, at which time the problem arises in applying the quality guide to the phases already performed. A decision must be made which parts of the guide to apply retroactively and which to apply from this phase onward.

The concepts of the quality guide are taken from the quality terminology, and many times these concepts are not understood. At times, a word has one meaning with respect to quality and another with respect to management of construction projects. For example, the word "exceptions" in connection to quality means deficiencies and performance discrepancies, while in construction project management it means extra work that was included in the original contract. In order to solve this problem, if only partially, and if interested, is to assign to one concept two names: one name according to the quality terminology and another name in brackets that applies to the terminology of construction project management. [11, p. 39].

Yet another problem, probably the most difficult, is the lack of perseverance. Implementing a quality guide must become a thing of habit. Many local authorities prepare quality guides and some of them receive certification with relative ease after that. When lack of

implementing the guide is encountered during simple reviews, authorities noted that they (meaning other local authorities of course) perform only the necessary minimum to maintain certification.

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Impact of Activity-Based Costing (ABC) System on competitiveness of industrial joint stock companies listed on Amman Stock Exchange (ASE)

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Abstract

The aim of this study is to identify the extent to which activity-based costing (ABC) accounting system is applied and its impact on competitiveness of industrial joint stock companies listed on Amman Stock Exchange (ASE). To achieve this objective, the study followed the analytical descriptive method, as it is relevant to the nature of the study. The most important findings of this study are that there is a positive effect of independent study variables (combined and separated) on competitiveness of industrial joint stock companies listed on Amman Stock Exchange (ASE).

The study concluded a set of recommendations, the most important of which is the importance of continual applying of the industrial companies listed on Amman Stock Exchange of the activity-based costing (ABC) accounting system working on the development of its application methods and developing awareness- raising and increasing it among the employees of the concept of activity-based costing (ABC) system , as this system has an effective impact in increasing competitiveness of these companies.

Key words: activity-based costing (ABC) accounting, Activity, competitiveness, product quality

First: Introduction

The past century and the beginning of this century witnessed an existence of goods and products that were not in the past, these characterized by their large numbers and diversity, which created new markets and severe competition among them, to the extent that many institutions were disappeared, evaporated and as they did not exist at all. On the other hand, many institutions emerged which characterized with power and stability as they depended on knowledge of the market and studying it in a way that led to reaching customers with all their tastes, needs and prices that were acceptable to them. This was not happening in light of the adoption by the institutions of traditional cost systems based on the arbitrary distribution of indirect costs to their products. Then activity-based costing (ABC) system comes out that allocates costs to activities accurately and then bearing them to the products. Thus, this helped management to neutralize the activities that do not add value, and keep that add value and this in turn may help reducing costs and enhancing competition for these institutions, according to the opinion the researcher.And for the importance of activity-based costing (ABC) system in the accuracy of defining of the cost of sold goods, determining selling price and adjusting the optimal mix of products and helping making the right decision, which is reflected on the competitiveness of companies. Consequently, this study was conducted to examine the extent to which activity-based costing (ABC) accounting system is applied and its impact on competitiveness of industrial joint stock companies listed on Amman Stock Exchange (ASE).

Second: Study Problem

Study problem is highlighted through efforts of many Jordanian companies, particularly the industrial ones, to reach a precise activity-based costing (ABC) system, especially with the technological development and the emergence of computers and their speed and accuracy in calculating costs without companies to know their applying to this system according to the researcher's opinion, as the researcher

visited a number of companies reviewed their cost systems that use modern technology to calculate their costs, as well as their lack of knowledge of their competitiveness as a result of applying activity-based costing (ABC) accounting system that is related to activities in their environment.

The study problem can be presented through the following questions:

1- What is the extent of applying activity-based costing (ABC) accounting system in industrial joint stock companies listed on Amman Stock Exchange (ASE)? The following sub-questions arise from this question:

A- What is the extent of accuracy of identifying cost of production based on activity-based costing (ABC) in industrial joint stock companies listed on Amman Stock Exchange (ASE)?

B- What is the extent of improving decisions quality based on activity-based costing (ABC) in industrial joint stock companies listed on Amman Stock Exchange (ASE)?

C- What is the extent of improving optimal mix of products and based on activity-based costing (ABC) in industrial joint stock companies listed on Amman Stock Exchange (ASE)?

2- Is there a statistically significant difference of applying activity-based costing (ABC) accounting system in industrial joint stock companies listed on Amman Stock Exchange (ASE)?

Third: Study Objectives

This study aims to achieve the following objectives:

A- Recognizing the extent of applying activity-based costing (ABC) accounting system in industrial joint stock companies listed on Amman Stock Exchange (ASE).

) **B-** Examining the impact of applying activity-based costing (ABC) accounting system in industrial joint stock companies listed on Amman Stock Exchange (ASE).

Fourth: Significance of Study

The importance of this study is that its subject matter is the subject of interest of all public and private institutions, according to the researcher's opinion. This reason shows the importance of this study, which deals with the extent of applying activity-based costing (ABC) accounting system and its impact on competiveness. Thus, the significance of this study can be summarized in the following points:

A- Showing the vital and significant role that activity-based costing (ABC) accounting system contributes with in enhancing competitiveness, according to the researcher.

B- Officials and those responsible of administrative and accounting works may benefit from study results, discussion and recommendations.

Fifth: Study Hypotheses

Major Hypothesis: There is no statistically significant difference of applying activity-based costing (ABC) accounting system on competitiveness of industrial joint stock companies listed on Amman Stock Exchange (ASE).

The major hypothesis has the following sub-hypotheses:

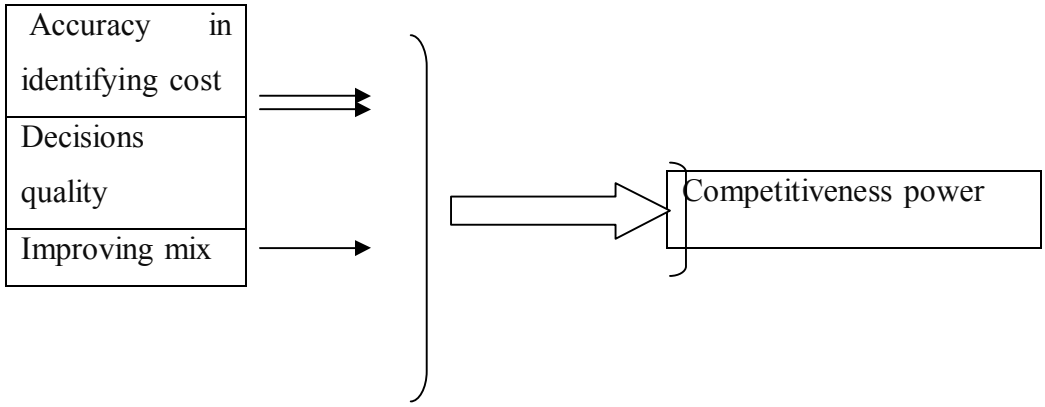
First Sub-hypothesis:There is no statistically significant difference of accuracy of identifying cost of production based on activity-based costing (ABC) on competitiveness in industrial companies listed on Amman Stock Exchange (ASE).

Second Sub-hypothesis: There is no statistically significant difference of decisions' quality based on activity-based costing (ABC) on competitiveness in industrial companies listed on Amman Stock Exchange (ASE).

Third Sub-hypothesis: There is no statistically significant difference of improving optimal mix based on activity-based costing (ABC) on competitiveness in industrial companies listed on Amman Stock Exchange (ASE).

Sixth: **Study Format**

The following form may represent the study format, like the following:



Form (1) Study Format

Source: Prepared by researcher

Theoretical Frame and Literature Review

Activity-based costing (ABC) accounting system

First: Definition of activity-based costing (ABC) system

There are many aspects that have addressed the definitions of activity-based costing (ABC) system and despite the formal differences among these concepts; nevertheless they have same meaning and content. The most important of these definitions are as follows:

Fudeh (2004) defines activity-based costing (ABC) system as "A new tool of management accounting tools, as it represents developing or broadening in the procedures of allocating indirect costs to products or services seeking to obtain more accurate product or service cost" (p. 110).

Madkour and Jamal Al-Deen (2001) define it as "a system of project operations, not just a better way to determine product cost and reduce costs, but rather eliminating activities that do not add value to the production process" (p. 261).

After reviewing the definitions, the researcher believes that activity-based costing (ABC) system identifies activities and allocates indirect costs to them, and then excludes activities that do not add a value for entity, which reduces costs in future periods.

Second: **Elements of activity-based costing (ABC) system**

Activity-based costing (ABC) system consists of the following elements:

First component: **Resources**: It includes activities inputs so that activities can not be carried out without them (Adass, 2007: 25). Obviously, these resources are not only physical but also human.

Second component: **Activities**: They are defined as "a number of operations or procedures that consist within them the essence of work to be done inside the entity (organization). The cost of activity includes all resources necessary to perform the activity. This cost is expressed by determining costs of activity inputs from all the resources (Al-Alkawi, 2004: 197). Activities can be divided into major and sub-sections, then segmenting them into easily measurable parts.

Third component: **Cost drivers**: It is known cost unit, which is a unit of quantitative measurement of a product, service, time, or a combination of, upon which the cost is determined. It can take the form of a production order or a set of production (Arab Society of Certified Public Accountants, 2001).

Cost drivers vary depending on industry or service, where in industrial organizations; it is found that indirect costs have a large share of organization's costs, as well as a variety of activities that need more varied cost drivers to reach to more precise allocation of activities, unlike

service organizations, which have less cost drivers than industrial organizations.

"The success of activity-based costing (ABC) system depends on accuracy of identifying cost drivers" (Al-Dulaimi, 2005).

Third: Advantages of implementing activity-based costing (ABC) system

Applying activity-based costing (ABC) system provides the following advantages: Tatikonda (2012):

1- The system gives a clear picture of real costs of different programs, and identifies the areas of extravagance, which increases control, and it determines the activities that add value and that do not add.

2- It contributes to proper distribution of scarce resources among programs.

3- Activity-based costing (ABC) system provides accurate information about the cost of activities.

The researcher concludes from above mentioned that ABC system has the ability to detect activities that add value compared to costly and secondary activities, which have no role in achieving more benefits for the organization in return for the costs incurred. Thus, ABC system helps, if it used in a proper way, which in turn aids decision maker to reduce costs and increase profitability in the future, which in turn

enhances organization's competitive position and makes it acquire a better market share, as reality indicates.

Fourth: Competitiveness

The concept of competitiveness

A number of researchers defined competitiveness as follows:

Salman (2005) defines it as "The ability to provide consumer or client with more efficient products and services than other competitors in domestic and international market" (p. 116).

Ismail (2007) defines it as "The ability to make profits on an ongoing basis and to acquire an appropriate market share (p. 43).

Idris and Al-Galabi (2011) define it as "The ability to provide consumer with products and services more efficiently and effectively than other competitors, indicating continuous success in the absence of support and protection by the government" (p. 44).

From above definitions of competitiveness, the researcher believes that it focuses on the ability of organization to provide its products and services to consumers and clients, satisfactory to them, make them to be attracted to this organization, and to be a positive media voice of this organization, which increases market share of this organization. This organization is required to maintain its customers by maintaining and increasing

efficiency and effectiveness of these products or services provided to them.

Fifth: Importance of competitiveness

A number of researchers pointed to the importance of competitiveness as follows: Homoud (2010)

1- It provides an appropriate competitive environment to achieve efficient allocation and use of resources.

2- It contributes in promoting creativity and innovation to be reflected on reduction of costs and prices.

3- It helps in eliminating the most important obstacles that face improving efficiency and productivity, namely the problem of local market.

4- It reflects the fundamental structural characteristics of each national economy. (P. 118)

In general, the researcher finds from aforementioned that competition creates a dynamic environment that encourages innovation and creativity, which fosters to excellence in producing services or products, and thus reduction in prices, unlike the environment dominated by monopoly, which often cause the boredom of consumers and who will shift in the moment when the market opens up to deal with other organizations, causing the monopoly organizations to lose their market share.

Sixth: Dimensions of competitiveness

The dimensions of competitiveness can be presented as follows: Abdelkader (2007)

The dimensions of competitiveness can be presented as follows: Abdelkader (2007)

Competing by time: We mean timely product production and timely sale at the lowest possible cost in terms of storage cost. This requires accurate market information about tastes of customers and consumers.

Competing by quality: It characterizes by manufacturing all that is quality and presenting it, through knowing customers expectations of designing the product, in addition to training the employees to innovate.

Competing by cost: This characterizes by developing special standards. It is essential when reducing cost requires maintain quality level, which requires accurate information about product or service components, to exclude costs that do not add value, which reduces cost.

Competing by excellence: It characterizes by creating significant differences in the product, or introducing new promotional activities, as most of competitive advantages of excellence are short-term and this means knowing customers tastes, which helps in providing a service with additional quality, which is impressive for the client and at the same time may be with low cost, even if the cost rises, there is justification for this increase, which is providing a distinctive service.

Seventh: Literature Review

1- **Abed and Kahala Study** (2013) entitled: "Activity-based costing (ABC) system": A case study about Arab Medical Center in Jordan

The aim of this study is to obtain more accurate cost information regarding indirect expenses and distributing them to the provided services by using modern systems. The most important of these is activity-based costing (ABC) system, where this system is applied in catheter section, while it was is not applied in other sections.

The study concluded that applying activity-based costing (ABC) system in catheter section gave more accurate cost results that help in making pricing decisions, while other sections that did not implement this system have given less accurate information and do not help the decision maker precisely.

2- **Nemer and Sweisi study** (2013) entitled: "Seeking to apply activity-based costing (ABC) system in university services sector": Studying the status of university residence.

This study aims to identify the possibility of applying activity-based costing (ABC) system to services activities in the Republic of Algeria, including universities sector. The results show the possibility of applying this system and taking advantage of its multiple positives, including pricing provided services accurately, excluding activities with the most expensive, least return and distributing indirect costs in a methodical and

not in an arbitrary manner. The study recommends and assures on applying this syetem to all state organizations.

3- **Al-Anati's study** (2009) entitled: "The extent of applying activity-based costing (ABC) and management system in electricity companies in Jordan".

This study aims to identify cost accounting systems used by Jordanian electricity companies and measuring their ability to analyze produced unit cost (kilowatt). The results show that three of the six electricity companies use activity-based costing (ABC) and management system, while the other three do not use this system at present. The study recommends applying this system in companies that do not use it, by educating individuals of this system and providing the necessary tools for implementing it.

4- **Dergham Study** (2006) entitled: "Evaluating of the applicability of applying activity-based costing (ABC) system". The study aims at knowing the necessary elements for applying activity-based costing (ABC) system in public hospitals in the State of Palestine in order to apply this system where such a possibility exists. The study comes out with the result that the possibilities and elements are available to apply activity-based costing (ABC) system in this sector. In addition, the study recommends to promptly applying this system because it helps in making appropriate pricing decisions more accurately.

5- **Mustafa Study** (2005) entitled "Competitiveness of Palestinian food industries and their prospects"

The study aims to identify competitiveness of food industries in Nablus area in Palestine. The results show moderate competitiveness of food industries based on relative cost scale as compared to all other manufacturing industries. Additionally, the results show a rise in competitiveness of food industries depending on the measure of profit average compared to all other manufacturing industries. In view of these results, the study recommends introducing technological element intensively in factories and relying on automation systems in production, even gradually.

What differentiates this study:

Previous studies dealt with activity-based costing (ABC) system, proved their importance and its role in allocating indirect costs. While this study, in addition to what researcher has proven about the importance of activity-based costing (ABC) system, it also links activity-based costing (ABC) with competitiveness as the researcher thinks that there is a relation between them.

Method and procedures

The method and procedures adopted for the completion of this study includes the methodology adopted in this study, population and sample, instrument used and the method of its preparation and the testing

instrument validity and reliability. The coefficient of reliability of the total instrument using Cronbach's Alpha is (89%) and the researcher used the most important statistical methods in processing data collected.

The researchers presented the questionnaire to a group of arbitrators with the expertise and experience from faculty members of in Jordanian Universities to verify its validity.

Sources of data collection

Preliminary sources: The researcher designed a questionnaire to achieve this purpose, and it was distributed to the study sample members (financial managers, heads of financial departments, cost accountants in industrial companies) and then collecting and analyzing data using statistical programming (SPSS) for testing the validity of study hypotheses.

Secondary sources: Secondary data related to this study were obtained from books, letters and magazines regarding the subject of the study

Study population and its sample

Study population consists of all the industrial companies listed on Amman Stock Exchange (ASE) amounting to (69) industrial companies.

Results of statistical analysis and testing hypotheses

First: Results related to answering first study question

Results for answering the first question:

What is the extent of applying activity-based costing (ABC) accounting system in industrial joint stock companies listed on Amman Stock Exchange (ASE)?

Table (1)

Arithmetic means and standard deviations of the extent of applying activity-based costing (ABC) system in industrial joint stock companies listed on Amman Stock Exchange (ASE)

No.	Activity-Based Costing (ABC) System	Arithmetic Mean	Standard Deviation	t-value	Degree of Application
1	Accuracy of identifying production cost	4.18	0.40	21.56	High
2	Improving decisions quality	4.13	0.37	21.97	High
3	Improving optimal mix of products	4.03	0.47	15.92	High

t- tabulated at significance level ($\alpha \leq 0.05$) = 2

It is noted from the results shown in table (1) that element of accuracy of identifying production ranked first on priorities list of study sample members' evaluation of the industrial companies listed on Amman Stock Exchange (ASE), with an arithmetic mean amounting to 4.18 and a standard deviation amounting to 0.40. Improving decisions quality ranked second on priorities list of study sample members' evaluation in

terms of its importance, with an arithmetic mean amounting to 4.13 and a standard deviation amounting to 0.37. Finally, element of improving optimal mix of products ranked last on priorities list of study sample members' evaluation in terms of its importance, with an arithmetic mean amounting to 4.03 and a standard deviation amounting to 0.47.

The results indicate that all calculated arithmetical means of preceding elements are greater than the test standard amounting to (3) out of (5) scores. These results indicate that level of study sample members' evaluation of applying activity-based costing (ABC) system in industrial joint stock companies listed on Amman Stock Exchange (ASE) is positive and the degree of its application is high from the viewpoint of sample members.

Second: Testing study hypotheses

Testing major hypothesis:

There is no statistically significant difference of applying activity-based costing (ABC) accounting system on competitiveness of industrial joint stock companies listed on Amman Stock Exchange (ASE) at the significance level ($\alpha \leq 0.05$)

To test this hypothesis, the researcher used multiple regression analysis to measure impact of applying activity-based costing (ABC) accounting system on competitiveness of industrial joint stock companies listed on

Amman Stock Exchange (ASE) at significance level (α≤0.05).The results in Table (2) show the following:

Table (2)

Results of Multiple Regression Analysis for measuring the impact of applying activity-based costing (ABC) system on competitiveness of industrial joint stock companies listed on Amman Stock Exchange (ASE)

Independent Variable	Source of Variance	Sum of Squares	Degrees of Freedom	F-value	Significance Level	Statistical Decision
Activity-Based Costing (ABC) System	Regression	3.483	3	18.82	0.000	Rejecting null hypothesis
	Error	3.023	49			
	Total	6.506	52			
R^2 -value	0.536					
R- value	0.732					

F- tabulated at significance level (α≤0.05) and degree of freedom 49,3 amounting to 2.80

It is obvious from the data in previous table that calculated F- value is 18.82, where its tabulated value is 2.80. By comparing the values obtained in from testing this hypothesis, it is found that the calculated value is greater than the tabulated value. Thus, the null hypothesis is rejected and the alternative hypothesis is accepted that indicates there is a statistically significant difference of applying activity-based costing

(ABC) accounting system on competitiveness of industrial joint stock companies listed on Amman Stock Exchange (ASE) at the significance level ($\alpha \leq 0.05$). This is confirmed by significance level value ($\alpha = 0.00$), which is less than significance level ($\alpha \leq 0.05$). Additionally, the table shows that variance of independent variable (R^2) shows 0.536 proportion of variation that explains improving in competitiveness of industrial joint stock companies listed on Amman Stock Exchange (ASE).

Testing first sub-hypothesis

There is no statistically significant difference of accuracy in identifying product cost based on activity-based costing (ABC) on competitiveness in industrial joint stock companies listed on Amman Stock Exchange (ASE) at significance level ($\alpha \leq 0.05$)

To test this hypothesis, the researcher used simple regression analysis to measure impact of applying activity-based costing (ABC) on competitiveness according to products quality industrial joint stock companies listed on Amman Stock Exchange (ASE) at significance level ($\alpha \leq 0.05$).The results in Table (3) show the following:

Results of Simple Regression Analysis for measuring impact of applying activity-based costing (ABC) on competitiveness according to products quality in industrial joint stock companies listed on Amman Stock Exchange (ASE)

Table (3)

Independent Variable	Source of Variance	Sum of Squares	Degrees of Freedom	t-value	Significance Level	Statistical Decision
Identifying product cost	Regression	0.289	1	1.306	0.197	Rejecting null hypothesis
	Error	8.640	51			
	Total	8.929	52			
R^2 value	0.32					
β value	0.18					

t- tabulated at significance level ($\alpha \leq 0.05$) = 2

It is apparent from the data in previous table that calculated t is 1.306, where its tabulated value is 2. By comparing the values obtained in from testing this hypothesis, it is found that calculated value is less than tabulated value. Thus, the null hypothesis is accepted and the alternative hypothesis is rejected that indicates there is a statistically significant difference of identifying product cost based on activity-based costing (ABC) on competitiveness according to products quality in industrial joint stock companies listed on Amman Stock Exchange (ASE) at the

significance level (α≤0.05).This is confirmed by significance level value (α = 0.197), which is greater than significance level (α≤0.05).

Testing second sub-hypothesis

There is no statistically significant difference of decisions quality based on activity-based costing (ABC) on competitiveness in industrial joint stock companies listed on Amman Stock Exchange (ASE) at significance level (α≤0.05)

To test this hypothesis, the researcher used simple regression analysis to measure decisions quality based on activity-based costing (ABC) on competitiveness according to products quality industrial joint stock companies listed on Amman Stock Exchange (ASE) at significance level (α≤0.05).The results in Table (4) show the following:

Table (4)

Results of Simple Regression Analysis for measuring impact of decisions quality based on activity-based costing (ABC) on competitiveness according to products quality in industrial joint stock companies listed on Amman Stock Exchange (ASE)

Independent Variable	Source of Variance	Sum of Squares	Degrees of Freedom	t-value	Significance Level	Statistical Decision
Decisions Quality	Regression	1.049	1	2.605	0.012	Rejecting null hypothesis
	Error	7.880	51			
	Total	8.929	52			
R^2 value	0.117					
β value	0.343					

t- tabulated at significance level (α≤0.05) = 2

It is clear from the data in previous table that calculated t is 2.605, where its tabulated value is 2. By comparing the values obtained in from testing this hypothesis, it is found that calculated value is greater than tabulated value. Thus, the null hypothesis is rejected and the alternative hypothesis is accepted that indicates there is a statistically significant difference of decisions quality based on activity-based costing (ABC) on competitiveness according to products quality in industrial joint stock companies listed on Amman Stock Exchange (ASE) at the significance level (α≤0.05).This is confirmed by significance level value (α = 0.012), which is greater than significance level (α≤0.05). Additionally, the table shows that variance of independent variable (R^2) shows 0.117 proportion of variation that explains improving in competitiveness according to

products quality in industrial joint stock companies listed on Amman Stock Exchange (ASE).

Testing third sub-hypothesis

There is no statistically significant difference of identifying optimal mix based on activity-based costing (ABC) on competitiveness according to products quality in industrial joint stock companies listed on Amman Stock Exchange (ASE) at significance level ($\alpha \leq 0.05$)

To test this hypothesis, the researcher used simple regression analysis to measure optimal mix based on activity-based costing (ABC) on competitiveness according to products quality in industrial joint stock companies listed on Amman Stock Exchange (ASE) at significance level ($\alpha \leq 0.05$).The results in Table (5) show the following:

Table (5)

Results of Simple Regression Analysis for measuring impact of optimal mix based on activity-based costing (ABC) on competitiveness according to products quality in industrial joint stock companies listed on Amman Stock Exchange (ASE).

Independent Variable	Source of Variance	Sum of Squares	Degrees of Freedom	t-value	Significance Level	Statistical Decision
Identifying optimal mix	Regression	2.469	1	4.415	00.00	Rejecting null hypothesis
	Error	6.460	51			
	Total	8.929	52			
$\mathbf{R^2}$ value	0.277					
β value	0.526					

t- tabulated at significance level ($\alpha \leq 0.05$) = 2

It is noted from the data in previous table that calculated t is 4.415, where its tabulated value is 2. By comparing the values obtained in from testing this hypothesis, it is found that calculated value is greater than tabulated value. Thus, the null hypothesis is rejected and the alternative hypothesis is accepted that indicates there is a statistically significant difference of optimal mix based on activity-based costing (ABC) on competitiveness according to products quality in industrial joint stock companies listed on Amman Stock Exchange (ASE) at the significance level ($\alpha \leq 0.05$).This is confirmed by significance level value ($\alpha = 0.000$), which is less than significance level ($\alpha \leq 0.05$). Additionally, the table shows that variance of independent variable (R^2) shows 0.277 proportion of variation that explains improving in competitiveness according to

products quality in industrial joint stock companies listed on Amman Stock Exchange (ASE).

Results and recommendations

First: Results

This study aims to identify the impact of applying activity-based costing (ABC) system on competitiveness of industrial joint stock companies listed on Amman Stock Exchange (ASE). Based on statistical analysis of data collected to achieve study objectives and its problem as well as testing study hypotheses results, the study results are summarized in the following points:

1- Study results show that industrial joint stock companies listed on Amman Stock Exchange (ASE) apply activity-based costing (ABC) system in high degree. Furthermore, results show that the highest extent of applying is related to identifying product cost then, improving quality decisions, lastly improving optimal mix.

2- Study independent variables that are represented by activity-based costing (ABC) system have a positive effect on competitiveness in industrial joint stock companies listed on Amman Stock Exchange (ASE) from the point of view of sample members.

Second: Recommendations

In the light of study results, a number of recommendations can be proposed that could contribute to improving competitiveness in industrial joint stock companies listed on Amman Stock Exchange (ASE) are the following:

1- Continuing in developing employees' skills in industrial joint stock companies listed on Amman Stock Exchange (ASE) through intensifying training courses and developing using modern scientific methods in line with applying activity-based costing (ABC) system.

2- Rising awareness and increasing it for the employees about the concept of activity-based costing (ABC) system, as this system has an effective impact on increasing competitiveness of these companies.

3- Issuing bulletins and lectures, which aim to explain importance of applying activity-based costing (ABC) system, its **objectives,** the benefits gained from its application and studying problems and difficulties that may hinder its application.

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