The Impact of Software Quality Assurance on Incident Management of Information Technology Service Management (ITSM)

A Field Study on Website's Development Companies in Jordan

أثر ضمان جودة البرمجيات على إدارة الحوادث كخدمة داعمة لإدارة خدمات تكنولوجيا المعلومات

دراسة ميدانية على شركات تطوير المواقع الإلكترونية الأردنية

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Thesis Submitted in Partial Fulfillment of the Requirement for the Degree of Master of E-Business

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June, 2017

Authorization

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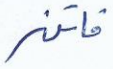
Signature: 

Thesis Committee Decision

This thesis, "The Impact of Software Quality Assurance on Incident Management of Information Technology Service Management (ITSM): A Field Study Websites Development Companies in Jordan, was discussed of certified on June, 2017.

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First of all I would like to express my whole hearted and sincere gratitude to Dr. Hanadi Salameh, for her guidance time, and patience, for supporting this thesis and me during every stage of its development.

I am grateful to all respondents who responded to my questionnaire and made the process of data collection speedier.

Sincerely Yours,

Faten Al- Sheikh

Dedication

It is my pleasure to dedicate this humble work to my beloved parents, husband Husam and friends.

With appreciation

Faten Al- Sheikh

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أثر ضمان جودة البرمجيات على ادارة الحوادث كخدمة داعمة لإدارة خدمات تقنية المعلومات
دراسة ميدانية على شركات تطوير المواقع الإلكترونية الأردنية

إعداد

فاتن عمر الشيخ

إشراف

الدكتورة هنادي سلامة

الملخص

تهدف هذه الدراسة للتحقيق في أثر ضمان جودة البرمجيات على إدارة الحوادث كخدمة داعمة لإدارة خدمات تكنولوجيا المعلومات في شركات تطوير المواقع الإلكترونية في الأردنية.

تضمن مجتمع الدراسة جميع الموظفين العاملين في شركات تطوير المواقع الإلكترونية الأردنية. تم توزيع 660 استبانة إلكترونيا وتم استعادة 264 استبانة.

قامت الباحثة بإستخدام المنهج الوصفي و جمعت البيانات من خلال الإجابة عن الإستبانة، تمت معالجة البيانات بإستخدام برنامج SPSS. أظهرت الدراسة مجموعة من النتائج يمكن تلخيصها كمايلي:

أظهرت الدراسة مستوى عالي من الأهمية لضمان جودة البرمجيات في شركات تطوير المواقع الإلكترونية الأردنية، مع الأبعاد التي ذكرت سابقا (إختبار البرمجيات، إدارة الحوادث، أثر الحادث، إلحاح الحادث).

إعتمادا على نتائج الدراسة و الإستنتاجات تم إقتراح عدد من التوصيات التالية: على شركات تطوير المواقع الإلكترونية الإعتماد على الإختبار الأتوماتيكي بدل الأختبار اليدوي، أيضا يجب على الشركات أن تعتمد على التغذية الراجعة من الزبائن بشكل مستمر لتحسين خدمة الموقع و التأكد من الجودة طول الوقت، أخيرا على شركات تطوير المواقع الإلكترونية تبني خطة إدارة حوادث واقعية، قابلة للإنجاز للتعامل مع أي حوادث قد تظهر.

الكلمات المفتاحية: جودة البرمجيات، إدارة خدمات تكنولوجيا لمعلومات، إدارة حوادث.

The Impact of Software Quality Assurance on Incident Management of Information Technology Service Management (ITSM)
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Abstract

This research aims at investigating the impact of software quality assurance on incident management of information technology service management (ITSM) in Jordanian websites development companies; the population of the study includes all employees working in websites development companies in Jordan. (660) questionnaires were distributed on-line, only (264) questionnaire returned. The researcher used descriptive study method and data collected from responses of the study questionnaire was used through Statistical Package for Social Science (SPSS). The study explored number of important and significant results that can be summarized as follow: The study shows high impact of software quality assurance (software testing) on ITSM incident management in term of reducing system incident urgency and incident impact. Based on study result and conclusions the following recommendations are suggested: Jordanian websites development companies are recommended to use automated testing rather than manual testing because of its accuracy

and lower cost, also companies must rely continuously on customer's feedback to improve websites services to ensure quality all the time, finally Jordanian websites development adopt incident management plan and it must be proportion with organizational realistic, achievable ,to deal with any incident appear.

Keywords: Software Quality Assurance, ITSM (Information Technology Service Management), Incident Management.

Chapter One

General Framework

(1-1) Introduction

(1-2) Problem of the Study

(1-3) Objectives of the Study

(1-4) Questions of the Study

(1-5) Significance of the Study

(1-6) Hypotheses of the Study

(1-7) Theoretical Framework

(1-8) Limitations of the Study

(1-9) Operational Definitions

Introduction

1.1 Overview:

Nowadays the success of business is determined by the size of information technology it uses. To improve service for the customers, and achieve customer's satisfaction to maintain competitive advantage. Therefore, the software quality assurance is necessary to run business.

For the purpose of meeting organizational goals, the interest of information technology service management ITSM is increasing it used to improve the quality of the IT information service management. The core purpose of IT information service management of incident, the most important thing is focus in service recovery when incident occur (Lim, Park,&Chung, 2016).

Currently ITSM provide specific processes, metrics, and guidance. To enable and manage assessment, planning, and implementation of IT services (Yazici,et.al., 2015).

Increasingly, software has become a gradually essential. Software affected personal and business activities, economic, education, all ones etc. Software development has become a critical activity that needs to be carefully studied, improved, understood, and supported (Fuggetta ,&Nitto,2014).

Software development is lying down to failure. One of the essential causes of this failure is the use of predictive processes for complex software. Predictive processes attempt to fully define all requirements directly. Traditional software development models such as the waterfall model, which involves predictive processes, are not the most appropriate when

business needs and technology changes rapidly. It is often difficult to establish a complete vision for the software product at inception, list all the requirements clearly, and devise a detailed plan to convert these requirements into the finished produce (Codabux,Williams,& Niu, 2014).

The detection of defect saves time and cost for software projects. It also reduces a number of defects in an application and increases customer satisfaction. Moreover, reliable software is easy to sell new customers (Khan, 2013).

Maintaining quality for a product is a very critical issue for business organizations. Any failure in software system can lead to serious problem. The main role of the software quality assurance is to maintain the quality of software product (Javed, et.al., 2012).

This study investigates of the impact of software quality assurance on ITSM incident management, it also examines the existence of relationship between software quality assurance in general and software testing in particular and ITSM incident management. This study may give some insights on how to ensure delivery of quality service to customers, and how software testing may reduce incidents in an IT service.

1.2 Problem of the study:

Some studies like (Xu,et.al., 2010) proved that software quality assurance is the most important component of software management, they also provided several practices to enhance software quality for businesses for the sake of improving their services and achieving customer's satisfaction. In addition, (Mora,,et.al.,2014) indicated that organizations can improve their IT service quality when ITSM practices are deployed in a proper way to decrease any defect for the services. The appearance of any Incident must be

decreased if the software undergoes sufficient and correct testing (Lucca,& Fasoline, 2006). Many websites, provide poor service quality and more incident appeared. Consequently, this research helps the websites development company in Jordan in term of achieving on-line service through the execution of quality assurance practices through software testing, and how to deal incident by implementing incident management.

1.3 Objectives of the Study:

This study aims at investigating the effect of software quality assurance and software testing on ITSM incident management through:

1.investigating the effect of software quality assurance on ITSM incident management.

2. investigating the effect of software testing on ITSM incident management.

1.4 Questions of the Study:

The study problem is represented by the main question:" *what is the effect of software quality assurance on ITSM incident management?"*

Based on the main question, the study seeks to answer the following sub-questions:

Question 1: *To what extent does the software testing affect the incident impact?*

Question 2: *To what extent does the software testing affect the incident urgency?*

1.5 Significance of the Study:

Incident management needs the service provider to take actions immediately to resolve the incident, as the cost of each hour's service downtime is high. The average cost of one hour's service downtime for Amazon.com is $180,000. Online services such as Amazon and Google, and have experienced live-site disruption. Therefore, service providers have invested great efforts on service-quality management to minimize the service downtime and to ensure high quality of the provided services. an important aspect of service-quality management is incident management. once a service incident occurs, the service provider should take actions immediately to diagnose the incident and get back the service as soon as possible. Such incident management needs to be efficient and effective to ensure service quality (Lou,et.al.,2013). A web application component will affect cost of build up a testing environment (Lucca,&Fasolino,2006).

IT service testing is a very important phase to identify and remove errors to reduce incidents happening in the future (Rennung,et.al.,2014).

The importance of this study is to investigate the impact of software quality assurance on incident management in Jordanian websites development companies This helps companies to setup their strategy and software management plan to enhance the best service, earn customer satisfaction, and competitive advantages. The competition in IT services sector is increasing day after day, hence is important to deliver services with high quality to achieve business strategy, improved business performance and customer loyalty.

1.6 Hypotheses of the Study:

Main Hypothesis:

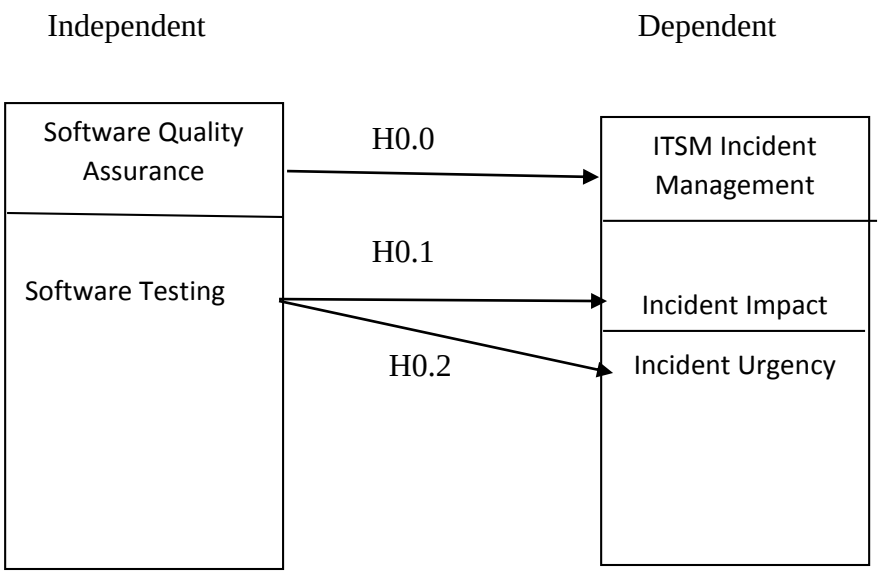
H0.0: software quality assurance does not have an impact on ITSM incident management at (p= α 0.05).

Sub Hypothesis:

H0.1: software testing doesn't have an effect on incident impact at (p= α 0.05).

H0.2: software testing doesn't have an impact on incident urgency at (p= α 0.05).

1.7 Theoretical Framework:



This model was created by the researcher based on the studies carried out by (Quadri,et.al., 2015), (Lee, 2014), and (Lou,et.al.,2013).

1.8 Limitations of the Study:

The scope of this study deal with the following:

Human Limitations: the study targets employees working at website development companies in Amman-Jordan.

Place Limitations: websites development companies in Amman.

Time Limitations: study time is the year 2017.

Sample limitation: the study was limited in number of companies and employees working at those companies, also there are a very few studies about quality assurance that toke incident management and ITSM point of view, this study will fill this gap.

(1-9) Operational Definitions:

Software Quality Assurance:

It is defined as a standard which is developed to help organizations deliver quality product and lead to better results. It aims to reduce system problems and help to find errors and defects in the software (Javed,et.al., 2012). Software testing is considered one of these processes.

Information Technology Service Management (ITSM):

ITSM is defined as the implementation and management processes to improve the quality of IT services to meet the needs of the business (Yazici,et.al., 2015). It is also presented as the management of IT infrastructure of a company to achieve business requirements and goals with low cost (Herring,et.al., 2014), as shown in figure ITSM focuses on several aspects of IT management such as service strategy, project management, policy and procedure, assets management, change management.

Figure (1) (ITSM) IT Service Management Support((on-line),available:http://solvit.rs/itil-itsm-cosulting)

The study investigates ITSM incident management and how software quality assurance impact on incident management to improve on-line services and achieve user's satisfaction.

ITSM Incident Management:

Incident management is an IT service management process area, it is defined as the processes used within an IT organization to reduce errors in a system as well as reduce errors impact and urgency when taking place. The first goal of the incident management process is to restore normal service operation as quickly as possible and to minimize the impact on business operation, thus ensuring that the best possible levels of service quality and availability are maintained.

Chapter Two

Literature Review& Previous Study

Literature Review

This chapter reviews studies that have been carried out in the field software quality assurance & ITSM specifically covering the following three areas

- Software Quality Assurance.
- Information Technology Service Management ITSM.
- Incident Management

Software Quality Assurance:

Software quality assurance is defined as framework to obtain systematic quality on the basic relationship between metrics and sub factors (Quadri et.al., 2015).

Software quality assurance is a formal process for evaluating and documenting the quality of each stage of the software development lifecycle, software quality factors (Lee,2014). There are several factors that help in achieving software quality assurance such as reliability, efficiency, reusability, flexibility, security as well as usability.

Reliability: refers to the extent to which a program can be maintained so that it can accomplish its specific function, where's **Efficiency:** deal with the problem which faced users in effective way. **Reusability**: ability to modify content to use it several times.

Flexibility: ability to modified system component to use it more than one time. Moving to the fifth factor i.e. **Security:** refers to controlled the access to software or data by unauthorized person. Finally **Usability:** is the ease with which a user can learn to operate and use the applications.

Software quality is an important factor in software sector. Software quality drives customer satisfaction which can be achieved through applying standards. In this era, achieving quality software is very important because of high customer demand (Javed,,et.al., 2012).

Software quality assurance implies planned and systematic pattern of all actions necessary to establish technical requirement provides for monitoring software engineering processes to ensure quality. Software quality assurance is broken into subclasses like: usability, efficiency, reliability, maintainability, which can be measured to improve quality product (Xu,et.al., 2010).

Software Testing:

Software testing is an essential activity for evaluating quality of software and also to test other software quality factors such as usability, maintainability, security, and efficiency

Software testing remains one of the most useful approaches for assessing and improving quality of software (Orso,& Rothermel, 2014). Testing practices includes but not limited test. automation testing, unit testing, and test case elimination which highlights test processes. (Begel, & Zimmermann, 2014).

The aim of the testing of a web application is to discover defect in the service to verify harmonization of the application with specific requirements. Software testing are defining as stages of activities such as **unit test** including, first, client page testing which means showing textual, hyper textual information for user, accepting user input, while the second server page tests this type to show the coordination of business rules and managing the retrieving and

storing of data from/ into database. **Integration test** which considers that the web pages' work together. **System test:** aims to discover defects that are found within web application (Lucca,& Fasolino, 2006).

Software testing is defined as an important and costly activity in the software development stages, as the lack of sufficient testing. usually leads to major risks and defect (Garousi, &Zhi, 2013).

Software testing is considered a part of software development life-cycle; the impact of insufficient software testing is increased in system failure which leads to poor quality software. Software testing confirms that system or software under test produces the desire and intended outputs taking to in consideration set of inputs and implementation environment, to ensure quality of software. It is also defined testing is an activity which implemented through building of test cases, **test cases** is consist of a set of input, precondition for expected result to compare with output after testing, test case can provide bug count, help in decision being makes by mangers, examine quality of product. (Kochhar, et.al., 2013).

Software testing is an activity which is aimed for evaluating quality of a program and also for improving it and to test other software quality factors usability, security, efficiency, maintainability (Kumar,& Syed, 2010)

Information Technology Service Management(ITSM):

ITSM is an international standard that can apply to all organizations managing IT services management system, its IT advanced management system to manage processes, technology, and resources. ITSM used to provide world service for internal and external customer using IT(Lim,et.al, 2016).

ITSM practices define approaches and standards for action, problem solving, performance and accountability. ITIL (Information Technology Infrastructure Library) is one of the best practices in ITSM which provides necessary context to analyzes organization practices relevant to benefit identification (Wijesighe,et.al., 2015). ITSM is a key issue, in planning and managing IT services with regards to business process (Yazici,et.al., 2015).

ITSM can be defined as a management system of organization capabilities and resources for proceeding value to customer through IT services and more efficiently of IT processes. Implementation of ITSM needs to identify core structures and attributes of ITSM process framework to select correct suitable framework for the organization (Mora,et.al., 2014).

Also it was defined as the management of the IT unit responsible for delivering service and infrastructure to a company. The goal of ITSM is to deliver IT service to a company in a cost effective way, while improving the quality of the service delivered.

ITSM management is the management of IT department to deliver service and infrastructure to a company with effective cost and improving service quality to the users (Herring,et.al., 2014). ITSM is a capability of organizations to improve the value for customers through services. Providing consistent quality is important but is difficult for software and service

industry because the supplier must assess a service continuously and how the service match customers expectations (Trinkenreich,et.al., 2015).

Incident Management:

An incident in terms of information system is defined as an unplanned interruption or the encounter of a bad quality while providing it service (Trinkenreich,et.al., 2015).

Incident management deals with management of all information technology and system incident to return the firm service as soon as possible (Rauchercker,2014). Incident management is not only responding to hazards it includes art craft handling, security awareness training, and vulnerability handling and other related service (Ab Rahman,&Choo, 2014). Incident management process is driven by two incident characteristics: incident urgency and incident impact.

Incident Urgency: Is the speed by which an incident should be resolved. Some incident management tools perform automatic calculations for urgency based on Impact. If not, a simple workaround would be to educate operators on a regular basis and to inform them on parameters of signed contracts. Incident urgency means how organization speed of organization to resolve incident appearance. There are levels for urgency **critical** which organization response immediately using all available resources and effort until resolve, **high** technician response immediately assess may interrupt other stuff with low or medium job priority the situation, **medium** responding using standard procedure with normal management structure, low respond using standard procedure as time allow (Marquis,2006).

Incident impact: Is the measure of how a business is critically impacted by an incident. Incident impact is usually directly proportional to the number of users influenced by the incident. Depending number of users an incident impact can be classified (as critical if more than 50% of users, **high** no more than 50% of users, **medium** no more than 25% of users, **low** affect single user(Marquis, 2006).

Previous Study:

(Garusi,& Zhi, 2016)

Entitled (A Survey of software testing practices in Canada)

This study presents the importance of software testing through regional survey of software testing in Canada. Authors found interesting result about software testing practices in Canada, they compared with results to similar studies in the US , Sweden , and Australia. The approach authors used in their survey questions, metrics methodology, depend on the goal of this study which was characterized the software testing practices in Canada, also provided the view on the latest testing techniques, metrics tools used by tester and challenging faced, to determine the strength and weakness to encouraging collaboration between academic and industry sector. Study finding was, the importance of testing training is an indicator of the importance of product quality. Testing skills rise product quality, in the Canadian firm the manager or tester don't use criteria for testing they might stop based on managerial concern. This lead to lack of understanding test termination criteria which increasing the defect in software product. Because of that the testers must receive training. To achieve high quality product. Functional and unit testing was two common types of test had most attention and efforts. Most Canadian companies used mix of two coverage metrics

in their project which was decision and condition coverage. Two important metrics for software quality were number of passing user acceptance tests and number of defects detected per (day, week, month). The ratio between tester and developer 1:2 1:5 in most Canadian companies. Canadian firms spent less than 40% effort budget and time), there is gap between testing industry and research this obvious through low research involvement.

The study helped the researcher to build questionnaire questions in a terms part of software, as it is part of software quality.

(**Lim,Park,&Chung, 2016)**

Entitled (Automatic Incident Process System using Naive Bayesian Classification on ITSM – based system)

The purpose for this study is to present AIPS for simple and repeated incidents registered through NBC it used to classify incidents and distinguish to simple or complex incident.

The method AIPS automatically distinguish and processed simple or complex incidents then present solutions with highest frequency to requesters by e-mail.

The finding emphasized that AIPS incident can be resolved quickly and the working hours for professional could be shorted by 77% reducing workload, which raised complex incident resolved leading to improved efficiency.This study concentrates incident and how to resolved it. Current study is different as it highlights the relation of how software quality assurance impacts incident management.

(Quadri,et.al., 2015)

Entitled (Software Quality Assurance in Component Based Software Development)

The study investigates how component based software development (CBSD), improved quality of component based software system without affecting quality attributes. By reusing verified component, the component came from component hardware they used to wire different hardware component to make product. CBSD raised when reduces time, cost, effort for development. Researcher reported information from literature survey it is recommended to develop software product using CBSD and to assure quality different framework from the previous study. After analysis authors explored that to achieve the quality in component based software system it, need to have the component that were certified through software measure. Because the quality attributes depend on quality attributes of the consist component integration process used. Study surveys different research paper and analysis different technique. Defining the optimal level of business benefits within IS/IT projects: Insights from benefit identification practices adopted in an IT Service Management (ITSM) project.

This study benefit current study in defining quality assurance criteria in forming questionnaire to measure software quality assurance.

(Lin,et.al., 2015)

Entitled (Quality Assurance through Rigorous Software Specification and nTesting: A Case Study)

The study present automated testing with no human intervention, testing tools for the chosen application, to provide fully automated testing, and software certification as feasible mean to achieve high product quality. At the end of this process researchers have the ability of running large numbers of tests, as a result an automated testing facility for low-cost, quick-turnaround testing and re-testing. their experiences demonstrate a pathway towards lowered cost of testing and improved product quality. The researcher used in their methodology two rigorous software testing method, sequence-based specification and Markov chain usage-based statistical testing.

(Barr,et.al., 2015)

Entitled (The Oracle Problem in Software Testing: A Survey)

This paper clarify the oracle test automation is important to remove bottleneck that inhibits greater test automation. All form test oracle involves challenges of reducing cost and increasing benefit. Test oracle a procedure that distinguish between correct and incorrect behaviors of the system under test. Researchers had comprehensive review and analysis other literature to test oracle problem, to achieve greater test automation.

Finally the result was showed test oracle is difficult to construct, there were two approaches to oracle reuse. They can built test oracle based on older version program.

(**Mora,et.al., 2015)**

Entitled(An Extensive Review of IT Service Design in Seven International ITSM Processes Frameworks: Part II)

This paper aims to clarify what are IT services and how they can be designed. Thus it is of broad significance to ITSM researchers and practitioners, its focusing on the IT service design, processes and practices reported in the seven ITSM processes frameworks. The research methodology depends on the theoretical lenses through the system engineering standard ISO/IEC 152888. Which concern with integrated design of man –made systems under an organizational context. As main conclusion in the design IT service must choose very carefully an ITSM model or standard, the processes different form organization to another depend on its size. (small, medium , large).

(Wijesinghe,Scheepers,&Mcloughlin, 2015)

Entitled (Defining the optimal level of business benefits within IS/IT projects: Insights from benefit identification practices adopted in an IT Service Management (ITSM) project)

The purpose of this paper is to describe and define a practice approach that reflects the outstanding organizational investment through a benefit identification process that serves to take advantage of a number of benefit identification methods. In addition to underline and

reflect on the importance of this benefit identification process in the context of IT service management (ITSM). This is achieved through a case study of an information technology infrastructure library (ITIL) implementation in a multinational organization.

Methodology for this study were revolve on single case study conducted by researchers at a financial service organization, data was collected from the project initiation phase and observation with documents as supplementary sources.

Finding shows the case study exposes an active practice approach of customizing such implementations in an effort to achieve cost effective implementation of IT services that reflects the context and requirements of that specific organization.

(Mclntosh,et.al., 2014)

Entitled (The Impact of Code Review Coverage and Code Review Participation on Software Quality: A Case Study of the Qt, VTK, and ITK Projects)

This paper study the relationship between software quality, firstly with code review which mean the rate of changes that have been code review, secondly with code review participation the certificate of reviewer involvement in the code review process Methodology: case study on QT,VTK, and ITK projects.

Study finding was ensure there were both code coverage and code review participant share link with software quality. Poorly reviewed code had negative impact on software quality.

(Mora,et.al., 2014)

Entitled (An Extensive review of IT Service design in Seven International ITSM Processes frameworks: Part I)

This study addressed an IT service design process to be a fundamental piece of the seven key international IT Service Management (ITSM) processes frameworks (ITIL v2, ITIL v3 (and ITIL v2011), ISO 20000-4, CobIT 4.0, CMMI-SVC, MOF 4.0, and ITUP). Never, the availability of IT service design processes, few –if any- descriptive-comparative studies among them have been reported. Thus, in this paper (Part I), researchers address this knowledge gap.

An extensive descriptive-comparative review of seven IT service design processes in above-mentioned frameworks is reported. Fundamental concepts (viz., design as noun, design as verb, service, service system, IT service, IT service system, and IT service architecture design) are analyzed by using a Systems Approach.

The findings indicate that the frameworks ITIL v2, ISO/IEC 20000 and Cobit 4.0 are using weak systemic concepts, while the frameworks ITIL v3, CMMI-SVC, ITUP and MOF 4.0 are more foundationally congruent with the new service systems view. Implications for ITSM theory and practice are discussed.

(Rennung, Luminosu,& Draghici 2014)

Entitled (Evaluation of methods for customer integration to the quality of IT services).

The aim of this study to analyze how the concepts of "customer integration" can support the evaluation of the IT service process quality with a positive improvement. The methodology which used is questionnaire provided for customer experts and experts of the service provider, and interviews. In the structured interview each five dimensions per customer.

The result show that an IT support for the evaluation of the customer integration can increase quality and efficiency in implementation.

(Lee, 2014)

Entitled (Software Quality Factors and Software Quality Metrics to Enhance Software Quality Assurance)

This paper build an appropriate method of Software quality metrics application in quality life cycle with software quality assurance. Successful software quality assurance is highly dependent on software metrics. It needs linkage the software quality model and software metrics through quality factors in order to provide measure method for software quality assurance. This paper solves customer value evaluation problem are: Build a framework of combination of software quality criteria. Describes software metrics. Build Software quality metrics application in quality life cycle with software quality assurance.

Result shows each activity in software life cycle there is one or more quality measure metrics to ensuring the quality of the process and the resulting product.

(Alberts et al., 2014)

Entitled (An Introduction to the Mission Risk Diagnosis for Incident Management Capabilities (MRD- IMC)

This study present Incident management (IM) as the activities that are performed in an organization when managing computer security events and incidents The term incident management function refers to the wide series of activities associated with providing IM services. The Mission Risk Diagnostic for Incident Management Capabilities (MRD-IMC) designed to address this need. The MRD-IMC is a risk-based approach for assessing the extent to which an IM function is in position to achieve its mission and objectives.

The goal of the MRD-IMC is to determine the extent to which an IM function is in position to achieve its mission and objective(s). To accomplish this goal, analysts applying the MRD-IMC evaluate a set of systemic risk factors (called drivers) to aggregate decision-making data and provide decision makers with a benchmark of an IM function's current state.

The resulting gap between the current and desired states points to specific areas where additional investment in an IM function is warranted.

(Hussain, Al Nasser, & Hussian, 2014)

Entitled (Service quality and customer satisfaction of UAE-based airline: An empirical investigation)

This paper presents the linkages among service quality, customer satisfaction and expectation service provider image and brand loyalty in a Dubai- based airline service quality was used to measure customer satisfaction. The methodology researcher used was quantitative approach to collect data from questionnaire. analyzed.

The finding suggests that brand image, service quality had positive significant impact on customer satisfaction which can lead brand loyalty.

(Orso,& Rothermel, 2014)

Entitled (Software Testing: A Research Travelogue (2000–2014))

The goal of this paper is to provide an accounting a some of some successful research in software testing since the year 2000, and to present what appear of the most significant challenges and opportunities in this area. To present and discuss the most successful software testing research.

The researcher contacting over 50 of their colleagues who are active in software testing by no means claim that their paper represents all the relevant and noteworthy research.

(Iden,&Eikbrokk, 2013)

Entitled (Implementing IT Service Management: A systematic literature review)

This study reviews the research on the implementation of ITSM. The aim to provide an update of ITSM, activities in these rapidly evolving area. The ITSM manages the IT function as service function.The method there were two main objectives for this review: identify, classify, and summarize existing research on ITSM.

The review concludes that the motive for implementation, critical factor complex, for implementation success, and the benefits of implementation is the most dominant in current research, and there are limited studies on implementation strategies and method. Therefore, the researcher encourages to join this research area.

(Lou,et.al., 2013)

Entitled (Software Analytics for Incident Management of Online Services: An Experience Report)

The study focused that the incident management has become critical task that aims to minimize the service downtime and ensure quality of the provided services, incident management faces challenges such as large data, complex problem, incomplete knowledge.

The researcher developed an industrial system called the Service Analysis Studio (SAS) has been deployed in worldwide for incident management.

The researcher extract incident signatures by analyzing the difference between the logs of failed requests and succeeded requests. In SAS, the authors go further to provide healing suggestions by leveraging the solutions of previous incidents in the incident repository

(Khan, 2013)

Entitled (Establishing a Defect Management Process Model for Software Quality Improvement)

This study observes there are defect in whole life of software lifecycle because is developed by human, the main goal is to produce quality software with less number of defect to reduce the impact of problem of the organization. In this paper author have proposed a defect management process model and finds observations by applying the proposed model in one of the case organization.The major goal of this study is to establish a defect management process model in an organization to reduce the number of defects and produce a quality software product.

(Kochhar,et.al.,2013)

Entitled (An Empirical Study of Adoption of Software Testing in Open Source Projects)

This paper defined testing as a critical activity that is designed to ensure the quality of program code. Also testing is an activity which is managed through the set of test cases. Test cases helped in bug count, help managers in decision making, examine quality of product.

In this study the researcher analyzes a large number of open source projects from the GitHub hosting site. The researcher use projects downloaded previously using the GitHub. They examine their dataset found famous projects like jQuery and Ruby on Rails framework.

The result show that projects with test cases were bigger in size and with bigger team had high number of test cases the number of test cases had weak correlation with number of bugs.

(Javed,et.al., 2012)

Entitled (How To Improve Software Quality Assurance In Developing Countries)

This paper will address the problems for lacking interest in improving the software quality by higher authorities and software assurance team. They have provided solution to the addressed problems. This research methodology depend on questionnaires are distributed among all seven developers and then their answers were collected and findings were explained in the different categories. Paper finding: software quality assurance plays a very important role in business of Software Company because the only factor which results in getting consistent projects from permanent customers is customer satisfaction.

(Iftikhar,& Ali, 2011)

Entitled (Software Quality Assurance A Study Based on Pakistan's Software Industry)

This paper investigates the role of quality management practices in software industry of Pakistan. Researchers present a comparison between the more-experienced and less-experienced firms with respect to the critical factors of quality management.

The critical factors of quality management practices in the software industry are first identified from the literature survey and validated through an empirical. The study tries to examination the influence of “age of quality” and “use of software” over software quality management practices and programs. The results of the study show that the ‘age of quality” and “use of software” have partial influence over the software quality management.

(Xu, Ho,& Caprtez, 2010)

Entitled (An Empirical Study on the Procedure to Derive Software Quality Estimation Models.)

Software quality assurance has been a heated topic for several decades. If factors that influence software quality can be identified, they may provide more insight for better software development management.

More precise quality assurance can be achieved by employing resources according to accurate quality estimation at the early stages of a project. In this paper, a general procedure is proposed to derive software quality estimation models and various techniques are presented to accomplish the tasks in respective steps. Several statistical techniques together with machine learning method are utilized to verify the effectiveness of software metrics. Moreover, a neuro-fuzzy approach is adopted to improve the accuracy of the estimation model. This procedure is carried out based on data from the ISBSG repository to present empirical.

(Tan,et.al.,2009)

Entitled (Implementing IT Services Management: A Case Study Focusing On Critical Success Factors)

This study is a case on Queen land health large Australian government agency implemented IT service management model based on ITIL framework, its highlight on the challenges which faces and confirm a set of factors that effect on project success.

The method depends on collaborative practice research. Researcher developed collaborative relationship with key member of the QH ITIL project team.

The study concludes the senior and the vendor need to have an effective change management process to move the culture from technology focus to focus on service.

This study differs from all previous studies because it is take a direct impact correlation of software quality assurance and incident management and it can improve that if there is high quality of the services there are low incident occur, which make it important.

Chapter Three

Methods and Procedures

(3-1) Introduction.

(3-2) Methodology of the Study.

(3-3) Population and Sample.

(3-4) Descriptive Analysis of the Demographic Data.

(3-5) Tools and Data Collection.

(3-6) Statistical Treatment.

(3-7) Validity and Reliability.

Methods & procedures

3-1 Introduction:

This chapter provides insight on the methodology used in this study. It describes the population and sample of the study and the researcher also discuss the demographic data of the study. It also elaborates on the research instrument, as well as data collection, statistical treatment. Finally, its validity and reliability.

3-2 Methodology of the Study

It is important to choose the method that best reflects the objective of the study. Method is the tool and technique used to obtain and analyze research data, including for example questionnaires, observation, interviews, and statistical and non-statistical techniques. The most common method to collect data is by using a questionnaire with an advance formulated alternative to answer, in order to collect the necessary data to achieve the main purpose of the study. The researcher collected primary data through a questionnaire which was distributed to website development companies' employees, where they been chosen randomly. The descriptive research is basically describing characteristics of a population or a phenomenon. In addition, descriptive studies involve collecting data in order to test hypotheses and answer questions concerning the current status of the subject. Typical descriptive studies are concerned with the assessment of attitudes, opinions, demographic information, conditions, and procedures.

The researcher designed a special questionnaire to collect data from the study sample.

3-3 Population and Sample of the Study:

The population of study was the employees of website development companies in Jordan which are 200 companies, the population contain 1000 employees of these companies, the sample contain 660 of employees so 660 questionnaires were sent via surveyplanet.com online, 264 questionnaires were returned with sufficient answers.

3-4 Descriptive Analysis of the Demographic Variables:

Tables (3-1), (3-2), (3-3), (3-4), (3-5), (3-6) show the demographic variables of the study sample.

Description of the Gender of the Respondents .

Table (3-1) shows that the male percentage was (71.2%) of sample, female was (28.8%)

Table (3-1) Description of the Gender of the Respondents

Variable	Categorizations	Frequency	Percent %
Gender	Male	188	71.2%
	Female	76	28.8%
Total		264	100%

Description of the Age of the Respondents:

Table(3-2) shows that (48.1%) of the sample less than 30 years, (20.8%) of the sample age between 31-35, the range between 36-40 years was (21.2%), (5.3%) between 41-45 years.

The range between 46-50 was (4.5%) years.

Table (3-2) Description of the Age of the Respondents .

Variables	Categorizations	Frequency	Percent %
Age	Less than 30 years	127	48.1%
	31-35 years	55	20.8%
	36- 40 years	56	21.2%
	41-45 years	14	5.3%
	46-50years	12	4.5%
	Total	264	100%

Description of the Educational Level of the Respondents :

Table (3-3) shows that the (2.3%) of the sample was from diploma, the bachelor degree was(82.6%) which show high percent, master's degree (9.8%), PHD (5.3%).

Table (3-3) Description of the Educational Level of the Respondents

Variables	Categorization	Frequency	Percent %
Educational Level	Community College	6	2.3%
	B.A	218	84.6%
	M.A	26	9.8%
	PH.D	14	5.3%
	Total	264	100%

Description of the Working Experience of the Respondents:

Table (3-4) shows that the experience years which were less than 3 years (28.4 %), (21.6%) from 4 years less than 6 years, (19.7%) from 6 years less than 10 year finally 10 years and more (30.3%).

Table (3-4) Description of the Working Experience of the Respondents

Variables	Categorization	Frequency	Percent%
Experience	Less than 3 years	75	28.4%
	4 - 6 years	57	21.6%
	6 - 10 years	52	19.7%
	More than10 years	80	30.3%
Total		264	100%

Description of the Job Description of the Respondents:

Table (3-5) shows that (51.5%) are software programmer, (33.7 %) software developer,

(14,8 %) are software tester.

Table (3-5) Description of the Job Description of the Respondents

Variables	Categorization	Frequency	Percent %
Job Description	Software programmer	136	51.5%
	Software developer	89	33.7 %
	Software tester	39	14.8 %
Total		264	100%

Description of the Company Age

Table (3-6) shows company age which was less than one year (28.0 %), between 1-2 years, (15.2 %), finally between 3-5 years (56.8 %).

Table (3-6) Description of the Company Age

Variables	Categorization	Frequancy	Percent %
Company age	Less than one year	74	28.0%
	1-2 years	40	15.2 %
	3-5 years	150	56.8 %
Total		264	100 %

3-5 Tools and Data Collection:

The current study is of two folds**,** theoretical and practical. In the theoretical aspect, the researcher relied on the scientific studies that related to the current study. Whereas in the practical aspect, the researcher relied on descriptive and analytical methods using the practical manner to collect, analyze data and test hypotheses.

The data collection, manner of analysis and programs used in the current study are based on two sources:

1. Secondary sources: books, journals, and theses to write the theoretical framework of the study.
2. Primary source: a questionnaire that was designed to reflect the study objectives and questions.

In this study, both primary and secondary data were used. The data collected for the model was through questionnaires. After conducting a thorough review of the literature pertaining to study variables, the researcher formulated the questionnaire instrument for this study.

The questionnaire was designed online through www.surveyplanet.com to be filled out via this link http://surveyplanet .com/58a7377515b061570172a58, forwarded by the researcher to the target sample employees of website development companies.

The questionnaire translated to Arabic language, to allow more convenience for sample members.

The questionnaire instrumental sections as follows:

Section One: the demographic data was collected with closed-ended

Questions, included six factors: (Gender, Age, Scientific Degree, Experience Level, Job

Description, Company Age.

Section two: Independent variable: **Software Quality Assurance (Software Testing)**

Software Quality Assurance: Procedures include the development of measurable standards for accessing the system for the error-free phase to achieve its objective and to ensure its quality. It was measured through (5) items on five Likert-type scale, from item

(1-14) (Lee, (2014) (Quadri,et.al., (2015)

Software Testing: Building test cases and variable conditions for the system and determining the level of success or acceptance of the test and the technology used. It was measured through (5) item on five Likert- type scale, from item (15-26) (Garousi,&Zhi, (2016).

Section three: **Dependent variables: Software Incident Management** (Incident Impact, Incident Urgency).

Software Incident Management: procedure included incident management and determine prioritization (impact, urgency), in efficient way within minimal time without causing system disruption. It was measured through (5) item on five Likert-type scale, from item (27-30) , (Alberts,et.al., (2014), (Bartolini,Salle &Trastour, (2006).

Incident Impact: a function of the time that its consume to resolution. Was measured through (5) item on five Likert-type scale. From item (31-36).

Incident Urgency: is the time it takes to resolve an incident. a period where a system is considered as more critical, when some systems are identified critical with a high availability level, it was measured through (5) item on five Likert-type scale. From item

(36-42).

(3-7) The scale is as follow:

Strongly Agree	Agree	Neutral	Disagree	Strongly disagree
5	4	3	2	1

3-6 Statistical Treatment

The data collected from the response of study questionnaire through Statistical

Package for Social Science (SPSS), the researcher used the following suitable statistical methods that consist of:

- Percentage and Frequency
- Reliability Test Cronbach Alpha (α) to measure strength of the correlation and coherence between questionnaire items.
- Normality Test: In order to verify the normal distribution of variables the researcher carried out Skewness and Kurtosis Test.
- Standard Deviation: to measure the response spacing degree about arithmetic Mean.
- Simple Linear Regression analysis to measure the impact of study variables on testing the direct effect.
- Descriptive Analysis: mean, standard deviation, and T-value used to analyze and describe the dependent and independent variables from statistical point of view.

3-7 Validity and Reliability:

Validity

To test the questionnaire for clarity and to provide a coherent research questionnaire, a macro review that covers all the research constructs was thoroughly performed by academic reviewers from Middle East University, Al- Ahliyya Amman University, Jordanian University specialized in faculty and practitioners E- Business, Business administrative, IT department, MIS department. Some items were added, while others were eliminated based on their valuable recommendations. Some others were reformulated to become more accurate to enhance the research instrument.

Reliability Test: Cronbach's alpha, was used to determine the internal consistency reliability of the elements comprising the three constructs. Reliability approximately (0.60) or higher to indicate adequate convergence or internal consistency. These results are the acceptable levels; The results were shown in Table (3-8).

Table (3-8) Reliability of Questionnaire Dimensions

No.	Variable	Dimensions	No. of items	Alpha Value (α)
1	**Software Quality Assurance**		14	0.791
(1-1)		**Software Testing**	11	0.757
2	**Software Incident Management**		4	0.71
(2-1) Incident Impact			6	0.68
(2-2) Incident Urgency			6	0.704
The all variables			0.866	

The result showed a value of (0.866) for the all items as well as alpha for each variable is greater than accepted percent 0.60, which is a reasonable value indicating the tool consistency that enhanced it.

Chapter Four

Analysis of the Results & Hypotheses

(4-1) Introduction

(4-2) Descriptive Analysis of Study Variables

(4-3) Analysis Adequacy of the Data to Test Hypotheses

(4-4) Hypotheses Testing

Analysis of the Results & Hypotheses

(4-1) Introduction:

According to the purpose of the research and the research framework presented in the previous chapter, this chapter describes the results of the statistical analysis for the data collected according to the research questions and hypotheses. The data analysis includes a description of the Means and Standard Deviations for the questions of the study; Simple and Linear Regression analysis used.

(4-2) Descriptive analysis of the study variables:

(4.2.1) Software Quality Assurance:

The researcher used the Mean and standard deviation, item level, item importance level as shown in table (4-1) indicates that there are positive attitudes toward the questions because its means are above the mean of the scale (3). The grand mean also reflects that there are positive attitudes toward all the questions. The most influential paragraph of the above variable was the 1st paragraph with a mean of (4.33) and articulated that **" Quality control**

operation for developing system adopt metrics to measure the usability facto ". While the least paragraph was the 5th paragraph **" Quality control operation for developing system adopt metrics to measure the reusability factor.** " with a mean of (3.8).

Table (4-1)

Mean, SD, Item Importance and Importance Level of Software Quality Assurance

Software Quality Assurance Paragraphs	Mean	Std. Deviation	Item Importance	Importance level
1. Quality control operation for developing system adopt metrics to measure the usability factor	4.33	.613	1	High
2. Quality control operation for developing system adopt metrics to measure the efficiency factor.	4.18	.768	2	High
3. Quality control operation for developing system adopt metrics to measure the maintainability factor.	4.06	.804	7	High
4.Quality control operation for developing system adopt metrics to measure the reliability factor	4.11	.932	4	High
5. Quality control operation for developing system adopt metrics to measure the reusability factor	3.83	.865	11	High
6.Quality control operation for developing system put metrics to measure the flexibility factor	3.84	.891	10	High
7.Quality control operation for developing system put metrics to measure the security factor	4.13	.897	3	High
8. Some standards may not be met in a single system because of the different use of each site (commercial, government, educational)	4.07	.625	6	High
9.Developer ensure that the system meets the requirements of the customer at each stage of development in a way that increases the quality.	4.09	.757	5	High
10. Customer feedback is based on continuous system development to ensure quality.	4.01	.841	8	High
11.Developer ensure that system requirements are enforceable.	4.09	.797	5	High
12. Developer sure that the system requirements are consistent	4.07	.922	6	High
13. Develop ensure that the system requirements are clear	4.09	.852	5	High
14. Cost affects the identification of requirements for implementation to affect their quality	3.98	.827	9	High

- **Software Testing:**

(4-2) table indicates that there are positive attitudes toward the above questions because their means are above the mean of the scale (3). The grand mean also reflects that they are positive attitudes toward all the questions. The most influential paragraph of the above variable was the 23rd paragraph with a mean of (4.18) and articulated that **"Developed system testing depend on functional prioritization in application to increase quality**.". While the least paragraph was the 19th paragraph **" The automatic test is accurate "** with a mean of (3.83).

Table (4-2)

Mean, SD, Item Importance Importance Level of Software Testing

Software Testing paragraph	Mean	Std. Deviation	Item importance	Importance level
15. Test cases help developer test system to ensure its matching with requirement.	4.11	.767	3	High
16.The condition for testing system contribute of analyze error to remove it	4.11	.699	3	High
17.Test cases number affect system quality in positive way	4.12	.689	2	High
18. System size (large, small) determine technology which use in system test (automatic, manual).	4.03	.655	5	High
19.The automatic test is accurate	3.83	.872	10	High
20. The automatic test saves testing time.	3.97	.716	7	High
21. The automatic test saves effort	4.05	.816	4	High
22. System lifecycle when developed affecting by test level (unit, integration, system).	4.02	.820	6	High
23.Developed system testing depend on functional prioritization in application to increase quality.	4.18	.574	1	High
24. It must determine the test type for single level from the beginning of developed system.	3.93	.957	9	High
25. Duplication when writing code cause quality weakness.	3.96	.997	8	High
26. Testing time for every level affect quality system.	4.02	.867	6	High

(4-2-2) Software Incident Management:

Table (4-3) indicates that there are positive attitudes toward the above questions because their means are above the mean of the scale (3). The grand mean also reflects that there are positive attitudes toward all the questions. The most influential paragraph of the above variable was the 27th paragraph with a mean of (4.11) and articulated that **"The company's plan for accident management must be realistic and achievable. Automatic testing with accuracy".** While the least paragraph was the 29th paragraph **" Policies are available in the company to facilitate incident management as they arise "** with a mean of (3.96)

Table (4-3)
Mean, SD, Item Importance and Importance Level of Software Incident Management

Software Incident Management paragraph	Mean	Std. Deviation	Item importance	Importance level
27.The company's plan for accident management must be realistic.	4.11	.660	1	High
28. Human resources in the company have a role in incident management.	3.98	.804	3	High
29. Policies are available in the company to facilitate incident management as they arise.	3.96	.786	4	High
30.Employees get information when they needed.	4.03	.711	2	High

- **Incident Impact:**

(4-4) table indicates that there are positive attitudes toward the above questions because their means are above the mean of the scale (3). The grand mean also reflects that there are positive attitudes toward all the questions. The most influential paragraph of the above variable was the 35th paragraph with a mean of (4.16) and articulated that "**incident impact degree means immediate and sustained effort by using all available resources until resolved immediately, as soon as possible** ". While the least paragraph was the 33rd paragraph " **Incident impact degree affecting maintenance cost "** with a mean of (3.76).

Table (4-4)
Mean, SD, item importance and importance level of Incident Impact

Incident Impact Paragraph	Mean	Std. Deviation	Item importance	Importance level
31.Incident impact measures by the number of user affecting.	4.05	.679	3	High
32. Incident impact must determine degree (high,medium,low) to deal with it correctly.	3.83	.812	5	High
33. Incident impact degree affecting maintenance cost.	3.76	.971	6	High
34.Development and maintenance department is given in the solution of problems of the greater impact of the worst of the system and its functions	3.84	1.037	3	High
35. incident impact degree immediate and sustained effort by using all available resources until resolved immediately, as soon as possible	4.16	.583	1	High
36.The impact of the incidents determine the way which organization will deal with it.	4.11	.660	2	High

- **Incident Urgency:**

(4-5) table indicates that there are positive attitudes toward the above questions because their means are above the mean of the scale (3). The grand mean also reflects that there are positive attitudes toward all the questions. The most influential paragraph of the above variable was the 38th paragraph with a mean of (4.236) and articulated that **"Incident urgency degree depend on the time sensitivity for resolution**.". While the least paragraph was the 40th paragraph "**Incident urgency high degree means that the technicians respond immediately and may delay other employees working in jobs with low or medium priority for assistance."** with a mean of (3.8256).

Table (4-5)

Mean, SD, Item Importance and Importance Level of Incident Urgency

Paragraph	Mean	Std. Deviation	Item importance	Importance level
37.Incident urgency high degree determine by the damaged caused by incident increases rapidly.	3.9651	1.02628	4	High
38.Incident urgency degree depend on the time sensitivity for resolution.	4.2364	.61933	1	High
39.Incident urgency high degree affect several users with VIP status (managers)	4.1008	.53435	2	High
40.Incident urgency high degree that the technicians respond immediately and may delay other employees working in jobs with low or medium priority for assistance.	3.8256	.93599	6	High
41.Incident urgency medium degree respond using the standard procedures and work within the regular supervisory administration structures.	4.0388	.63495	3	High
42. Incident urgency low degree low priority to respond using standard operating procedures as time permits.	3.8488	.81117	5	High

(4-3) Analysis Adequacy of the Data to Test the Study Hypothesis

Before testing the study hypotheses, the researcher conducts some important test to ensure the data adequacy for the regression assumption analysis:

Normality Test: Skewness conducted in order to test that the data follow normal distribution, Skewness value is less than (1.0).

4-3-1 Normality Test:

Skewness and Kurtosis test are used to test the normality of the data. Following table shows that Skewness results ranged between (-0.839 to 0.317) whereas Kurtosis results ranged between (0.037 to 0.969).

Table (4-6) Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
Quality	264	3.14	5.00	4.0633	.42463	.317	.150	.037	.299
Testing	264	3.00	5.00	4.0287	.41459	-.255-	.150	.621	.299
ITSM	264	3.00	5.00	4.0189	.47225	-.045-	.150	.473	.299
Impact	264	2.50	5.00	3.9602	.50095	-.167-	.150	.876	.299
Urgency	258	2.83	4.67	4.0026	.39148	-.839-	.152	.969	.302
Valid N (listwise)	258								

(4-4) Hypothesis Testing:

(4-4-1) Main Hypothesis:

H0.0: software quality assurance does not have an impact on ITSM incident management at (α 0.05).

Linear Regression is used to test (H0.0) hypothesis. It is found that R (0.38) is the correlation between the variables. Also table (4-7) is found that R Square (0.145), which is the explained variance, is actually the square of the multiple R (0.38)2. What the results mean is that (14.5%) of the variance (R-Square) in ITSM incident management has been significantly explained by software quality assurance.

Table (4-7)

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.380[a]	.145	.141	.43760

Predictors: (Constant), quality

Table (4-8) ANOVA

Model		Sum of Squares	DF	Mean Square	F	Sig.
1	Regression	8.484	1	8.484	44.307	.000[a]
	Residual	50.171	262	.191		
	Total	58.655	263			

Predictors: (Constant), quality

b. Dependent Variable: ITSM

Table (4-9) Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.300	.260		8.860	.000
	Quality	.423	.064	.380	6.656	.000

Dependent Variable: ITSM

The ANOVA table shows that the F value of (44.307) is significant at (0.05) level. Thus,

software quality assurance has an impact on ITSM incident management at (α 0.05)

(4-4-2) Sub Hypothesis:

H0.1: software testing doesn't have an effect on incident impact at (α 0.05).

Linear Regression is used to test (H.0.1) hypothesis. It is found that R (0.33) is the correlation between the variables. Also table (4-10) is found that R Square (0.109), which is the explained variance, is actually the square of the multiple R (0.33)2. What the results mean is that (10.9%) of the variance (R-Square) in incident impact has been significantly explained by software testing

Table (4-10)

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.330[a]	.109	.105	.47383

a. Predictors: (Constant), testing

Table (4-11) ANOVA

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	7.175	1	7.175	31.958	.000[a]
	Residual	58.824	262	.225		
	Total	65.999	263			

Predictors: (Constant), testing

b. Dependent Variable: impact

Table (4-12) Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.355	.285		8.252	.000
	Testing	.398	.070	.330	5.653	.000

a. Dependent Variable: impact

The ANOVA table shows that the F value of (31.958) is significant at (0.05) level. Thus,

software testing has an effect on incident impact at (α 0.05).

H0.2: software testing doesn't have an impact on incident urgency at (α 0.05).

Linear Regression is used to test (H.0.2) hypothesis. It is found that R (0.198) is the correlation between the variables. Also table (4-13) is found that R Square (0.039), which is the explained variance, is actually the square of the multiple R (0.198)2. What the results mean is that (3.9%) of the variance (R-Square) in incident urgency has been significantly explained by software testing.

Table (4-13)

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.198[a]	.039	.036	.38446

Predictors: (Constant), testing

Table (4-14) ANOVA

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	1.549	1	1.549	10.478	.001[a]
	Residual	37.838	256	.148		
	Total	39.387	257			

Predictors: (Constant), testing

b. Dependent Variable: urgency

Table (4-15) Coefficients[b]

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	3.192	.252		12.688	.000
	Testing	.200	.062	.198	3.237	.001

Dependent Variable: urgency

The ANOVA table shows that the F value of (10.478) is significant at (0.05) level. Thus,

software testing has an effect on incident urgency at (α 0.05).

Chapter Five

Results, Conclusions & Recommendations

(5-1) The Main Results of Study

(5-2) Study Conclusions.

(5-3) Study Recommendations.

Results, Conclusions & Recommendations

(5-1) The Main Results of the Study

The study explored a number of important and significant results that the researcher hopes that they would lead to novel contributions to theory and relevant literature. The researcher also hopes that such results would trigger a number of critical decisions by website development organizations in Jordan. Also hopes that such decisions would be reflected positively on their business' benefits. Based on the data analysis and hypotheses testing in chapter 4, the research results generated from this piece of work can be summarized as follows:

1. The study evaluated software quality assurance through one main dimension (software testing). The study showed high importance level of software quality assurance in Jordanian websites development companies with its dimension discussed earlier in this study. From researcher point view, websites service quality is an important factor in improving service and decreasing maintenance cost and achieving customer satisfaction. That agrees long with the study (Trinkenreich,et.al, 2015).
2. The importance level of software testing in Jordanian websites development companies was high (4.0633), this is because software testing process leads to high software quality, in addition, software testing considered an essential stone to improve service quality, which corresponds with (Khochhar,et.al, 2012) finding of the influence of the adoption of software testing in open source projects, in which result showed having higher number of test cases leading to better quality and less number of after go-live incidents.

3. The importance of software incident management in Jordanian websites development companies was high (4.0189), we observed that the highest mean for the item " the companies plan for an incident management must be realistic and achievable." With high (4.11), the lowest mean was for the item "policies are available in the company to facilitate incidents management when its appear" with mean (3.9), researcher explained that depend on the software incident management it its an important activity to deal with any incident appeared, to prevent any reduction of services, and improve customer satisfactions, In general, it appears that the importance level of software incident management was high which supports (Alberts,et.al., 2014) study entitled (An Introduction to the Mission Risk Diagnosis for Incident Management Capabilities' (MRD-IMC)).
4. The importance level of incident impact in Jordanian websites development companies, equal to (3.9602), the statistical analysis clarifies the important level of incident impact where the mean range between (3.76- 4.16) compared with general mean (3.9602). the highest mean for item "incident impact high degree immediate and sustained effort by using all available resources until resolved immediately, as soon as possible" with mean (4.16). the lowest mean was for item "incident impact degree affecting cost" with mean (3.76). In general, it appears that the importance level of incident impact was high, to prevent an incident impact other system functions it must use all available resources to deal with it.
5. The importance level of incident urgency in Jordanian websites development companies was high (4.0026), and standard deviation (.39148). The highest mean for item "incident urgency high degree means there are multiple users status are

affected", and the lowest mean for item "incident urgency high degree means that the technicians respond immediately and may delay other employees working in jobs with low or medium priority for assistance" with average (3.8265). In general, it appears that the importance level of incident urgency was high.

6. There is a positive direct effect of software quality assurance on ITSM incident management among Jordanian websites development companies. The (R) was (.380), at the level ($\alpha \leq 0.05$), while independent variables (R- square) was (.145). that support result of (Trinkenreich,et al., 2015) which ensure that to achieve high quality for service the incident management returns service operation as quickly as possible and mitigates negative impact to business ensuring agreed level of service quality.
7. Software testing has positive direct effect on incident impact in Jordanian websites development companies at level ($\alpha \leq 0.05$).
8. According to statistical analysis there was software testing has positive direct effect on incident urgency in Jordanian websites development companies at the level ($\alpha \leq 0.05$).

That means that there is a positive direct impact between the independent variables and the dependent variables.

(5-2) Conclusions

This research focused on studying the impact of software quality assurance on ITSM incident management generally, and the effect of software testing on incident impact and incident urgency specifically . The second aim of the study was to understand the impact of software quality assurance on ITSM incident management. In this new digital world of business, the quality of service is the first priority to enhance the customer satisfaction through improved the service level. To achieve the objectives of this study, the researcher developed a novel model to measure the impact of software quality assurance and ITSM incident management. An extensive literature review has been prepared and considered as essential element for developing research model. The model has two main variables: software quality assurance, ITSM incident management. The construct of software quality includes the following sub-dimension: software testing and sub-dimensions for incident management as follow: incident impact, incident urgency.

The developed model was applied and tested in the context of Jordanian websites development companies, the sample was determined to include the employees of Jordanian websites development companies. For hypotheses testing, a questionnaire instrument was designed on the basis of the constructed model. Prior to data collection, the questionnaire instrument was validated by a number of professors and experts in the domain of this study and working at Middle East University and other universities in Jordan. Moreover, questionnaire instrument was validated in terms of clearance, meaning, format, and its ability to measure the constructs included within the research model. Questionnaire instrument revised to reflect the comments and suggestions of those received by the referees. Thereafter, (660) questionnaire distributed to the sample of this study and (264) responses considered

valid for data analysis. The analysis conducted using Statistical Package for Social Sciences (SPSS) Version (20). Following data analysis, results were obtained and reported in chapter four.

Having a positive direct impact between software quality assurance and ITSM incident management in Jordanian websites development companies an indicator to invest more on the infrastructure technology and qualifications employees to occupy its place in business competition to achievable its goals and customer satisfaction.

(5-3) Recommendations

Based on the study results and conclusions, the following recommendations are suggested:

1. Jordanian websites development companies are recommended to deploy automated testing rather than manual testing because its accuracy and lower cost.
2. Jordanian websites development companies are recommended to rely continuously on customer's feedback to improve websites services.
3. Jordanian websites development companies are recommended to adopt incident management plan and processes.
4. The researcher recommends future research to study other ITSM processes (information technology service management) such as configuration management, change management, problem management and its role in improving the software system service and systems quality.

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Appendixes

Appendix 1: Arabic Questioner

اعزائي المشاركين / المشاركات

تقوم الباحثة بدراسة ميدانية لمعرفة اراء مطورين البرمجيات في اجراءات ضمان جودة البرمجيات المطورة و طريقة الاختبار و التعامل مع الحوادث التي تظهر أثناء التطبيق. و قد طورت هذه الاستبانة لتقدم اجابات تسهم في تحقيق اهداف الرسالة بعنوان (اثر ضمان جودة البرمجيات على إدارة الحوادث كخدمة داعمة لإدارة الخدمات المعلوماتية دراسة ميدانية لشركات تطوير المواقع الإلكترونية الأردنية)

ارجو التكرم بالإجابة عن الأسئلة جميعها بدقة تامة و ذلك من خلال تحديد درجة الموافقة او عدمها لكل فقرات الإستبانة، و أؤكد جميع الإجابات ستستخدم لغايات البحث العلمي فقط.

الطالبة : فاتن الشيخ

المشرفة الدكتورة: هنادي سلامة

بيانات ديموغرافية

الجنس: ذكر □ انثى □

العمر : 30 سنة فأقل □ 31- 35 سنة □
36 -40 سنة □ 41- 45 سنة □
46- 50 سنة □

المؤهل العلمي : دبلوم كلية مجتمع □ بكالوريوس □
ماجستير □ دكتوراه □

عدد سنوات الخبرة : 3 سنوات فأقل □ 4-6 سنوات □
6- 10 سنوات □ أكثر من 10 سنوات □

المسمى الوظيفي: مبرمج □ مطور برمجيات □ فاحص برمجية □

عمر الشركة : أقل من سنة □ 1-2 سنة □ 3-5سنوات □

أرجو قراءة الفقرات الاتية ثم ضع إشارة √ إزاء كل فقرة حسب درجة الموافقة او عدمه

أوافق بشدة	أوافق	محايد	لا أوافق	لا أوافق على الإطلاق
5	4	3	2	1

ضمان جودة البرمجيات :Software Quality Assuranceهي إجراءات تتضمن وضع معايير لقياس عوامل ضمان الجودة للوصول بالنظام لمرحلة الخلو من الأخطاء لتحقيق الدف منه و لضمان جودته.

الفقرة	أوافق بشدة	أوافق	محايد	لا أوافق	لا أوافق على الاطلاق
1.عمليات ضبط الجودة الخاصة بالأنظمة المطورة تضع معايير لقياس عامل الاستخدامية usability					
2.عمليات ضبط الجودة الخاصة بالأنظمة المطورة تضع معايير لقياس عامل الكفاءة efficiency					
3.عمليات ضبط الجودة الخاصة بالانظمة المطورة تضع معايير لقياس عامل الصيانةmaintainability					
4.عمليات ضبط الجودة الخاصة بالأنظمة المطورة تضع معايير لقياس عامل الموثوقيةreliability					
5.عمليات ضبط الجودة الخاصة بالأنظمة المطورة تضع معايير لقياس عامل إمكانية إعادة الإستخدام Reusability					
6.عمليات ضبط الجودة الخاصة بالأنظمة المطورة تضع معايير لقياس عامل المرونة flexibility					
7.عمليات ضبط الجودة الخاصة بالأنظمة المطورة تضع معايير لقياس عامل الأمانsecurity					
8.من الممكن ان لا تتحقق بعض المعايير في النظام الواحد بسبب اختلاف الاستخدام لكل موقع (تجاري، حكومي، تعليمي).					
9.يتم التأكد ان النظام يحقق متطلبات الزبون في كل مرحلة من مراحل التطوير بشكل يزيد من جودته.					
10.يتم الاعتماد على التغذية الراجعة من الزبائن للعمل على تطوير النظام بشكل مستمر لضمان الجودة.					
11.يتم التأكد ان متطلبات النظام قابلة للتنفيذ					
12.يتم التأكد ان متطلبات النظام متناسقة					
13.يتم التأكد ان متطلبات النظام واضحة					

14.تؤثر التكلفة على تحديد المتطلبات.					
اختبار النظام : Software Testing بناء مجموعة من الحالات التجريبية و المتغيرات لنظام و تحديد مستوى نجاح او قبول الاختبار و التقنية المستخدمة لذلك.					
15.تساعد الحالات التجريبية لاختبار النظام المطورين له التأكد من انه يطابق المتطلبات الموضوعة.					
16.تساهم الشروط لاختبار النظام في تحليل الأخطاء الظاهرة لمحاولة ازالتها.					
17.يؤثر عدد الحالات التجريبية لاختبار النظام على جودة النظام بشكل إيجابي.					
18.يحدد حجم النظام (كبير،صغير) التقنية المستخدمة في الاختبار (اتوماتيكي، يدوي).					
19. الإختبار الأتوماتيكي دقيق					
20.يوفر الإختبار الأوتوماتيكي الوقت في الإختبار					
21.يوفر الإختبار الأتوماتيكي الجهد					
22.تتاثر دورة حياة النظام عند تطوره بمستوى الاختبار : وحدة unit test تجميع integration test النظام system test					
23. إختبار النظام المطور تعتمد الأولويات الوظيفية للتطبيق ليزيد جودته.					
24.يجب تحديد نوع الاختبار لكل مستوى منذ اعداد الخطة لانشاء النظام.					
25.تؤثر الازدواجية في كتابة الترميز للنظام الواحد من قبل اكثر من مبرمج على اختباره ليضعف جودته.					
26.يؤثر الوقت المستخدم لاختبار كل مستوى على جودة النظام.					
إدارة الحوادث البرمجياتSoftware Incident Management : هي أنشطة تقوم بها الشركة للتخطيط،التعريف،التحليل، التصحيح للأخطاء التي تظهر في البرمجيات لمنع ظهورها في المستقبل.					
27.الخطة الموضوعة في الشركة لإدارة الحوادث يجب ان تكون واقعية.					
28.توفر الموارد البشرية في الشركة لها الدور في إدارة الحوادث.					
29.توفر سياسات في الشركة تسهل إدارة الحوادث عند ظهورها.					
30.يحصل الموظفين على المعلومات التي يحتاجونها فور طلبها.					

حادث الأثر Incident Impact : هو الحادث الذي تقاس درجته بحيث تكون (منخفضة، متوسطة ، عالية) بناء على عدد المستخدمين المتضررين من تقديم الخدمة.					
31. يقاس أثر الحادث بعدد المستخدمين المتأثرين للخدمة المقدمة.					
32.يجب ان تتم معرفة درجة أثر الحادث (حرجة، عالية، متوسطة، منخفضة) ليتم التعامل معه بطريقة صحيحة					
33. درجة أثر الحادث تؤثر بشكل مباشر على التكلفة المادية للتعامل معه					
34. يقوم قسم التطوير والصيانة بالنظر في حل المشاكل ذات الأثر الأكبر والأسوأ على النظام ووظائفه					
35 .درجة أثر الحادث الحرجة تتطلب الجهد الفوري والمستدام باستخدام جميع الموارد المتاحة لحين حلها بشكل فوري في أقرب وقت ممكن					
36. تأثير الحادث يحدد الإجراءات التي ستتخذها الشركة لحله.					
الحاح الحادث Incident Urgency : هو الحادث الذي تقاس درجته (منخفضة، متوسطة، عالية) بناء على الوقت المستغرق لحل الحادث الظاهر.					
37. درجة الحاح الحادث تتحدد بمقدار التخريب الحاصل بزيادة الوقت.					
38.درجة إلحاح الحادث تتحدد بالزمن اللازم للتعامل مع الحادث لحساسية عامل الوقت.					
39.درجة إلحاح الحادث العالية تؤثر على الحالة لعدد من المستخدمين عند استخدام الموقع.					
40.درجة إلحاح الحادث العالية تجعل الفنيين يستجيبون فورا و قد يقطعون موظفين آخرين يعملون في وظائف ذات أولوية منخفضة أو متوسطة للحصول على المساعدة.					
41 .درجة إلحاح الحادث المتوسطة تتطلب إستخدام إجراءات قياسية للعمل ضمن هياكل الإدارة الإشرافية العادية.					
42. درجة إلحاح الحادث منخفضة بحيث أن أولوية الاستجابة منخفضة باستخدام إجراءات التشغيل العادية وكما يسمح الوقت.					

Appendix 2:English Questioner

Middle East University

Business faculty

E-Business department

Dear Responder,

The researcher is in the process of conducting a field study regarding the Impact of Software Quality Assurance on Incident Management in Supporting for Information Technology Management (ITSM) Field Study on Jordanian Website's Development Companies.

Being a part of the requirement to acquire a master's degree in e Business.

This questionnaire is intended only for the purposes of scientific research.

Please note that basis of the questionnaire measurement would be a five point Lekart scale, employed accordingly:

Strongly disagree	Disagree	Natural	Agree	Strongly agree
1	2	3	4	5

Prepared : Faten Al-Sheikh

Supervisor: Dr.Hanadi Salameh

Part 1

Demographic Data:

Gender: □ Male □ Female

Age: □ less than 30 years □ 31-35 years
□ 36-40 years □ 41-45 years
□ 46-50 years □ more than 50 years

Education level : □ Community College □ B.A
□ M.A □ Ph.D □ others

Working Experience: □ less than 3 years □ 4- 6 years
□ 7- 10 years □ More than10 years

Job Description: □ programmer □ software developer
□ software tester □ others

Company Age: □ less than 1 year □ 1-2 years □ 3-5 years
□ more than 5 years

Part 2

Paragraph	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
Software Quality Assurance: Procedures include the development of metrics to measure quality assurance factors for assessing the system error-free phase to achieve its objective and to ensure its quality.					
1. Quality control operation for developing system adopt metrics to measure the usability factor.					
2. Quality control operation for developing system adopt metrics to measure the efficiency factor.					
3. Quality control operation for developing system adopt metrics to measure the maintainability factor.					
4.Quality control operation for developing system adopt metrics to measure the reliability factor					
5. Quality control operation for developing system adopt metrics to measure the reusability factor.					
6.Quality control operation for developing system put metrics to measure the flexibility factor.					
7.Quality control operation for developing system put metrics to measure the security factor.					
8. Some standards may not be met in a single system because of the different use of each site (commercial, government, educational).					
9.Developer ensure that the system meets the requirements of the customer at each stage of development in a way that increases the quality.					
10. Customer feedback is based on continuous system development to ensure quality.					
11.Developer ensure that system requirements are enforceable.					
12. Developer sure that the system requirements are consistent					
13. Develop ensure that the system requirements are clear					
14. Cost affects the identification of requirements for implementation.					

Software Testing: Software testing: Building test cases and variable conditions for the system and determining the level of success or acceptance of the test and the technology used.					
15. Test cases help developer test system to ensure its matching with requirement.					
16.The condition for testing system contribute of analyze error to remove it					
17.Test cases number affect system quality in positive way					
18. System size (large, small) determine technology which use in system test (automatic, manual).					
19.The automatic test is accurate					
20. The automatic test saves testing time.					
21. The automatic test saves effort					
22. System lifecycle when developed affecting by test level (unit, integration, system).					
23.Developed system testing depend on functional prioritization in application to increase quality.					
24. It must determine the test type for single level from the beginning of developed system.					
25. Duplication when writing code cause quality weakness.					
26. Testing time for every level affect quality system.					
Software Incident Management: its activity of an organization to plan, identify, analyze, and correct system defect to prevent software error appearance in the future.					
27.The company's plan for accident management must be realistic and achievable. Automatic testing with accuracy					
28. Human and technological resources in the company have a role in accident management.					
29. Policies are available in the company to facilitate incident management as they arise.					
30.Employees get information when they needed.					
Incident Impact: it's an incident determine its degree (low, medium, high), depend the number of users are affected					
31.Incident impact measures by the number of user affecting.					
32. Incident impact must determine degree (high,medium,low) to deal with it correctly.					

33. Incident impact degree affecting maintenance cost.					
34.Development and maintenance department is given in the solution of problems of the greater impact of the worst of the system and its functions					
35. Incident impact degree means immediate and sustained effort by using all available resources until resolved immediately, as soon as possible					
36.The impact of the incidents determine the way which organization will deal with it.					
Incident Urgency: it's an incident determine its degree (low, medium, high), depend on the time consuming to deal with incident					
37.Incident urgency high degree determine by the damaged caused by incident increases rapidly.					
38.Incident urgency degree depend on the time sensitivity for resolution.					
39.Incident urgency high degree affected several users with VIP status (managers)					
40.Incident urgency high degree that the technicians respond immediately and may delay other employees working in jobs with low or medium priority for assistance.					
41.Incident urgency medium degree respond using the standard procedures and work within the regular supervisory administration structures.					
42. Incident urgency low degree low priority to respond using standard operating procedures as time permits.					

3. Appendix 3: Names of Arbitrators.

No.	Name	Specialization	Work Place
1	Dr. Salam Frehhat	IT Faculty	AAU
2	Ph.D Hussein Al-Yassein	M.I.S	AAU
2	Dr. Sultan Al- Massied	E- business	AAU
3	Dr. Ahamed Ali Saleh	Business Administration	MEU
4	Dr. Rami Al- Dweiri	Marketing	Jordanian University
5	Dr. Mohammad Al-Maieta	Business Administration	MEU
6	Dr. Qassem Kharma	IT Faculty	AAU
7	Dr. Anas Rateb Al- Soud	E-Business	AAU