



**The Impact of Internet of Things (IoT) on Financial Services  
Quality: Field Study in Jordanian Commercial Banks.**

أثرانترنت الأشياء على جودة الخدمات المالية: دراسة ميدانية على البنوك  
التجارية الأردنية.

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## Authorization

I, Dina Masha'al Abd Al Nabi Al Nahar authorize Middle East University for graduate studies, to provide hard or electronic copies of my thesis to libraries, organizations, or institutions concerns in academic research upon request.



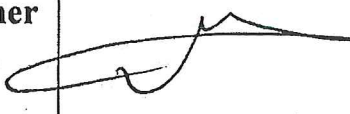
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## Committee discussion and decision

This thesis of the student Dina Masha'al Abd Al Nabi Al Nahar, which studied "The impact of internet of things on financial services quality: Field study in Jordanian Commercial Banks" has been defied, accepted and approved on.....16.th..... of February 2019, by the following committee members:

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improvement of the thesis...

## **Dedication**

This study is dedicated to my deepest gratitude to my beloved parents Mesha'al Al Nahar "Abu sattam" and "Um sattam" for supporting me with their love, care and prayers, for encouraging me and keep pushing me forward to the better level every day in my life, and special thanks also to my brothers Sattam, Saif and Sanad, and my sister Farah who always stand with me at the hard times and give me their endless support and care.

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<b>Abbreviations</b>	<b>Meaning</b>
IoT	Internet of Things
FSQ	Financial Services Quality
PE	Performance Expectance
EE	Effort Expectancy
SI	Social Influence
FC	Facilitating Conditions
E-banking	Electronic banking

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**The Impact of Internet of Things (IoT) on Financial Services Quality: Field Study in  
Commercial Banks in Jordan**

**Prepared by Dina Al Nahar**

**Supervised by  
Dr. Ahmad Al Sukkar**

The primary purpose at this study is to examine the impact of internet of things of the financial services quality in Jordanian commercial banks. The data were collected through questionnaire by using simple random for a sampling. (367) questionnaires were distributed among top, middle managers and employees working at (5) commercial banks in Amman, (295) were valid to statistical analysis. Furthermore, the study used statistical science for social science (SPSS) for descriptive statistical. Moreover, to answer the research questions, the study used frequencies, means, standard deviations, and Cronbach's Alpha test to examine the consistency and reliability of the data collection tool.

The study concluded that there is an impact of internet on financial services quality in banks. Moreover, there is a strong impact of internet of things (Performance expectancy, Effort expectancy, Social influence and facilitating conditions) on financial service quality. The results show that the effort expectancy was the highest impact followed by social influence on the quality of services.

The study recommends a better understanding of service quality as well training courses in different programs for employees including the management that would help to develop better solutions for banks performance in general and in employee in specific to avoid any performance troubles caused by quality.

**Key word: Internet of Things, Financial Services Quality, Service Quality,  
Performance Expectancy, Effort Expectancy, Social Influence, Facilitating Conditions**

## أثر إنترنت الأشياء على جودة الخدمات المالية: دراسة ميدانية على البنوك التجارية الأردنية.

اعداد

دينا مشعل النهار

اشراف

د. أحمد السكر

الهدف من هذه الدراسة هو دراسة تأثير الإنترنت على جودة الخدمات المالية في البنوك التجارية الاردنيه. جمعت البيانات من خلال استبيان طبق على عينة عشوائية. تم توزيع (367) استبيان على الادارة العليا والوسطى والموظفين الذين يعملون في (5) بنوك تجارية في عمان، (295) استبيان صالح للتحليلات الاحصائية. اضافة الى ذلك، استخدمت الدراسة برنامج (SPSS) لأغراض الإحصاءات الوصفية. وللإجابة على أسئلة البحث، استخدمت الدراسة الترددات والوسائل والانحرافات المعيارية واختبار كرونباخ ألفا لفحص اتساق وموثوقية أداة جمع البيانات.

وخرجت الدراسة بنتائج أن هناك تأثيرا لإنترنت الأشياء على جوده الخدمات المالية في البنوك. اضافة الى ذلك، هناك تأثير قوي لإنترنت الأشياء (الأداء المتوقع، الجهد المتوقع، التأثير الاجتماعي، تسهيل الاستخدام) على جودة الخدمات المالية. وتبين النتائج ان الجهد المتوقع هو اعلى أثر يعقبه التأثير الاجتماعي على جودة الخدمات.

وتوصي الدراسة بفهم أفضل لجوده الخدمات وكذلك عقد دورات تدريبيه في برامج مختلفه للموظفين بما في ذلك الاداره اللذين من شأنهم ان يساعدوا على تطوير حلول أفضل لأداء البنوك بشكل عام وفي الموظف علي وجه التحديد لتجنب اي متاعب الأداء الناجمة عن الجودة.

**Key word: Internet of Things, Financial Services Quality, Service Quality, Performance Expectancy, Effort Expectancy, Social Influence, Facilitating Conditions**

## **Chapter One – Study background**

### **1.1 Introduction**

### **1.2 Study Problem**

### **1.3 Study Objectives**

### **1.4 Study Significance**

### **1.5 Study Questions and Hypothesis**

### **1.6 Study Model**

### **1.7 Study limitations**

### **1.8 Study Delimitations**

### **1.9 Study conceptual Definitions**

## **1.1 Introduction**

The technological advancement has create a competitive environment lately in several industries, as it is being a challenge for industries to find the key factors in order to keep them on track among others at the same pace. With the growth of technologies, IoT platform has appeared strongly in banks and changed the way of bank works, as it offers many opportunities that benefit banks by improving efficiencies and empower processes, which in turn enhance performance. The study implemented the UTAUT model as it is suitable to test the acceptance of technology with independent variables (Performance expectancy, Effort expectancy, Social influence, facilitating conditions) on financial services quality dependent variable with dimensions (Reliability, Responsiveness, Assurance, Empathy, Tangibles).

The term internet of things (IoT) appeared in 1999 that refers to a network connection of devices to the internet that allows exchanging and sending data through an implanted chips and sensors between devices (Greenough & Camhi, 2015). It is considered as a revolution in the internet that enables connecting three categories: machine to machine, people to people, and people to machines to the internet through wireless connection, IoT platform broke the traditional computer networks connection to a direct connection in the physical word (Patel, 2016). Banks are recognizing the importance of adopting such new technologies in their services as it has strongly affect in growing banks rapidly by the result of returning their investments, increasing profitability and handling large volumes of business with efficiency. Communication and computers technologies enable banks to offer products that are technology based and to widen their reach international to wide clients (Chase, 2013).

According to an article by (Gubbi, et al., 2013) there is a belief that banks will benefit from IoT to generate a personalized intelligent cross sell opportunities for customers, furthermore, IoT support banks to innovate ways to reduce costs, improve risk management and improve general operational efficiency.

In the world of connected “things” the communication between customers and banks is flexible; banks are enabled to gather data and identify the customer’s needs in order to offer the best for customers, this information will help banks to deliver value-added services (Infosys, 2016).

Commercial Banks in Jordan are 22 banks, they are divided into (13) Jordanian commercial banks, and (9) Non- Jordanian banks. This number of banks creates a tremendous competition between them, for that, quality of services have to be improved to keep on track with this competition, as the quality is a main factor of the banks to be successful in their business, moreover, the non-Jordanian banks are increasing with good quality and technology development, local banks have to do effort to compete in improving service quality by (Mualla, 2016).

Financial services in Jordan are being spread very fast with the high development of technology that allows creating a diversity of banking services. Banks provide forms of services related to internet of things such as ATM which is considered as one of the earliest IoT technology, electronic banking: internet banking/ online banking, mobile banking, tablets and smart bracelet, however it is not easy to attract customers to use these services if it don’t met their expectations (Gharaibeh et.al, 2016).



This research emphasizes on IoT because this field is still in the early stage of research, but even at this point, the predictions by researches for this new technology indicates that it will be the central source of the upcoming digitalization and transformation (World Economic Forum, 2015; Deakin et al., 2015), the current study will examine the impact of IoT on financial services quality in commercial banks in Jordan.

## **1.2 Study problem**

Technology usage is considered as the most important trend in this decade, which is being highly used in Jordanian banks since it provides an easy access for employees to gather customers data as banks relies heavily on gathering and analyzing data, in addition it facilitates interaction between devices that save time and cost (Zanella et al., 2014). The concept of quality refers to excellence and superiority with all efforts on processes to serve customers and fulfill their needs with less time (Charles, 2016), as the quality is being used as a total scale to assess services, and also a crucial factor in shaping work progress and its output, therefore, bank managers must recognize the expectation and perception so as to develop the quality of service standards accordingly (Al jazzazi & sultan, 2017).

Banks in Jordan have been introduced to electronic financial services since 2000 (AL-Maaitah et al., 2015), during 2008 (66) service was added to services list at banks. Recently, managers put effort to provide services with good quality that are related to IoT such as e-banking services and smart bracelet in some banks as they need to utilize the full internet capabilities (Rawashdeh, 2015). The changes in banks services has resulted a new products related to e-banking, thus, banks are required to maintain a high quality of electronic banking services (Aladwan & AlTarawneh, 2017).

The service quality that achieves the customers' expectation will gain the customer satisfaction, hence the development of technologies are increasing as the same pace as competition among banks, which will also create a pressure on banks to retain or even to attract new customer, customers will expect a high quality of service (Kotler & Keller, 2006).

As the internal perspective of quality reflects the external perspective, the main problem of the study focused on the impact of IoT (Performance expectancy, effort expectancy, social influence, facilitating conditions) on financial services quality.

So the main question of the study is:

**“Does IoT impact financial service quality?”**

### **1.3 Study objectives**

The study aims to investigate the impact of IoT on financial services quality in commercial banks in Jordan taking into consideration the impact IoT factors.

The main objectives for this study are:

- To examine the impact of IoT on financial services quality in commercial banks.
- To examine the impact of performance expectancy on financial service quality in commercial banks in Jordan.
- To examine the impact of effort expectancy on financial service quality in commercial banks in Jordan.
- To examine the impact of social influence on financial service quality in commercial banks in Jordan.

- To examine the impact of facilitating conditions on financial service quality in commercial banks in Jordan.
- To provide appropriate recommendations based on the study results for the decision makers in commercial banks in Jordan.

#### **1.4 Study Significance**

The significance of the study comes from addressing the employee's perspective of quality of financial services in banks as it is changing due to the rapid progressing of technologies and as mentioned before the internal perspective reflects the external perspective, and it is essential for banks to keep abreast of new technologies adoption as it benefits them in several ways. IoT technology is being the main key in banking sector for providing growth and ease of connection in services. As services in Jordanian banks are being electronically ,the significance of this study is to demonstrate the impact of IoT on financial service quality at Jordanian commercial banks, IoT is measured by independent variables such as (performance expectancy, effort expectancy, social influence, facilitating condition) on dependent variables of financial service quality with dimension (reliability, empathy, assurance, responsiveness, tangibility). The IoT is still under research therefore, result of the study and recommendations would help decision makers of commercial banks in Jordan to make a remarkable enhancement on the quality of financial services with high reliability and efficiency, taking into consideration that studies in this field from employee's perspective in Jordan are not available.

Previous studies related to this field in Jordan are few, and studies that are titled with the term of internet of things are is not available, globally studies from employee's perspective are limited.

## **1.5 Study Questions and Hypothesis**

### **Study questions**

To achieve the objectives, the study will answer the following questions:

**Main question: Does IoT (performance expectancy, effort expectancy, social influence, and facilitating conditions) impact financial service quality in commercial banks?**

- Does performance expectancy impact financial service quality in commercial banks?
- Does effort expectancy impact financial services quality in commercial banks?
- Does social influence impact financial services quality in commercial banks?
- Do facilitating conditions impact the quality of services in commercial banks?

### **1.5.1 Study Hypotheses**

The study articulates the following main hypothesis:

**Ho1. Internet of things (Performance expectancy, effort expectancy, Social influence, facilitating conditions) does not impact financial services quality in Jordanian commercial banks.**

Therefore the main hypothesis can be divided into the following sub-hypothesis:

**Ho1.a.** Performance expectancy does not impactt the financial service quality in Jordanian commercial banks

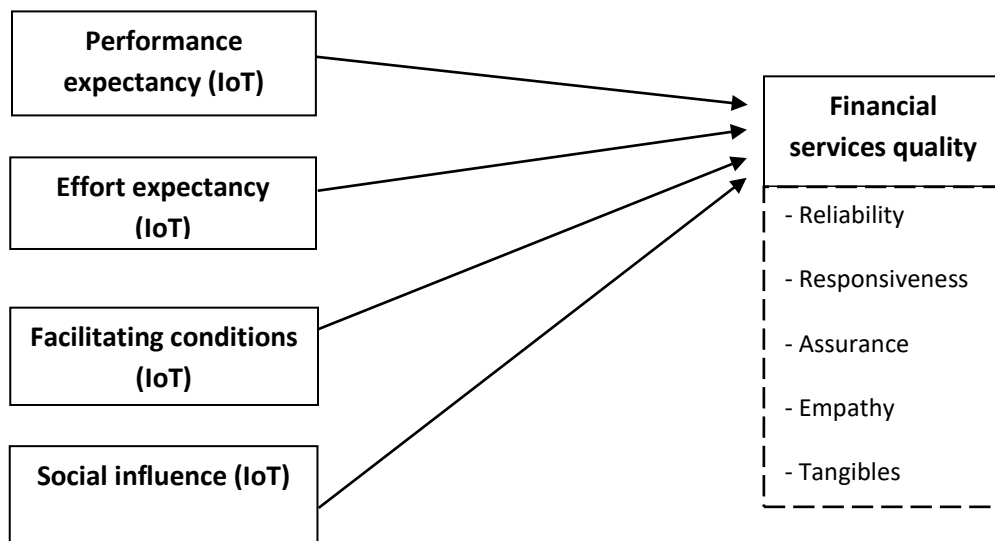
**Ho1.b.** Effort expectancy does not impact the financial services quality in Jordanian commercial banks.

**Ho1.c.** Social influence does not impact the financial services quality in Jordanian commercial banks.

**Ho1.d.** Facilitating conditions do not impact the financial services quality in Jordanian commercial banks.

## 1.6 Study Model

**Figure (1-1): study model**



**Sources:**

**Independent variable:**

- Based on UTAUT model by Venkatesh et al. (2012).

**Dependent variable:**

- (Alshuridah et.al 2017) under the title “The impact of Islamic banks’ service quality perception on Jordanian customer loyalty”.

**1.7 Study limitations**

Following are the study limitation:

- **Human limitation:** the study was carried with top, middle managers and employee in commercial Banks in Jordan.
- **Place limitation:** The study was conducted in commercial banks in Amman, Jordan.
- **Time limitation:** The study is carried within period between 2018/2019.
- **Scientific limitation:** The study will follow the unified theory of acceptance and use of technology (UTAUT) model that to test the impact of IoT on FSQ.

**1.8 Study Delimitations**

- The study is implemented in commercial banks in Jordan, which is limited and can’t be generalized to other organization.
- Study results will restrict only at commercial banks managers and employees.
- The amount of collect data will depend on manager’s and employee’s response to the questionnaires.

## 1.9 Study conceptual Definitions

**Internet of things (IoT):** is a technology that enables interconnection via internet between devices by sensors, electronics, software, to present smart services and applications which allow a wider communication with customers. (SINTEF & Norway, 2014).

**Financial service quality:** is an important term between companies that is based on the service quality delivery with dimension of reliability, assurance, empathy, responsiveness and tangibility to customers. (Wilkinson et.al, 1995).

**Service quality:** is the perception of the customer of the difference between the perceived service and the expected service.(Zeithaml, 2000).

**Service:** is a process that contains a series of intangible activities that are done between customer and system of service, service employee, which deliver solutions for customer's problems. (Grönroos, 2007).

- **Performance expectancy:** The expect degree of users to a specific system of helping them to achieve gains in their job (Venkatesh et al., 2003).

- **Effort expectancy:** is the degree of suitability perceived from using a specific system (Venkatesh et al., 2003).

- **Social influence:** the extent of user perceives that others are important to use a system(Venkatesh et al., 2003).

-**Facilitating conditions:** refers to the degree of availability of an organizational infrastructure and technical to use a specific system (Venkatesh et al., 2003).

## **Chapter Two – Theoretical framework**

### **2.1 IoT**

### **2.2 Financial services**

#### **2.2.1 Financial service quality**

### **2.3 Service quality**

#### **2.3.1 Service quality dimensions**

### **2.4 Relationship between variables**

### **2.5 Previous Studies**

### **2.6 Distinctive Features of the Current Study**



## **2.1 Internet of Things**

Throughout researching the quality of services to know more about the impact of IoT, researcher have found a limited studies that focused on internet of things or electronic banking services or even of new technology on service quality in banks, others focused on traditional services at banks.

Yerpude and Singhal (2017) stated that IoT comprises worldwide network that have devices called sensor inter-connect with each other, they have a unique identifiers and their task is to collect data. Data will be transmitted over internet over the internet and get stored in a database, which helps businesses in many issues like inventory management and demand forecasting which is based on the past consumption patterns. Moreover (Talbot, 2017) mentioned that real time data allows managers to depend on the output forecast and do corrections in decision making, to avoid any further losses to the organization. Real time insights help organizations to forecast errors which will facilitate react rapidly to any problem.

IoT technology support decision makers in banks by finding solutions and improve the productivity with a wide range and a least direct intervention with human. IoT embodies a progress in M2M by connecting devices to the internet multiple networks, which help employees providing a quick response and opens up new streams of revenue, improve efficiencies and delivered services (Morrish, 2015).

Responsiveness is a factor of service quality in internet banking that benefit employees in providing a rapid responsiveness to customers demand with less time and cost for both of them, emphasis is placed on showing awareness and sensitivity of questions, requests and

complaints by customers, for instance if there is a trouble with account opening and a relevant employee was asked to help, the time that will be spent on finding a solution will reflect on the level of personal liability, and here it came the importance of employee to have empathy in performing services with respect to individuals, treat each one in a special way so that customers are convinced that this bank understands them which also reflects respectable reputation on the bank performance.

According to (Madakam, et.al, 2015) the IoT development has been mainly driven by requirements of large firms that stand to profit highly from the foresight and predictability afforded by the capability to follow devices through embedded sensors and chips.

Banks are becoming more efficient by implementing IoT related devices, they have the ability to track processes that are done by customers through wearable devices; employees are able to gather the needed data easily which will refine and enrich their tasks and practices to advanced levels of proof and quality.

On the other hand (Anderson, 2017) emphasized that the needs and perception of customers are rapidly changing; banks have to be aligned to these changes as customers need trusted services, researches proved that the accuracy in forecast increases with the usage of tracking processes and collecting real time data automatically by the internet of things systems.

Reliability is also a key factor in quality of services in internet banking, as it provides services with a credible and secure way to meet the customer expectation. It is important to ensure the ability to deliver the promised service or information on time accurately and

dependably, such as transaction process, check account. Furthermore, assurance of quality in internet banking is the ability of the employee to induce a sense of trust and trust in the customer towards the organization.

The internet of things gives the growth opportunities to semiconductor with potential for billions of smart devices and machine to machine connected devices that provide the man machine user experience, as well as offers opportunities to companies with the implementations of applications, the next generation of smart connected homes, internet of energy, smart connected vehicles, smart grids, smart health and smart manufacturing will enable new applications that use the internet of things real time sourced big data while improving user's lives (Drucker, 2015).

Dhillon, et.al, (2017) stated that the IoT wireless connectivity range from M2M cellular modules from cellular providers, to specific chips for Zigbee, WiFi, BLE (Bluetooth Low Energy) and 6LoWPAN (IPv6 over Low power Wireless Personal Area Networks). The opportunities of IoT require aligning with the right standards and the involvement of broad technologies including SOC's, Big Data, connectivity, power, and software, it's considered a real challenge.

Riggins and FossoWamba (2015) pointed that the tracing and the tracking of any movable item has become easier and possible after the evolving of the Internet of things, which considered as way to easily control and get into the device that is capable of monitoring what surrounds it. Moreover, report conditions and the surrounding environment can be monitored by the stationary objects that are connected with control capabilities and sensors to the Internet of things, 75 billion objects with such functionality make massive

opportunities for strategic and operational benefits for organizations that know how to use this technology. The effective management of this level of automation requires the collection, sensors, social media feeds, combination and analysis of data from RFID tags, video and cell phone GPS signals, photos, shortly, big data analytics.

IoT comprises worldwide network that have devices called sensor inter-connect with each other, they have a unique identifiers and their task is to collect data (Yerpude & Singhal, 2017). Data will be transmitted over internet over the internet and get stored in a database, which helps businesses in many issues like inventory management and demand forecasting which is based on the past consumption patterns. Moreover (Talbot, 2017) mentioned that real time data allows managers to depend on the output forecast and do corrections in decision making, to avoid any further losses to the organization. Real time insights help organizations to forecast errors which will facilitate react rapidly to any problem.

### **Characteristics of IoT:**

Following are the characteristics of internet of things (Patel, 2016):

- **Connectivity:** Connectivity allows compatibility and network accessibility.
- **Interconnectivity:** IoT enables anything to be interconnected with the communication infrastructure and the global information.
- **Heterogeneity:** IoT devices are heterogeneous, based on different networks and hardware platforms that allow interacting with service platforms and devices through different networks.

- Things-related services: IoT have the ability to provide thing-related services within the things constrains, providing thing-related services will change the technologies in information world and physical world.
- Enormous scale: the devices that communicate with others and need to be managed will be larger than the connected devices to the internet.
- Disconnected wakeup and sleeping as well as the device's context including speed and location.
- Safety: The safety of the creators and recipients of the IoT is a must, safety of physical well-being and of personal data, securing networks and endpoints.

### **IoT Infrastructure:**

Innovations adoption at organizations has their own risks besides their benefits; financial industry might have a quite challenge with the overflow of data they got therefore, it is important to have a deep look on issues with infrastructure and network, whereas the increasingly turning in banks adopter to IoT to improve customer loyalty, sickness and experience, improve growth of revenue and increase market share, requires improvements in whole network infrastructure, analytics, big data , accessibility and cloud infrastructure must be established before IoT can be implemented on a truly massive scale (Ag, 2015).

Karpinski (2017) stated that with the IoT, IT infrastructure and the whole IT landscape is completed, a wide range of new software, hardware, services and connectivity solutions that are obvious, from IoT platforms software and hardware of the smart “things”, the actuators, sensors, IoT gateways devices, to a bunch of connectivity solutions for IoT wireless, a new big services market on top of services providers and services platforms and new ways to analyze and process IoT data like edge computing. And what's in common

between is the various aspects of IoT data and get them as well as leverage and combining them to have good actionable intelligence and the most important to an intelligent outcomes and actions.

According to Chody (2017), traditional banks have difficulties to keep up in the same level with competitors because of the old complex IT systems they have, its slowing processes down for that, huge banks have up-to-date infrastructure to be faced with competitors, old IT solutions will force banks to fund expensive projects to create solutions that could be integrated with the ageing infrastructure. Meanwhile, banks with developed IT infrastructure will invest in new technology that drive their growth and it will be seamlessly integrated with the existing IT systems.

The key in digital banking is how to can organizations analyze and leverage insights from big data in real time, great insight is invaluable when it's being applied at the right time. But, some reports warned from the flow of IoT- generated data as it will adversely affect current firm's data volumes, threatening technologies and strategies to get overwhelmed, so again the challenge here is the legacy infrastructure that will slows down the application and delivery of insights, non-bank firms can advantage from their new technologies by engaging the consumer and effect the traditional business model of legacy banking organizations (Leimer, 2015).

The demand of smart devices connection throughout location require a new level of designing and thinking, that's why it's important to create a better infrastructure of "Things". Most places with networks weren't created to provide a wireless infrastructure with universal internet, high quality media, and increasing demand bandwidth, building

intelligent applications and protocols will not address the needs, a change must be in the actual architecture of networks (Hamby, 2018).

Harvey (2017) stated that in order to improve the IoT efforts, organizations must pay attentions to their networks, especially the wireless networks, according to a survey under the title “IDC's February 2017 IoT IT Infrastructure”, Bluetooth and WiFi are the most contenders in IoT connectivity.

## **2.2 Financial services**

The growth in financial services after 2008, behind this are many reasons such as new entrants of new innovations and technologies in financial services sector such as large cutting-edge technology companies and technology startups offer. The changings in sector are shaped upon regulations and customer’s habits and strategies, customers are being attracted to these new entrants of services and technologies, incumbents are collaborating with them to protect their interest and adopt new environment, the technology developments have changed business models of technology (Erman, 2017), likewise according to a study by (Kemunto and Kagiri, 2018) stated that what increase competitiveness in commercial banks are the increasing in mobile banking, e-banking, process automation and agency banking.

Nicoletti (2017) mentioned that traditional financial organizations like insurance companies and banks are now changing due to the changing in the world; these organizations need to narrow the technological gap between the traditional and the digital, many primary issues have to be changed, the rigid business models and the old routines, digital financial services are now compete the traditional services; it offers customer-centric services that are capable

of combining flexibility and speed, customers enjoy more enabling technological devices such as tablet, smartphones and by other trends such as IoT, customers need a characterized nearly complete immediacy and availability of information.

Innovative technologies has affect the financial services, traditional banking services is replaced and still expanding by the digital financial services to meet the growing complex needs and globalization challenges, the varied digital products help the organizations to remain competitive in the market and to improve the performance of the firm, moreover, it also helps in growing the market share to improve financial position and increase their profitability, some investigations has review the impact of digital financial services on firm's performance, identifies and analyzes the gaps, so it is observed that despite swift technological improvements in digital financial services throughout last ten years, it didn't get the reasonable attention in academic literature, although digital financial services is the main factor which affects firm`s performance. We noticed that researches are limited by authors to banking sector, disregarding other mobile network operators and non-banking entrants, also it's noticed the new researchers investigate are investigating the same issues (Abbasi and Weigand, 2017).

Rana, et.al, (2018) stated that digital financial services extended the delivery of traditional bank services to the customers by innovative technologies like mobile-phone-enabled solutions, internet banking, digital payment platforms and electronic money models. Modern digital banking started with phone banking and automated teller machine (ATM) therefore, mobile banking and the internet offer effective and fast delivery channels traditional banking products and prepare the way for the new products, the widened uses of tablets and smartphones along with the 3G and 4G internet technologies have increased the



demand for digital services; this demand encourages software houses, financial institutions and many service providers to apply services of digital banking along with the new varied applications and products to retain the clients and reach the unbanked population.

Digital financial services are the wide range of accessed and delivered financial services through digital channels, including credit, payments, remittances, saving, financial information and insurance. The “Digital channels” term refers to mobile phones (digital feature phone and smartphones), internet, POS terminal, ATMs, chips, NFC-enabled devices, electronically enabled cards, tablets, biometric devices, phablets, etc (Abbasi and Weigand, 2017).

Gabor and Brooks (2017) mentioned that digital financial services have the ability to expand the delivery of basic financial services via convenient, affordable and secure environment through innovative technologies like electronic money models, digital payment platforms and mobile-phone-enabled solutions to the public. Financial institutions (Microfinance institutions, Banks) and non-financial firms (mobile network operators) beside third party providers (payment aggregators, agent network managers, and others) are benefit digital channels to offer financial services at better scale, lower cost and convenient than traditional banking allow.

On the other hand, one of the digital service functions is to facilitate financial issues, (Demirguc-Kunt, et.al, 2018) stated that there is some requirements are essential to exist in digital financial services to ensure that people benefit from it such as good physical infrastructure, well-developed payment system, vigorous consumer protection safeguards and appropriate regulations, financial services must be tailored upon the needs of

disadvantaged groups such as poor people and first-time users of financial services, who might have low literacy and numeracy skills.

According to PwC (2016) the financial services industry have faced a drastic changes in technology in the few years ago, banks executive aimed to improve efficiency in their IT department and facilitate game-changing innovation as well as lowering costs and backing the legacy systems, in a survey on business leader's sectors by PwC, showed that 70% of leaders biggest concern is the rapid change of technology in financial services.

Technological advancement creates development in information technology like the invention personal computer, microprocessor, development of software, and the rapid advancement of telecommunication; banks utilize this advancement to achieve handling massive capacity of business with efficiency and maximize profitably that will reach to a wide spectrum. Over the last few years the account holders were satisfied by the services like receipt and payment of cash, safe deposit locker, etc., while today, customers expect more services like phone and mobile banking, Automatic teller machine, home banking, internet banking, car loans and personal loans, credit card, smart card, debit card facility, and electronic purse. New technology facilities products to be introduced in banks, the success of new products depend on suitability of technology in the bank (Prabhu, 2010).

The continuous development of technology happening now it's the system of real-time gross settlement, transactions can be done between banks through a settlement system, electronically, online, ensuring faster collection, this advancement in banks makes the possibility to use internet as a channel to deliver banking services, as well it allow financial and non-financial firms to efficiently store, collect, sell and use information about

customers. Technological innovation has benefited banks by facilitating the transmission and process of information and it improved access services to customers and ease of accessing data of banking products, it moved from the connection of inter branch to interbank, moreover financial services industry became more connected to IT enables, most banks made their effort to keep updated to new process and systems to deliver best services to customers, furthermore the internet users spurt are increasing each year by the base of internet banking (Rangarajan, 2010).

Technology has changed the nature of delivery of banking services; it improves cost effectiveness and enables small value transaction, besides making services and products accessible and affordable, at the same time it ensures profitability and viability to providers. Technology has enlarged the reach and banking coverage over a significant networking as well as enabling the availability of varied delivery channels to reach a large extent (Rangarajan, 2010).

William (2003) stated that measurement of performance now is prevalent across the public sector and private sector of many countries, key performance indicator (KPI) is the most common used for this process, it provides an intelligence of the useful information about the private and public sector performance. The entire economy of the country is related to commercial banks, since it's the core of credit to any national economy, which means that any efficiency in commercial banks activities will have implications on the economy.

Profitability in banks depends on how banks can undertake risks and to expand their activities, the indicators that are used to measure the profitability of banks are:

Return on Asset, ROA ( $\text{Net income} / \text{Total assets}$ ), the indicator of financial leverage or ( $\text{Equity} / \text{Total Assets}$ ) and the indicator of Return on equity, ROE ( $\text{Net income} / \text{Average Equity}$ ) (Dardac&Barbu, 2005). The indicators observe a period of time to reveal the profitability a tendency, the analysis of the modification of the indicators shows the in time changes of the strategies, policies and the business environment of the bank (Greuning&Bratanovic, 2004).

The performance in financial services can be determined by gathering funds at the lowest from customers, financial innovations allow all sectors to raise large amounts of money at a lower cost than they ever had (Lerner, 2006), Banks are benefit from innovations that are fee based income such as the ATM network banks can generate income from using the ATM machine by other customer`s bank or from corporation with third party. In comparing performance between traditional banks services and innovation services, it turn out that innovation have affected positively by increasing the profits of banks and efficiency in reduced cost of labor, delivery of services, saving time, reliability, accuracy and quality of services and for this, banks are gradually moving from manual to electronic (Sana, et.al, 2011).

A study by Hernando and Nieto (2006) on the internet delivery channels and bank`s performance, it founds out that the use of internet as a delivery channel cause a decrease in overhead expenses (Marketing, IT and staff) which leads to increase the profitability in banks, also it shows that internet is used in physical branches as complement not as substitute.

Another study by Kagan, et.al, (2008) of the impact of online banking on performance, the study result shows by regressing the profit efficiency index against the intensity of online banking, the measurement shows that the use of internet in banking services as an additional channel has progressed the financial performance of banks.

According to Apte, et.al, (2008) financial service is now involved as an important segment in services economy; operations in financial services have specific unique characteristics to this industry that haven't got a sufficient attention in literature, the following are the characteristics:

- Fungible products with an extensive use of technology

The difference in operations between financial services and manufacturing is that the “widgets” can be considered as money, or any relates instruments in financial services, as there is a reducing is using physical vestige such as coins, bond, while inventory is fungible and easy to be transported in malleable way that are easy in manufacturing, the use of online transactions are increasing which forced a fundamental changes in operation management.

- High volumes and heterogeneity of clients.

A characteristic of financial services is a high volume transactions and different customers. In firms, a fraction of customers can increase the profits, for that; firms have to provide customers with different treatment by their limited resources, for instance, individuals with a high net worth have to be treated by asset management differently, moreover, clients of a

high balance checking accounts with a highly transaction process differ in treatment with clients who keeps their funds in saving accounts with a poorly transaction process.

- Repeated service encounters

Repeated service encounters is a character of financial services between customers and firms due to monthly and year-end statement, sell/buy transactions, money transfer, etc., customers with a low asset balance contribute the least revenue to firm with a maximum operational cost through customer service calls. New customers are making calls asking about their bank statement or billing questions calls, so billing and statement issues have to be handled differently to provide care for customers, this can reduce the traffic on call centers and help in managing a high volume of calls. Credit Card Companies also struggled with the demand of mailing bill printing and call center operation; they had no control on the very high volatile in demand so after recognizing the problem they manage it by creating portfolio of customers that is distributed in 25 cycles, each cycle has a specific day monthly to work on it, while some clients closed their accounts and many new customers were added.

- Long-term contractual relationships between customers and firms

The existence of technology and availability of information facilitate shopping comparison, which in result facilitate switching between firms and cause high attrition, this loss of customers increase the importance of profitability and growth in firms, therefore to stop the loss firms adopt a loyalty programs such as balance transfer programs, rewards and credit card business, these programs are design based on processes that needs to consider costs,

risks, incremental sales, scheduling, redemption, etc. These operations will increase revenues; also it might be other process to reduce the unnecessary costs.

- Customers' sense of well-being closely intertwined with services

The process of financial services means that workforce is working with something close to customer's sense of well-being; so operations with poor management will cause quality issues, delays and many issues that will make an immediate rebuke in form of complaints, calls, which will result in customer attrition and it is easy to customer to move their accounts (Schneider, 2010).

This characteristic is important in financial services industry; some cases used the approach direct to consumer (credit card), and cases used (insurance agent, financial advisors) and other cases require collaboration between the firm's employee and agents with other party (insurance), firms that work with intermediaries might face some issue unlike services by firms without intermediaries, for instance service design and financial products and delivery get changed upon the agent's best interest. Sometimes the relationship between intermediaries and firm are not exclusive, because the customer may choose between competing firms and products which adds a layer of complexity therefore, what are planned in the financial services firms is different from what is seen by the customer. The operations management did not pay attention to services and products design in such situation.

### **2.2.1 Financial service quality**

The quality of services became major subject that has been investigated in several researches, it has been defined in a number of studies, it refers to a customers' expectation

of a specific services that is provided by firm (Yasin et al., 2004), and other defines it as the expectation of customer of a perceived service (Gefen, 2002), definitions leads to one thing which is to meet the customers' expectations, for that, a superior quality in financial services is very important nowadays, it creates a differentiation competition between banks for delivered services that are offered to customers. A study by (Mualla, 2015) recommended that banks should include effective progress in technology of services to improve quality.

The quality of financial services in Jordan

## **2.3 Service quality**

Many researchers define the quality of services in many ways, but as mentioned before all definitions are around customers satisfaction of the quality, (Brady and Cronin, 2003; Rust and Oliver, 2006) stated that quality of service can be measured by the perception of the provided outcome, in addition to the delivery improved process of the outcome.

### **2.3.1 Service quality dimensions**

Lau et al., (2013) have pointed five dimensions of service quality that can be measured by:

- **Reliability:** is how accurate the firm to offer a service in the promised time, if the staff cannot offer the promises, customers will be dissatisfied and results in negative word-of-mouth. In contrast, when the company is able to keep its promises, it increases customer confidence on the staff and creates customer satisfaction.
- **Responsiveness:** refers to willingness to respond to needed services. It is having the ability to solve customer's problems during service process. Furthermore, it includes



the employees' skills and companies operation; high responsiveness can solve customers' problems effectively and can make customers feel that the companies have high responsibility and competence.

- **Assurance:** depends on knowledge of the employees and their capability to ensure confidence and trust. It is ability to protect customers as they need a safety environment and high assurance system in service process.
- **Empathy:** refers to the attention and care the customers got from employees through getting their service. It is all about entertaining the customers in term of place, better communication and time. It focuses on customer's importance even complains of customers really matter.
- **Tangible:** refers to the equipment, physical elements and personal materials, since services are tangible, customers derive their perception of service quality by comparing the tangible associated with these services provided.

## **2.4 Relationship between Internet of Things and Financial services Quality**

The adoption of new technologies has been the driving force of innovation in services, as industries have witnessed the impact of technologies on service offerings and service business, a study by IBM (2012) results that technologies factor (71%) is considered as the most critical external forces, which is over the people skills and the market factors.

The core values of deploying IoT infrastructure to connect the physical world in offering smarter and new services for individuals, communities and regions. IoT offers instance location-based service (LBS) which is enabled by embedded GPS sensors in

connected devices to gather information from computer, people to things in physical world, smart phones, tablets that are already connected to the internet, so they both are information receivers and providers (Ericsson, 2011).

In the service innovation context, information plays a key role, services can be in forms of information such as software, data mining, business consulting, financial services, public information in city management, and more are facilitating for new and better services, researches pointed that information technology revolution was an “industrial revolution” (Miles, 2006).

IoT supports services in several industries by the creation of new applications and the upgrading of related ICT services (such as public services and industry-based services), IoT infra-structure services (such as cloud computing, data storage, data center, infrastructure components services, IoT software development and system integration (such as system integration, software development, software services, intelligent information processing), IoT network services (such as M2M information and communication services, industry-based ICT network services) (MIIT, 2011). Therefore, the IoT can be defined in the services context as a dynamic end to end information network seamlessly linking physical and space by which data from objects are connected, interacting and processed to enable people, objects and systems turning data into useful information and valued services to the users (Miles, 2006).

Finally, “smart” is the feature of the relationship between IoT and financial services, as implementing IoT supports services and systems through providing new abilities to create values that they previously cannot. Automation in IoT vision aims to offer smart

services that enable creating new services with high quality, the capacity and smart characteristics of IoT enables innovation in services to enlarge the data collection from human centered to the human-nonhuman network, moreover it offers smart services realized by automation from varied embedded networked sensors (Miles,2006); (Sheehan, 2006).

Few studies examined the relationship between internet of things and quality of banks services. However, some researchers studied the relationship between service qualities in banks by Magboul & Abbad (2018) and by AL Hawari, et.al (2017) was investigating the relationship between the qualities electronic banking services on financial services in banks. Moreover, a study in Egypt by Ismail & Abd Al Aziz (2013).

## **2.5 Previous studies**

### **❖ (Sindwani & Goel, 2012) study entitled by “Online banking service quality”**

This paper discusses the internet banking service quality as it has been used to evaluate performance of the bank. After reviewing many related studies, the study finds out that there is no determined dimension or standard scale to measure the services quality in case of online banking, and out of 39 dimensions of services there are only few of them can be considered as major dimensions of services.

### **❖ (Ismail & Abd Al Aziz, 2013) study entitled by “Investigating e-banking service quality on one of Egypt’s banks” Egypt.**

The study aims to investigate the dimensions of e-banking quality affecting the customer satisfaction. The study was demonstrated on banks customers and about 120

questionnaires were distributed on them, and a meeting with decision makers has been done to have a wider picture.

After collecting data; the researcher used SPSS to analyze the results, it indicates that there is a significant effect on service quality of customers' satisfaction, as well banks can benefit from high quality of services to decision makers, thus recognize the needs of their customers. In addition, the study demonstrates an analysis for stakeholders about dimension of e-banking service quality.

Customers can have an embedded wallet to do their automated payment.

❖ **(Saeed et al., 2015) study entitled by “Service quality factors affecting adoption of internet banking ” in Pakistan.**

The study discussed the main factors that affect service quality in internet banking that fills the gap in banking service. The study pointed out of the importance of banks to do effort to have quality that avoid any operational risks, and after testing factors (Reliability, Empathy, Reputation, Website design & Privacy), the study concludes all of them were important in adopting internet banking as these factors provide minimum error, quick response about every transaction as well fast maintenance if needed.

❖ **(Amin, 2016) study entitled by “Internet banking service quality and its implication on e-customer satisfaction and e-customer loyalty” Saudi Arabia.**

The investigation is done on customers of kingdom of Saudi Arabia bank, a 520 questionnaire were returned to researcher with a result that four dimensions (site organization, efficiency of website, personal needs and user friendliness) has a distinct construct, also the study found that the dimension of internet banking services quality

has a significant relationship with each one of them as well the relationship between e-customer satisfaction, e-loyalty and internet banking services quality is significant.

❖ **(Yaseen & El Qirem, 2018) study entitled by “Intention to use e-banking services in the Jordanian commercial banks” Jordan.**

This purpose of the study was to investigate factors influencing e-banking services in Jordanian commercial banks by customer’s perspective; the study applied the unified theory of acceptance and use technology model to evaluate the intention to use e-banking services, it focused on the perceived e-banking services quality as it was the most effective predictor to explain the behavioral intention of using e-banking services quality, in addition to effort expectancy and social influence. The study also recommend for banks manager to promote services quality of e-banking for costumers effort expectancy, perceived e- banking services quality and social influences by being convenience.

❖ **(Goldstien, 2017) study entitled “How Is IoT Impacting Banks and Financial Services?”**

The article discussed the importance of IoT sensors in delivering a personalized banking services by gathering data that helps in creating personalized offers and understand the customer and business clients moves, spending money and other insights, this will lead to achieving a new level of customer’s confidence, it also discussed creating partnership between commercial bank any sector that is involved to IoT such as real estate websites by introducing a mortgage offers, and tracking assets by monitoring location of goods that are financing.

Banks can benefit from IoT by creating more context-aware customer rewards and generating personalized and intelligent cross sell opportunity for customers.

❖ **(Yelina, 2017) study entitled “IoT in Banking: Exploring Exciting Opportunities”**

According to this study, it is planned to spend \$153.5 million by 2018 on monitoring customer status through (wearable, mobile phones, and sensors) and products, services, and experiences, banks owners are looking to hire an experienced business analysts that are able to understand the needed data and how to gather data through the IoT.

Banks can advantage from the IoT by:

- Mobile applications on smartphones that increase the customer experience and can make a secure payment on it, so banks can take advantage from the experts in custom business applications development.

- Wearable devices such as smart watches will help in conducting operations; bank expert said that wearable devices are taking the place of smartphones in banking transactions.

- Sensors allow banks to capture market new markets as well monitoring the status and activities of industries.

- Smart home and connected cars allow customers to conduct transaction at home through smart appliances also payment in cars through applications.

❖ **(Gupta, 2017) study entitled “IoT& Banking”**

The study focused on the sensitivity of data, as over ten years the banking industry will have main changes in the IoT, it will manage the security to make sure that all the connected bank experience is secure and safe in order to increase customers trust and some concern of business and personal data, and some of developments regard this

issue are being implemented such as biometric data (voice-recognition software-fingerprints).

Banks are looking to add extra layer of security in the whole IoT ecosystem starting from the devices then the network and to the cloud level.

❖ **(Schulte & Liu, 2017) study entitled “FinTech Is Merging with IoT and AI to Challenge Banks: How Entrenched Interests Can Prepare”**

The study discussed the authors concern due to this change in financial institutions; they might not be prepared for a huge revolution of IoT in banking today, and the challenge in the financial services is to let people who were engaged to traditional banking services (Datasets into Excel, phone calls, etc.) to acquire new skills and new ecosystem, IoT is also challenge the workers in the financial institutions to expand their skills, the technological advances are forcing these changes to occur excluding the manual labor.

❖ **(Fitpay, 2017) study entitled “Bank of America and NXT-ID Subsidiary Fit Pay Collaborate to Accelerate Wearable and IoT Payment Adoption” America.**

The article exposed an agreement between Bank of America and NXT-ID, Inc. - which provides a platform of technology services and products that enable the (IoT) – to meet the Bank’s goal which is to adopt new and latest technologies and new devices to extend the capabilities of contactless payments, the collaboration allows Bank of America customers to have an easy secure contactless payments while using their debit and credit cards by the integrated devices with the fitpay platform in many banks of America ATMs and enabled locations of point of sale, the head of enterprise payments

of Bank of America said that this will enable customers to improve the experience of payments and to fit any lifestyle.

❖ **(AL Hawari, et.al, 2017) study entitled by “Impact of Electronic Service Quality on Islamic Banks in Jordan” Jordan.**

The study investigate six dimensions of electronic service quality that are: Ease of use, Reliability, Responsiveness, effectiveness and web design. The study was assessed on 300 customer of the Islamic bank in Jordan. The researcher has concluded the study by founding an impact of e-service quality on the satisfaction of Islamic banks; it indicates that there is a significant impact on the satisfaction of customers, as to get the customers’ attractiveness; there must be a sufficient experience from the field specialists in creating an electronic site design, to benefit from their experience on adding value of protecting the customers information.

❖ **(Boumalik & Bahaj 2017) study entitled by “Big data and IoT: A Prime opportunity for banking industry”**

This study discussed storing and retrieving information from massive volume that can be collecting via interne of things in banks as it will provide exceptional services, and adaptable financial solutions and advices that closely associate with day to day events in customer’s lives that will impact positively the bank’s revenues and gain many competitive advantages. It is a network of billion devices connected through internet, by doing so, this become an intelligent system of systems. These devices present in Fig. 1 can collect data that allows banks to provide a complete view of customer’s finance status in real time. Consequently, banks can anticipate customer’s needs through data



collected and analyzed, then provide solutions that can help customers take sound and smart financial decisions.

## **2.6 Distinctive Features of the Current Study**

**Internet of things concept:** it is expected from the current study to raise the awareness of managers and employees of banks.

**Purpose:** Most of previous studies of e-banking were conducted to study impact of e-banking from customer perspective; few of them were studied from employee perspective.

**Environment:** This study was carried on in Amman, Jordan; particularly in Jordanian commercial banks sector which considered as the back bone of the economy.

**Industry:** The current study focused on banks industry particularly commercial banks.

**Comparison:** the results of the study will be compared to other previous similar studies to underline the similarities and differences that will be noticed.

## **Chapter Three - Methodology**

### **3.1 Introduction**

### **3.2 Study Methodology**

### **3.3 Study Population**

### **3.4 Study Sampling and data collection.**

### **3.5 Data sources**

### **3.6 Study Reliability**

### **3.7 Study Validity**

### **3.8 Study Variables**

### **3.9 Study Treatment**

### **3.1 Introduction**

In this chapter, the used research paradigm that guides the researcher is explained based on the main purpose of the study, and then explain the methodology of the study, samples, population and then a description of the data analysis, then in the last of the chapter are the statistical tool and study variables explained.

### **3.2 Study Methodology**

This study aims to research the impact of internet of things on financial services quality in commercial banks in Jordan, so the study has followed a descriptive approach to test the study variables and samples. The study was developed by collecting the data by questionnaire, and after data being collected, it's been coded by SPSS. Reliability, validity also were tested, and at last the variables correlations was checked.

#### **Unified theory of acceptance and use of technology (UTAUT)**

The unified theory of acceptance and use of technology (UTAUT) by (Venkatesh et al., 2012), it was developed after several theories and models that were design to measure the degree of acceptance and satisfaction to the individuals against technology or information system from many points of view; it depends on constructs that represent their structure. Following are the theories:

- **Technology acceptance model (TAM)** by Davis (1989) which was designed to predict the acceptance of information technology in jobs, and it measures the perceived usefulness and perceived ease of use. Moreover, TAM 2 was ended from TAM to measure the increase

of users' experience in technology over the time with moderator constructs perceived usefulness, perceived ease of use, social influence and cognitive instrumental processes.

- **Combined TAM and TPB (C-TAM-TPB)** by Taylor and Todd (1995), this model combined between the perceived usefulness of TAM and predictors of TPB model, and the constructs are perceived usefulness, perceived ease of use, attitude, subjective norms, and perceived behavior control.

- **Model of PC utilization (MPCU)** by Thompson, Higgins, and Howell (1991), this model was designed to measure of the behavior of while using the personal computer (PC), with moderator constructs social factors, complexity, job-fit, long-term consequences, affect towards use and facilitating conditions.

- **Innovation diffusion theory (IDT)** by Moore and Benbasat (1996), this theory focused on individuals' differences in innovativeness with factors of relative advantages, complexity, trialability and observability.

- **The motivational model (MM)** by Davis, Bagozzi, and Warshaw (1992), this theory has supported the researches in psychology as an explanation for behavior; it has two major constructs which are extrinsic motivation and intrinsic motivation.

- **Social cognitive theory (SCT)** by Compeau and Higgins (1995), this theory focused on the previous experience of individuals with constructs: outcome expectations, emotional reactions and self-efficacy.

- **Unified theory of acceptance and use of technology (UTAUT)** by (Venkatesh et al., 2012), it is the most suitable theory that is used by managers to assess the success the

acceptance of IoT in financial services (Dulle&Minishi-Majanja, 2011), the theory consists four key constructs (independent variable): Performance expectance (PE), Effort expectancy (EE), Social influence (SI) and Facilitating conditions (FC), and two outcomes (dependent variables) behavioral intention and use behavior, and four key moderators: gender, age, experience and voluntariness of use which effect on the strength of dependent and independent variables relationship. Three constructs have direct influence on behavioral intention, while FC and behavioral intention influence the usage behavior.

### **UTAUT constructs**

#### **Performance expectance**

As mentioned before indicates to the users believe of a system that make a positive effect in his or her performance in job (Venkatesh et al., 2003). This factor came out from a combination of five previous constructs of models which are: performance expectancy from (TAM) model, Job fit from (PC utilization model), outcome expectations from (social cognition theory), external motivation from (motivational model) and relative advantages from (innovation diffusion theory). (Venkatesh & Davis, 2000).

#### **Effort Expectancy**

This construct is similar to other constructs models like complexity construct from (Pc utilization model) and perceived ease of use from (Technology acceptance model). (Venkatesh & Davis, 2000).

**Social influence:**

Subjective norms constructs are similar to social influence construct in models and theories like (Planned behavior theory, rational action theory, theory acceptance model 2 and decomposed planned behavior theory).

**Facilitating conditions:**

The facilitating condition construct is similar to adaptability construct in theory of innovation diffusion, perceived behavioral control construct from theory of decomposed planned behavior and planned behavior theory, and the same construct name which is facilitating conditions in PC utilization model.

**Table (3-1): Technology acceptance Factors**

Author	Research title	Model used	Factors
Riyadh, et.al, (2016)	E-banking implementation and technology acceptance in the rafidain and rasheed banks in Iraq	TAM	Perceived usefulness
Adisona and Ayo (2010)	the acceptance of internet banking in Nigeria	TAM	Perceived ease of use Perceived usefulness Perceived credibility Computer self-efficacy
Zhou et al., (2010)	Integrating TTF and UTAUT to explain mobile banking user adoption	UTAUT	Effort expectancy Performance expectancy

Yiu et al. (2007)	Factors affecting the adoption of internet banking in Hong Kong – implications for the banking sector.	TAM	Perceived usefulness Perceived ease of use
Riffai, Grant, & Eedger (2012)	Exploring the promise of on-line banking, its adoption by customers and the challenges in banking in Oman	UTAUT	Performance expectancy Effort expectancy Facilitating conditions

This study used UTAUT (Venkatesh et al., 2003), as it is suitable theory to assess the acceptance of IoT technology in banks for managers and employee, as the UTAUT model measure the relationship in employee’s perspective.

### 3.3 Study Population

The field of the current study was in (5) Jordanian commercial banks in Amman. The study consists of different positions of managers and bank employees.

### 3.4 Study Sampling

The sample of the study consists of (367) out of (8306) employees at commercial banks were chosen by simple random sample. The sample size was considered appropriately as it represents the total community according to (Sekaran & Bougie, 2013).

The sample was calculated through the following equation:

- Sample Size =  $Z^2 * (p) * (1-p) / c^2$
- Z = Z value (95% confidence level)
- p = percentage picking a choice, (.5 used for sample size needed)
- c = confidence interval, (5)

After distributing (367) questionnaire through employee, a total of (315) were retrieved, of which (20) were discarded due to large missing data, therefore, (295) questionnaires from study unit of analysis were valid.

### **3.5 Data Sources**

For the research, the collected data were from two sources: primary data that are collected by questionnaire that are created from the literature reviews is assessed by the referee committee, and secondary sources data that are collected form dissertations, journals, thesis and articles.

#### **The Questionnaire:**

The study questionnaire has included demographic variable and about IoT and financial services quality. The questionnaire was divided into three parts:

#### **Section one:**

Demographic information that was a close-ended questions, which contains characteristics of: Age, Gender, Education, Job level, Job Title and years of experience of the banks' participants



### Section two:

Section two of the questionnaire was to measure the internet of things through four constructs (performance expectancy, effort expectancy, social influence and facilitating conditions); 17 items adopted from (Elsaadany & Soliman, 2017). However IoT variables was measured by likert-scale range from (1) strongly disagree to (5) strongly agree as shown in table (3-2).

### Section Three:

This section measured the behavioral intention of FSQ through (5) dimensions (Reliability, responsiveness, assurance, empathy, tangibles); 17 items was adopted from (Hammoud et.al, 2018) & (Alsayed et.al, 2015). However financial service quality variables was measured by likert-scale ranging from (1) strongly disagree to (5) strongly agree as shown in table (3-2).

**Table (3-2): Likert-Scale Used with Variables**

<b>Strongly disagree</b>	<b>disagree</b>	<b>Not sure</b>	<b>Agree</b>	<b>Strongly Agree</b>
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>

### 3.6 Study Reliability

To verify the reliability and the internal consistency of the study's constructs, the Cronbachs' alpha ( $\alpha$ ) measurement was used. Table (3-3) demonstrated that Cronbachs' alpha value range from between (0.76 and 0.91). Therefore, the reliability of the instruments is very good as ( $\alpha$ ) of the whole variables is higher than (00.76).

**Table (3-3): Internal Consistency Coefficients (Cronbach's Alpha)**

No	Variables	Items	Cronbach's Alpha
1	Performance expectancy	1-5	0.83
2	Effort expectancy	6-9	0.86
3	Social influence	10-11	0.82
4	Facilitating conditions	12-17	0.78
5	Reliability	18-19	0.81
6	responsiveness	20-23	0.76
7	Assurance	24-27	0.90
8	Empathy	29-30	0.77
9	Tangibles	31-34	0.87

### 3.7 Study Validity

To authorize the validity of the study tool, face validity and content validity were used, as for the face validity, the study questionnaire has been assessed by (7) academic reviewers that are experienced in this field study as shown in appendix (3), while content validity in confirmed by using sources of literatures such as articles, dissertation, journals and world wild web. Some items just need to be reformulated and updated to become suitable to the research instrument. And other items were given recommendations from the experts.

### 3.8 Study Variables

- **Independent variable:** IoT (Performance expectancy, Effort expectancy, Social influence, Facilitating conditions).
- **Dependent variable:** FSQ (Reliability, Responsiveness, Assurance, Empathy, Tangibility).

### 3.9 Study Treatment

The collected data conducted were utilized by statistical package for social sciences (SPSS) for conclusion and data analysis. Therefore, the following suitable statistical methods were utilized:

- Percentage and Frequencies used to explain the characteristics of research respondents.
- Cronbach's Alpha reliability to measure strength of the coherence between questionnaire Questions.
- Arithmetic Mean to identify the level of response of study sample individuals to the study variables.
- Standard Deviation to measure the responses spacing degree about Arithmetic Mean.
- Multiple Regression analysis to measure the impact of independent variables on dependent variable
- Simple Regression analysis to measure the impact of study each independent variables effect on dependent variable.

## **Chapter Four - Data Analysis and hypothesis**

### **4.1 Introduction**

### **4.2 Demographic variables of the study sample**

### **4.3 Description of Statistics of the Study Variables**

### **4.4 Hypothesis testing**

## 4.1 Introduction

This chapter describes the results of the statistical analysis for the data collected according to the research questions and research hypotheses. The data analysis includes correlations between variables and multiple regressions to test the impact of internet of things on financial services quality in Jordanian commercial banks and a description of the Means and Standard Deviations for the questions of the study.

## 4.2 Demographic variables of the study sample

This section demonstrates the demographic information of the study sample based on characteristics: gender, age, education qualification, job title, job level and years of experience in current bank.

**Table (4-1): Demographic information of the study sample**

Variable	Categories	Frequency	Percentage
<b>Gender</b>	Male	173	58.6
	Female	122	41.4
<b>Age</b>	Less than 25	20	6.8
	24-45	150	50.8
	More than 45	125	42.4
<b>Educational qualification</b>	College/ Diploma	93	31.5
	Bachelor's Degree	155	52.5
	Master's Degree	43	14.6
	PHD degree	4	1.4
<b>Job Title</b>	Executive Manager	7	2.4
	Administrative Manager	3	1.0
	Director General	20	6.8
	Head of Section	139	47.1
	Other position	126	42.7
<b>Job level</b>	Low level	87	29.5
	Mid-level	178	60.3

	Hgih-level	30	10.2
<b>Years of experience</b>	Less than 5 years	15	5.1
	5-10	116	40.0
	10-15	139	47.1
	More than 15 years	23	7.8

The table (4-1) shows that in the **gender** category the highest level is for employed Male by frequency (173) at percentage (58.6%), while the lowest category for employed Female by frequency (122) at percentage (41.4%). It indicates that Male employees are more able to

While **age** category shows that the sample ranged (Less than 25) was the percentage (6.8%) by frequency (20), and the age between (25-45) was the percentage (50.8%) by frequency (150), and finally the age (more than 45) was at the percentage (42.4%) by frequency (125), this leads that the study to identify that most of the study sample were young people that are skillful.

The **educational qualification** category shows that College/Diploma was at the percentage (3.7%) by frequency (11), and the bachelor's degree category at the percentage (80.3) by frequency (237), while master's degree category at the percentage of (80.3%) by frequency (237), then the PHD degree category is at the percentage (1.4%) by frequency (4). That leads that the good qualifications of education can impact on the awareness of technologies.

Moreover, **job title** category shows that executive managers category was at the percentage of (2.4) by frequency (7), and the administrative manager category was at percentage (1.0%) by frequency (3), while the director general was at the percentage (6.8%) by frequency (20), and head of section category was at the percentage (47.1%) by frequency

(139), and last category other position was at the percentage (42.7%) by frequency (126).

The table indicates that participants of head of section were the highest of the study sample.

**Job level** category shows that the low level job category was at the percentage (29.5%) by frequency (87), while the highest category was mid-level job and it was at the percentage (60.3%) by frequency (178), and last category the high level job was at the percentage (10.2%) by frequency (30). The table indicates that the study sample was evaluated mostly from the mid-level category.

last category **years of experience** that is categorized with less than 5 years was at the percentage (5.1%) by frequency (15), and category of 5-10 years' experience was at the percentage (40.0%) by frequency (116), and category of 10-15 years of experience was at the percentage (47.1%) by frequency (139), and last category of more than 15 years of experience was at the percentage (7.8%) by frequency (23) which was the highest category, it indicates that participants with 10-15 years of experience.

### 4.3 Description of Statistics of the Study Variables

This section includes description of statistics, which contain the arithmetic mean, and standard deviations as well as the level of importance. The level of responses of study sample and the importance of items will be measured at three levels due to the following Interval Length according to (Sekaran & Bougie, 2013):

(Highest Value – Lowest Value) / Number of Levels of the Interval Length =

$$(5-1) / 3 = 4/3 = 1.33$$

- The low degree (From 1 to 2.33)

- The medium degree (From 2.34 to 3.66).

- The high degree (From 3.67 to 5).

### a) Descriptive Analysis of the Independent

Table (4-2) shows that the means of internet of things variables range between (3.76 and 3.98), with standard deviations that range between (0.37 and 0.60). The average mean for all internet of things variables is (3.84) with standard deviations (0.29). The social influence rated the highest followed by performance expectancy, then facilitating conditions and finally effort expectancy. This indicates that the social influence is an important issue at commercial banks.

**Table (4-2) Mean Standard Deviation, Ranking and Importance for (IoT)**

No	Dimension	Mean	St.D	Rank	Importance
1	Performance expectancy (IoT)	3.86	0.37	2	High
2	Effort expectancy (IoT)	3.76	0.46	4	High
3	Social influence (IoT)	3.98	0.60	1	High
4	Facilitating conditions (IoT)	3.82	0.39	3	High
<b>IoT</b>		<b>3.84</b>	<b>0.29</b>	<b>-</b>	<b>High</b>

### Performance expectancy

Table (4-3) shows the statistics of “Performance expectancy” where the means range from (3.72 to 4.11) with standard deviations range from (0.68 to 0.91). The highest mean was for statement (1) at high importance, while the lowest mean was for statement (4). The total mean for the importance of performance expectancy was at (3.86) with high importance, which indicates that performance has a high importance in the sample study.



**Table (4-3) Mean, Standard Deviation, Ranking and Importance for (Performance expectancy)**

No	Statement	Mean	St.D	Rank	Importance
1	I fully understand what does IoT means.	4.11	0.91	1	High
2	IoT has increased my perceived benefits	3.77	0.80	3	High
3	IoT enhanced the extrinsic motivation.	3.77	0.78	3	High
4	IoT has improved my work efficiency.	3.72	0.79	4	High
5	IoT has enhanced a relative advantage in my job.	3.95	0.68	2	High
<b>Performance expectancy</b>		<b>3.86</b>	<b>0.37</b>	-	High

### **Effort expectancy**

Table (4-4) shows the statistics of “Effort expectancy” where the means range from (3.57 to 4.02) with standard deviation that range between (4.02 to 3.57). The highest mean was for statement (8) at a high importance, while the lowest mean was for statement (7) at medium importance. The total mean of importance for the effort expectancy was (3.76) with high importance, which indicates that effort expectancy has a high importance in the sample study.

**Table (4-4) Mean, Standard Deviation, Ranking and Importance for (Effort expectancy)**

No	Statement	Mean	St.D	Rank	Importance
6	IoT encourage me to use the latest technology.	3.60	0.79	3	Medium
7	It was easy for me to be skillful in IoT.	3.57	0.76	4	Medium
8	IoT usage is clear.	4.02	0.76	1	High
9	IoT enables faster development platforms.	3.86	0.64	2	High

<b>Effort expectancy</b>	<b>3.76</b>	<b>0.46</b>	<b>-</b>	<b>High</b>
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### **Social influence**

Table (4-5) shows the statistics of “Social influence” where the means range from (3.86 to 4.10) with standard deviations that range from (0.68 to 0.79). The highest mean was for statement (10) at a high importance, while the lowest mean was for statement (11) at high importance. The total mean of the social influence was (3.98) with a high importance, which indicates that social influence has a high importance in the sample study.

**Table (4-5) Mean, Standard Deviation, Ranking and Importance for (Social influence)**

<b>No</b>	<b>Statement</b>	<b>Mean</b>	<b>St.D</b>	<b>Rank</b>	<b>Importance</b>
<b>10</b>	People who influence me think that I should use IoT.	<b>4.10</b>	<b>0.68</b>	<b>1</b>	<b>High</b>
<b>11</b>	I prefer keep enrolling our organizations with IoT technology.	<b>3.86</b>	<b>0.79</b>	<b>2</b>	<b>High</b>
<b>Social influence</b>		<b>3.98</b>	<b>0.60</b>	<b>-</b>	<b>High</b>

### **Facilitating conditions**

Table (4-6) shows the statistics “Facilitating conditions” where the means range from (3.56 to 4.04) with standard deviations that range from (0.69 to 0.88). The highest mean was for statement (17) at a high importance, while the lowest mean was for statement (14) at a medium importance. The total mean for the facilitating conditions was (3.82) with a high importance, which indicates that facilitating conditions have importance in the sample study.

**Table (4-6) Mean, Standard Deviation, Ranking and Importance for (Facilitating conditions)**

No	Statement	Mean	St. D.	Rank	Importance
12	Our organization have the necessary resources and network to be compatible to implement IoT.	3.82	0.79	4	High
13	Our organization connecting is compatible to implement IoT.	3.60	0.80	5	Medium
14	IoT based applications would be more fun to use.	3.56	0.78	6	Medium
15	IoT has enhanced e services.	3.91	0.75	3	High
16	I believe IoT helped me to learn more technologies.	3.97	0.69	2	High
17	IoT has improved the machine to machine.	4.04	0.88	1	High
<b>Facilitating conditions</b>		<b>3.82</b>	<b>0.39</b>	-	High

### b) Description of the dependent Variable

Table (4-7) shows the mean of service quality dimensions that ranges from (3.92 to 4.14) with standard deviations that range from (0.40 to 0.52). The average mean of service quality was (3.99) with standard deviation (0.27). The reliability rated the highest followed by empathy, then responsiveness, finally assurance and tangibles were the lowest at the same rate. The reliability was at the highest importance, which indicates that reliability is an important issue in commercial banks.

**Table (4-7) Mean, Standard Deviation, Ranking and Importance for (Service quality)**

No	Statement	Mean	St. D.	Rank	Importance
1	Reliability	4.14	0.52	1	High
2	Responsiveness	4.01	0.41	3	High
3	Assurance	3.92	0.40	4	High
4	Empathy	4.05	0.43	2	High
5	Tangibles	3.92	0.40	4	High

<b>Service quality</b>	<b>3.99</b>	<b>0.27</b>	<b>_</b>	<b>High</b>
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### Reliability

Table (4-8) shows statistics of “Reliability” where the mean ranges from (4.12 to 4.16) with standard deviations that range from (0.66 to 0.69). The highest mean was for statement (18) at a high importance followed by statement (19) at a high importance. The total mean of reliability was (4.14) at a high importance, which indicates that reliability has importance in the sample study.

**Table (4-8) Mean, Standard Deviation, Ranking and Importance for (Reliability)**

<b>No</b>	<b>Statement</b>	<b>Mean</b>	<b>St. D.</b>	<b>Rank</b>	<b>Importance</b>
<b>18</b>	Whenever a banking service is requested, the quality of financial service allows staff to provide it at the promised time.	<b>4.16</b>	<b>0.66</b>	<b>1</b>	<b>High</b>
<b>19</b>	Once a problem is experienced, the quality of financial service allows staff to handle it in a particular technique.	<b>4.12</b>	<b>0.69</b>	<b>2</b>	<b>High</b>
<b>Reliability</b>		<b>4.14</b>	<b>0.52</b>	<b>_</b>	<b>High</b>

### Responsiveness

Table (4-9) shows the statistics of “Responsiveness” where the means range from (3.60 to 4.26) with standard deviation that range from (0.66 to 0.94). The highest mean was for statement (22) at high importance, while the lowest mean was for statement (20) at medium importance. The total mean for responsiveness was (4.01) at high importance, which indicates that responsiveness has importance in the sample study.

**Table (4-9) Mean, Standard Deviation, Ranking and Importance for (Responsiveness)**

No	Statement	Mean	St. D	Rank	Importance
20	Whenever a service is needed, staff offers a prompt service.	3.60	0.94	4	Medium
21	Whenever a service is needed, banking service staff serves readily in a good manner.	4.16	0.75	2	High
22	The quality of financial service allows staff to solve customer problems.	4.26	0.62	1	High
23	The banking service keeps the customers informed when service is performed.	4.01	0.66	3	High
<b>Responsiveness</b>		<b>4.01</b>	<b>0.41</b>		<b>High</b>

### Assurance

Table (4-10) shows the statistics of “Assurance” where the mean range from (3.69 to 4.02) with standard deviations that range from (0.64 to 0.73). The highest mean was for statement (27) at high importance, while the lowest mean was for statement (24) at high importance. The total mean for the assurance was (3.92) at high importance, which indicates that assurance has importance in the sample study.

**Table (4-10) Mean, Standard Deviation, Ranking and Importance for (Assurance)**

No	Statement	Mean	St. D.	Rank	Importance
24	Employees’ behavior in the bank embeds confidence when handling transactions.	3.69	0.73	4	High
25	Employees ensure safety in transactions with banks services.	4.01	0.71	2	High
26	Employees of bank have the knowledge to answer any questions.	3.99	0.71	3	High
27	Employees ensure consistent courteous.	4.02	0.64	1	High

<b>Assurance</b>	<b>3.92</b>	<b>0.40</b>		<b>High</b>
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### **Empathy**

Table (4-11) shows the statistics of “Empathy” where the mean range from (3.95 to 4.21) with standard deviations that range from (0.63 to 0.74). The highest mean was for statement (28) at high importance, while the lowest mean was for statement (29) at high importance. The total mean for empathy was (4.05) at high importance, which indicates that empathy has importance in the sample study.

**Table (4-11) Mean, Standard Deviation, Ranking and Importance for (Empathy)**

<b>No</b>	<b>Statement</b>	<b>Mean</b>	<b>St. D.</b>	<b>Rank</b>	<b>Importance</b>
<b>28</b>	Banking services transactions are passed in a caring manner.	<b>4.21</b>	<b>0.63</b>	<b>1</b>	<b>High</b>
<b>29</b>	Banks have convenient branches (sub branches/outlet) and operate in extended hours to all their customers without spending much time on long queues.	<b>3.95</b>	<b>0.68</b>	<b>3</b>	<b>High</b>
<b>30</b>	Customer’s needs are understood with full attention.	<b>3.98</b>	<b>0.74</b>	<b>2</b>	<b>High</b>
<b>Empathy</b>		<b>4.05</b>	<b>0.43</b>	<b>_</b>	<b>High</b>

### **Tangibles**

Table (4-12) shows the statistics of “Tangibles” where the mean range from (3.60 to 4.26) with standard deviations that range from (0.62 to 0.94). The highest mean was for statement (31) at high importance, while the lowest mean was for statement (32) at medium

importance. The total mean for tangibles was (3.92) at high importance, which indicates that tangible has importance where the highest statement was (32).

**Table (4-12) Mean, Standard Deviation, Ranking and Importance for (Tangibles)**

No	Statement	Mean	St. D.	Rank	Importance
31	The banking service has modern-looking equipment.	4.26	0.62	1	High
32	Employees of bank main branch are professionally dressed.	3.60	0.94	4	Medium
33	The interior and exterior of the bank is visually appealing and spacious.	3.97	0.69	2	High
34	The interior and exterior of the bank is visually appealing and spacious.	3.86	0.64	3	High
<b>Tangibles</b>		<b>3.92</b>	<b>4.06</b>	–	High

### 4.3 Relationships between Variables

**(4-13) Bivariate Pearson Correlation (r) Matrix between Independent and Dependent Variables.**

No		1	2	3	4	5	6	7	8	9	10	11
1	Performance expectancy											
2	Effort expectancy	0.328										
		0.00										
3	Social influence	0.365	0.311									
		0.00	0.00									
4	Facilitating conditions	0.292	0.371	0.131								
		0.00	0.00	0.00								
5	IOT	0.724	0.625	0.753	0.629							
		0.00	0.00	0.00	0.00							
6	Reliability	0.119	0.134	0.232	0.303	0.151						
		0.00	0.00	0.00	0.00	0.00						
7	Responsiveness	0.303	0.272	0.175	0.276	0.236	0.101					
		0.00	0.00	0.00	0.00	0.00	0.00					
8	Assurance	0.177	0.232	0.408	0.260	0.251	0.457	0.156				
		0.00	0.00	0.00	0.00	0.00	0.00	0.00				
9	Empathy	0.206	0.166	0.407	0.400	0.113	0.239	0.75	0.407			
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			
1	Tangibles	0.190	0.303	0.619	0.236	0.445	0.380	0.287	0.445	0.114		

0		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
1	Service quality	0.793	0.489	0.585	0.760	0.426	0.542	0.353	0.412	0.524	0.229	
1		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	

Table (4-13) shows that there are relationships among sub-variables, where (r) ranging between (0.753 and 0.131), Moreover, there are relationships between service quality dimensions where (r) ranges between (0.793 and 0.101)

#### 4.4 Hypothesis Testing

Multiple regressions are used to test the impact of internet of things on financial service quality on Jordanian commercial banks. After confirming validity, reliability and relationships between variables, the following tests were carried out to be able to use multiple regressions and multicollinearity (Sekaran & Bougie, 2013).

##### Multi-Collinearity Test:

To test the morphological and explanatory strength of the multi-linear regression model used, and to test the moral and explanatory strength of the regression analysis model, the linear correlation test, the VIF test, the Tolerance test for each dimension of the independent variable, There is no high correlation between them and they are independent of each other, and the results after calculating the previous transactions for all dimensions of the independent variable as shown in the table (4-14)

**Table (4-14): Multicollinearity: VIF, Tolerance test**

Independent Variables	Tolerance	VIF
Performance expectancy(IoT)	0.85	1.17
Effort expectancy (IoT)	0.74	1.34
Social influence (IoT)	0.79	1.25



<b>Facilitating conditions (IoT)</b>	0.83	1.20
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It is evident from the above table that the Variance of Inflation (VIF) values for all variables are less than (10) and range from (1.17-1.34), and tolerance values ranged from (0.74-0.58), which is higher than 0.2.

### **The Main Hypothesis:**

**Ho1. Internet of things factors (Performance expectancy, effort expectancy, Social influence, facilitating conditions) does not impact the behavioral intention of financial services quality in Jordanian commercial banks, at the level of significance ( $\alpha \leq 0.05$ ).**

To test this hypothesis, and to detect the impact of internet of things variables on financial services quality in Jordanian commercial banks, the study used the multiple regression analysis as shows in table (4-15) below:

**Table (4-15): Multiple Regression Analysis of the impact IoT (Performance expectancy, effort expectancy, Social influence, and facilitating conditions) on behavioral intention of financial services quality.**

Independent Variable	Model Summary			ANOVA		Standardized Coefficients	Coefficients	
	R	R <sup>2</sup>	Adjusted R <sup>2</sup>	"F" Value	"F" Sig	Beta	"T"	"T" Sig
		0.59	0.34	0.33	38.62	0.000		
Performance expectancy						0.22	4.01	0.00

Effort expectancy			0.52	10.52	0.00
Social influence			0.41	7.7	0.00
Facilitating conditions			0.35	6.45	0.00

Table (4-15) indicates that there is a statistically significant effect on the level of ( $\alpha \leq 0.05$ ) Where the value of each ( $R^2, f=38.6, F=38.62, sig=0.000$ ), This means that there is a trace of the variable IoT (Performance expectancy, effort expectancy, Social influence, facilitating conditions) on behavioral intention of financial services quality. This means that we reject the nihilistic hypothesis and accept the alternative hypothesis which is:

There is impact IoT ((Performance expectancy, effort expectancy, Social influence, facilitating conditions) on financial services quality in Jordanian commercial banks.

**Sub-hypotheses:**

**Ho1.a.** Performance expectancy does not affect the financial service quality in Jordanian commercial banks at ( $\alpha \leq 0.05$ ).

The table (4-15) indicates that the effect of the variable on the expected performance on the financial service quality ( $R=0.22, F=16.14, sig=0.00$ ). This means that we reject the null hypothesis and accept the alternative hypothesis:

- **There is an impact of Performance expectancy on financial service quality.**

**Ho1.b.** Effort expectancy does not affect the financial services quality in Jordanian commercial banks at ( $\alpha \leq 0.05$ ).

The table (4-15) indicates that the effect of the variable on the effort expectancy on the quality of service ( $R=0.52$ ,  $F=0.27$ ,  $Sig=0.000$ ). This means that we reject the null hypothesis and accept the alternative hypothesis:

- **There is an impact of Effort expectancy on financial service quality.**

**Ho1.c.** Social influence does not affect the financial services quality in Jordanian commercial banks at ( $\alpha \leq 0.05$ ).

The table (4-15) indicates that the effect of the variable on the social influence on the quality of service ( $R=0.41$ ,  $F=59.7$ ,  $Sig=0.00$ ). This means that we reject the null hypothesis and accept the alternative hypothesis:

- **There is an impact of Social influence on financial service quality.**

**Ho1.d.** Facilitating conditions do not affect the financial services quality in Jordanian commercial banks at ( $\alpha \leq 0.05$ ).

The table (4-15) indicates that the effect of the variable on the Facilitating conditions on the quality of service ( $R=0.35$ ,  $F=14.61$ ,  $Sig=0.000$ ), This means that we reject the null hypothesis and accept the alternative hypothesis:

- **There is an impact of Facilitating condition on financial service quality.**

In brief, the multiple regressions analysis shows that the internet of things variables together impact the financial services quality, where ( $R^2=0.34$ ,  $F=38.62$ ,  $Sig. =0.00$ ). In addition, it shows that all the four variables impact financial services quality.

## **Chapter Five – Discussion**

### **5.1 Introduction**

### **5.2 Descriptive Results**

### **5.3 Hypothesis Results**

### **5.4 Recommendations and Future work**

## 5.1 Introduction

This chapter will discuss what have been found from studies conducted and the results in this research comparing them with previous researchers' opinions in the literature review. Achieving objectives will be illustrated and explained.

## 5.2 Descriptive Results

- The statistics show that the responses was ranged between (4.14 and 3.92) with the highest mean (4.14) and the standard deviation (0.52) for variable reliability with a high importance, then followed by empathy by the mean (4.05) with standard deviation (0.43), then responsiveness by the mean (4.01) and standard deviation (0.41), finally the lowest for assurance and tangibles by them mean (3.92) with standard deviation (0.40), finally the
- The questionnaire responses ranged between (3.56 and 4.26). The highest mean (4.26) with standard deviation (0.62) for statement (31) which was “The banking service has modern looking equipment”. While the lowest mean (3.56) for statement (14) which was “IoT has improved the machine to machine”.

## 5.3 Hypothesis Results

- 1- There is an impact of IoT at the significant level ( $\alpha \leq 0.05$ ) on financial services quality in Jordanian commercial banks.
- 2- There is impact Performance expectancy at the significant level ( $\alpha \leq 0.05$ ) on financial service quality in Jordanian commercial banks
- 3- There is impact Effort expectancy at the significant level ( $\alpha \leq 0.05$ ) on financial service quality in Jordanian commercial banks.

4- There is impact Social influence at the significant level ( $\alpha \leq 0.05$ ) on financial service quality in Jordanian commercial banks.

5- There is impact facilitating condition at the significant level ( $\alpha \leq 0.05$ ) on financial service quality in commercial banks.

The results of the study were agreed on high importance of empathy with the study by Shanka (2012) which resulted that empathy seems to be a light of human concern for others; it plays an important role in improving services in bank as well its economics. Moreover, through quality, competition can be best managed as well as customer satisfaction can be achieved by anticipating customer's needs and providing them personal care customer retention can be gained and it can be the cause of cost reduction. Also the study agreed with Furnell, Karweni (2012) as it concludes that reliability is the most important dimension in forming the financial service quality, which positive effect on customer satisfaction by avoiding any problem from employee in dealing with financial matters, employees have to provide services correctly, promptly without errors. Moreover a study by Sleimi et.al, (2018) agreed with current study as reliability is the most affective dimension in banking services.

Also there is an agreement with study Kumar et.al, (2012) as the responsiveness is a crucial dimension it was the highest dimension which is same as the current study, it has a strong effect on internet banking services as employees have to be talented, skillful and have the ability to respond professionally and quickly.

## 5.4 Recommendations

The internet of things is an updatable and complicated field of study, which deals with quality improvement in banks. Even though a large number of previous researchers have investigated in this research topic, more information is obtainable for the future research. Recommendations and suggestions are provided for further and future research and they are:

- 1- The study recommends a better understanding of service quality that would help to develop better solutions for banks performance in general and in employee in specific to avoid any performance troubles caused by quality.
- 2- The study recommends continuous training in different programs for employees including the management to raise the awareness in accepting any upcoming technologies.
- 3- The implementation of internet of things at commercial banks in Amman is undoubtedly a contribution in enriching and raising awareness and the importance of this study to other studies.
- 4- More studies and researches within this topic must be conducted since the internet of things devices are on their way to spread in Jordan and all developing countries. Experiences of other countries are a crucial way for techniques and strategies in internet of things in Jordan to be improved.
- 5- The study recommends regular feedbacks to be taken about the provided services of the banks. Such feedback gives an insight of customers' expectation from banks and gives scope for further improvement.

**Future recommendations:**

On the basis of this empirical study, the researcher visualized the following areas of further comprehensive research:

- 1- A further development of this study needs to be investigated on the moderators of the UTAUT model (Age, gender, experience) as it was a choice to be used in study, but their importance were not major in it, future studies might be interested.
- 2- The study recommends investigating the sub-dimensions of the service quality and their impact banking financial services.
- 3- The study recommended applying the study model on all Jordanian banks, since five banks were selected in the current study.
- 4- The study is carried on only commercial banks in Jordan; therefore, it can be studied in non-commercial banks.
- 5- It is recommended applying this model on another population in different industries such as telecommunications companies.
- 6- The current study strongly recommends future researches upon this field to use the same modeling except with larger sample.



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## **Appendix (1) - The Questionnaire (English form)**

Dears,

You are kindly requested to answer the questionnaire, as it is part of my master thesis that is entitled by “**The impact of internet of things (IoT) on the financial service quality in commercial banks in Amman, Jordan**” from managers and employees’ perspective.

The questionnaire is to develop the study of the quality of financial services in commercial Jordanian banks that are impacted by internet of things. The target participants are managers and employees of banking services system, as they will have the suitable answers to gain information to develop the study.

**Thank you**

**Researchers name:**

**Dina Masha'al Al Nahar**

**Supervised by:**

**Dr. Ahmad Al Sukkar**



**Job level** Low -level. Mid-level. Top- level.**Years of experience** Less than 5 years. 5-10 years. 10-15 years. More than 15 years.

## Part 1

Please provide your answer with the number regard the appropriate answer:

No.	Performance expectancy	Strongly disagree (1)	Disagree (2)	Not sure (3)	Agree (4)	Strongly Agree (5)
1	I fully understand what does IoT means.					
2	IoT has increased my perceived benefits.					
3	IoT has enhanced the extrinsic motivation.					
4	IoT has improved my work efficiency.					
5	IoT has enhanced a relative advantage in my job.					
<b>Effort expectancy</b>						
1	IoT encourage me to use the latest technology.					
2	It was easy for me to be skillful in IoT.					
3	IoT usage is clear.					
4	IoT enables faster development platforms.					
<b>Social influence</b>						
1	People who influence me think that I should use IoT.					
2	I prefer keep enrolling our organizations with IoT technology.					
<b>Facilitating conditions</b>						
1	Our organization have the necessary resources and network to be compatible to implement IoT.					
2	Our organization connecting is compatible to implement IoT.					
3	IoT based applications would be more fun to use.					
4	IoT has enhanced e services.					
5	I believe IoT helped me to learn more technologies.					
6	IoT has improved the machine to machine.					



## Part 2

No.	Reliability	Strongly Disagree (1)	Disagree (2)	Not sure (3)	Agree (4)	Strongly Agree (5)
1	Whenever a banking service is requested, the quality of financial service allows staff to provide it at the promised time.					
2	Once a problem is experienced, the quality of financial service allows staff to handle it in a particular technique.					
<b>Responsiveness</b>						
1	Whenever a service is needed, staff offers a prompt service.					
2	Whenever a service is needed, banking service staff serves readily in a good manner.					
3	The quality of financial service allows staff to solve customer problems.					
4	The banking service keeps the customers informed when service is performed.					
<b>Assurance</b>						
1	Employees' behavior in the bank embeds confidence when handling transactions.					
2	Employees ensure safety in transactions with banks services.					
3	Employees of bank have the knowledge to answer any questions.					
4	Employees ensure consistent courteous.					
<b>Empathy</b>						
1	Banking services transactions are passed in a caring manner.					
2	Banks have convenient branches (sub branches/outlet) and operate in extended hours to all their customers without spending much time on long queues.					
3	Customer's needs are understood with full attention.					
<b>Tangibility</b>						
1	The banking service has modern-looking equipment.					

<b>2</b>	Employees of bank main branch are professionally dressed.					
<b>3</b>	The interior and exterior of the bank is visually appealing and spacious.					
<b>4</b>	The interior and exterior of the bank is visually appealing and spacious.					

## Appendix (2) - The Questionnaire (Arabic Form)

السادة الأفاضل..

يرجى منكم تعبئة الاستبيان الذي يعد جزء من رسالة الماجستير المعنونة بأثر انترنت الأشياء على جودة الخدمات المالية في البنوك التجارية الأردنية من وجهة نظر المدراء و الموظفين, و التي تعد متطلب من متطلبات الجامعة للحصول على درجة الماجستير.

تعد الاستبانة أداة للدراسة و التي يجب تطويرها لمعرفة مدى تأثير جودة الخدمات المالية في البنوك التجارية الأردنية بانترنت الأشياء. و لذلك الافضل لتقديم المعلومات المفيدة هم المدراء و الموظفون العاملون على الخدمات المالية.

اسم الباحثة:

دينا مشعل النهار

اسم المشرف:

د. أحمد السكر

## المتغيرات الجغرافية

## الجنس:

ذكر  أنثى

## العمر:

أقل من 25  24-25  أكثر من 45

## المؤهل العلمي:

كلية/دبلوم  بكالوريوس  ماجستير

دكتوراه

## المسمى الوظيفي:

مدير تنفيذي  مدير عام  مدير اداري

رئيس قسم  ذلك

## المستوى العملي:

درجة متدنية  درجة متوسطة  درجة عالية

## سنوات الخبرات العملية في البنك:

أقل من 5 سنوات  10- سنوات

15-10 سنة  أكثر من 15 سنة

## الجزء الأول:

No	الاداء المتوقع	Strongly Disagree (1)	Disagree (2)	Not sure (3)	Agree (4)	Strongly Agree (5)
1	أفهم تماما ما هو انترنت الأشياء.					
2	زاد انترنت الأشياء من ادراك الفائدة.					
3	حسن انترنت الأشياء التحفيز الخارجي.					
4	حسن انترنت الأشياء من فعاليتي الوظيفية.					
5	حقق انترنت الأشياء ميزة نسبية في وظيفتي					
<b>الجهد المتوقع</b>						
1	يشجعني انترنت الأشياء على استخدام أحدث التقنيات.					
2	كان من السهل أن اصبح ماهرا في انترنت الأشياء.					
3	أستخدم انترنت الأشياء واضح.					
4	مكن انترنت الأشياء من تطوير المنصات بشكل اسرع.					
<b>Social influence</b>						
1	الأشخاص اللذين يؤثرون علي يعتقدون انه علي استخدام انترنت الأشياء.					
2	أفضل بقاء شركتنا منضمة لانترنت الأشياء					
<b>Facilitating conditions</b>						
1	تمتلك شركتنا الشبكة و المصادر المهمة لتنفيذ انترنت الأشياء.					
2	اتصال شركتنا موافق مع انترنت الأشياء.					
3	تطبيقات انترنت الأشياء أكثر متعة في الاستخدام.					
4	حسن انترنت الأشياء الخدمات المالية الالكترونية.					
5	أعتقد أن انترنت الأشياء ساعدني على تعلم تقنيات اخرى.					
6	حسن انترنت الأشياء الاتصال بين الالات					

## الجزء الثاني:

No .	الموثوقية	Strongly Disagree (1)	Digree (2)	Not sure (3)	Agree (4)	Strongly Agree (5)
1	عند طلب خدمة مالية, جودة الخدمات المالية تسمح للموظفين بتوفرها في الوقت الموعود.					
2	عند وجود مشكلة, تسمح جودة الخدمات المالية للموظفين بالتعامل معها بأسلوب معين.					
<b>الاستجابة</b>						
1	عند طلب خدمة, يقدمها الموظفون بشكل سريع					
2	عند طلب خدمة, يقوموا موظفو الخدمات المالية بالخدمة بشكل بسهولة و بطريقة جيدة.					
3	جودة الخدمات المالية, تسمح للموظفين بحل مشاكل العملاء.					
4	تعمل الخدمة المالية على إبقاء العملاء على اطلاع عند تنفيذ الخدمة					
<b>التأكيد</b>						
1	يغرس سلوك الموظفين في البنك الثقة عند التعامل مع المعاملات.					
2	يضمن الموظفون السلامة في المعاملات مع الخدمات المالية البنكية.					
3	موظفون البنك لديهم المعرفة للاجابة على اي اسئلة.					
4	يضمن الموظفون اللباقة باستمرار					
<b>التعاطف</b>						
1	يتم تمرير معاملات الخدمات المالية بعناية.					
2	لدى البنوك فروع مناسبة (فروع فرعية / منفذ) تعمل في ساعات طويلة لجميع عملائها دون قضاء الكثير من الوقت في طوابير طويلة.					
3	يتم فهم احتياجات العميل باهتمام كامل.					
<b>الملحوسات</b>						
1	الخدمة المالية لديها معدات حديثة المظهر					
2	موظفو الفرع الرئيسي للبنك يرتدون ملابس مهنية					
3	المناطق الداخلية والخارجية للبنك جذابة وواسعة.					
4	المناطق الداخلية والخارجية للبنك جذابة وواسعة					

**Appendix (3) - Questionnaire referee**

<b>No.</b>	<b>Name</b>	<b>University</b>
1	Prof. Ahmad Ali Saleh	Middle East University
2	Prof. Sameer Al Jabali	Middle East University
3	Dr. Mohammad Al Adaileh	Middle East University
4	Dr. Khaled Aladwan	American University of Madaba
5	Dr. Reem Al Fayez	University of Jordan
6	Dr. Khaled abo alganam	University of Jeddah
7	Dr. Amer Al Sakarnah	Petra University

### Appendix (4) - List of commercial banks in Jordan

No.	Banks' Name	Arabic Name	No. of branch	No. of staff
1	Bank of Jordan	بنك الأردن	46	1385
2	Ahli Bank	البنك الأهلي	34	1186
3	Cairo Amman Bank	بنك القاهرة عمان	37	1121
4	Housing Bank	بنك الاسكان للتجارة و التمويل	60	1814
5	Arab bank	البنك العربي	50	2800
<b>Total</b>			<b>227</b>	<b>8306</b>