Factors Affecting the Success of Internet of Things for Enhancing Quality and Efficiency Implementation in Hospitals Sector in Jordan During the Crises of Covid-19

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Abstract The rapid growth of Internet of things (IoT) has vigorously affected healthcare applications over the last decade particularly in the health information technology sector. This is done through improving healthcare delivery by increasing efficiency, reducing cost and time involved. However, the applicability of DeLone and McLean IS success model achievement model for health welfare implementation in IoT remains unknown. Thus, this research amid to establish the significance of IS application and its associations with user intention, client fulfilment and net advantages of IoT in five hospitals in a developing country such as Jordan. Furthermore, this research emphasized on the technological and infrastructural facilities factors that are considered imperative in improving the social healthcare procedures of resident's health care. Hope that this discovery would convince the administration of hospitals to focus on important viewpoints that impact the utilization of Internet of things (IoT) in healthcare services. The fundamental of this research is to determine the variables that impact the achievement of Internet of things (IoT) in the execution of human services from the viewpoint of medical clinic residents in Jordan. The fundamental point of the current paper was to examine the features that impact the achievement of Internet of things (IoT) in the implementation of health care from the perspective of hospitals in Jordan. An aggregate of 700 questionnaires will be circulated to five (5) hospitals in various regions in Jordan, out of which 417 questionnaire surveys returned, representing a response rate of between 50 and 60 per cent. This study presented elements of technological and infrastructural features of technological and infrastructural factors in the DeLone and McLean success model data framework and how these variables impacted user intention and citizen satisfaction as parts of medicinal healthcare services in Internet of things (IoT). This research used the PLS-SEM analysis techniques to test fourteen hypotheses. Variables are technological and infrastructural factors, estimation of data, framework quality and

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nature of administration. The research results supported technological and infrastructural factors, quality of the data and system service quality as significant aspects affecting the successful implementation of the Internet of things (IoT) for health care in Jordan. The study extended the DeLone and McLean IS success model by implementing variables of technological and infrastructural facilities factors impact that are critical factors in the Arab regions.

Keywords Internet of things · Covid-19 · Health care · Jordan

1 Introduction

According to Worldometer, the population of the world is rising at a rapid pace. As of May 2020, the current total population is 7.8 billion, as explained by the most recent United Nations [1]. The total population will peak at 9.22 billion in 2075, based on a UN report [2]. In contrast, the asset is not boundless, there is a sure deficiency of the absolute most significant common assets overall. For example, new water, non-renewable energy sources, petroleum gas and precious metal. What is more, the irregular circulation of the population is exacerbated by more than 50% of the total population packs in urban communities and urban centres. The distinction in volume of the populations is a thousand-overlay. There are subsequently megacities with a population of more than 10 million such as Tokyo, Shanghai and New York [3]. Without a doubt, there are various issues related to metropolitan territories. For example, overwhelming contamination, clog, wasteful utilization of energy and assets.

In order to adapt to the circumstances, a number of activities were undertaken. Observably, the United Nations has defined the term "Sustainable Development" as a reference model and direction for every single human movement on Earth. As indicated in the report of the United Nations World Commission on Environment and Development 1987 (Brundtland Report), economic growth is characterized as "a step forward that discusses the needs of the present generation without compromising future generations' ability to overcome their own problems down the line" [2]. From the whole point on, a huge amount of ideas and philosophies tried to present the possibility of "sustainable development" or "sustainable development".

2 Research Background

Today, fifty percentage (50%) of the world's citizens live in cities and towns. The pattern is expected to continue, helping to bring urban residents to around 75% of the total population by 2050. [4]. There are a few explanations behind this, including better access to human services, diversion, media transmission and transportation. Notwithstanding, from the city authorities' perspective, urbanization is meeting new

expectations and opportunities. City officials are relied upon to face a range of emerging issues, ranging from technical, social, physical to hierarchical, brought by the overcrowded population in a geologically constrained region. Congested driving conditions, environmental contamination (air, water, noise, light and radioactivity), high crime rate, wasteful use of energy and assets, and waste disposal are problems in a major urban area.

The point is to analyse Covid-19 prior and to improve its treatment by applying clinical innovation, the "COVID-19 Intelligent Diagnosis and Treatment Assistant Program (NCAP)" in view of the Internet of things (IoT). Terminal eight (8) capacities can be actualized continuously online correspondence with the "cloud" through the page choice key. As per existing information, surveys and check results, the determination is naturally created as affirmed, suspected or dubious of 2019 novel coronavirus (2019-nCoV) contamination. This arranges patients to mellow, moderate, extreme or basic pneumonia. NCapp can likewise build up an online Covid-19 continuous update database, and it refreshes the model of analysis progressively dependent on the most recent genuine case information to improve symptomatic precision. Moreover, nCapp can manage treatment. Forefront doctors, specialists and directors are connected to perform discussion and anticipation. nCapp additionally adds to the long-haul line up of patients with Covid-19. A definitive objective is into empower various degrees of Covid-19 finding and treatment among various specialists from various medical clinics to move up to the national and worldwide by through the insightful help of the nCapp framework. Along these lines, we can square ailment transmission, keep away from doctor disease and plague anticipation and control as quickly as time permits [5].

As the coronavirus extends its effect from China, growing its catchment into encompassing locales and different nations, expanded national and universal measures are being taken to contain the flare-up. The putting of whole urban communities in "lockdown" straightforwardly influences urban economies on a multi-sidelong level, including from social and monetary points of view. This is being stressed as the episode makes strides in different nations, driving towards a worldwide well-being crisis, and as worldwide joint effort is looked for in various quarters. Be that as it may, while powerful conventions concerning the sharing of well-being information are stressed, urban information, then again, explicitly identifying with urban well-being and safe city ideas, is still seen from a patriot viewpoint as exclusively profiting a country's economy and its monetary and political impact. This point of view paper thought of one month after location and through the flare-up, overviews the infection episode from an urban viewpoint and advances how brilliant city systems have to progress in the direction of improving normalization conventions for expanded information partaking in case of flare-ups or fiascos, prompting better worldwide comprehension and the board of the equivalent [6].

3 Theories and Models of Successful IS Implementation

Currently, a noticeable issue circulating among associations is the significance of putting resources into new data frameworks design and foundation. The requirement for the venture is driven by the need to give predominant items and administrations through powerful flexibly chains.

Therefore, business administrators have started searching for approaches to evaluate their financial-related allocation of IS at three levels: strategic, operative and strategic tactical.

Moreover, administrators are concerned with their capability to appraise IS investments before leveraging their fiscal and emotional capitals [7].

3.1 IS Success Theory

The primary causes to provide a sense of description of the information structure framework have been faced with difficulty due to the complex, dependent and multi-dimensional nature of the estimates. This issue was addressed during the period 1981–1987, as a result of which the scientific classification of IS was successful [8]. The model structure is introduced in Fig. 1.

3.2 Information Systems (IS) Effectiveness Concept

Seddon [10] revised DeLone and McLean's [8] model framework. Primary differentiation among the two was the grouping and significance of IS utilization. As per Seddon et al. [10], IS use as conduct offers anticipation for net advantages from the utilization of IS. Subsequently, the model of IS use comes from conduct of IS achievement. This new formulation of DeLone and McLean's perspective into other two restricted change models caused difficulties in the evaluation dimension. Indeed, the first idea to explain IS's hypothesis was simplicity.

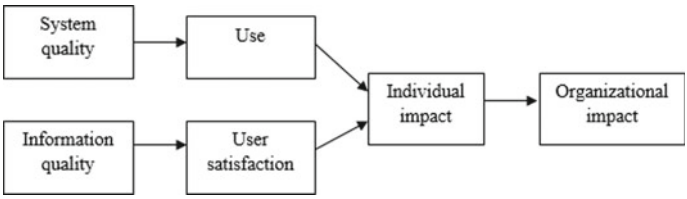

Fig. 1 DeLone and Mclean's theory *Source* DeLone and Mclean's [9]

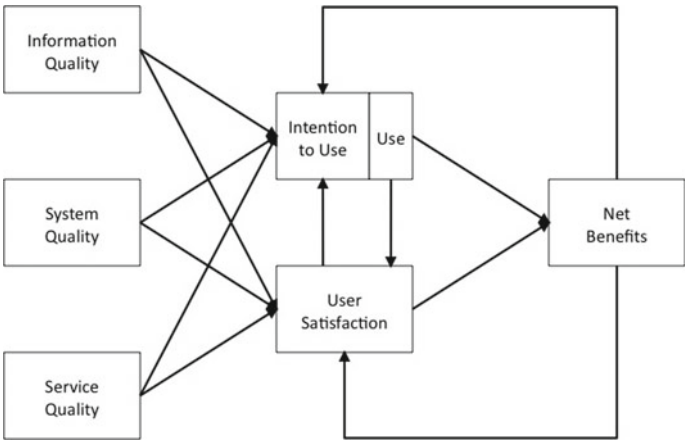

Fig. 2 DeLone and McLean Theory *Source* DeLone and McLean's [11]

3.3 Extended of Information Systems (IS) Success Theory

It is a refinement of DeLone and McLean's original theory [9], which they considered several disparagements and recommendations for enhancement. The improved concept is presented in Fig. 2, in which the arrows depict influences. This new formulation of DeLone and McLean's perspective into other two restricted change models caused difficulties in the evaluation dimension. Indeed, the first idea to explain IS's hypothesis was simplicity, redetermination of the construct connections and expansion of the idea of administration quality.

3.4 Systems Dynamic Theory of Information Systems (IS) Success

Wang and Liu [12] integrated the DeLone and McLean theory with the technology reception framework (proposed by Venkatesh et al. [13]) and proposed a new model that is presented in Fig. 2.6.3. Their effort became known as The framework dynamics model of IS success and includes two steady circles and a single adjusting circle. Figure 2.8 shows the influence diagram with response associations. A response connection refers to a closed-loop circle hover of circumstances and logical effect. In addition, response circles can be considered as relationship-generating and goal-seeking behaviour while behaviour remains core action in which the entire dynamic schemes interact.

Goal maintains the course of conditions within a system. In case of deviation, feedback relationships bring about corrective actions to return the process to its correct direction. Feedback relationships are of two types, namely negative (counteracting)

and positive (reinforcing). The former is designated as B, while the latter is designated as R. In case any concept in a negative loop is transformed, the loop drives the readjustment of the construct in the opposite way. The negative loop generates a self-correcting mechanism. Wang and Liu [12] emphasis that the main support, loop R1, which arises from the IS benefits, uses the modification loop that arises from the benefits of IS, will be the dominant element in the model's behaviour.

However, the complexity of this model makes it challenging to test and validate. On top of this, the response loops contribute to the strain of semantic testing. Wang and Liu [12] acknowledged this complexity and noted that they tested the model on the basis of a small response size. They proceeded to recommend a thorough and expansive review of literature to refine their model. They further acknowledged that the lack of practical test and a minimal data set made the constructs difficult to test successfully.

3.5 Sabherwal's Theory

Sabherwal et al. [14] took Rai et al. [15] observations into consideration and developed a theory for IS success. They presented two novel constructs in their theory, which is top administration support and simplifying conditions. The senior executives' positive attitudes are towards IS, whereas the latter reflects processes and resources enabling individuals use of IS. With top management supporting IS, considerable resources may be appropriated for their development and support in improving facilitating conditions [14].

This theory has disadvantages. The primary disadvantage is the fact that it is based on conveyed info obtained after a significant quantity of disparate pragmatic studies. The theory proposes that combining findings on the basis of various constructs and measures throughout different empirical studies is reasonable, which, in fact, may not be appropriate [14]. Another drawback lies in the constructs prior research has validated such as information qualities that were largely ignored. In addition to this, moderating effects were also excluded owing to the incapability of testing [14]. They concluded through contending that the developing structure created from the hypothesis best suits the post-execution circumstances with reverence to data frameworks towards associations.

3.6 Information Systems-Impact Success Theory

According to DeLone and McLean's [9] theory, Gable et al. [16] claimed that an encompassing measure for surveying IS usage includes scopes covering the regressive feature (impacts) and the frontward aspects (quality). According to them, the IS-Impact of Information Systems considers a sum at a point in spell of the net assistance created by information system as perceived by key client user groups as

state of the art and expected. They accepted that this model's validity and development were carried out with the help of data from the Australian public sector, and they are unclear as to the citations' completeness and the suitable representation of information system. Besides Gable et al.'s [16] study, the model has been largely untested.

3.7 Information Systems Success Research

This section presented a review of literature that has examined successful implementation of IS, most specifically in relationship to the D&M's model. Prior studies have examined and evaluated the various dimension of IS success and investigated how the dimension affects organizational attributes.

The original work of DeLone and McLean is referred to IS accomplishment literature. Somewhere in the range of 1993 and 2002, their paper was referred to in excess of 285 companion evaluated articles and gathering procedures. The DeLone and McLean's [9] model provides detailed elements of IS achievement factors [17, 18]. Some help of the model is that it offers a setting depending on the orders of the few accomplishment methodology. Also, the model shows that the interrelationships among the achievement intermediaries are not lasting and that the connections are easy going [9]. In the interim, disagreeing sees in regard to DeLone and McLean model exist most particularly as that model identifies with the collaborations inside the model, including relationship among the measurements, and the intermediaries used to speak to the different measurements. The fundamental work of D&M's is habitually cited in IS achievement writing. Somewhere in the range of 1993 and 2002, their paper was referred to in excess of 285 friend looked into articles and meeting procedures. The DeLone and McLean's [9] model gives definite components of IS achievement factors [17, 18]. A few commitments of the model are that it gives a system that is dependent on the arrangements of the different achievement measures. Likewise, the model shows that the interrelationships among the achievement intermediaries are not perpetual and that the connections are easy going [9]. Meanwhile, contradicting view concerning DeLone and McLean is most likely to occur as the model structure contributes to the connections in the model, and crucial relationship between the degrees and intermediaries used to represent measurements system framework.

More than 29 lessons have been thoroughly examined in the relations between the two constructs in the model as well as findings of these studies are consistent. Generally, these studies either use the entire construct in the model or select some of the constructs to suit a specific context. Some researchers are enlarging the framework by adding or removing variables from the model. For example, Pitt, Watson, & Kavan [19] and Wilkin and Hewitt [20] presented the quality of service, a design model from advertising to the model framework. In addition, Van Dyke, Kappelman, & Prybutok [21] and Seddon [18] challenged the inclusion of service value in the model and excluded them from their studies.

3.8 Summary of IS Success Theories

An aggregate of six achievement speculations was given the point of picking one for usage to suit the setting of a developing nation. A synopsis of the examinations between the hypotheses is introduced in Table 2.9. The inference of elements to look at changed speculations of IS achievement was taken from Garity and Sanders (1998) and Petter & McLean [8]. The top measures for choosing a model system to utilize are that clients must be sure about the hypothesis and for this to occur, the hypothesis must be well tested and authorized (Petter and McLean [8].

Another basis for speculations is the domain of utilization in a manner of speaking where the level at which the model structure is used. The solicitation zone alludes to the hypothesis' adaptability of work to the investigation level that the specialist regards to be generally huge. Simplicity makes reference to the opportunity from trouble and is regularly connected with the difficulties that a thought ventures and on the person, who is attempting to get it. Something that is straightforward is basic while that which is difficult to comprehend is unpredictable [22]. Adaptability is characterized as the adjusting capacity (getting appropriate) towards an accurate condition or use [22]. IS can be evaluated by more than three statures [23]. These levels are firm or hierarchical-level proportions of accomplishment, capacity or procedure-level proportions of accomplishment, lastly singular proportions of achievement. At the hierarchical level, IS accomplishment can be surveyed for the most part through systems identifying with basic execution including an expanded piece of the overall industry or productivity, working proficiency, working expenses and profit for value and stock. At the capacity or procedure level, IS can be assessed as far as skilled asset use and the minimization of procedure cycles. At the individual or client level, information systems (IS) can be measured as far as client recognitions concerning viability and fulfilment [23].

Among the six concepts revised, the DeLone and McLean [9] and [24] theories have extensively verified and authorized (i.e. by [8, 12]. The top challenges faced by most developed countries are lack of educated users [25]. Therefore, a concept to be employed in a emerging nation needs to be modest. Simplicity has been attributed to DeLone and McLean's theories [9, 24], Sabherwal et al.'s theory [14] and Gable et al.'s theory [16].

Seddon et al.'s theory [10] is considered to be among the most complex of the theories. The most flexible is the D&M's model (2002), and it is the most suitable to be employed in a developing country. That is because, according to Petter and McLean [8], the spearheading efforts to diagram IS triumph failed from the perplexing, interdependent and multidimensional scene of information system (IS) measurements.

Few researchers have changed the first DeLone and McLean hypothesis to survey applications including information management (e.g. Kulkarni, Ravindran & Freeze [26, 27] and web-based business [28–30]. When some researchers found effects of IS success on workgroups, industries and societies (e.g. [10, 31], DeLone and McLean replaced individual effect and authoritative contact with net advantages, along these

lines representing help at different investigation levels. This idea empowered its application to whatever degree of examination the analyst considered the most extreme significant.

As to date, only a few practical studies pertaining to IS and its achievements in developing nations exist [32, 33]. DeLone and McLean's [11] concept created a vital lens through which to look at the successful implementation of IS. The limited studies about developing regions concerning IS success are a sign of potential to conduct further examinations of the constructs that could propel successful implementation of IS applications and the manner in which those constructs might be correlated. With this in mind, the recognition of the factors that affect IS success might bring about an understanding of what to do insure IS success in those regions.

This research suggests that D&M's theory can be used to look into the possible successful introduction of the technological and infrastructural facilities features that considered imperative in improving the social healthcare procedures of resident's health care. A need exists to address the use of their concepts for evaluating the success of IT in developing regions (like Jordan) and the prospects of developing the model by looking at supplementary aspects (such as technological and infrastructural facilities services quality, data quality and framework system). This would represent the variables that could be included for the examination model. This procedure additionally recognizes the effect of technological and infrastructural facilities, administration esteem, data worth and framework quality on DeLone and Mclean's factors spoke to by individual's well-being fulfilment and expectation of utilization or use as a type of inner free factors. Also, it analyses the net preferred position of IoT as a dependent variable.

3.9 Research Factors

This section presented two (2) types of factor: first type is original factors of IS theory, namely the administration quality, data quality, framework quality, client fulfilment, intention to use and net advantages. Second type of factors is external factors, namely technological and infrastructure facilities factors as following:

3.9.1 Service Quality (SeQu)

Generally, administration quality is derived from the perspective of client attitudes, in which value is characterized as continuing the client's necessities [34, 35]. Effectively satisfying these requirements relies upon an association's ability to identify and meet them [36]. From the organization's perspective, customers can be seen as persons with singular necessities. In case a standard degree of administration quality is set up to fulfil these necessities, associations professing to give great administrations must fulfil clients' prerequisites with the goal that they will create more constructive positive image in the commercial centre over its opponents.

Interestingly, high-quality service does not necessarily translate to decreasing negative quality (poor service and irregularity); however, it can mean expanding positive characteristics like luxury and fun, that lead to the development of significant worth [36]; Grohmann, Hofer and Martin, [37]; Lee et al. [38–40].

Strategic advantage for an institution in the market with respect to products and services can be obtained through measuring quality gaps. This dimension delivers the determination to enable institution to enhance its spot in the marketplace. In any case, earlier examinations dedicated to this topic have demonstrated that estimating quality in a target way of administration portion that is a result of intangible, heterogeneous and inseparable landscape of services [41].

However, Sachdev and Verma [42] assessed the relative significance of value measurements in particular assistance enterprises and featured two (2) perspectives concerning quality measurement: internal and external perspectives. The previous is characterized as zero (0) deformities or conformance to prerequisites while the last reveals an insight into quality estimation with respect to client insights of knowledge, fulfilment, demeanour and delight.

Prior studies have applied many measurement instruments in the hope of contributing to the quality perception literature [43]. In precise, Llusar and Zornoza [43] stated that these tools added to the measurement of technology value and quality studies. Several lessons have attempted to recognize the major facility quality dimensions in the framework of hospitals in which individual collaboration among understudies and Stockholders (staff, nurses, doctor and patients) or lecturers was the principal administration conveyance and correspondence channel.

3.9.2 Information Quality

Data quality refers to the predominance results that data framework creates [9] and often appears as input of feedback. While gauging end-user satisfaction, information quality usually serves as a chief variable; thus, it is normally regarded as part of user satisfaction instead of an independent construct [8].

The strength and validity of the information produced by IS impact users´ satisfaction in applying that information for their purposes. If the information is complicated and not understandable, that information may produce dissatisfaction among users [44]. Concerning its result, few IS researchers have altogether contemplated data quality [45]. Several of the strongest and most vital elements of information quality, as mentioned by Petter and McLean [8], comprise accuracy, wholeness, significance, timeliness and the nature of information.

3.9.3 System Quality Factor

One well-researched component of IS achievement is system framework value. System quality signifies the degree to which the data handling framework itself

works and how the equipment and program ready to work together when consolidated. Framework quality has been concentrated through the perspective of assortment factors in the IS space. Nonetheless, the ones that are seen with as progressively important are accommodation of access, adaptability of framework, function efficiency, system integration, reaction time [46] and IS utility perceived [47].

Studies on IS have led to several metrics for gauging system quality, and chief among them are usability and user-friendliness, which are oft-used factors for gauging IS success and user satisfaction. The framework of websites and studies have detected the elements that form system quality features, namely interactivity, navigation, access, hyperlinks and entertaining [48].

3.9.4 User Satisfaction

The possibility of consumer fulfilment was applied to data frameworks (IS) research and assembled in the system identified with client fulfilment. User satisfaction was frequently viewed as a measurement for deciding data framework system achievement [49]. Kotler [50] described consumer gratification as follows: "Satisfaction is an individual's feelings of enjoyment or disappointment arising from gazing at the apparent display of an object equivalent to their wishes". Brown [51] explained consumer satisfaction as: "The condition in which customer needs and expectations are met or exceeded over the entire life of the object or administration, arising in repeated buying, loyalty and good mood".

3.9.5 Intention to Use

Framework practice is identified with the use and correspondence of information system (IS) by individuals, populaces or associations [52, 53]. DeLone and McLean [11] suggested that a substitute estimation of framework use could be the reason to utilize which is a subject of the research framework system. The definition "Use" is a complex perplexing term to comprehend on the grounds that it includes an expansive range of definitions that deliberate, informed or uninformed and effective or ineffective. In some cases, assessing the intention to use (otherwise known as attitude) could be worthy option because gauging intention is linked to behaviour intention [11].

3.9.6 Factor of Net Benefits (NBs)

Net benefits (NBs) are used to be a formed version of the original model structure [9] in which individual elements and organizational impacts were separated into a solitary descriptor of the last achievement variable.

An individual impression alludes such that data from IS have the attitudes of clients with respect to the client's activity [54]. The term includes individual enhancements

and the general ramifications for the exhibition of an office or specialty unit according to impacts data from IS have on the executive's choices.

These effects happen when the data are recognized and interpreted by clients and applied to their occupations [9, 52].

3.9.7 Technological Factor

This investigation will consider the mechanical factor that is just four components from the all-inclusive [11] IS achievement model to be specific framework quality, data quality, administration quality and client fulfilment.

The utilization of the patients' online interface was not a priority but rather compulsory to the patients, the build "use" was subsumed in client fulfilment since clients' fulfilment of a data framework must be gone before by its utilization.

Net advantage as a build was dropped since allotting it will be of setting in this investigation. Client fulfilment which incorporates "use" in this setting remains the most feasible proportion of the information system (IS) achievement. This prompts the adjustment of the IS achievement model in accessing user's satisfaction within the context of the research.

3.9.8 Infrastructural Facilities

IS competency refers to how much extend staff has the basic aptitudes and information so as to play out the basic administrations [55]. As indicated by Allen and Boynton [56], IS structure refers to the extent to which the data frameworks are organized or dispersed all through an association. Client support manages the specialized support and help given to clients as far as practical data frameworks in the association [57].

4 Research Methods

This section addresses and explains the methods used in this research. It sheds light on the theoretical framework, research theories, research design, the questionnaire design, gauging scale, population, sampling and data gathering process. To conclude the chapter, a conversation on the statistical methods used to analyse the data is provided.

4.1 Data Collection Method and Framework

An examination analysis approach, wherein a quantitative strategy was utilized to gather the fundamental information, is received in this study. Patients of public and

Table 1 Comparing success theories

Model and criteria	[9]	[10]	[24]	Wang and Liu [12]	[14]	[16]
Well tested and validated	Yes	No	Yes	No	No	No
Simple	Yes	No	Yes	No	Yes	Yes
Captures all factors to DCs	No	No	No	No	No	No
Flexible	No	No	Yes	No	No	No

private hospitals in Jordan are included in the study population through an appropriate sampling technique system. Three hundred thirty-four (700) questionnaires were distributed, and from these, three hundred twenty-five (417) were analysed. The example attributes are then outlined out in Table 1.

4.2 Research Framework and Hypotheses

The research framework—which serves as the foundation of the study problems—illustrates that that all the thoughts, implications and recommendations are connected to the research complications.

This research recommends that, despite the presence of current innovative movements, the DeLone and McLean's information systems (IS) success model gets by as a fundamental reference to the achievement estimation idea that has been generally utilized in the assortment of research since the time it was distributed in 1992 [9] and keeps on being an effective measuring of IS achievement. Starting late, a need to recognize the interest for appraisal procedures that fit the assessment procedure of advances, to be specific, Internet of things for enhancing quality and efficiency during the emergencies of coronavirus has showed up. The recommendation has been made that through coordinating aspects of standard DeLone and McLean's assessment components, a more up-to-date, progressively refined and refreshed version of the DeLone and McLean's IS success model can be utilized in estimating factors affecting the success of Internet of things for enhancing quality and efficiency implementation in hospitals sector in Jordan during the crisis of coronavirus.

Several writers have looked into the aspects (or incorporated variables) that could possibly affect Internet of things for enhancing quality and efficiency implementation in hospitals sector, as well as their success in healthcare sector establishments. This study has acknowledged certain measures, namely the technological and infrastructural facilities factors that considered imperative in improving the social healthcare procedures of resident's health care. Hope that this discovery will convince the administration of hospitals to focus on important viewpoints that impact the utilization of Internet of things (IoT) in healthcare services.

The need to understand the workings of information systems (IS) and their impacts motivated the conception of the first DeLone and McLean IS success model. According to DeLone and McLean [11], this paradigm for the research framework

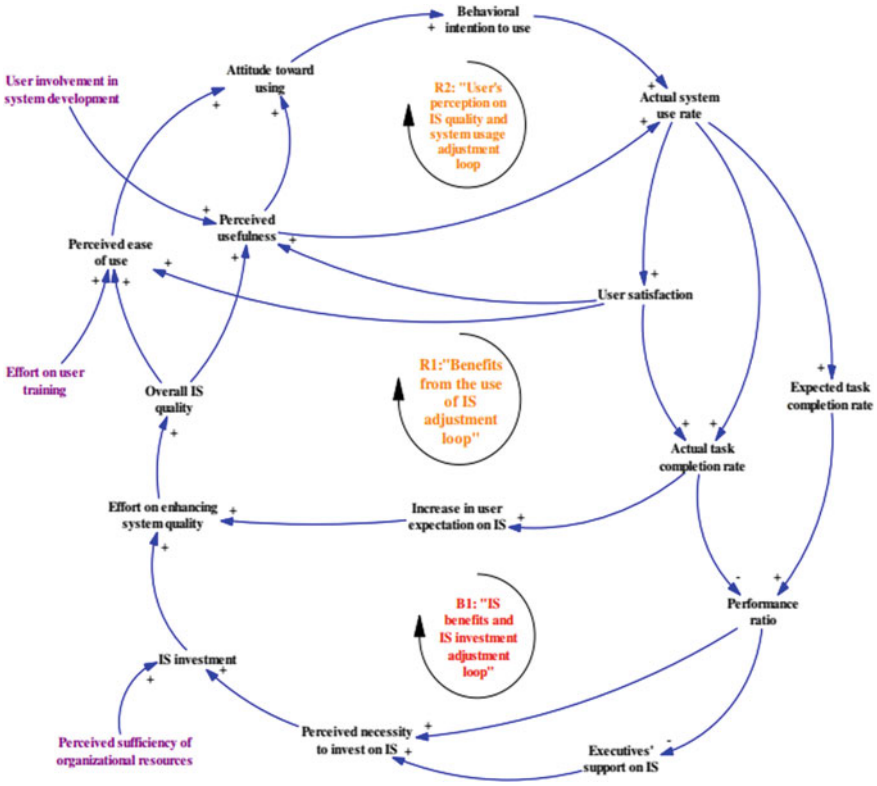

Fig. 3 Wang and Liu system dynamics theory of information system (IS) success *Source* Dynamics theory (2005)

has only three parts: the design of a structure, the use of the structure and the definitions of this model. Every step is appropriate, but not sufficient, for the resulting outcome(s). The concept of the current study sustains the three facets, which are system conception, system use and system significances as illustrated in Fig. 3.

4.3 Instrument Design

A poll of questionnaire survey, that endured face and contents validity, was developed for this study case, for ease of translation from the Likert scale five-point. This survey is separated into two sections: the first part relates to personal information with four (4) items, and the second part relates to the research variables with fifty (50) items. Smart PLS software was applied for the selected partial least square modelling method applied for this study, in such a two-stage approach to structural equation model testing.

5 Reliability of Measuring Instrument

This area presents the consequence of validity and dependability of the information gathered and the instruments. One strategy to make sure that the error of estimation is at a minimum rate is to describe the purity of the measure. The goal of these instument is usually to conduct these tasks assigment in appproraite way. The properties incorporate legitimacy and unwavering quality. To guarantee the legitimacy of the builds, a scientist must lead factor examination; in like manner, to guarantee the unwavering quality of the things, dependability investigation must be performed. This area incorporates the information screening and cleaning, profiles of respondents for real information assortment, validity assessment and reliability assessment.

5.1 Data Screening and Cleaning

The screening and cleaning techniques for information on blunders or exceptions were used before the information was examined.

At that point, the two develops and the constructs in the builds were approved. Factor analysis was performed on the independent and dependent variable items variable things to guarantee the legitimacy of the constructs. Information screening is a procedure that is led to guarantee that there will be no ambiguity in the information qualities that can possibly affect the discoveries. It is basic to do the screening procedure in light of the fact that as often as possible previous advances influence the decisions to be made in the latter steps.

5.2 Profiles of Respondents for Actual Data Collection (N = 417)

By researching the reliability quality, which explicitly refers to interior consistency, united legitimacy just as discriminative validity, the measurement model can be evaluated and assessed, as illustrated in Table 1.

6 Data Analysis

This section presented validity the measures, testing the research model and robustness testing as following.

6.1 Validity the Measures

SPSS software program and smart partial least squares (SPLS) were used to confirm the observations, just as the entire model system was tested. Convergent, discriminating credibility is built upon resulting factors (as seen in Fig. 2). Cronbach's alphas are above 0.80 of all definitions (Table 2). The average variance generated (AVE) square basis of all ideas is above 0.75 (Table diagonal elements.

A specific descriptive analysis of the test set out in Table 3 depicts the overall situation of the hospitals in Middle East. This analysis produces the mean, the normal deviation, maximum and minimum of the concepts. Meanwhile, to make the five-point Likert scale easily construable, three categories are applied in this study as follows: scores less than 2.33 [4/3 + lowest rate (1)] reported to be low; grades of 3.67 [highest value (5)−4/3] were rated as high and referred to as moderate in the middle table.

We have additionally conducted appraisals for normal framework inclination (i.e. change attributed to measurement method as opposed to difference clarified by the investigation's builds). To start with, proof for normal technique inclination exists on

Table 2 Respondents' profiles (N = 417)

Variables	Frequency (%)	Percentage (%)
Gender		
Male	168	40.3
Female	249	59.7
Nationality		
Jordanian	310	74.3
Non Jordanian	107	25.7
Age		
<25	125	30.0
25-35	93	22.3
More than 35	199	47.7
Educational level		
Less than bachelor's degree	184	40.1
Undergraduate degree	97	21.4
Graduation degree	111	23.7
Ph.D degree	61	14.8
Type of treatment received		
Inpatient	182	43.6
Outpatient	83	19.9
Both	152	36.5
Total	417	100%

Table 3 Validity and reliability of measurement

Variables	N	Cronbach's alpha	AVE
Information quality (IQ)	417	0.85	0.93
System quality (SQ)	417	0.88	0.91
Service quality (SerQ)	417	0.87	0.87
Technological (Tech)	417	0.82	0.86
Infrastructural facilities (InFa)	417	0.83	0.85
User Satisfaction (UsSa)	417	0.89	0.83
Use (U)	417	0.86	0.84
Net benefit (NBs)	417	0.79	0.90

the off chance that one principal factor means the greater part of the change clarified [58].

Our essential parts include investigation of full samples that demonstrates the eight (8) builds with eigenvalues predominant than 1.0 record for 78.57% of the fluctuation, while the main develop clarified 19.24% of the change.

Table 4 displays that the most noteworthy link between build association is 0.841, while the predisposition of the basic strategy is generally confirmed by very high connections (r > .90)) [59]. These tests show that the propensity of the basic method is definitely not a big problem in this study. The full-example Olkin test (n = 417) estimate is 0.978, implying this investigation's example skill [60]. Additionally, collinearity markers (resilience esteems and differential swelling factors) were planned and viewed as not exactly the appropriate cut-off focuses [61], meaning the investigation does not experience the ill effects of multicollinearity problems.

6.2 Testing the Research Model

In view of PLS analysis, the basic model and conjectured associations were reviewed by strategies methods for bootstrapping philosophy with 5000 iterations, the quantifiable centrality and the way coefficients were assessed.

For the complete example, we tried the exploration models using the SPLS ($n = 417$). The corroborative angle shown in the SPLS test is appropriate where all loadings exceed 0.71 and are greater than the pass stacking. The results SPLS of the research reviewing the structural model SPLS results are summarized in Fig. 4. In addition to H4 and H5, the proposed research program provided information on the data. In specific, the results show factors: data quality and system quality.

Technological (Tech) and infrastructural facilities (InFa) significantly affect client fulfilment ($b = 0.35, p < 0.01$), ($b = 0.38, p < 0.01$), ($b = 0.33, p < 0.01$), ($b = 0.41, p < 0.01$), along these lines supporting H1, H2, H3 and H4, and the outcomes show that factors in particular: information quality (IQ), service quality (SerQ) technological (Tech), infrastructural facilities (InFa), significantly affects intention to use (ItU) (b

Table 4 Result of variables analysis

Variables		Dimensions	Factor loading(FL)	Mean ± SD	(CR)	Cronbach's alpha	(AVE)
Information quality (IQ)	Content usefulness	CU1	0.758	3.755 ± 0.936	0.874	0.717	0.632
		CU2	0.738	3.776 ± 0.834			
		CU3	0.878	3.753 ± 0.723			
		CU4	0.796	3.741 ± 1.083			
		CU5	0.856	3.753 ± 0.723			
	Content adequacy	CA1	0.817	3.761 ± 1.083			
		CA2	0.741	3.728 ± 0.946			
		CA3	0.857	3.736 ± 0.836			
		CA4	0.823	3.723 ± 0.986			
		CA5	0.864	3.766 ± 0.936			
System quality (SQ)	Ease of use	EU1	0.738	3.767 ± 1.071	0.865	0.858	0.653
		EU2	0.753	3.763 ± 1.041			
		EU3	0.738	3.767 ± 1.029			
		EU4	0.726	3.853 ± 0.775			
		EU5	0.871	3.875 ± 0.855			
	Accessibility	Acc1	0.761	3.776 ± 0.834			
		Acc2	0.846	3.753 ± 0.723			
		Acc3	0.874	3.761 ± 1.083			
		Acc4	0.765	3.722 ± 1.064			
	Interactivity	Int1	0.754	3.771 ± 1.071			
		Int2	0.758	3.736 ± 1.077			

(continued)

Table 4 (continued)

Variables		Dimensions	Factor loading(FL)	Mean ± SD	(CR)	Cronbach's alpha	(AVE)
		Int3	0.734	3.741 ± 1.055			
Service quality (SerQ)	Accessibility(Acc)	ACC1	0.753	3.797 ± 1.021	0.768	0766	0.672
		ACC2	0.796	3.752 ± 1.081			
		ACC3	0.874	3.734 ± 1.031			
		ACC4	0.863	3.746 ± 1.062			
	Interface design (IDS)	ID1	0.748	3.733 ± 1.057			
		ID2	0.728	3.783 ± 1.054			
		ID3	0.878	3.871 ± 0.964			
	Reliability and response (R&R)	RR1	0.778	3.824 ± 0.773			
		RR2	0.845	3.831 ± 0.873			
	Content quality(CQ)	CQ1	0.817	3.855 ± 0.883			
		CQ2	0.762	3.657 ± 1.855			
	Personalization (Per)	Per1	0.767	3.784 ± 1.061			
		Per2	0.758	3.739 ± 0.774			
		Per3	0.771	3.744 ± 0.794			
		Per4	0.756	3.872 ± 0.874			
		Per5	0.753	3.738 ± 1.046			
	Privacy and security(P&S)	(P&S)1	0.723	3.731 ± 1.065			
		(P&S) 2	0.739	3.738 ± 1.026			
Technological (Tech)	Availability of human capital (AHC)	AHC1	0.833	3.875 ± 0.981	0.727	0.958	0.841
		AHC2	0.742	3.744 ± 0.764			

(continued)

Table 4 (continued)

Variables		Dimensions	Factor loading(FL)	Mean ± SD	(CR)	Cronbach's alpha	(AVE)
		AHC3	0.776	3.872 ± 0.854			
		AHC4	0.857	3.738 ± 1.026			
	Infrastructure in the field of research and development (IFRD)	IFRD1	0.791	3.731 ± 0.815			
		IFRD2	0.762	3.844 ± 1.042			
		IFRD3	0.847	3.834 ± 0.731			
		IFRD4	0.837	3.825 ± 0.859			
	Cooperation of the private and the public sector (CPPS)	CPPS1	0.749	3.764 ± 0.865			
		CPPS2	0.784	3.827 ± 0.732			
		CPPS3	0.763	3.831 ± 0.875			
Infrastructural facilities (InFaFaci)	Parking facilities	InFaFaci1	0.768	3.854 ± 1.062	0.876	0.853	0.785
	General entrance	InFaFaci 2	0.761	3.834 ± 0.731			
	Emergency entrance	InFaFaci 3	0.857	3.825 ± 0.889			
	Waiting area	InFaFaci 4	0.816	3.734 ± 0.865			
	Seating place	InFaFaci 5	0.823	3.827 ± 0.732			
	Washroom facilities	InFaFaci 6	0.859	3.841 ± 0.875			
	Cleanliness and hygiene	InFaFaci 7	0.871	3.831 ± 0.921			
	Canteen	InFaFaci 8	0.763	3.726 ± 0.882			
	Signboards	InFaFaci 9	0.852	3.724 ± 0.863			
	Technology	InFaFaci 10	0.784	3.843 ± 0.856			
User Satisfaction(UsSa)	UsSa1		0.718	3.821 ± 0.873	0.877	0.862	0.734
	UsSa2		0.715	3.835 ± 0.853			

(continued)

Table 4 (continued)

Variables		Dimensions	Factor loading(FL)	Mean ± SD	(CR)	Cronbach's alpha	(AVE)
	UsSs3		0.829	3.657 ± 1.835			
	UsSa4		0.813	3.764 ± 1.051			
Intention to use (U)	ItN1		0.738	3.739 ± 0.764	0.872	0.846	0.645
	ItN2		0.866	3.724 ± 0.774			
	ItN3		0.754	3.872 ± 0.854			
	ItN4		0.824	3.738 ± 1.034			
	ItN5		0.825	3.721 ± 1.025			
	ItN6		0.876	3.738 ± 1.066			
	ItN7		0.821	3.875 ± 0.961			
Net benefit (NBs)	NB1		0.821	3.754 ± 0.754	0.862	0.858	0.766
	NB2		0.853	3.872 ± 0.874			
	NB3		0.723	3.738 ± 1.026			

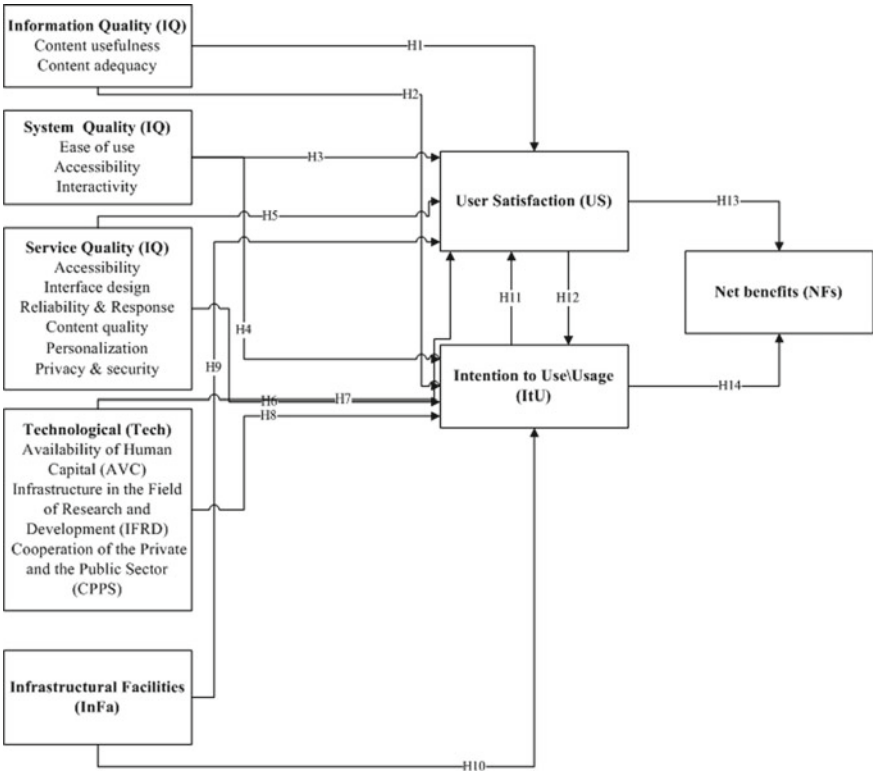

Fig. 4 Research framework and hypotheses

$= 0.40$, $p < 0.01$), ($b = 0.40$, $p < 0.01$), ($b = 0.59$, $p < 0.01$), ($b = 0.48$, $p < 0.01$), hence supporting H1, H2, H3 and H5.

In any case, we found a substantially negative relationship between the consistency of the system and the intention to use (ItU) (b = -0.17, $0.05 < p < 0.10$), dismissing H4 in this manner. It also starts an essentially negative relationship between quality of administration and user satisfaction (UsSa) ($b = -0.12$, $0.05 < p < 0.10$), thereby dismissing H5. The impacts of data quality on both client fulfilment ($b = 0.35$, $p < 0.01$) and use ($b = 0.36$, $p < 0.01$) are both huge, supporting H1 and H2. The connection between technological (Tech) and intention to use ($b = 0.40$, $0.05 < p<0.10$) and intention to use (ItU) ($b = 0.59$, $p < 0.01$) are both critical, supporting H7 and H8. The infrastructure facilities (InFa) and use relationships ($b = 0.41$, $0.05 < p < 0.10$) and intention to use (ItU) ($b = 0.48$, $p < 0.01$) are both noteworthy and support H9 and H10. The findings show that consumer loyalty effectively influences both usage ($b = 0.41$, $p < 0.01$) and net benefits ($b = 0.37$, $p < 0.01$), with support of H12 and H13.

The outcomes show that client fulfilment effectively affects both intention to use ($b = 0.\ 21$, $p < 0.01$) and net benefits ($b = 0.36$, $p < 0.01$), approving H11 and H14.

The clarified fluctuation of net advantages yields 0.43%. The changes clarified by client fulfilment and intention to use (ItU) are 0.56% and 0.36%, separately. Overall, the R^2 results for each needed variable, along with all the AVE, Cronbach's alpha, the unwavering composite quality and the increased factor stacking, provide sufficient decency for the general research model [62].

6.3 Testing Robustness

This same information shows an important serious effect of framework appraisal on intention to use (ItU) and insignificant impact of administration quality on client fulfilment.

So as to inspect whether this result is applicable to discover that impact the accomplishment of Internet of things (IoT) in the implementation of health care from the viewpoint of hospitals in Jordan, we conducted smart PLS analysis with these samples (Figs. 5, 6).

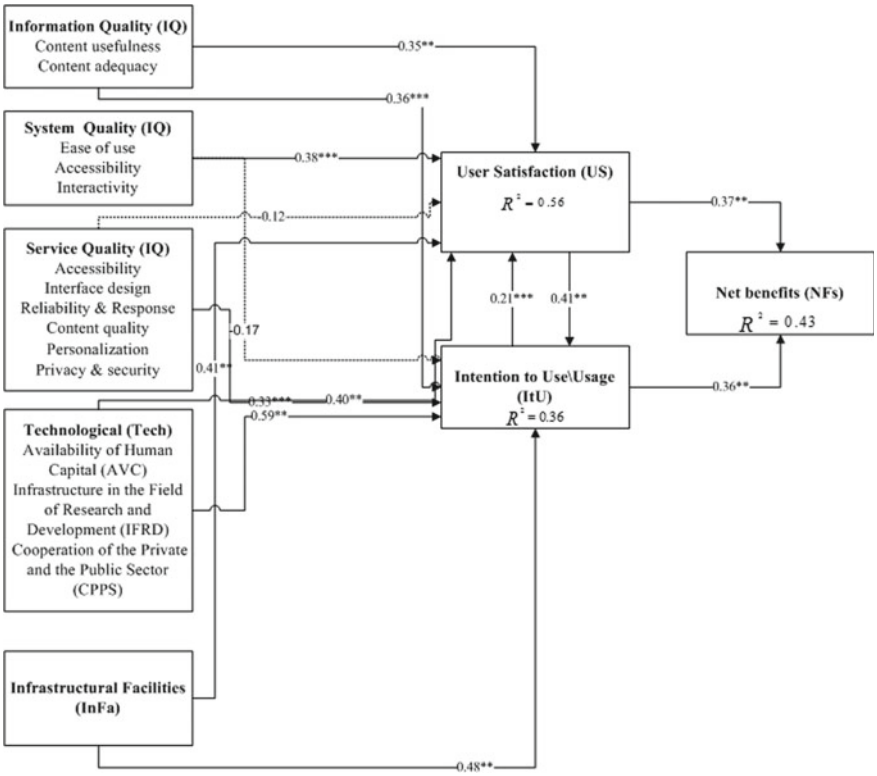

Fig. 5 Structural model SPLS results

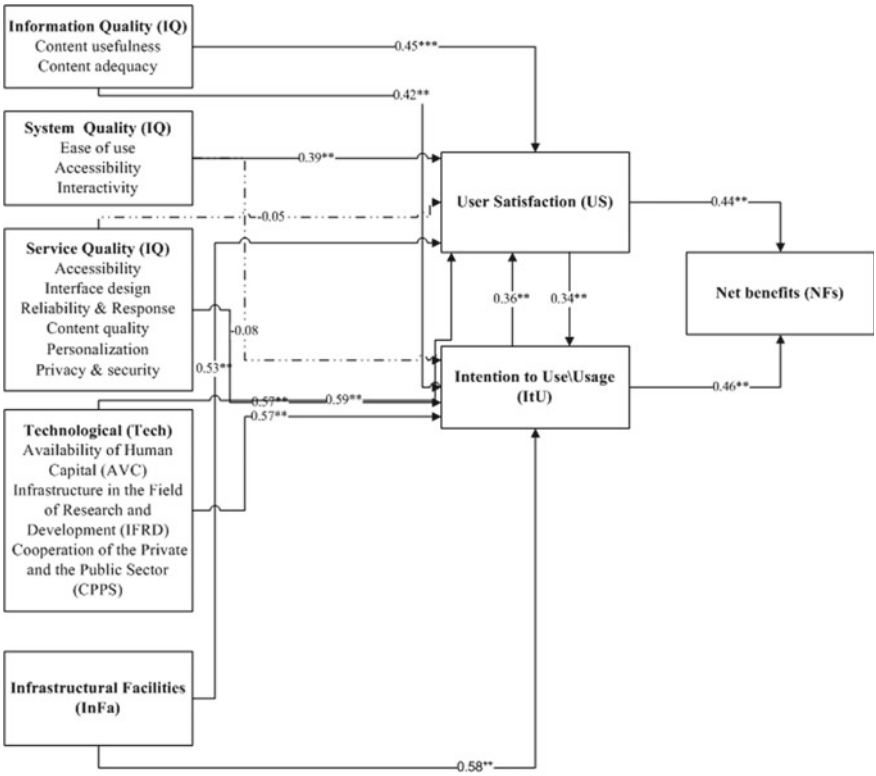

Fig. 6 SPLS results of structural model

The last advance in the PLS-SEM conceptual framework is to test the approximate connections by having to run PLS calculation and modularizing the 2.0 3 M smart PLS algorithm. Despite the fact that coefficients are significant in the analysis of PLS, Hair et al. (2011) confirmed that the earlier theory should be discarded when ways are irrelevant or show signs contrary to the conjectured pathway.

Then again, notable ways of demonstrating the conjectured path support the suggested observational causal relationship. We also conveyed that the hugeness of each coefficient, similar to the loads and loading of the indicators, can be tested using methods for a bootstrapping methodology. Within the past Fig. 4.3, we can observe the loading, path coefficient and R2 values of items clearly.

Utilizing the bootstrapping method in the appraisal of way coefficients includes bootstrap test of 500 and the amount of cases ought to be equivalent to the quantity of perceptions in the original model example (Winnie, Poh-Ming Wong, [63]; Winnie & Ramayah, [64]; Sumo & Regien, [65]; Lorenzo-Romero & Carlota, [66]; Henseler, Jörg, [67]; Monecke & Armin, [68]; Rubel & Mohammad, [69]; Iivari & Juhani, [70]).

In addition, the basic t-values for a two-tailed assessment are 1.64 (with a noteworthiness equivalent of 10%), 1.96 (with an outcome level of 5%) and 2.58 (with an essentials level of 1%).

The specialist set 500 re-examines with an extra number from the bootstrap cases equal to the first number of test (416) so as to create standard blunders and acquire t-statistics. Table 5 contains the path coefficient and the bootstrapping results, where the hypothesized relationships below were tested. (Table 6).

7 Research Contributions

This research makes significant commitments in the system of Internet of things viewpoints for the patients during the Covid-19 crisis in developing nations. This exploration has made subsequent noteworthy contributions.

7.1 Methodological Contribution

- The procedures, speculation, estimation apparatuses set-up in the basic piece of this study give an exceptionally lively viewpoint of the plan and groundwork for this exploration.
  The gathering of the poll study and model structure for this examination have been efficiently and noticeably expressed in this study. This exploration additionally offers legitimization for the choice to utilize the instruments that have been assigned for the fulfilment of this investigation. A basic condition demonstrating (SEM) additionally utilized to 200 approves the structure framework model. This examination adds to the improvement of SEM research in the technology innovation field.
- Firstly, identify and classify the range of IoT solutions and techniques for the patients during the Covid-19 crisis; secondly, identify the technological (Tech) and infrastructural facilities (InFa) issues for these IoT solutions and techniques; thirdly, presenting known technological (Tech), infrastructural facilities (InFa) features for these IoT solutions and techniques; and finally, identifying technological (Tech), infrastructural facilities (InFa) requirements for the IoT applications for the patients during the Covid-19 crisis.

7.2 Theoretical Contribution in Research

(1) The objective of this research involvement relates to how issues affect the level of success of Internet of things for enhancing quality and efficiency implementation in hospitals sector in Jordan during the crises of coronavirus. Furthermore, this

Table 5 Mean, standard deviation (SD), correlations and square root of AVE

Variables	Mean *(N = 417)*	SD *(N = 417)*	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***α***
			(N = 417)								
Information quality (IQ)	3.751	0.9086	***0.78***								0.74
System quality (SQ)	3.773	0.9732	0.64	***0.79***							0.75
Quality of service (SerQ)	3.774	1.0163	0.46	0.42	***0.48***						0.81
Technological (Tech)	3.808	0.8676	0.54	0.60	0.62	***0.96***					0.72
Infrastructural facilities (InFa)	3.804	0.8676	0.42	0.55	0.40	0.61	***0.94***				0.75
User satisfaction (UsSa)	3.769	1.153	0.39	0.59	0.48	0.58	0.46	***0.94***			0.76
Use (U)	3.772	0.9254	0.553	0.342	0.400	0.349	0.306	0.602	***0.86***		0.92
Net benefit (NBs)	3.788	0.8847	0.651	0.414	0.618	.446	0.406	0.310	0.530	***0.85***	0.83

Table 6 Hypothesis testing result

Hypo	Relationship	P coefficient	S. error	*t*-value	Supported	
H1	Information quality (IQ)→ user satisfaction	1.368	0.121	2.971	***	Yes
H2	Information quality (IQ)→Intention to use	0.312	0.094	0.154	**	Yes
H3	System quality (IQ)→User satisfaction	0.595	0.052	01.702	*	Yes
H4	System quality (IQ)→Intention to use	-0.396	0.043	10.334	n.s	No
H5	Service quality (IQ)→User satisfaction	-1.021	0.148	7.011	n.s	No
H6	Service quality (IQ)→Intention to use	0.668	0.115	1.583	***	Yes
H7	Technological (Tech)→User satisfaction	0.522	0.095	5.327	**	Yes
H8	Technological (Tech)→Intention to use	0.063	0.067	0.996	***	Yes
H9	Infrastructural facilities (InFa)→User satisfaction	0.847	0.113	7.853	***	Yes
H10	Infrastructural facilities (InFa)→Intention to use	0.787	0.077	0.558	**	Yes
H11	Intention to use→User satisfaction	0.611	0.061	10.152	***	Yes
H12	User satisfaction →Net benefit	0.204	0.046	5.278	***	Yes
H13	Intention to use→Net benefit	0.771	0.038	20.556	***	Yes
H14	User satisfaction→Intention to use	0.448	0.051	8.842	***	Yes

research highlights the rank of features affecting the context of Internet of things aspects for the patients during the Covid-19 crisis. This thus shows a major job in expanding the standard of success of Internet of things for enhancing quality and efficiency implementation in hospitals sector in developing nations.

(2) This study contemplated the correspondence-related features of Internet of things factors in the framework system of health for smart areas, specifically to know the transmission capacity essential and volume of information generated.

Based on the performance of current business preliminary, it is additionally contemplated and distinguished its qualities and shortcomings as far as Internet of things viewpoints for the patients during the Covid-19 crisis.

As a following stage, the thesis proposed a conceptual model that addressed the disadvantage of existing variables while looking over their qualities. This proposed

reasonable model determines the components that impact the accomplishment of Internet of things (IoT) in the implementation of health care from the perspective of hospitals in Jordan for receiving a comprehensive responsiveness of a person's health.

7.3 Practical Contributions

On the basis of the level of observation, analysis and the degree of innovation Internet of things for enhancing quality and efficiency implementation in hospitals sector in Jordan during the emergencies of Covid-19, eight (8) deciding variables have been recognized to determine elements of success of Internet of things. These incorporate the two (2) factors referenced above which have been changed to suit the unit of analysis of this exploration and furthermore includes increasingly factor, which is, technological and infrastructural facilities factors.

These variables impact are accepted to have a significant impact in success of Internet of things within developing nations and along these lines extremely fundamental to this research. The idea of these variables on account of progress of Internet of things is one that mirrors the multilayered values that have been gathered by customers from individual encounters [71].

Lack of trust by patients is progressively influencing the selection of achievement Internet of things; unfortunate cases like hacking has become serious these days and the fear of such can demoralize patients from accomplish enhancing quality and efficiency implementation in hospitals sector in Jordan during the emergencies of Covid-19 [72].

8 Research Implications

This research highlighted the importance of technological and infrastructural facilities factors on success of Internet of things for enhancing quality and efficiency implementation in hospitals level. This outcome is in line through that of [73] who show that it is imperative to emphasis on the enhancing value and efficiency implementation in hospitals sector in Jordan during the crises of coronavirus. These factors are serious issues to be considered when presenting a health for smart regions for the patients during the Covid-19 crisis in developing countries. Internet of things (IoT) providers need to continuously strive to examine the other important factors for smart regions with IoT technology.

This research has revealed that user gratification and intention to use have an important impact on success of net benefits. Then again, notable ways of demonstrating the conjectured path support the suggested observational causal relationship. We also conveyed that the hugeness of each coefficient, similarly to the loads and charging of the indicators, can be tested using techniques for a bootstrapping

methodology. Within the past Fig. 4.3, we can notice the loading, path coefficient and R2 values of items clearly and infrastructural facilities (parking facilities, general entrance, emergency entrance, waiting area, seating place, washroom Facilities, cleanliness and hygiene, canteen, signboards and technology).

9 Conclusion

The current present presented a detailed analysis of factors affecting the success of success of Internet of things for enhancing quality and efficiency implementation in hospitals sector in Jordan during the crises of Covid-19 on IS achievement. Most researches are conducted in different settings and IS context. Very little known about the impact of factors related to technological and infrastructural facilities as a determinant of IS success in the context of the success model framework for D&M. Subsequently, this study investigated the relationships between the technological and infrastructural facilities, the service quality, information quality, the system quality, and use of intent and user satisfaction. Additionally, the studies examine the connection between intention to use, in addition to user sense of achievement, user intent and net benefit, customer satisfaction and user intention.

The advantages of investing with technology (human capital availability, research and development infrastructure, and private and public sector cooperation); infrastructural facilities (parking facilities, general entrance, emergency entrance, waiting area, seating place, washroom facilities, cleanliness and hygiene, canteen, signboards and technology); and success of Internet of things for enhancing quality and efficiency implementation in hospitals level were assessed against patients' evaluation of the portal's attributes, in particular quality of framework, quality of data and quality of administration issues. The disclosures of this research can become a sign of the need for administrative hospitals to start taking prompt measures by conveniently supporting and revising the web-based human services framework interface and acknowledging the study's innovative and infrastructure development obstacles.

10 Recommendations for Future Research

This study has assessed effectively the influence of the aspects on satisfaction level and the purpose of using the total advantages of technological and infrastructural facilities factors that considered imperative in improving the social healthcare procedures of resident's health care. Hope that this discovery will convince the administration of hospitals to focus on important viewpoints that impact the utilization of Internet of things (IoT) in healthcare services. Furthermore, this study has emphasized the impact of the user interface and its relationship with the demographic features. However, all the variables affecting the success still need to be inspected of

Internet of things (IoT) in healthcare services. Consequently, this study offers some suggestions for future study as follows:

(1) Other methods could be utilized in future examinations, such as the case study, the contextual investigation, centre gatherings and expert interview to research the connection between segment factors, client fulfilment and expectation to use in the achievement of Internet of things (IoT).
(2) In the future, studies could inspect other features such as empowerment, safety, trust ability and efficiency in accumulation to the issues covered in the study.
(3) The research test was gathered from five hospitals in Jordan, which may not be satisfactory to signify the circumstance across Jordan. Thus, future analysts should be thoughtful when looking to simplify discoveries of this research for the entire nation.

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