An integration between information systems engineering and software engineering theories towards engineering a novel framework of web-based systems success for institutions based on students’ perceptions

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Abstract. Large numbers of dissatisfying systems users, organizations and higher rate of systems failure is still a problem. In targeting this failure, measure of systems success categorized as a solution to increase the rate of success in future systems initiatives. Success measure of systems is an important part of software’s engineering and information systems engineering to improve systems performance. However, studies showed a lack of research done on systems success evaluation in the universities of world, Arab region and Yemeni as special. Systems especially the web-based faces high rate of failure in Arab region, it was observed that many funded system projects failed, it was also, noted that in Yemen systems were completed and implemented without success measuring. Data analysis and interpretation for the web based information systems (WIS) success framework related to higher education can be taken as a latest phenomenon for the incorporation of theories of TAM, DM 2003 and software engineering ISO 25010. Moreover, this is also responsive and effective for assessing computer anxiety and management support aspects to explain satisfaction, loyalty and net impact. The present study is enthusiastic to outline the need for highlighting student perspective where exists dearth of research in this regard and dire need for engineering framework that works as a tool for organizations to success measure of their systems. Though, prior scholarly work has outlined significant role and importance of designing quality university WIS framework from the aspect of WIS developers not from the side of users. Henceforth, the present study aims to strive for highlighting the perception of users (students) regarding to universities WIS.
1. Introduction
The importance and vitality of measure of any software and/or any information system can be tracked in several disciplines [1]. Notably, software success measures and information system assessment has become more critical, consequently resulting in incurring challenges regarding its measurement [2]. Accordingly, it has also become important to underline challenges and demands related to systems that deplete the effectiveness and success of the measurement [2]. Therefore, assessment and test of the success of any particular information systems or software whilst keeping in view the context that it is used in has become more important these days [2]. With regards to this, scholars in the area are encountering issues whilst examining the success of a system. For this, it is important to understand that taking customer on the central position to examine the responsiveness and effectivity of a system is important [2]. For this, culture is playing a robust role as success prospects vary from one culture to another. This is due to the fact that every culture comes with certain norms, values and codes of conduct which influence the perceptions and the way systems are used [3].

The country Yemen ranks amongst the poorest Arab economies whereby, it has landed at 160th place in the human development index (HDI) [4]. Though, the economy is striving via accelerating its educational development over the past decade [5]. Sadly, this proliferation has also resulted in different issues such as wastage of resources, duplication of materials, poor systems and increasing numbers of dissatisfied users and organizations [1,5,6,7]. Pertaining to Arab economies, there is a dearth of research on success of systems whereby, the critical review of the literature has highlighted underlined no single study pertaining to Yemen in this regard [1,7,8]. The current global economy has witnessed rapid advancements in the domains of information technology (IT) and information systems. Academic institutions such as universities have been reported as amongst the earliest developers of WIS for the purpose of attracting target audience [9,55]. In fact, least developed countries suffered from low-level economies that in turn effect all aspects of life in the countries negatively. So, scientific research and higher education hardly affected which lead to don’t pay any importance for the research process at all [1,7,8]. Markedly, majority of the available web assessment and engineered frameworks are not robust in assessing the quality of the systems. Henceforth, it is essentially important to understand the quality of the systems in the context of Yemen and develop a success quality measurement framework from the perspective of users respectively [10,11,12]. It was pointed out that success measure is essentially important to be examined from the perspective of users to outline the actual worth of the systems [13].

2. Problem Statement
Notably, there is a dearth of integrative research on variables that could significantly affect success [2,11,38]. In line with inconsistency and mixed results [2,39,40] there are considerable gaps in the knowledge pertaining to what actually causes IS success [2]. With a limited engineering approach for building quality WIS framework, the existing systems are not capable of meeting the needs of users under the higher education domain wherein, they are also failing to sufficiently measure systems success since being domain-specific [10,11,12,16, 18]. Till date, little is known about the success of the website systems [41] which is similar to Arab countries whereby, empirical research pertaining to IS success is largely absent [8]. High rate of systems fails, which lead to business risks and financial losses [2,7,8,33,34,35,42]. There is a cognitive gap between users’ expectations from the systems and what the users perceives [21]. Investigating variables of quality of systems based on the context is highly needed since there is no common definition for the quality of information [10,11,43].

It is still a challenge to engineer a framework that could measure a service quality in the domain of higher education [26]. Due to lack of studies, little is known about how loyalty towards non-commerce systems can influence. Up to date research relationships between these two concepts i.e satisfaction and loyalty are unclear [3,8,44]. Likewise, measuring systems’ success and quality in Mukalla’s universities is not yet mature this is also in line with high rate of systems dissatisfying users and organizations [1,6,7,8]. As comprehensively discussed, failure of systems is still a major problem for organizations, in targeting this failure, measuring of systems success emerges as a solution to increase the rate of success in future systems initiatives [1,7,8,34,37,42]. Success or failure of any system is one of the most prominent streams in the research. Therein, understanding pertaining to why some systems
fulfill their expectations and other fail in doing is a complex arena for research scholars in the area [34]. In parallel, the quality of the systems has also remained one of the major issues that requires a framework for better understanding [16]. Henceforth, it is important to measure and understand the success and quality of university’s web-based system in the context of Hadhramaut universities to forward a comprehensive framework that could provide a robust guideline to such kinds of systems from the perspectives of the users. This study seeks to developing a universities web based systems novel framework for the higher education domain in the country by measuring the success of Hadhramaut universities web-systems and determine the quality factors towards achieving user satisfaction.

3. Literature Review
Assessing the success of systems is critical to outline how a particular system is performing and to what length, it is capable of identifying any issues; resolving user problems, and forwarding suggestions to meet the user requirements [1, 2, 10, 11, 13, 14, 15, 16, 17, 18]. Principally, satisfaction of the student and quality of the systems should be the most important element and accordingly, WIS should be developed to satisfy students through meeting their expectations [19]. Today, researchers have agreed to the fact that users’ satisfaction is a more accessible measure than the rest and the success of WIS is completely dependent on the users’ satisfaction. Importantly, users’ satisfaction can be adaptable in specific contexts (9, 19, 20, ,21, 54). Earlier frameworks sadly have failed to identify prominent factors and sub-factors that can potentially enhance satisfaction of users and help eliminate aspects like computer anxiety [22]. Therein, quality characteristics should also be included as core components for systems success assessment by the future studies to help refine the measurement items in a new context [23]. It has been confirmed that net benefit must be defined within the context of system under study and within the frame of reference of those who evaluate the system benefits [24]. Organizations can outline the effectiveness and success of their web information systems through highlighting satisfaction and benefits of all such factors that play valuable role in the determination of success [2, 19, 21, 24]. Organizations henceforth need a well-structured framework and advanced tools to assist the examination of complex web-based systems and their quality against defined standards [11, 23, 25, 26]. Similarly, it has been asserted scholarly work in the academics is expanding the researches horizon in different fields [2]. The development and formulation of robust system quality assessment framework is thus, highly important [16, 18]. The users’ satisfaction antecedents such as quality components have been highlighted in several comprehensive research studies. Therein, the literature has guided that systems’ quality is principally one of the urgent issues with limited empirical attention. Moreover, there is limited association between different metrics and frameworks as well [11, 16, 21, 27, 28]. Importantly, notable authors have underlined that computer anxiety is important for consideration to develop a balanced system satisfaction framework [29]. Accordingly, management support plays a vital role in systems’ success, affecting the satisfaction and should therefore be deployed in comprehensive studies in future [1, 30]. Furthermore, culture also plays a critical role in this regard hence, scholars need to examine this construct to forward more generalizable results in this regard [31]. It is important to note that people as users switch from one system to another mainly due to experiencing dissatisfaction. Likewise, users also switch to alternative system when they have doubts regarding the quality of the systems and the information that it provides [32]. Bundles of studies concerning to system implementation have surfaced outlining businesses incurring massive financial losses due to system failures [33]. Therein, numerous organizations can also be tracked providing statistical records pertaining to these losses. Taking an example, 27,000 students at the university of Massachusetts, Stanford, and Indiana university ended up facing severe consequences due to the failure of Information system of their respective universities [34]. It has been reported that practitioner surveys consistently suggest that more than 50 percent of systems have not achieved their goals [2]. Accordingly, 56 percent of the 5400 mega information technology projects have failed over the past decades. Regrettably, the assessment of such systems is entirely based on the stakeholders which is a tricky and expensive entity [2]. Shane Hastie (2015), based on CHAOS’s report (2015), has asserted that there is still working to be done to achieve considerable successful outcomes from systems and the percentage whereby, the success of projects is still very low
[35,36]. It should be mentioned that the failure of systems is a big concern to the organizations, business world, marketplace and stakeholders [8,37]. As per the statistical records from international data corporation, 43 billion US dollars have been spent on information systems [8]. This conclusively indicates that there is much interest in practice studies in a valid means for benchmarking these systems in order to track how the ICT investments are resulting to explain the benefits to the organization, and to better plan for future systems and ICT investments [8]. This is consonant with the issue in the Yemen as its’ higher education system is aimed to enhance and improve the management of the institution and facilitate users especially the students [8]. Universities in the country are generally not satisfied with the information systems whereby, they are also experiencing challenges pertaining to justifying these massive investments and expenses [8].

4. Methodology
Survey is an appropriate approach to study complex phenomenon of technology implementation in an organizational setting [45,46] to assess individual perceptions, attitudes and behaviours [47]. Moreover, surveys serve as a means of measuring the research variables for explaining the relationship of each research variable in a study [45,48]. Research could be quantitative, qualitative or a combination of both. The best method depends on the research objective and purpose a particular research is aiming to address [1,49,50].

In the present research, the quantitative approach has been selected whereby, the data will be collected through using the questionnaire technique. In parallel, the instruments have been pretested via users. Also, study, instruments and frameworks are further validated by one specialized expert and five PhD specialized academic lecturers from different universities in Yemen and Malaysia. This study will use the census method to collect the data from 2017 respondents (bachelor students of level four) from all four universities located in Mukalla.

5. Pilot Study
A total of 40 students participated in the pilot study. The test of reliability consistency is Cronbach’s coefficient alpha which is used for multipoint scale items [51,52]. The higher amount of coefficient indicates the better measures. Ideally, the Cronbach’s coefficient alpha should be greater than 0.70 [53]. Table 1 indicates the results of reliability for pilot study.

| Construct                      | No. Items | Cronbach’s alpha |
|--------------------------------|-----------|------------------|
| Information Quality            | 6         | 0.770            |
| System Quality                 | 6         | 0.897            |
| Services Quality               | 6         | 0.862            |
| Efficiency                     | 6         | 0.850            |
| Functionality                  | 6         | 0.907            |
| Reliability                    | 6         | 0.877            |
| Usability                      | 6         | 0.894            |
| Security                       | 5         | 0.794            |
| Management Support             | 4         | 0.832            |
| Computer Anxiety               | 4         | 0.842            |
| Perceived Ease of use          | 4         | 0.709            |
| Perceived Usefulness           | 4         | 0.763            |
| Student Satisfaction           | 7         | 0.864            |
| Loyalty                        | 7         | 0.817            |
| Net Benefit                    | 5         | 0.849            |
6. The Instrument
The instrument consists of 12 independent variables (IV), which hypothesized as will significantly affect the first dependent variable (DV) students’ satisfactions, then the dependent variable students’ satisfactions will work as independent variable that hypothesized as will significantly affect the second dependent variables loyalty and benefit.
First IV Perceived Information Quality (PINFQ) will measuring the accuracy, content and understandability using: The information outputs of my university web system (including on-screen and printed outputs) are Complete. The information outputs of my university web system (including on-screen and printed outputs) are concise. The information outputs of my university web system (including on-screen and printed outputs) are easy to understand. It is easy to find what I’m looking for when using my university web system. My university web system provides the precise information I need.
Second IV Perceived System Quality (PSYSQ) will measuring the adaptability and sophistication using: It is easy for me to become skilful by using my university web system. In general, I find my university web system is easy to use. My university web system applied modern technology. My university web system is well integrated. My university web system applied modern technology. My university web system is well integrated. My university web system has a short time lag between input and output of data as example (registration process). My university web system has a short response time for on-line enquiry.
Third IV Perceived Service Quality (PSERVQ) will be measuring the empathy of tech personal support and integrity using: Service support staff for my university web system are prompt in responding to my queries. Service support staff of my university web system understands my needs. Service support staff responds in a cooperative manner. The information received from my university web system is adequate. It is easy for me to get the desired information while interacting with my university web system.
Forth IV Perceived Efficiency (PEFF) will measuring the time behaviour and accessibility using: It is possible to switch between pages of my university web system within reasonable time. It is possible to find in my university web system what I want in a reasonable time. My university web system enables me to get on to it quickly. My university web system does not use advertise or unwanted plug-ins. I can access my university web system from my favourite browser. It is easy to get and browse any part on my university web system.
Fifth IV Perceived Functionality (PFUN) will measuring the navigation and search using: It is easy to go to the home page while I’m browsing any other page in my university web system. I’m able to move from one page to another page without getting lost while browsing my university web system. While navigating my university web system pages, I can immediately tell where I’m browsing in the system. While using my university web system, I can easily navigate backwards through previously visited pages. My university web system provides varied search options (e.g. By faculty, courses, etc.). Search hints are provided when wrong search keywords are used.
Sixth IV Perceived Reliability (PREL) will measuring maturity, fault tolerance, recoverability, availability and reliability using: My university web system never stops unexpectedly. When there is a problem in some part or parts in my university web system I still can browse and perform some of process. In case of interruption of fault, my university web system recovers properly. My university web system allows information to be readily accessible to me. In general, my university web system is available 24/7. I believe that my university web system is reliable.
Seventh IV Perceived Usability (PUSA) will measuring the user interface aesthetics and protection from users’ error using: The interface design of my university web system is attractive. All interface elements are well combined and harmonious in my university web system. My university web system interfaces are pleasant. My university web system protects me from making errors when interring data. My university web system errors messages clearly indicate to me how to correct the problem. In my university web system, it is easy to recover from the error quickly.
Eighth IV Perceived Security (PSEC) will measuring the security privacy and trust using: I believe my university web system is secure. Overall, I trust my university web system. My university web system has adequate security features that make you feel secure while using. I believe that the information
offered by my university on the university web system is sincere and honest. The output information of my university web system is secure. 

Ninth IV Perceived Usefulness (PUSE) will be measured using: Using my university web system improves my performance. Using my university web system is useful. Using my university web system would enhance my effectiveness. My university web system is efficient.

Tenth IV Perceived Ease of Use (PEOU) will be measured using: I find my university web system flexible to interact with. My interactions with my university web system during doing online process were clear and understandable. My university web system is convenient for me. My university web system is laid out in a modern and fashionable.

Eleventh IV Perceived Management Support (PMSU) will be measured using: Management support discusses problems regarding the university web system and provides all necessary resources to improve it. Management support encourages using the university web system. Management support frequently mentions the various problems, matters related to university web system. Management support much interested in university web system usage rate.

Twelfth IV Computer Anxiety (COAN) will be measured using: Using my university web system let me feel bad. Using my university web system let me feel anxiety. Using my university web system let me feel uncomfortable. Using my university web system let me feel nervous.

First DV Students’ Satisfaction (STSA) will be measured using: My university web system is of high quality. My university web system has met my expectations. My interaction with my university web system is very satisfying. Overall, I am satisfied by using my university web system. Overall, I’m happy with my university web system. My university web system serves my need as well as a student. My university web system is enjoyable.

Second DV Benefit (BENE) will be measured using: My university web system helps me to retrieve my information easier and quickly. My university web system saves my time. Overall, I obtained benefits from using my university web system. My university web system is an important and valuable aid to me. My university web system has a large, positive impact on me as a user.

Third DV loyalty (LOYA) will be measured using: I will be using more of my university web system in the future. I will recommend my university web system to others. I will say positive things about my university web system to others. I like using my university web system. I use my university web system frequently. I tend to use my university web system. I encourage to use my university web system.

7. Conclusion

High rate of system fails, limited of engineered frameworks that can help organization to know about the quality and benefits of their systems towards the users’ satisfactions and loyalty, lack of theoretical grounding, lack of data collection and empirical data. In the Arab word knowledges about systems quality and success are lack in line with almost nonexistence studies in Yemen with the high numbers of systems dissatisfying users and organizations. There is a hardness in engineered a framework that measures quality factors in the higher education domain. Together with inconsistent results in management support, computer anxiety and quality factors towards users’ satisfaction and users’ satisfaction towards benefit of the systems. In parallel, relationship of users’ satisfaction towards loyalty of users to the systems is ambiguous. Researches are invited to investigate these issues. It's highly recommended to engineer a framework that make integration between the theories of software engineering and information systems such as ISO 20510 and DM 2003. It’s of most important to conduct a comprehensive study that develop a novel framework, can solve all or parts of the issues mentioned above. This research aims to contribute the body of knowledge by targeting these issues. PLS and SPSS tools are going to be used because research will develop a framework and predict results. By rely on the literature and consults of the experts PLS and SPSS are the suited tools. Pilot tested showed excellent result. So, researcher can be performing the data collection since the instrument are well developed and validated. After collecting the data will spreading the final result in the next article.
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