

Usability Framework for E-Government Services in Developing Countries

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ABSTRACT

Lack of usability frameworks for developing countries has contributed to designing and deploying systems that fails at a high rate. This paper discusses a research effort on how rejuvenated Living Lab concept can contribute to designing usability frameworks for developing countries. Living Lab is a user centric innovative setting that involves everyday practices and research that facilitates user influence approach in an open and distributed innovation processes. The concept enables engaging relevant partners in a real life context for addressing usability issues.

Keywords

User Needs, Usable E-Government Services, Framework, Living Labs, usability issues

1. INTRODUCTION

Efficient and effective e-Government suggests that governments will gain economies of scale, reduce costs, and provide technology enabled user services [29]

2. THEORETICAL USABILITY FRAMEWORKS

A **framework** is a real or conceptual structure intended to serve as a support or guide for the building of something that expands the structure into something useful. A framework may be for a set of functions within a system and how they interrelate, it is generally more comprehensive than a protocol and more prescriptive than a structure [25].

2.1 Evaluation of E-Government Websites Usability in Jordan

[1] Observed that the level of usability of the existing e-Government projects results from the attention paid to end user requirements before and after the design. The analysis from the data indicate that the possibility of paying the attention to the end user before establishing the system is 35% and the percentage indicating that the user was not possible to given any attention the end user is 59% [1]. It is also clear from the data that the requirement of end user that can be use for improvement after launching the system is 45%. The analysis indicates that 51% of end user requirements for improvement after launching the system were not possible [1]. The different between the standard deviation between the two modes of analysis is 0.007%

[1] Observed that lack of end users involvement before designing e-government initiatives becomes a big challenge to designing and deploying usable e-government project. Usability investigations using Jordan e-Government websites was based on Nielson's Usability Model [2] and the main

focused was on user testing and assessment processes which greatly obstructed the focus on usability [1].

Experience in developing usable e-Government and unclear understanding about usability guidelines are among other factors that affects usability of the resulting artifacts that cannot be used for generalization purposes. This has been contributed to by lack of awareness of usability amongst the management, unclear framework for collaboration and coordination, poor standardizations and lack of trust [1].

Table 1: Biggest Challenges of Making a Website Usable for end-users (AlFawaz, 2011)

	Strongly agree, Agree	Not sure	Strongly disagree, Disagree	Mean	SD
Lack of awareness of usability	73%	8%	19%	4.72	0.450
Not involving end-user in the stage of design	62%	11%	27%	3.56	1.385
Lack of budget	54%	16%	30%	3.45	1.282
Lack of feedback from end-users	48%	23%	29%	3.40	1.517
Lack of expert website designers	47%	26%	27%	3.08	1.299
Management problems	30%	14%	56%	2.62	1.497

However, the model for designing e-government projects lacks user centered process that can comprehensively focus on variables that influenced user involvement and usability inclusively in developing a framework that can be use for developing e-government services in developing countries [1].

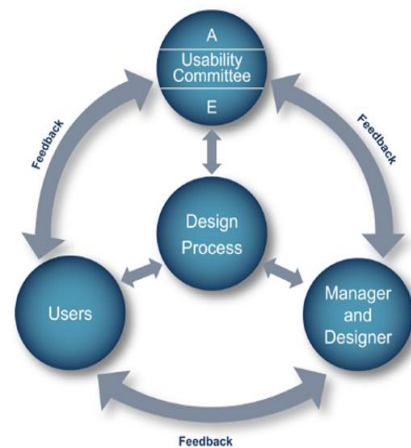


Figure 1: Model for Improving Usability of e-Government Websites in Jordan (AlFawaz, 2012)

3. CONSOLIDATING THE ISO USABILITY MODELS

[2] Usability has been defined in different ways as a determinant factor of software quality because of the nature of the characteristics and required attributes that depend on the context in which the product is used (see [2] pg. 2). The summarized consolidated usability model below gives a summary of one of the quality elements of the software. The consolidation of ISO usability models was based on the fact that there is lack of unclear architectural measurements, overlapping of concepts such as usability, lack of quality requirement standards, guidance in assessing the results of measurement and ambiguous choice of measurements for usability [2]. The elaboration for user involvement in the standards is ill defined.

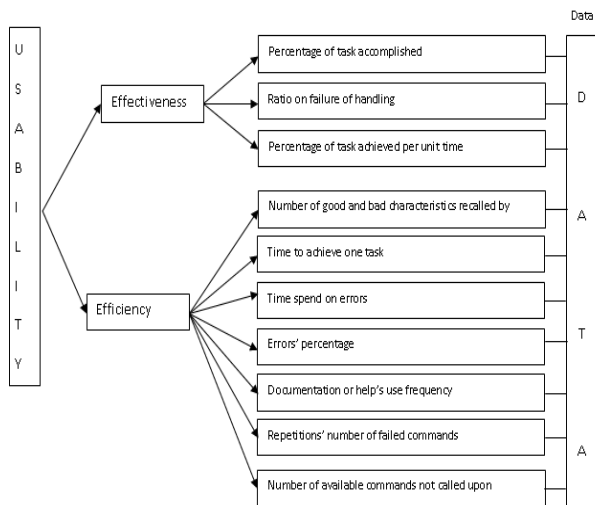


Figure 2: Nielsen's Usability Model [2]

The figure illustrates usability metrics as they are elaborated by ISO standards. It provides understanding on the importance of usability in relation to usage determining the end results. The involvement of the end users is not clear from the model (figure 2)

4. ENHANCING ADOPTION OF E-GOVERNMENT INITIATIVES IN TANZANIA

[3] Suggested that relevance, usefulness and usability of the guidelines are important indicators that the guidelines can facilitate a good decision making mainly to enhance e-government adoption. The data collection process was done by conducting ICT experts, and potential ordinary users and non-users [3]. In this case, usability professionals were represented because those included as ICT expert are explain and they are important in usability design process [4]. Ordinary users were taken as non ICT experts and were not involved in the implementation process [3]. Non user involvement in e-government services design before and during the design results in poor usability of the service and increases chances of failure of projects [1]. [3] Suggested that from the analysis of data from the numbers of e-Government adopters it was not easy to explain the extent of citizen adoption of e-government due to poor deployment of e-government. Governments' preparedness, lack of user involvement and lack of publicity behaviour affects electronic service delivery [3]. Most citizens in Tanzania preferred face-to-face communication because e-Government initiatives were conceived, developed, deployed and evaluated by

individual government institutions [3]. He noted that the adoption guidelines were not tested for usage since the main concerned was in the usability of the guidelines for making decisions on the adoption. This explains the fact that usability of the adopted e-government services is not ensured since the adoption framework figure 1. 3 did not integrate usability design process to improve on the usability of e-government services.

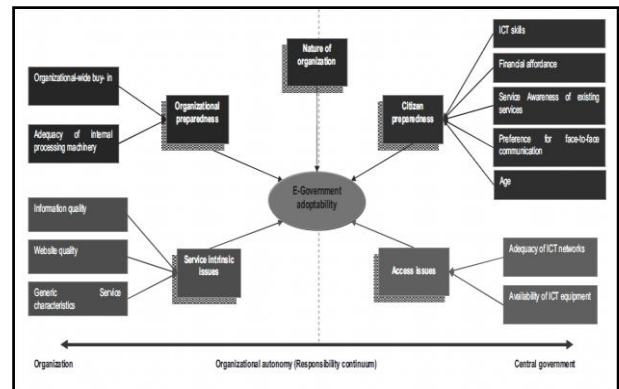


Figure 3: e-Government Adoption Issues in Tanzania [3]

5. A USER-CENTERED FRAMEWORK FOR REDESIGNING HEALTH CARE INTERFACES

[6] Noted that small scale usability is done by incorporating documented user centered design principles in the framework with the aim of understanding the users, the environment, and their tasks when designing quality health care systems. [6] observed that to attain quality of health care and to reduce errors that will emanate from the final artifact the knowledge of user-centered design must be integrated in design process for the clinicians to specifically focus on integrating the knowledge gained from the use of the system and not on the design process of these systems

6. FACTORS AFFECTING ADOPTION OF E-GOVERNMENT IN ZAMBIA

[5] Noted that usage, trust and usability remain major challenges of the adopted e-government services. In Zambia's context, usability level has become an impediment to e-government adoption [5]. The proposed adoption model emphasized on e-participation by citizens to provide a mechanism for feedback on policy and decision making processes for efficient public service delivery [5]. The framework does not have a strategy for addressing usability of e-government services before and during design process.

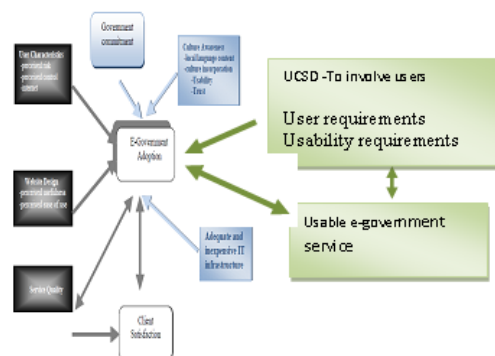


Figure 4: Proposed e-adoption Model [5]

7. CONCEPTUAL FRAMEWORK

The conceptual framework will involve the adoption of the model (figure 3) and integrate user centered design to facilitate a process of user involvement to address usability [26]. This is because adoptable e-government services must be usable [3]. The design process is underpinned by design cycle in design science that will be operationalised under living labs approach

8. THE STRENGTH AND WEAKNESSES OF THE PROPOSED SOLUTIONS

The previous section has discussed usability factors that have contributed to the high failure rates of e-government services and discusses related work of usability of e-government services. In this section proposed solutions on improving the usability of e-government services are analysed to determine to what extent they address the factors causing failure of e-government services and existing gaps.

9. ISO STANDARDS AND ACCESSIBILITY GUIDELINES

Usability standards/guidelines have been developed to address usability issues worldwide such as [7], [8] and Web Accessibility Initiative's (WAI) guidelines such as the Web Content Accessibility Guidelines (WCAG) ([9], 2005). [7] is a human-centered design guideline for designing interactive systems see figure 1.

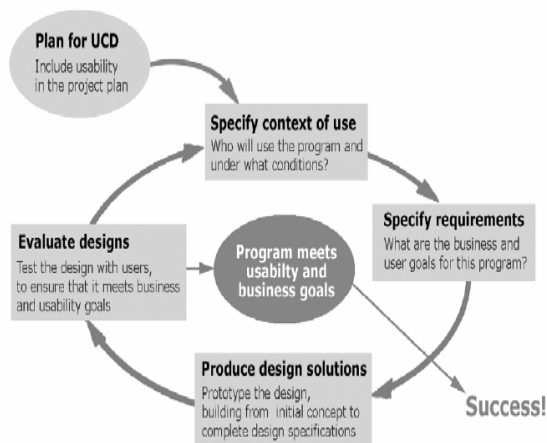


Figure 5: the ISO 13407 standards design cycle activities [9]

The figure represents ISO 13407 standard design activities that involves planning for UCD, context of use specification, business and user goals specification, prototype production and evaluation process where the design is tested with users.

[14] Observed that ISO 13407 has an element of human centered process for iterative systems which is not enough to maintain user centeredness in project. [2] noted that the ISO 13407 standards is a human-centered design guidelines have included the views of users and have introduced the concept of quality in use to ensure usable products to qualified users may not necessarily be usable to beginners. The ISO 13407 standards activities provides acknowledgment of the importance of the context of use that must be understood and specified, user requirements specification, evaluation of designed solution against business and user requirements to determine if the system meets business and user goals[16].

The [8] initially referred to as Common Industry Format (CIF) requires user involvement in the initial stages of the design rather than guiding the entire development process [9].

The international standards (ISO) for example ISO 9241-11 and ISO 9126-1 focus more on software and graphical user interfaces in general and not dedicated to software usability [10]. The standard guidelines are not specific to any application domain and environment in terms of developed or developing countries yet these two environments have unique aspects such as level of infrastructure development, general literacy of the population, ICT literacy, etc. In addition, during design and development of systems, software engineers assume duties of designers with user backgrounds [9]. ISO 13407 standards encourages better usability practices in software development processes to take care of usability certification [9]. [11] noted that the international standards provides general advice and guidance but not much practical support to identify, analyse and address usability issues and user requirements for development of usable systems. For [12], the [13] and [13] emphasized that usability is the quality in use of the system meaning that usability is what is achieved and is not concerned with how it is achieved with no specific attention to context of use yet there are reality gaps between different environments. ISO 9241-11 is a usability framework that recommends usability to be integrated in systems development processes because there is no clear explanation on how the integration of usability design involving users should occur in development cycle [15]. There is still a need for research on how factors causing poor usability of e-government services in developing countries can be addressed in the entire development process of e-government services.

10. AGILE METHODS

Agile refers to methodologies that are different, iterative and incremental for software development Rannikko (2011). Agile ensures that agile methods can easily incorporate changes before releasing the product [18]. Agile methods focus on customer involvement to establish, prioritize, and verifying the requirements [20]. The applicability of these methods is well suited to small projects with low life critical system as companies compete for customers [21].

[20] Observed that agile software developments methods such as Extreme Programming (XP), SCRUM, Feature Driven Development (FDD), and Dynamic System Development Method (DSDM) lacks user centered processes that can be utilized in agile processes for improving usability of software systems. According to [14] agile development methods cannot be considered user centered unless they are integrated with user centered approaches, because its values do not have the necessary focus on the user, user requirements and usability issues. This has resulted in the inadequate addressed to usability requirements because usability testing is done through integrated development environment (IDE) [14]. Agile development teams also lack a process that can be appropriately used to integrate user centered method to be utilized in agile design process for addressing usability of software systems [20]. According to [22] there is a lack of collaboration with customers in software development because software is always developed before customer asks for them. This has cause confusion between users and customers, unsatisfactory techniques for modeling users and tasks and the fear of early designs [14]. In fact, in agile approaches, handling of non-functional requirements (which includes usability) is ill defined [23].

11. PARTICIPATORY DESIGN METHODS

[24] Noted that participatory design is an approach that actively involves end users in the design process in order to meet user needs in developing usable systems. Participatory design practitioners lack enough time to hire enough people for participatory design process, at the same time it can be bias in identifying participants with extreme characteristics to be involved in design process [24]. According to [19] participatory design projects are challenged by different impact groups on ensuring correct representations and how dominated groups are identified. This indicates that participatory design lacks a process that can be used to properly evaluate the project. With the participation of users in design work does not guarantee that the interests of the dominated group will be accounted for [19].

12. WATERFALL METHODS

[14] Observed that waterfall process works well in traditional engineering and predictable manufacturing. He noted that in waterfall processes projects are challenged by lack of user inputs, incomplete requirements, specification and changing requirements and specifications. End users and non-technical stakeholders are not comprehensively involved in requirement analysis process for feedback collections [14]. The user needs that have remained unknown when using waterfall methods have lead to developing unnecessary features [14].

Hence to date, suggested methods for improving usability of e-services including e-government services are inadequate. This indicates that there is lack of a framework for developing usable e-Government services or projects, [28].

Table 2: summarizes the strength and weaknesses of the proposed solutions for addressing usability issues.

The strength and weaknesses of the proposed solution to usability issues			
Proposed Method	Strength	Weakness	Reference
ISO standards	-understanding of UCD -engineers do design work	-not dedicated to usability -domain not specified	Jokela et al., 2007; Al-Badi & Mayhew, 2010
Agile methods	-can easily incorporate changes	-lacks UCD process -deliver products to customers -no non functional requirements	Humayoun, 2011; McCormick, 2012; Durrani & Qureshi, 2012
Participatory design	Involve end users	Lacks Time -bias identifying participants	Kim & Lee, 2009 Martine, 2012
Waterfall	Good for traditional engineering -predictable manufacturing	not involves end users -non-technical	Rannikko, 2011

13. CONCLUSION

The study offers usability frameworks information that provides an insight to furnish stakeholders with knowledge that could be applied in developing and deploying usable e-Government services. The study also empower e-government services with a comprehensive resource pertaining to usability, [30], The problem of lack of methodologies and concrete frameworks to translate high level prescriptions into actions contribute to project failure. E-government project failure is originates from lack of cohesion between related UCSD processes and the usability requirements. These have been worsening due to lack of frameworks for developing usable e-Government services or projects, [28].

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