Effective Use of Search Functionality in Pakistan E-Government Websites

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Abstract. The modern era of technology makes technology an integrated part of our lives. The information and communication technology ICTs and information technology has diverse impacts on the human lives both in positive and negative aspects. The modern emerging trends in the technology and their impact on the human race encourage researchers to develop new enhanced techniques. The researchers proposed the concept of e-government to use the information technology and information and communication technology (ICT) and web-services to encourage the involvement of different stakeholders in the development and enhancement of government procedures. The electronic government directorate of Pakistan under the supervision of Ministry of Information approves an e-government plan. This paper provides an insight into the importance of search functionality in the e-government websites of Pakistan. A survey is conducted to evaluate the importance of search functionality and effective use of search functionality to improve the effectiveness, efficiency and satisfaction of the websites.

Keywords: E-government · Search functionality in e-government · Effective use of search functionality

1 Introduction

The basic definition of an E-Government is "The employment of the Internet and the world-wide-web for delivering government information and services to the citizens" [1]. Electronic government can also be stated as "The utilization of Information Technology (IT), Information and Communication Technologies (ICTs), and other web-based telecommunication technologies to improve and/or enhance on the efficiency and effectiveness of service delivery in the public sector" [2]. E-government encourages the involvement of different stakeholders in the development of state and community as well as develops the governance process better [3].

Network society theorists' states in various studies that activities and social structures in societies are increasingly centers around network largely on information and communication technologies (ICTs) [4–6]. Though most governments hesitates in taking up new technologies. The current practices of public administrations become increasingly complex, have to harmonize activities the developing stakeholders in the

public domain. The management and processing of huge amount of information seems like a silo, insular culture, slow decision making and information dispersion of the old model appears to be not suited for the advance information dissemination and corporation, legitimacy and trust professed by the citizens and eventually affects efficiency and proficiency [7].

Since the middle of 1990s, the e-government and ICT become the ideal solutions for the traditional public administration problems. Researchers are of opinion that intensive use of technology could increase the efficiency of public administration operational rules, abridges organizational procedures [8], citizen's involvement to be increased [9] and transparent and accountable government activities could be legislate [10]. High expectations requires an exploration to evaluate the limit to which public administration and procedures can integrate ICTs in their basic activities. It is fascinating to validate whether governments are becoming suppler, transparent and considers citizen's preferences, and transition towards new form of administrative organization might be considered as a virtual state [11] or as a network administration [12].

The government of Pakistan announced its first e-government strategy in 2005 for five years. The E-Government Directorate revised the strategic planning based on the consideration of past years, new realities and current conditions. The E-Government strategic plan is approved for three years in July 2012 [13]. Salient feature of this strategic plan is human resource development, top-level owner-ship, comprehensive planning, priority on high impact projects, interoperability of applications, security of government information, timely availability of funds and software development. The Government of Pakistan aims to spend Rs.4.6 billion on the information technology in the form of e-government, infrastructure and human resource development. The e-government is gaining fame in recent years. It is observed that over the past few years, almost every ministry is moving towards the e-government. This allows the citizens of Pakistan to have an easy access to rules, regulations, legislations and laws. The e-government sector is in its initial stages having many short comings. Apart from many other limitations, these government sector websites do not address the issue the intelligent information retrieval.

This paper is organized in section; in Sect. 2 literature review is provided, Sect. 3 provide the evaluation of effective use search functionality and Sect. 4 provides with the conclusion.

2 Literature Review

The traditional web applications do not address the features and usage context of mobile applications. In the paper [18], authors highlight the issues of user interface operability and their impact on the evaluation on the mobile applications usability. An ISO 25010 based quality model called 2Q2U is offered to assess and improve the MobileApp usability. 2Q2U addresses the quality attribute (1) quality, (2) quality in use, (3) actual usability and (4) user experience. They looked as the mobile app usage context and impact on app design. In combination with 2Q2U a new framework for the quality is proposed in [19]. SIQinU (strategy to improve quality in use) aims to improve the quality. The propose strategy is used for the evaluation of radio WebApps for user's hedonic and pragmatic needs.

A framework is presented [20] to evaluate Hindi and Punjabi websites on the basis of external quality attributes based on ISO/IEC 25010-11 standard. The proposed framework includes visual and automated observations. In their research proposal, 290 websites from academic, newspaper and government domains will be selected to evaluate on the basis of designed framework.

Abbasi et al. in [21] presents the ISO 25010 user interface aesthetics (UIA) from product quality (PQ) and quality in use (QIU) perspectives. In the said ISO standard, aesthetics is categorized as sub-characteristics of usability. While designing, it is important to design and evaluate aesthetics from user's perspective as well as from the product design perspective. The proposed approached is used to evaluate local Chinese websites.

The web portals as discussed in [22] provide wide range of applications, information and services. The quality in use, as important perspective of ISO/IEC 25010 standard is used as base to define a quality model for the web portals.

Stefani in [23] defines the B2C-specific quality assessment model for web metrics. Three dimensions based on end-user interaction categories, internal specifications of metrics and sub-characteristics of quality in light of ISO9126.

Jayakumar [24] evaluates the websites quality on the basis of accuracy, feasibility, usability and Website quality Assessment model (WQAM). The quality metrics are evaluated through the questionnaire sample. The feedback is used to identify the areas in the website requires improvement. On the basis of the feedback, new e-learning framework is proposed to incorporate the findings. High-level structure based on characteristics, sub-characteristics and main three dimensions attributes (content, service and technical quality) is suggested for the comparison, evaluation and improvement of websites [25].

The independency between the six quality attributes of ISO/IEC9126 is confirmed in the paper [26]. Customer satisfaction is quantitatively measured on the basis of these quality attributes. A prediction model is presented to assess the total customer satisfaction based on the inherit characteristics of the product. Based on these quality attributes "three dimensional integrated value model [27] " model is proposed to display the total quality of the system visually. The entire quality of the system can be measured and compared using integration meter of the evaluation of the system presented through solid volume cubic vectors of the characteristics.

3   Results

The intended context of use of the e-government websites is describe in this section. This section describes the participants who took part in the quality in use evaluation process.

3.1   Effectiveness in Use

The data for the Effectiveness in use was collected using the usability test, observations, retrospective think aloud (RTA) and post evaluation questionnaire. The results for effectiveness were recorded for all the eight websites during the task performance phase. The mean, median and mode values for each websites is shown in Table 1.

Table 1. Results for effective in use

Sr. No.	Websites	Mean %age completion rate			User response		
		Mean	Median	Mode	Mean	Median	Mode
1.	FBR	70%	67%	60%	2.355	2	2
2.	Ministry of Defence	56.66%	49%	50%	2.5	1	2
3.	Federal education Institute Directorate	46.66%	35%	40%	1.3	1	1
4.	Ministry of Finance	63.33%	55%	50%	2	2	2
5.	Ministry of Professional and Technical Training	53.33%	60%	45%	2.3	1	2
6.	Ministry of Planning, Development and Reform	46.67%	38%	48%	3	1	2
7.	Official Gateway to Government of Pakistan	40%	25%	35%	1.3	2	1
8.	Ministry of Science and Technology	54%	56%	45%	2	2	2

Note: all task complete = 100%, each task with error = 10% deduction, help from evaluator = 5% deduction User Response: 1 = strongly not agree, 2 = disagree, 3 = neutral/somewhat agree, 4 = agree, 5 = strongly agree

The analysis of the Fig. 1 showed that measures for the website of FBR are greater than all other websites. This shows that users find it easy to complete the assigned tasks with less errors and least help from the evaluator. The results indicated that users had more difficulty in completing the tasks, made mistakes and required frequent help from the evaluator while using other websites. The Fig. 1 show that users faced great difficulty in finding the desired results while using the Official Gateway to Government of Pakistan.

The lower scores show poor performance of the users. The user response for Official Gateway to Government of Pakistan and Federal Education Institute
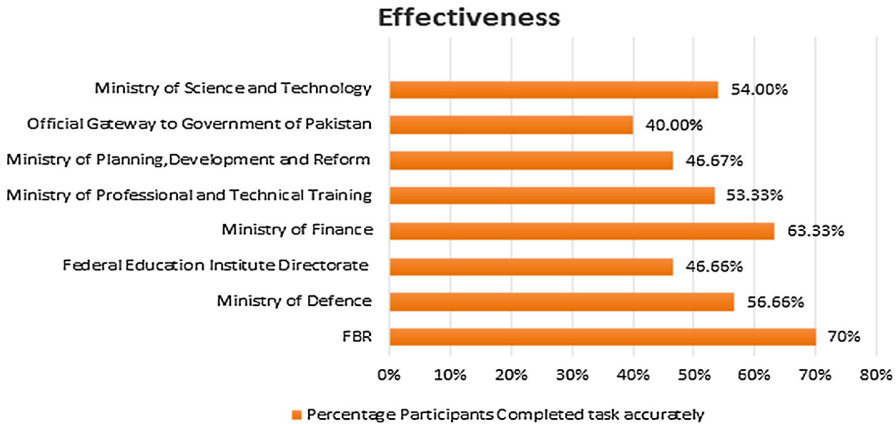

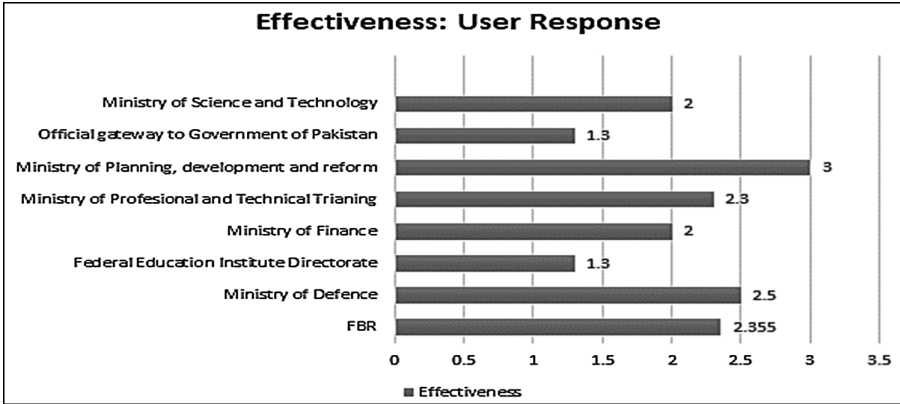**Fig. 1.** Comparative analysis of effectiveness in use for the websites

Fig. 2. Effective in use: user response

Directorate is least. The analysis of the results shows users were not or somewhat satisfied with their task performance as shown in Fig. 2.

3.2 Efficiency in Use

The mean time taken to complete the accurately completed task is measures using the usability test and observations. The mean, median and mode values measures through the post evaluation satisfaction questionnaire for each websites is shown in Table 2.

Table 2. Efficiency in use

Sr. No	Websites	Mean efficiency			User response		
		Mean %age task rate (%age)	Time	%age / Time	Mean	Median	Mode
1.	FBR	70%	1.25 m	56%	2.473	1	2
2.	Ministry of Defence	56.66%	1.5 m	37.77%	2.7	2	2
3.	Federal education Institute Directorate	46.66%	2.5 m	19%	1	1	1
4.	Ministry of Finance	63.33%	2.5 m	25.33%	2.1	1	2
5.	Ministry of Professional and Technical Training	53.33%	1.25 m	42.66%	1	2	1
6.	Ministry of Planning, Development and reform	46.67%	1.5 m	31.11%	2	2	2
7.	Official Gateway to Government of Pakistan	40%	2.5 m	16%	2.3	1	2
8.	Ministry of Science and Technology	54%	1.12 m	48.21%	1	1	1

Note: Mean %age task rate (%age) is used from the Table 4.1, Time is calculated in minutes using stop watch, User Response: 1 = strongly not agree, 2 = disagree, 3 = neutral/somewhat agree, 4 = agree, 5 = strongly agree

The comparative analysis of the results shown as bar graph in Fig. 3. The analysis of the results shows that the efficiency rate of the selected websites were not high. These websites do not provide functions that access users in finding the desired results within specified time. Other factor that affect the efficiency was the organization of the data on these websites. Users found it difficult to memorize these websites for later use. The website of FBR presented the partial search functionality helped in achieving high efficiency rate. On the other hand Official Gateway to Government of Pakistan and Federal Education Institute Directorate had the least efficiency rates.
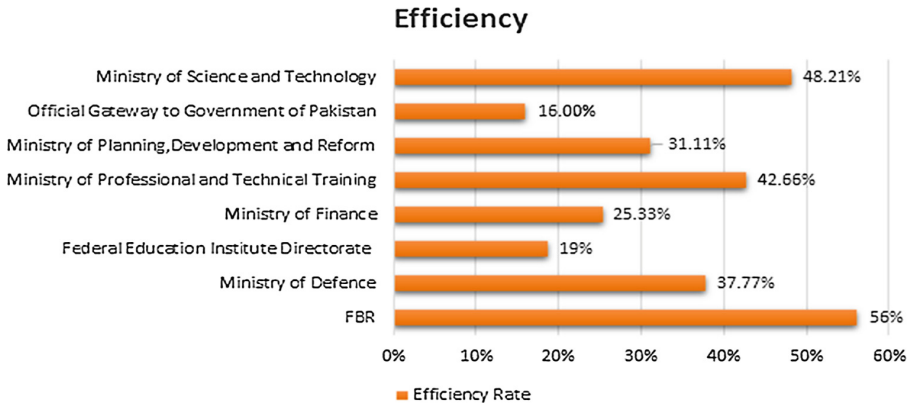

Fig. 3. Efficiency

The high scale indicate the greater satisfaction achieved obtained by completing tasks in limited/ minimum time. The users did not feel satisfied after achieving the goals shown in the Fig. 4.
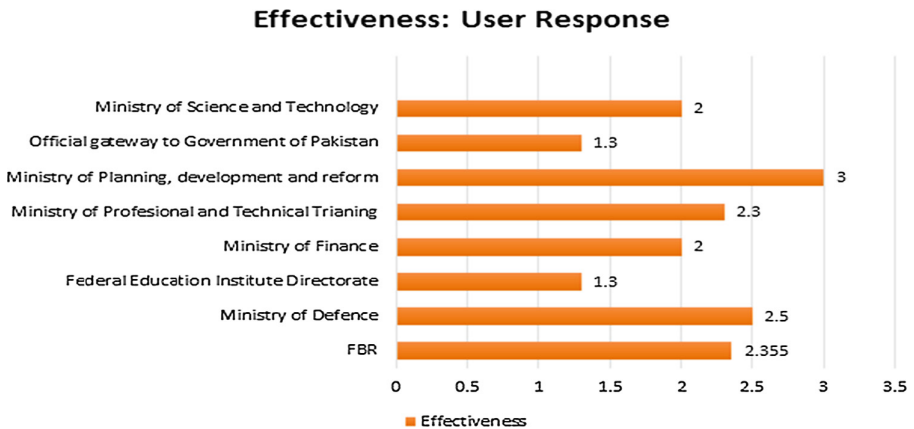

Fig. 4. Efficiency: user response

3.3   Satisfaction in Use

Satisfaction is accomplished by the achieving the pragmatic goals. Satisfaction in use in measured in terms of satisfaction, likability, trust, pleasure and comfort obtained while using the system. The response showed users were not felt accomplished after achieving the tasks. The pragmatic goal did not fulfilled and users faced number of difficulties in achieving the goals (Fig. 5).
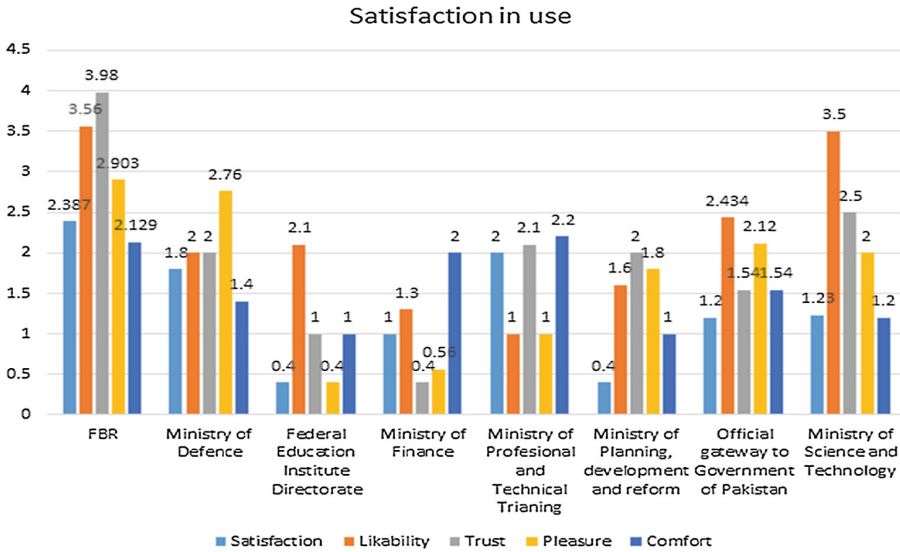

Fig. 5. Satisfaction in use

4   Conclusion

For the survey eight different websites were selected. The criteria for the selection was (1) information on the website, (2) number of pages, (3) website layout, (4) importance of data and (5) amount of data on the website. These factors has great impact on the learnability, cognitive learning, though process, likability, pleasure, comfort and trust of the users on these websites. An important factor that contribute to poor performance is lack of search feature in those websites. The tasks for the survey were organized in such a way that participants were asked to use the websites for 20–30 min to get familiar with the features of the websites. After the said time period, different tasks were assigned to them. Most tasks were designed to find a particular data present on these websites. The users found it hard to memorize the provided information leads to poor performance in completing the task accurately within the allocated time period. The satisfaction in use directly associated with the effectiveness in use and efficiency in use. If the user fails to complete the tasks accurately without external help within the specified time leads to poor satisfaction results. The trust, comfort, pleasure, likability and satisfaction are associated with the pragmatic goals of the users. The users faced

difficulty in using these websites, find it hard to achieve the desired goals. The results shows that users had to explore the websites multiple times before reaching to the destination. Due to lack of search feature, user's performance degraded. The participants did not perform their tasks with effectiveness and efficiently. Once the tasks not completed effectively and efficiently, user satisfaction, trust, comfort and pleasure had not achieved. The users faced difficulty in using these websites, find it hard to achieve the desired goals. The results shows that users had to explore the websites multiple times before reaching to the destination.

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