

An Assessment of the Impact of the Development and Use of the NCC-developed Government Website Template and the Website Content Management System

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ABSTRACT

Realizing the impossibility of government agencies to comply with the mandate of the e-Commerce Act President Arroyo gave the directive for agencies to comply with at least an Emerging Web Presence. The National Computer Center initiated the Government Website Development Project. The primary objective of this study is to determine the merits and impact of NCC's Government Website Development Project with the technology solution developed and diffused to government agencies and assess the aptness of the technology used as well. The study used a combination of a survey, literature research, and personal interviews. After a year of implementing the Project, NCC reported in May 2003 that 98.4% of National Government Agencies are accessible via Internet. Data for Local Government Units is more encouraging, 98.45% provinces and cities and 64.6% municipalities are now available in the Internet. State Universities and Colleges are now 96% online. Based on the results of the study the following recommendations are made, 1) include in its future project internal capability development, 2) training must be combined with learning by doing and using, 3) identify beneficial new technologies and diffused in an orderly manner, 4) engage in collaborative research and technology projects to address the gaps between technology development and deployment, 5) formulate standards to facilitate the diffusion of quality measurement techniques and 6) avoidance of duplicative tasks.

Keywords – *Technology Adoption, Technology Diffusion, Website Development, Website Content Management System, Usability*

1. Introduction

The Internet has ushered in the greatest period of wealth creation in history. It rocked the way information is delivered and received and the way businesses are done. And so, for many, it is easy to accept euphoric claims - like those of Vice President Al Gore - that the Internet is also bringing about a

brave new world replete with an "electronic agora" and "online democracy".

The Internet as a highly leveraged enabling tool has brought about a new set of services transforming the traditional way for faster delivery of products and services in the public and the private sector as well. Governments around the world have taken advantage of these advances to provide efficient services to citizens and businesses.

Electronic Government [1] or e-Governance has emerged as one of the flagship applications with aspirations to employ innovations in the Internet to reinvent the way the government works. Significantly, e-governance go far beyond the mere computerization of government processes but rather supports the following:

- remote access by the public to government information and services in a variety of ways;
- cooperative arrangement among government agencies to integrate services and provide one stop shopping;
- easier methods of gathering information without duplication of effort; and
- simplification or elimination of routine and repetitive tasks; and more efficient and easier data storage and sharing through common index schemes, networks and the like

1.1 NCC Project Background

The evolution of Internet technology affected the way companies handle their business processes. Similarly, government processes are also affected by this technological revolution. The Philippine Government, realizing the advantages and benefits of using Internet Technology enacted Republic Act 8792 [2]. This immediate action put the Philippines as the 5th Asian country to craft an e-Commerce law.

RA 8792, otherwise known as the e-Commerce Act was signed by the then President Estrada on June 14, 2000 with its Implementing Rules and Regulations signed on July 13, 2000. It was an act providing for the regulation and use of electronic commercial and non-commercial transactions, penalties for the unlawful use thereof.

The Act recognizes the vital role of ICT in nation building. It also recognizes the necessity to adopt

appropriate legal, financial, diplomatic and technical framework, systems and facilities. Moreover, the Act also recognizes the primary responsibility of the private sector for investments and services in ICT. In addition, it provides the avenue towards the establishment of an e-Government, or, at least, for the electronic delivery of government information and services in improving government processes within and among agencies, connecting citizens and building external interactions.

The law provides, among others:

1. Legal recognition of electronic documents, electronic data messages, and electronic signatures;
2. Guidelines for retention and storage of documents in electronic form;
3. Recognition and validity of electronic contracts;
4. Penalties to crimes such as hacking, cracking, and piracy offenses;
5. Parties are given the right to choose the type and level of security methods that suit their needs;
6. Mandate that cable, broadcast, and wireless physical infrastructure are within the activity of telecommunications;
7. Guidelines as to when a service provider can be liable

In particular, Section 27 of the Act mandates the government, as well as government-owned and -controlled corporations to use electronic transactions in all its processes, have online transactions by June 2002 and do the following:

1. Accept the creation, filing and retention of documents;
2. Issue permits, licenses, or approval;
3. Require/accept payments, and issue receipts acknowledging payments, through systems; and
4. Transact the government business and/or perform governmental functions the form of or using electronic data messages or electronic documents.

Since the passage of the Act, numerous e-commerce initiatives by government agencies came into reality intending to comply to the Act. However, after two (2) years upon its enactment, only a handful of government agencies were accessible via the Internet in compliance to the Act. Based on the survey NCC did on April 2000 as shown in Fig. 1, compliance to the Act is very low. Out of 399 NGAs only 66.67 % or 266 NGAs are connected to the Internet and have website while the remaining 33.33 % or 133 NGAs have no website. Out of 133, there are 54 or 14 % of the 399 NGAs are not even connected to the Internet.

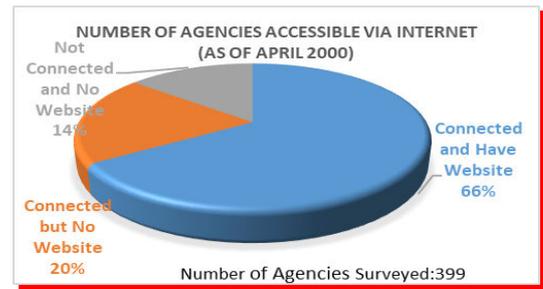


Figure 1. Number of Agencies Accessible via Internet as of April 2000

Also, as revealed in Fig. 2 there are only 51 % out of 194 provinces and cities have websites.

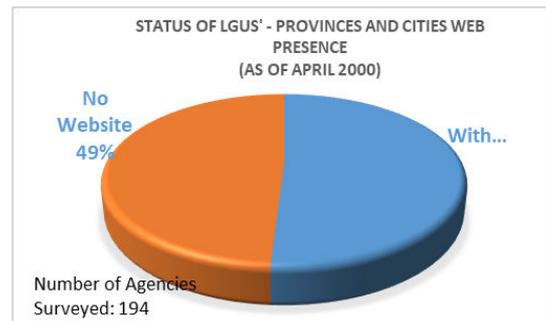


Figure 2. Status of LGUs - Provinces and Cities' Web Presence as of April 2000

Moreover, only 3 % out of 1,496 municipalities have websites as presented in Fig. 3. No data was obtained for the SUCs.

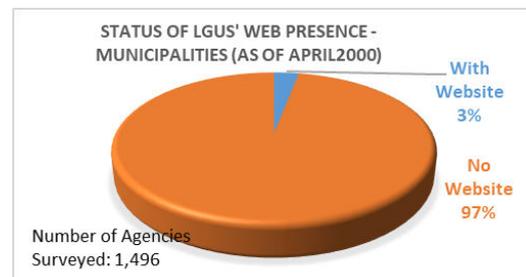


Figure 3. Status of LGUs - Municipalities' Web Presence as of April 2000

Realizing the impossibility for all government agencies to comply with the mandate of the RA 8792, President Arroyo gave a new directive in a meeting at the then ITECC in April 2002. The NCC, being the lead IT agency in the government was tasked to coordinate with government agencies to ensure uniformity in content of all agency websites. She further directed NCC's assistance for the Philippine government to comply with at least Stage 1, an Emerging Web Presence of the UN-ASPA Five Stages of e-Government [3].

The Web Presence Measurement Model, is a quantitative five-stage model, ascending in nature. For the governments that have established an on-line presence, the model defines stages of e-government

readiness according to a scale of progressively sophisticated services. As countries progress in both coverage and sophistication of their state-provided e-service and e-product availability they are ranked higher in the Model according to a numerical classification corresponding to five stages. The five stages, given in Chart 1 [1], are theoretically ascending in the level of maturity of e-government presence on-line. They are: Emerging Presence, Enhanced Presence, Interactive Presence, Transactional Presence and Networked Presence.

Web Presence Measurement Model

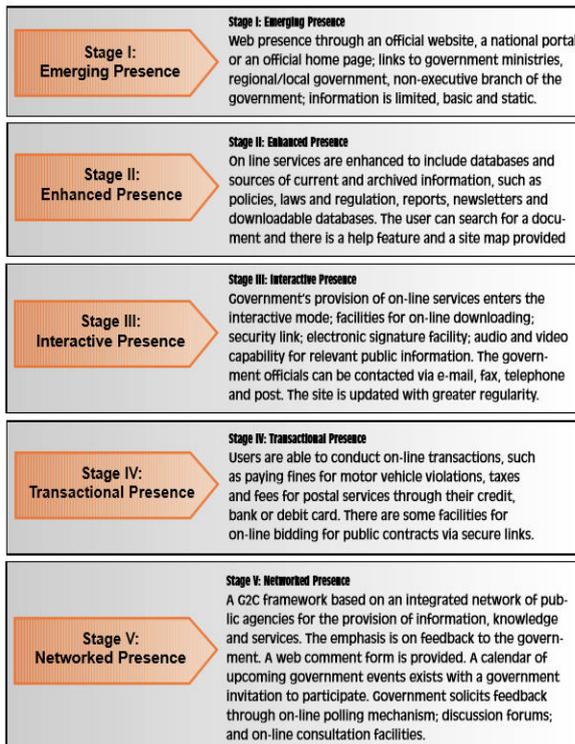


Chart 1. UN-ASP A Five Stages of e-Government

Further, all national government agencies (NGAs), local government agencies (LGUs), state universities and colleges (SUCs), and all other government instrumentalities were also directed to be at least in Stage 1.

Acting on this directive, the NCC issued on July 22, 2002 the Memorandum Circular 2002-01 [4] prescribing the minimum and basic content of the agency's official website to include the following:

1. Philippine National Flag Graphics Image
2. Agency Name and Logo
3. Mandate, Main Functions, Organizational Aims and Objectives
4. Write Up About the Agency
5. Organizational Structure and the Responsibilities of Each Unit
6. List of Key Officials
7. Plans/Programs/Projects
8. Policy Pronouncements/Official Statements/ Rules and Regulations Issued

9. Products, Services, Reports, Publications and Statistical Information
10. Agency Contact Details (Postal and Email Addresses, Telephone and Fax Numbers)
11. Link to Philippine Government Portal and Other Government Offices

Consequently, to facilitate agency compliance to the President's directive the NCC initiated a project tagged as the "Government Website Development Project". The project involved the development of a technology solution i.e. the first version of the Government Website Template together with a Website Content Management System. The technology solution developed addressed the concern of most agencies especially those that do not have the necessary infrastructure, technical know-how/skill and budget to bring their agencies' websites to at least in stage 1 as source of basic public information.

TABLE 1. Status of National Government Agencies' Web Presence as of May 2003

| Agency | | Status of Web Presence | | |
|--------|---------|------------------------|---------|-------|
| | | With | Without | Total |
| A | Number | 373 | 22 | 379 |
| | Percent | 98.40 | 23.56 | |
| B | Number | 191 | 3 | 194 |
| | Percent | 98.45 | 1.55 | |
| C | Number | 745 | 751 | 1,496 |
| | Percent | 64.60 | 52.87 | |
| D | Number | 107 | 4 | 111 |
| | Percent | 96.30 | 13.51 | |

Legend: A – NGAs B – Provinces and Cities
C – Municipalities D – SUCs

After a year of extending technical assistance, NCC reported on May 2003 as shown in TABLE 1, there are 373 or 98.4 % NGAs available in the World Wide Web. The data for LGUs was even encouraging with 98.45 % or 191 of the 194 provinces and cities have web presence. The recent figures 64.6 % or 795 of the 1,496 municipalities are now available in the Internet. Also, about 96.3 % of the 111 SUCs are likewise online.

This prompted the NCC to issue NCC Memorandum Circular 2003-01 on July 31, 2003 [5] and to develop the second version of the Website Template and WCMS. This will facilitate government agencies' web presence to progress to Stage 2, and Stage 3, with the following website features:

1. Accessible information at the website, which will be regularly updated (at least once a month);
2. Forms, Publications, Newsletters, and other documents that can be made available for downloading or maybe ordered online;
3. Announcements of Procurement/Bid Activities, Bulletins of Vacant Positions;

4. Links to all Regional/Field Offices with separately hosted websites;
5. Search Features and Sitemap;
6. Use of e-Mail and Feedback Form for posting comments and other inquiries; and
7. Privacy, Security and other Intellectual Property Protection Statements

Consequently, the next series of “handholding” workshops were also conducted. The workshop was participated by 121 NGAs, 212 LGUs and 53 SUCs.

The presence of agencies in the Internet facilitated the citizenry’s access to the wealth of vital information these agencies have. Furthermore, information on the various services provided to its stakeholders are easily available and accessible.

After the series of workshops, the latest survey NCC conducted on June 2004 in Fig, 4 showed a significant progress on the agencies’ stage of web presence. The survey reported that NGAs obtained 98.42 % web presence. The Provinces and Cities; and Municipalities recorded with 100.00 % and 53.26 % web presence respectively. The SUCs achieved 97.66 % (107 SUCs out of 111) web presence.

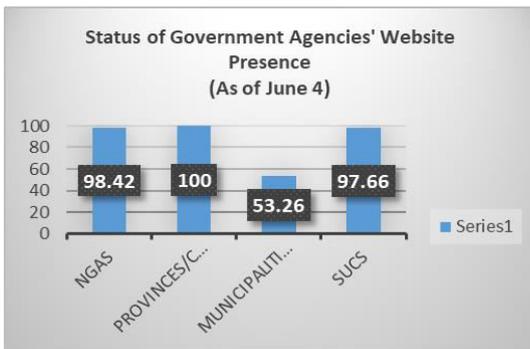


Figure 4. Status of Government Agencies’ Web Presence as of June 2004

1.1.1 Website Template Version 1

The Website Template Version 1 as presented in Fig 5. provides a starter website that can be made to grow in content and features.

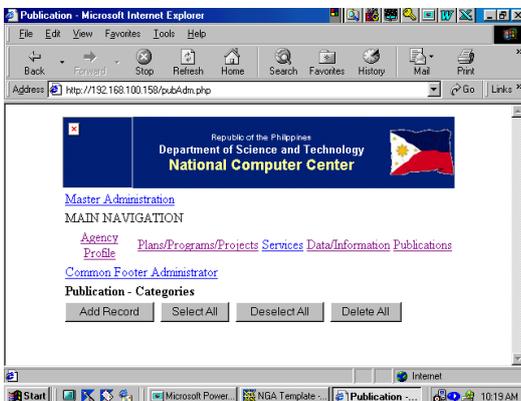


Figure 5. Website Template Version 1

The template is designed to comply with the features and facilities categorized as Stage 1 of the UN-ASP A Five Stages of E-Government. Likewise, the template

provides flexibility in defining the information content architecture of the agency website can be designed in three levels:

1. Main navigation as the first level (Home, About Us, Services, etc.),
2. Categories for each main navigation as the second level (Under About Us – History, Functions/Mandate, etc.) and
3. Sub-categories for each category as the third level (Under Licensing of Services Category – List of Requirements, Procedures, Forms, etc.)

1.1.2 Website Content Management System Version 1

The WCMS Version 1 as shown in Fig. 6. was developed to assist agencies in creating and populating the content of the agency website using the Website Template.



Figure 6. Website Content Management System Version 1

The system provides a facility to update or maintain the agency website content, i. e.

1. Add a new content,
2. Edit a previously created content, or
3. Delete an initially created content.

The browser-based WCMS developed using PHP, an open-source web development tool is accessible via the Internet anytime, anywhere. Implementing a Client/Server design as exhibited in Fig.7, the content of the website is logged into a database using an open-source database management tool, the MySQL. All “user-interface” processing for the maintenance of the website content is done through a Client PC/Workstation.

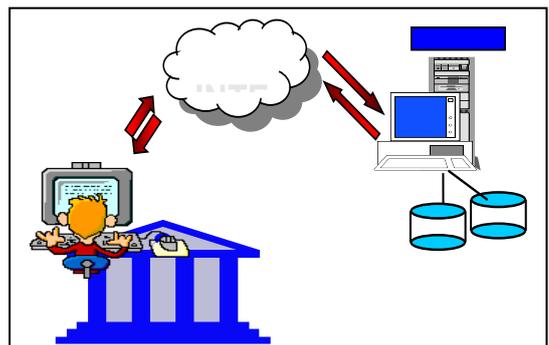


Figure 7. WCMS Architectural Design

The accompanying Website Template was developed using the Hypertext Mark Up Language (HTML) web development tool. Hardware and software necessary to operate the system are:

1. For Hosting:
 - Software Requirements/Specifications*
 - Linux Operating System,
 - Apache Server for Server Management,
 - PHP Hypertext Pre-Processor, and
 - MySQL for Database Management
 - Hardware Requirements/Specifications*
 - At least 10 GB of disk space, and
 - At least 1 GB of memory
2. Client PC/Workstation:
 - Software Requirements/Specifications*
 - Windows 95 or higher,
 - PHP Hypertext Pre-Processor, and
 - MySQL (if standalone)
 - Hardware Requirements/Specifications*
 - At least 10 GB of disk space, and
 - At least 128 MB of memory

To hasten the development and deployment of websites of lagging NGAs, LGUs, and SUCs, the NCC entered into partnership with Intel Philippines, AyalaPort, e-PLDT, K2IA and Systems Technology Institute to tap their facilities and technical support for web hosting. The NCC conducted series of “handholding” workshops free of charge to those agencies that have no websites yet to enable them to beat the deadline set by the E-Commerce Act. The workshop objectives are: 1) explain the structure and components of the government agency Website; 2) Familiarize the participants with the use of the accompanying Website Content Management System in creating and populating the Website Template; 3) Provide firsthand experience in using the Website Content Management System; 4) Develop and create the initial Agency Website to be publish in the internet; and 5) Comply with Stage 1 in preparation for Stage 2

1.1.3 Website Template Version 2

The Website Template version 2 in Fig. 8 is designed to comply with the features and facilities categorized as Stage 2 and 3.

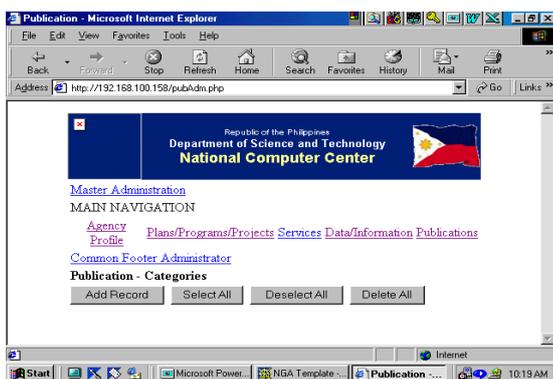


Figure 8. Website Template Version 2

1.1.4 Website Content Management System Version 2

The WCMS Version 2 shown in Fig. 9 was developed to provide a facility to maintain the agency website content, i.e. to add a new content, to edit a previously created content or to delete an initially created content. Aside from text content, the WCMS can also accept graphics, images and multimedia content to enhance the agency website’s “look and feel”.



Figure 9. Website Content Management System Version 2

1.2 Problem Statement

Technology diffusion [6] involves the dissemination of technical information and know-how and the subsequent adoption of these new technologies and techniques by the target users. In this context, technology includes "hard" technologies (such as computer-controlled machine tools) and "soft" technologies (for example, improved manufacturing, quality, or training methods). Diffused technologies can be embodied in products and processes. Technology can be diffused in multiple ways and with significant variations, depending on the particular technology, across time, over space, and between different industries and enterprise types.

The effective use of diffused technologies by firms frequently requires organizational, workforce, and follow-on technical changes. In many cases, diffused technologies are neither new nor necessarily advanced (although they are often new to the user), and they may be acquired from a variety of sources, including private vendors, customers, consultants, and peer firms, as well as public technology centers, government laboratories, and universities. Technology also diffuses through the internal "catch-up" efforts of firms, the transfer and mobility of skilled labor, the activities of professional societies and the trade and scientific press, varied forms of informal knowledge trading, and such practices as reverse engineering.

TABLE 2. Status of Government Agencies' per Stage of Web Presence as of June 2004

| Agency | With Website per Stage of Web Presence (in Percent) | | | | | With No Website |
|--------|---|-------|-------|------|-------|-----------------|
| | 1 | 2 | 3 | 4 | Total | |
| A | 24.90 | 43.20 | 30.35 | 1.60 | 98.42 | 1.58 |
| B | 83.50 | 7.14 | 6.79 | 0.0 | 100.0 | 0.00 |
| C | 53.06 | 0.20 | 0.0 | 0.0 | 53.26 | 46.74 |
| D | 62.16 | 32.70 | 2.80 | 0.0 | 97.66 | 2.34 |

Legend: A – NGAs B – Provinces and Cities
C – Municipalities D – SUCs

The intervention of the NCC through the diffusion of a technology solution significantly increased the emergence of government agencies' web presence. However, about 24.90 % of NGAs (See Table 2), 83.50 % of Provinces/Cities, 53.06 % of municipalities and 62.16 % of SUCs remained in stage 1.

Apparently, based on the statistical figures presented in NCC's website monitoring activity it can be surmised that the completed Website Development Project was able to achieve its objective of putting the government agencies on the web. However, there is no evaluation done on the merits and impacts of the project. More often, measurements are made only for monitoring purposes and usually guessing. Measurement and analysis, if done can contribute greatly to an organization's project efforts. It will allow organizations to quantify schedule, work effort, product and process quality, customer satisfaction and performance.

1.3 Objectives of the Study

The primary objective of this study is to probe deeper the merits and impact of the NCC Project and will achieve the following specific objectives:

1. Determine the effectiveness of the Government Website Development Project;
2. Establish the usability and functionality of technology solution developed;
3. Assess the aptness of technology used in developing the website template and WCMS,
4. Evaluate the effectiveness of technology deployment through the conduct of the Website Development Workshops; and
5. Recommend areas for improvement of the technology solution developed

1.3 Significance of the Study

The relevant and useful information as well as insights gathered in this study will provide NCC the baseline data for the establishment of a guideline for the evaluation of similar projects. Moreover, data gathered and its analysis can also be used as foundation to further improve the management and implementation of similar projects. Further, the results generated will provide information on areas needing improvement which can be used as basis for the

enhancement of the technology solution developed and diffused.

1.4 Conceptual Framework

Following the conceptual framework, Fig. 10, this study will focus on assessing the merits and impact of the NCC Project looking into the usability and functionality of the technology solution developed, diffused, and adopted as well as coming up with possible recommendations for its enhancements.

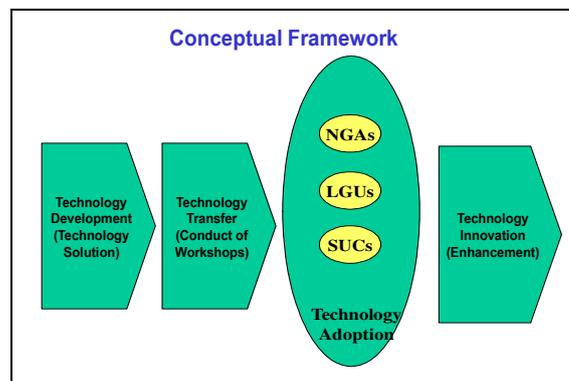


Figure 10. Conceptual Framework of the Study

A technological innovation, a new idea or a new system is considered to be successful when it is adopted by users and diffused through the user population. Diffusion [6] is the process by which an innovation is communicated, overtime, through certain channels to members of a social system. Under most circumstances, the success or failure of the widespread adoption of a technology [7] is dependent on the following activities:

Technology Development

The technical aspects must be developed to a point such that the technology is simple, compatible and rugged enough to be used in real-world applications. Additionally, the technical advantages (economics, materials efficiency, etc.) must be well established.

Technology Transfer

Technology transfer requires a proactive approach that combines engaging researchers, promoting the technology, and encouraging potential industrial partners to use the technology. The technology must have moved beyond the laboratory testing and demonstration phases. It needs to be marketed to intended users. Users need technology education assistance to create technology awareness and promote understanding of technical principles.

Technology Adoption

This involves the wide spread use of the technology and its dominance in the market place. Firms may be employing adoption as way of solving a problem or may simply be buying a product or service. The decision of the user to adopt a technology or an innovation is dependent on the possible efficacy of that

technology solution in solving a perceived problem as having greater relative advantage, compatibility and less complexity.

2. Methodology

This section discusses the steps undertaken of the study. These steps served as guide for the researcher to do data collection, and come up with assessment, conclusions and recommendations.

2.1 Research Design

A survey will be conducted to gather primary data from the respondents using a survey questionnaire (Refer to Appendix A). Although there are 399 NGAs, 117 SUCs and 1,496 LGUs, the survey questionnaire was distributed only to those who participated in the series of workshops in TABLE 3.

TABLE 3. Distribution of Survey Respondents

| Type | Number |
|------|--------|
| NGAs | 121 |
| SUCs | 53 |
| LGUs | 212 |

TABLE 3 presents the number of attendees to the series of workshops NCC conducted.

TABLE 4. Rating Scale

| Numerical Value | Descriptive Equivalent |
|-----------------|------------------------|
| 5 | Very Strongly Agree |
| 4 | Strongly Agree |
| 3 | Moderately Agree |
| 2 | Slightly Agree |
| 1 | Strongly Disagree |

The rating scale in TABLE 4 will be used with 1 as the lowest and 5 as highest. For each item the respondent can provide additional information or explanation on the question ask and rating given. The questionnaire will cover the following dimensions:

- Responsiveness of the Website Content Management System in terms of usability and functionality/features provided
- Appeal of the website template design in terms of the “look and feel” and features supported
- Aptness of the technology used in terms of economic benefits

2.2 Data Collection Procedure

The respondents were divided into two, namely: the adopters and the non-adopters. The respondents shall be requested to answer a survey questionnaire to measure why they adopted the technology solution or why they did not adopt the solution as provided.

A follow up with the respondents by phone will also be done to ensure that the survey questionnaires are

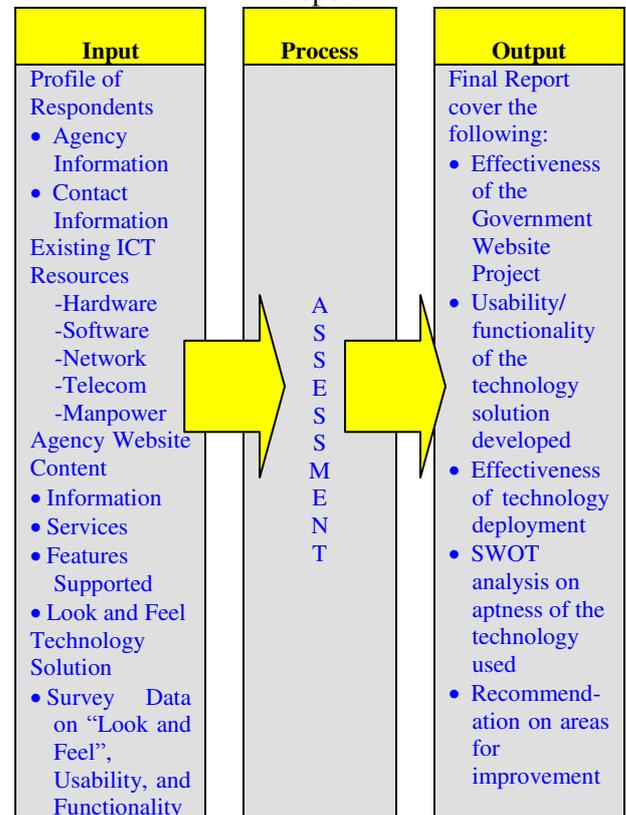
received and set the date for the retrieval of filed up questionnaires. Survey questionnaires will then be collected from the respondents. Should further clarifications on the responses be needed, coordination and scheduling of interview with the respondents will be done. Aside from survey, secondary data will be obtained through library and Internet research. Notes and research summaries will be prepared.

2.3 Data Analysis Procedure

The survey will tabulate the responses on the questionnaire to assess the usability and functionality of the Website Template and the WCMS. The goal of usability testing is to find out what is and is not working well on the technology solution developed to minimize the time needed to perform the functionality/features provided on the technology solution.

The data gathered through library and Internet research will be used in evaluating the aptness of the technology used. A SWOT analysis will be carried out illuminating - both in terms of pointing out what needs to be done, and in putting problems into perspective. SWOT Analysis is a very effective way of identifying Strengths and Weaknesses, and of examining the Opportunities and Threats to face. Carrying out an analysis using the SWOT framework helps focusing into areas where you are strong and where the greatest opportunities lie.

TABLE 5. Inputs Required for Assessment and Final Report



In order to formulate the final report of this study several inputs required are identified and listed in Table 5. It is also expected that the technology management tools learned will be applied in measuring, analyzing and assessing these inputs in coming up with the final report.

This study will document the result of assessing the impact and merits of the NCC Project producing a Final Report containing among others the following information:

- Determination of the effectiveness of the NCC Government Website Project
- Determination of the usability/functionality of the technology solution developed
- Determination of the effectiveness of the technology deployment implemented
- SWOT analysis on the aptness of the technology used, and
- Identification of areas for improvement of the technology solution developed

3. Results and Discussions

As mentioned in the conceptual framework technological innovation, a new idea or a new system is considered to be successful when it is adopted by users and diffused through the user population. Under most circumstances, the success or failure of the widespread adoption of a technology is dependent on 1) Technology Development, 2) Technology Transfer, and 3) Technology Adoption.

3.1 Technology Development

By definition, technology is a system of knowledge, techniques, skills, expertise and organization used to produce, commercialize and utilize goods and services that satisfy economic and social demands. Technological innovations can have important strategic implications for individual companies and can greatly influence industries as a whole. Yet, not all technological change is strategically beneficial [8].

Technology development is a human activity that converts knowledge and ideas into physical hardware, software or service [6]. It is a process that converts ideas and scientific knowledge into physical reality and real-world application in terms of useful products and services that have socioeconomic impact. It requires the integration of inventions and existing technologies to bring innovations to the marketplace.

Technology diffusion [7] is a process by which an innovation is propagated through certain channels over time among the units of a system. There are four elements in this definition: innovation, propagation through certain channels, time and units of a social system. From the point of view of the customer, a technical solution is considered to be an innovation when it is new or perceived as new by the individual or

a unit of adoption. Propagation is referred to the spread of an innovation beyond its inventor. The time dimension is involved in diffusion because it takes time for individuals or firms to decide to adopt an innovation. A system is a set of interlinked units that participate in the diffusion process.

3.2 Technology Transfer

The effective deployment of technology has been associated with competitiveness, productivity and efficiency, economic development, business growth, business flexibility, quality, and the support of further rounds of innovation. Attention has been paid not only to specific policy measures that might accelerate technology diffusion and tighten links between technology developers and users, but also to the creation and nurturing of supportive systems and infrastructures for technology diffusion (Khalil 2000). Technology diffusion involves the dissemination of technical information and know-how and the subsequent adoption of new technologies and techniques by users. Diffused technologies can be embodied in products and processes. Although classic models of technological development suggest a straightforward linear path from basic research and development to technology commercialization and adoption, in practice technology diffusion is more often a complex and iterative process. Technology can be diffused in many ways and with significant variations, depending on the particular technology, across time, over space, and between different industries and enterprise types. Moreover, the effective use of diffused technologies by firms frequently requires organizational, workforce, and follow-on technical changes (Khalil 2000).

3.3 Technology Adoption

The decision process that leads to adopt a technology or an innovation is depicted in the Five Step Model of Innovation Adoption [7] which involves the following steps: awareness, attitude formation, decision, implementation and confirmation. During awareness, the individual or firm is exposed to the existence of a technology or an innovation and gains understanding of how it functions. In the attitude formation stage, this involves the formation of a favorable or an unfavorable attitude towards innovation. At the decision stage, decision leading to the adoption or rejection of a technology or an innovation is judged based on the individual's or firm's activities. Implementation stage puts the innovation into use. At the fifth stage, confirmation occurs when an individual or firm seeks the reinforcement of a technology or an innovation decision that has already been made.

3.4 Assessment of the NCC Project

TABLE 6. Number of Respondents by Agency

| Agency | Respondents | Responded | Percent |
|--------|-------------|-----------|---------|
| NGAs | 121 | 103 | 85.12 |
| LGUs | 212 | 163 | 76.89 |
| SUCs | 53 | 38 | 71.70 |
| Total | 386 | 304 | 78.76 |

The study was able to achieve more than 70% response to the survey conducted as presented in TABLE 6. As gathered there are 96 or 93.20% of the NGAs, 155 or 95.06 of the LGUs and 35 or 92.11% of the SUCs continued to adopt the solution provided availing the free hosting service thru the NCC. AyalPort and PLDT partnership.

As an active governmental role in harnessing Internet technology, the NCC continues to stir the unprecedented adoption of this technology in the government. In response to the call of the President to assist government agencies to comply with the mandate of the e-Commerce Act, the NCC pursued the Government Website Project.

3.4.1 Assessment of the Technology Solution

Open Source Software (OSS) development has emerged in the last decades as one of the most important phenomenon of computer science and engineering [9]. It has been instrumental for education and research in the Academia, providing free access to essential tools, such as compilers, word processors, spreadsheets, etc. It has changed the way people perceive the software business, and it has often kept the software market away from monopolies.

OSS programs are programs whose licenses give users the freedom to run the program for any purpose, to study and modify the program, and to redistribute copies of either the original or modified program (without having to pay royalties to previous developers.

In the government or public sector, many organizations believe that open source software will enable them to successfully tackle two types of challenges [10];

As IT users, they are trying to keep cost down and stretch their IT budget as far as possible in order to deliver on ambitious e-government targets, and

As policy makers, they are trying to use IT as a driver for economic growth. Most are looking to develop their 'knowledge economy' and at the same time address the challenge of the 'digital divide' between citizens. They want to boost their local software industry and reduce their dependency on foreign technology. And some have a particular concern about the dominance of Microsoft's technology on the desktop.

As gathered on the survey, the use of OSS to develop the Website Template and the corresponding WCMS is able to achieve the following goals of the NCC project, to wit:

- Reduced development time with the availability of usable scripts
- Reduced cost with no investment for the licensing of the development tool
- Flexibility/Scalability/Performance of the starter program where the user can readily enhance or modify to suit its specific requirement
- Wide range of hardware supported
- Vendor independence

Designing websites is easy, however, designing clean, elegant, professional-looking websites is difficult. No matter how clear the words are on your web site, if the appearance is less than professional, your target users will not captivate the user to navigate your website. There is a need have a good "look and feel" to make your audience stick on your website.

Look-and-feel refers to design aspects of a graphical user interface (GUI) in terms of both colours, shapes, layout, typefaces, etc (the "look"); and, the behaviour of dynamic elements such as buttons, boxes, and menus (the "feel"). It is used in reference to both software and websites. describes is the way that branding and communication messages are reflected in a website design [11].

Usability rules the web. If a user can [12] not navigate your website, then he will not use your website to find needed information or service. The rest of the Internet is only a mouse click away. Website usability refers to the ease with which a User Interface can be used by intended audience of the website to achieve information or services desired from the subject website. Usability incorporates many factors: design, functionality, structure, information architecture, and more.

A User Interface (UI) is the interface with the by which a computer user is able to interact with the website. It describes the way that the user uses input devices such as keyboards and mouse, and the way the information or services is portrayed on screen or on the output device. A Graphical User Interface (GUI) uses visual controls such as menus and buttons to allow the user to accomplish tasks. The user typically uses a mouse. A console or command-line interface requires the user to type commands as text using the keyboard. A web site can be considered as having a User Interface. The term User Interface describes the way in which the user interacts with the Web site.

Reading about web design and promotion you will soon come across the term 'functionality'. But what does it really mean? Functionality refers to the way a website is used, not its technical capabilities. What users do with the technology, not what they could do if

only they would learn the system. "Designed for" implies usability, how simple and intuitive the site is to use in the real world.

Understanding how website users want to interact with the website is the most important design consideration, bar none. Design is the interpretation of functional requirements. It is not art. A pretentious website might win a couple of dodgy awards today but unless it's functional, it won't win many customers and will probably go out of fashion tomorrow.

Based on the survey results, the high rating in terms of usability and functionality proved that the technology solution provided was able to satisfy immediate needs of government agencies to put up their agency websites [13]. Although the website template was rated relatively low, the agency can readily have enhanced the "look and feel" since the copies of the source codes is made available to interested agencies for free with no licensing issues to be resolved.

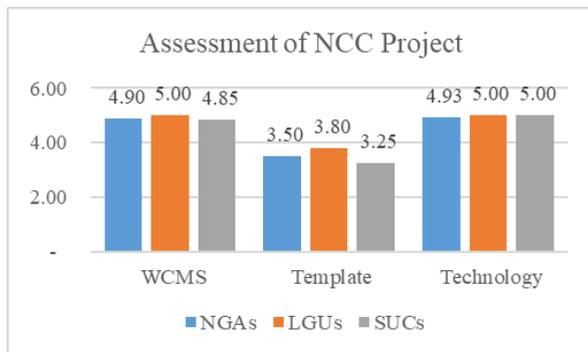


Figure 11. Assessment of NCC Project

3.4.1.1 Strength of the Technology Solution

The attraction on the use of the OSS in the government sector is credited to the following advantages [10]:

- Low cost - Open source software render 'free to use and share' and offers 'free of cost' in terms of licensing.
- Source code access and change - Open source software is open to scrutiny and modification. This allow some organizations (including public sector ones) to gain a much better understanding of the inner workings of the software products.
- Vendor independence – The organization is not committed to a particular vendor, irrespective of whether this vendor specializes in open source software or not, based on the best judgement that it is in the long-term interests of the organization.
- Easier licensing regime – Open source software may be downloaded and deployed onto as many machines as desired.
- Software quality - Open source supporters cite quality as a key benefit of open source software. There are, indeed, several well-known open source products (Linux, the Apache web server,

the Tomcat and JBoss middleware products) that equal if not better proprietary counterparts.

- Community support - The open source community consists of two distinct groups: 1) experts who contribute to the code base: and cooperate with an active group of contributors 2) users with various levels of knowledge, beta testers (rather than coders) and regular contributors. These people have created an enormous support network surrounding open source software. This network means that systems administrators and developers can gain access to valuable advice, usually within hours.
- Cross platform support - The ability to modify open source software enables anybody to port it to various hardware platforms.
- Ability to pick and mix components - Some open source software advantages are poorly advertised. The ability to pick and mix the components of an open source product is one of them. It enables users to lower the installation and maintenance cost of their open source software while improving resilience and scalability.

The NCC is giving the package free of charge, with no cost on the part of the agency at all. The package is user-friendly. The users only have to prepare and define their website information content architecture. The actual data and information to populate the website is done using the website template and the WCMS. Technical support from the NCC is also provided free-of-charge.

As mentioned previously, the system is developed using open-source. The development tool as well as the operating system and all the related software attached to it are free and can be downloaded freely.

The system is designed as user-friendly that it can be used by anybody who has very basic knowledge on ICT and basic skill on the use of the Internet and the operation of a microcomputer under the "de facto" standard Microsoft Windows environment. Adding to the strength of the technology is the fact that being a browser-based, the system can be accessed via the Internet anytime, anywhere. Note that authorized accessed to the system is controlled by a user account and password.

3.4.1.2 Weakness of the Technology Solution

Although there are advantages in using open source software the government should avoid an idealistic view on the benefits and not close their eyes to the disadvantages. They should instead take a pragmatic approach based on a close scrutiny of the following current 'myths' that surround open source software [10]:

- Open Source Software is not 'free' as in 'free of cost' but moving to open source software can be

costly in terms of integration, migration, management and training.

- Although Open Source Software is open to scrutiny and modification. This is only beneficial to vendors. Most user organizations, including public sector ones, do not have the resources and knowledge to do so. Even if they do, they should have more pressing priorities.
- Vendor independence is also more a supply-side benefit than a user-side one: Any vendor can 'pick up' open source software and continue developing and maintaining it. It would be hard work for a user organization to do so.
- Open Source Software may be downloaded as desired but in this case you are on your own. The organizations that market open source software will always limit your freedom in order to ascertain their ability to provide you with the level of service you are expecting from them. Beside the practical issues of delivering service-level agreements, there are still question marks over the legality of general public licensing. Finally, the increasing number of open source licensing models confuses all organizations.
- One of the key issues of the Open Source Software quality debate is security. This is a reaction to users getting increasingly annoyed at the multiplication of security attacks focused on Windows.
- Community support is not as consistent or timely as professional support.
- The ability to modify open source software enables anybody to port it to various hardware platforms. On one hand, this can enable public sector organizations to stretch the useful life of old hardware platforms. On the other hand, they may not find anybody capable or willing to port the software. If they do, this may prove costly. If they don't, they may have to port it themselves, which may prove even more costly.

The general "look and feel" and functionalities provided in the Website Template is fixed, hence, the layout cannot be redesigned. The user can only use or attach a multimedia to enhance its look and feel and functionality, only if the user is knowledgeable of the OSS website development tool used.

The content of the website is logged in a MySQL-based database. The graphics or images placed as part of the website content is limited only to ".jpeg" or ".gif" formats.

The initial design of the system caters only to the features of UN-ASPA Stage 1, 2 and 3. Inclusion of features of the other stages will require modification of the whole package.

If the user opted to find its own web-hosting provider, assistance from the NCC may be necessary to facilitate

installation of the package. However, due to the scarcity of OSS experts in the NCC, maintenance is left to the user.

3.4.1.3 Opportunities of the Technology

Considering the current trends, there is a growing adoption of or adaptation to Open Source Software by individual users, schools, governments and companies. Due to the scarcity of funds, the government has the tendency of looking into the benefits of adopting the open source software for the development of other government application systems.

The NCC-developed package provided an initial design that can evolve to suit the additional requirements of the users. As a starter package, upgrade or enhancement of government website can be done and all codes are reusable.

3.4.1.4 Threats of the Technology

One major drawback on the use of the OSS is the apparent availability of limited technical support. Considering that the technology is still new in the government there is lack of critical mass of existing users.

Continuous development of the package to include the features of the other stages requires funding. Again, the question to be addressed here is where to get the funding to support other developments.

Another area to consider is the integration of web-based application systems that could have been developed using other platform. Likewise, conversion and integration of legacy system initially developed under a different platform may prove to be difficult.

3.4.2 Assessment of the Technology Transfer

The effective deployment of technology and improved operational techniques invariably involves changes in human capital requirements. A very common technology diffusion measure is thus training, conducted in many different forms, including on-the-job training, classroom training, management seminars, team-building workshops, and distance learning. These measures address the tendency of technology users to under-invest in human capital development, which often not only hinders the initial decision to deploy a technology but can also lead to subsequent inefficiencies once in use. Additionally, special measures to promote training for technology diffusion may also address deficiencies among existing institutions and vendors who may be unable to effectively mount courses in new technologies without additional support [14].

During technology transfer technical assistance from the technology developer is imperative. This encompasses a wide band of services that support users to assess business problems, identify opportunities to upgrade technologies and assistance in implementation. These measures seek to address limitations of expertise among both users and suppliers of technology and to stimulate and assist firms to take

action (or, in some cases, not to act on an undesirable investment). Availability of a network of trained staff offering technological advice conducts assessments, and offers must be available.

To promote the use of the Website Content Management System and the Website Template, the NCC conducted a series of workshops. Attendees to this workshop were identified based on the survey of agencies that do not have website accessible through the Internet. As such, access to the solution became limiting.

A one-day workshop was conducted to familiarize the participants with use of the Website Content Management System in creating and populating the Website Template and to provide firsthand experience in using the Website Content Management System. At the end of the workshop the participating agency is able to develop/create the initial Agency Website to be publish in the Internet and is able to comply with Stages 1, 2 and 3 of the UN-ASPA Five Stages of e-Government.

As claimed by the respondents, the workshop duration is not enough to absorb the new idea presented. Moreover, there was no follow up made on the attendees of the workshop to validate its effectiveness. In view of technical assistance, the NCC failed to prepare a critical mass of knowledgeable staff that would support the implementation of the NCC project at the agency level. The downside of OSS is that it is much more of an unbundled product compared to its commercial software. The users usually depend on getting the necessary training in order to do program maintenance. The NCC project, however, was able to consider provision of basic backend training on the OSS installation and maintenance of the operating environment. What was provided is limited only on the use of the NCC-developed package.

3.4.3 Assessment of the Technology Adoption

Based on the responses and the results of the surveys conducted by NCC, the Government Website Project was not able to meet the 100% target of putting all the government agencies accessible to the World Wide Web.

During awareness stage, the target user is exposed to the existence of a technology and gains a clear understanding of how it functions. Awareness-building and technology demonstration seek to make potential users more knowledgeable about available technologies, possible applications, benefits and costs. Demonstration services are offered for potential users to see and try the new idea. Similarly, technology providers demonstrate new technologies to firms, often extending to hands-on training and pilot production. Another method of awareness-building attracting increasing interest is benchmarking which allows companies to compare their use of technology with that of comparable and best practice firms. Media and

new communications technologies can assist in awareness-building [7].

In the attitude formation stage, favorable or an unfavorable attitude towards innovation is developed. It is often assumed that, once a new technology or innovations were developed, private mechanisms, aided by existing public institutions, could adequately disseminate available technologies. In many instances, this assumption has held true. However, it is increasingly recognized that market failures and strategic interests also exist in the process of technology adoption. Potential users face uncertainty, information and learning costs, and other externalities that may result in unfavorable attitude towards the new technology. Similarly, potential suppliers of information and assistance also face learning costs, may lack expertise, or face other barriers in promoting the adoption of rewarding technologies. System-level factors, such as the lack of standardization, regulatory impediments, weaknesses in financial mechanisms, and poorly organized inter-firm relationships, may also constrain the pace of technology adoption [7].

At the decision stage, decision leading to the adoption or rejection of a technology or an innovation is judged based on information generated out of the individual' or firm's activities. Most often, the changes in human capital requirement influence the decision to adopt a new technology. Potential users of technology may lack the internal expertise to absorb new technologies or they may lack resources to apply their existing personnel to new research and technology projects. A concern on financial constraints among users associated with the initial or ongoing costs of adopting new technologies is another factor that influences the decision [7].

Based on the experience of putting the new idea into use, confirmation occurs when an individual or firm seeks the reinforcement of a technology or an innovation decision that has already been made. The information generated by trying out the new technology becomes key to continued use as well to confirm the value of the decision made.

4. Conclusions

Overall in the adoption of new technologies there are often considerable barriers that slow down, if not hinder, the barriers noted in the successful diffusion of the NCC-developed Website package are:

- Lack of concrete strategy for the promotion and advocacy to launch the NCC project. The agencies are not aware to the existence and did not gain the necessary understanding of how the technology solution developed will address the problem of putting their websites and comply with the directive of the President.

- The conduct of a one-day workshop is not sufficient to develop the level of appreciation for the agency to make a judgement on the appropriateness of the technology solution being offered which may be able to solve a problem at hand.
- After the workshop, the agency is left to itself to use the technology solution given with minimal assistance from NCC. The project does not have the mechanism to provide the “after-sales support” to support the decision to adopt said solution.
- After diffusing the technology developed, NCC do not have the necessary resources (especially manpower to provide technical support) to assist the agencies.
- In this context, the NCC project failed to consider the strategies to manage the five stages of adoption. Note that the key to unlocking adoption of an innovation is the reduction in uncertainty experienced by the unit of adoption. Hence, the information that flows to a potential adopter is an important element for attitude formation and eventuality for making a decision whether to adopt or not to adopt such technology.

3. Learning by Doing and Learning by Using. Training must be combined with learning by doing and using, i.e. being able to repeat the tasks. Conduct research and experiment to resolve problems. Expose the technical personnel of the potential users to avail of the same level of training as those of the NCC technical personnel.
4. Identify beneficial new technologies and diffused in an orderly manner. It ensures that new technologies are evaluated to determine their effect on quality and productivity. After which they are transferred into normal practice across the government agencies
5. Engage in collaborative research and technology projects. To address the gaps between technology development and deployment, a range of collaborative public-private research mechanisms must be established. These measures seek to shorten the time taken to diffuse or commercialize new technological innovations and, through industry involvement, focus research on key needs and opportunities.
6. Formulate standards. Uncertainty about the compatibility of a technology can present barriers to diffusion investments by potential users. The diffusion of technology can be accelerated by common agreement between technology developers and users about standards and technological compatibility that will facilitate the diffusion of quality measurement techniques and the avoidance of duplicative tasks.

5. Recommendations

The NCC being the lead IT agency in government is tasked to assist agencies in their computerization projects. Among others, the NCC is tasked to develop software packages to support common government applications in the following areas:

- human resource management (attendance monitoring, payroll processing, leave monitoring, etc.),
- logistics management (inventory monitoring, purchasing processing, etc.)
- financial management (accounting, budgeting, cashiering, etc.)
- and other administrative processes

Based on the result of the assessment of the NCC Project and discussions on technology diffusion the following recommendations are being made:

1. At the planning stage, the strategies for the adoption of the Five Stages of Web Presence must be given attention. This should indicate how the NCC could address the concerns of the adoption model for each stage.
2. There is a need for the NCC to include in its future project strategies the internal capability building. This will ensure the availability of a significant number of technical personnel who will participate in the technology diffusion.

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APPENDIX A

SURVEY QUESTIONNAIRE

| | |
|-----------------------------|-----------------|
| Agency Name/Respondent Name | Date : |
| Title/Designation | Contact Details |

Instruction: Please indicate your rating for each item based on the scale below:

5 – Excellent; 4 – Very Good; 3 – Good; 2 – Fair; 1 – Poor

| | |
|--|--|
| On the use of the WCMS: | |
| <ul style="list-style-type: none"> • Procedures are “easy-to-follow” • Users can complete a task successfully • Features or functionalities are user-friendly • Features or functionalities are enough to suit the present requirements • Good User interface • Search functionality available • The application (WCMS) have payoff • Users need not have technical skill | |
| Additional Comments: | |
| On the Website Template Design | |
| <ul style="list-style-type: none"> • Fast loading of web pages • Consistent look and feel • Flexible design to suit user requirements • Website is easy to navigate • Breadcrumb is available to guide users • Web design is simple and clean • Insert images to enhance visual design • Has clear navigation design | |
| Additional Comments: | |
| On the technology used | |
| <ul style="list-style-type: none"> • Enable the user to easily try the technology • Wide range of IT resources (hardware and software) supported • Equipment required is “easy-to-use” • Savings in time and effort to come up with an agency website • Require minimal budget to use the technology • Relevant resources on the technology are available to the users • Results and benefits of the technology is easily visible • Benefits of using the technology are immediate | |
| Additional Comments | |