

Correspondence Analysis of Indonesian e-government Websites

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Abstract

Some websites are currently experiencing huge information overloads, as a result of new and emerging ICT capabilities, and a shortage of information management skills and human expertise. Additionally, various features of information categories and user services add to the complexity of these websites. E-government websites in developing countries are one category of these complex websites. However, little evaluation of the huge contents of e-government websites has taken place. The e-government website design mainly concentrates on website features that enhance usability based-on a designer-centric rather than user centric approach. Few examine what web designs facilitate users' information seeking and other services. The goal of the research presented in this paper is to explore concepts and models for huge-content websites for developing countries by investigating the characteristics and motives of the users in browsing the sites to seek information and use other services. We do this by using correspondence analysis to investigate users of e-government websites of the central government of Indonesia.

Keywords: correspondence analysis, e-government, user-centric analysis, web content

Introduction

The Internet has emerged as an integral part of human society. The gathering and sharing of electronic information have become essential elements of modern life. In government administrations, over the past ten years, the application of Information and Communication Technology (ICT) to maximize service quality and improve efficiency has been an important orientation. Particularly following the lead of the Information Superhighway of the U.S., all countries have devoted great efforts to improve administration using ICT. They have built up e-government websites, and provided various services for businesses, residents and the entire society.

By 2002, 169 countries had already implemented an e-government to improve the efficiency and effectiveness of their services (UNPAN 2003). By the end of 2007, this number had increased to 192 countries (UN 2008). Ninety-eight percent of

governments in the world already had their government websites, and only 2 percent did not.

The gap between e-government services in developing and developed countries is still wide. In the 2008 e-Government Readiness Report, European countries made up 70 percent of the top 35 countries. The Asian countries made up 20 per cent of the top 35, and the North American and Oceania regions 5 percent. The European countries as a group have invested heavily in deploying broadband infrastructure, and increased the implementation of e-government applications for their citizens (UN 2008).

To improve the usability and accessibility of e-government websites, some countries make standard features for their website contents. In 2001, the US Department of Health and Human services produced *Research-based web design and usability guidelines*. The US government revised these guidelines many times, with the 2006 version being the latest. Many countries translated these guidelines to follow the US standard to assist them in developing their own e-government websites (Lewis 2006).

However, some countries still have a low level of website usability and accessibility from their citizens' perspective. Some e-governments' websites are currently experiencing huge information overloads as a result of the new and emerging ICT capabilities, and a shortage of information management skills and human expertise. Additionally, various features of information categories and user services add to the complexity of these websites, with a shortage of information management skills and human expertise (UNPAN, 2005, 2008). As the main users of the e-government websites have diverse educational and social backgrounds, professions, ages, access locations, and diversity of tools performance, this makes the task of e-government even more difficult.

The characteristics and perspectives of users need to be analyzed when measuring the usability and effectiveness of information quality and services provided on e-government websites, in order to provide the most appropriate model of e-government for developing countries. We conducted a case study of Indonesian government websites.

Existing Evaluations of e-government

Only a few previous studies have attempted to evaluate e-government provision of services through the Web. Those studies generally fall into two categories: those that take a services and performance approach; and those that have a web structural and network analysis approach.

The study by Wood et al. (2003) tried to utilize lessons and experiences from an evaluation of a website services' performance. The authors suggested the use of a

multidimensional Web evaluation strategy, which includes methods such as usability testing, user feedback, usage data, and Web and Internet performance, etc. that are common in the evaluation of commercial websites. The study by Wang et al. (2005) was aimed at developing and evaluating a model for e-government services that focuses on how characteristics of the site interact with both the services and citizens to influence the efficient delivery of services. It was also aimed at helping answer why a government website designed to be citizen-centric in service delivery succeeds or fails. Research by Wangpipatwong et al. (2005) investigated factors that influence the adoption of e-government websites directly by citizens. This work focused on the characteristics of information quality and system quality of the e-government websites. The authors suggested that characteristics of information quality significantly influence the adoption of e-government websites. The study concluded that efficiency, accuracy, relevancy and completeness are more significant factors than timeliness and precision of information in the e-government websites. The work of Higashigawa et al. (2006) is typical of studies which examine the e-government progress level based on a questionnaire survey. The authors suggested the use of three progress levels (input, output, and outcome) in measuring e-government achievement. The authors considered that the progress level was high when the outcome was achieved.

Research by Kojima et al., and Patricek et al., represent the second approach to evaluation of e-government websites. The work of Kojima et al. (2002) proposed a method of website grouping based on a link structure in order to compose the whole structure of a site by considering semantically related pages as one virtual document. The work of Patricek et al. (2006) is a study that tries to improve e-government evaluation using a range of techniques from webmetric and social networks analysis. The authors examined two structural characteristics of the websites: internal structure that is indicative of navigability of a site, and external structure that is indicative of hubness and authority of a site.

However, all of these studies evaluate progress level and characteristics of services of the website itself, without reference to the behavior of users. This article uses a user-centric evaluation model which utilizes an approach that studies the characteristics and perspectives of users in relation to the level of usability and effectiveness of information quality and services provided on the e-government websites in Indonesia.

Research Purposes

The purposes of this research project are as follows:

- 1) To analyse the characteristics and perspectives of users in relation to the level of usability and effectiveness of information quality and services provided on e-

government websites

- 2) To provide a model of evaluation for the e-government of developing countries
- 3) To evaluate the benefits of e-government for citizens of developing countries
- 4) To explore and develop intelligent interfaces and tools to guide the diverse user when searching for information in complex e-government websites
- 5) To improve the usability, accessibility and effectiveness of e-government services for citizens.

This article will only cover the first three points mentioned above by undertaking a case study of Indonesian government websites.

The Development of e-government in Indonesia

The initiative of e-government in Indonesia was introduced via President Instruction in April 2001, titled *Telematika (Telekomunikasi, Media, Informatika/Telecommunication, Media, and Information Technology)* which stated that government apparatus should use ICT to support good governance and to accelerate the democratic process (Munaf 2001). Furthermore, the different objectives of e-government should be publicized. Public administration is one area in which the Internet can be used to provide access to basic services for citizens and to simplify the relations between citizens and government. ICT has been recognized as a key facilitator of this by the government of Indonesia. A National ICT Task Force—a cross-departmental team called TKTI (National ICT Coordination Team)—was formed by the government of Indonesia to ensure the inclusion of ICT in all sectors (Telematics 2003). The taskforce was formed to overview, coordinate and monitor the progress of the activities, programs, and projects undertaken by different ministries and departments of the central government of Indonesia.

In Indonesia, e-government is needed for the following reasons:

- 1) to support the government's change to democratic governance;
- 2) to support the application of authority balances between central and local government;
- 3) to facilitate communication between central and local governments;
- 4) to gain openness; and
- 5) transformation towards an information society era (Djoko 2004).

In 2003, some of the local governments in Indonesia started to prepare an e-government network. Some of these are located in Denpasar, Gianyar, Sulawesi, Gorontalo, and Semarang. In Takalar regency—South Sulawesi and East Kutai—East

Kalimantan provinces, the implementation of e-government has been initiated by government in collaboration with the Indonesia Telecommunication Company and has been in development since September 2000. Among the information provided by these two regencies is the Geographic Information System (GIS) and Management Information System (MIS). This information has been used for the promotion of investment to some developed countries.

Based on a report of the State Ministry of Communication and Information of Indonesia, in March 2004, there were 564 registered domain names for government-related websites in Indonesia named with the suffix **.go.id* (M. R. Technology 2004; M. o. Technology 2005). Two hundred and eighty-three government-related websites are available to be accessed: 69 websites of central government agencies and 214 websites of local governments. One hundred and eighty-six of the 468 local governments had delivered their public services using websites. In 2008, the Indonesian central government website listed and integrated all 70 websites of central government departments and agencies, and all 33 websites of the provinces level of local governments in Indonesia. Table 3 shows the category and number of the departments and agencies of central government.

Some studies about the level of e-government indicated that the state of Indonesia's e-government between 2003 and 2005 is in the level of emerging and enhanced e-government, or the level of informational e-government (UNPAN 2005, 2008). For example, the UNDESA report (2003) indicated that in 2003, around 55 percent of Indonesia's e-government websites were in the level of informational e-government. Our previous study showed that of e-governments in 2007, 46.4 percent were informational, 49.2 percent were interactive, and 5.4 percent were transactional (Dahlan 2008a, 2008b). The UNPAN report of 2008 also indicated that around 4 percent of Indonesia's e-government was in the transactional level in that year (UNPAN 2008). The percentage of interactive e-government had been increasing significantly in the three years preceding the report, It shows that the implementation of e-government in Indonesia is developing from informational e-government to transactional e-government. The percentage of transactional e-government is growing only a small amount, but is still perhaps developing.

Our previous study also indicated that the current contents of e-government in Indonesia are mostly high political and economic orientations services (Dahlan 2009). It showed that some institutions of central government of Indonesia have made great efforts to implement the program of e-government to support good governance and to maximize the participation of Indonesian citizens in the political and economic orientations of government processes.

Table 1: Category of Agencies listed on the Central Government of Indonesia's website

Category	Number of Agencies
The Central Government of Indonesia	1
Coordinating Ministers	3
Departments	20
State Ministers	10
Ministerial Level Officials	8
Non-Department Agencies	22
Others State's High Agencies	6
Total	70

Research Methodology

We conducted an online survey between December 2008 and November to December 2009. The target of the survey was users of the Indonesian central government's websites. Table 2 shows the respondent demographics of the total 298 respondents from different areas of Indonesia.

Table 3 shows the questions used to evaluate the websites' usability, information quality and benefit for the users. We requested that respondents indicated their answers by using a scale of 1 to 5 (1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = strongly agree).

Table 2: Respondent demographics

Attribute	Response	Percentage (%)
Sex	Male	58.6%
	Female	41.4%
Age	Under 20	11.4%
	21–30	34.9%
	31–40	31.2%
	41–50	12.8%
	Over 51	9.7%
Highest Education	Primary School	3.3%
	Secondary School	11.1%
	High School	26.8%
	College/University	58.8%
Occupation/Job	Student	19.7%
	Employee in private sector	16.6%
	Employee in government institution	21.8%
	Self-owned business	13.8%
	Professional (doctor, lawyer, teacher, etc.)	16.3%
	Unemployed/retired	11.8%
Domicile	Big City	29.1%
	Small City/Town	29.4%
	Rural Area	23.2%
	Foreign Countries	18.3%

Figure 1: City/Region of Respondents

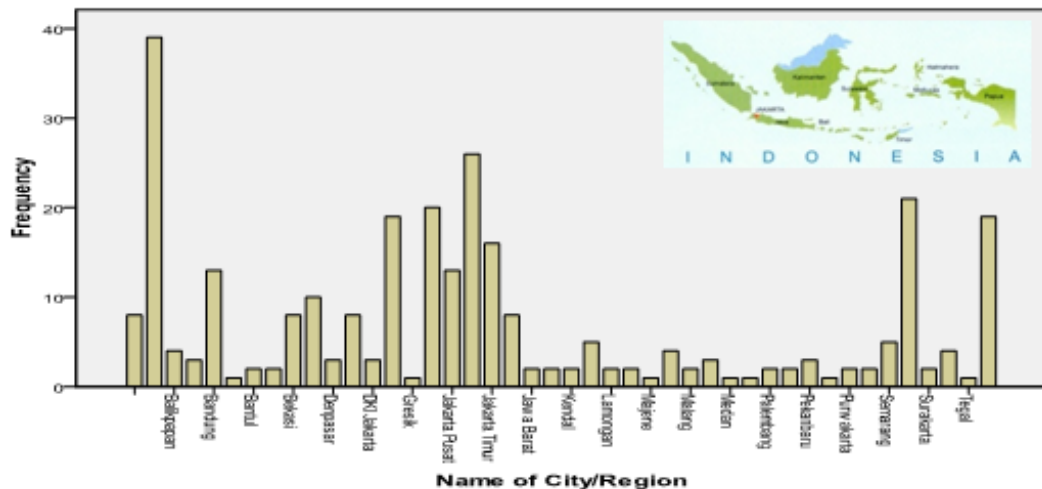


Table 3: A list of questions

No	Questions
Q1	The site is easy to learn to operate
Q2	Interaction with the site is clear and understandable
Q3	The site is easy to navigate
Q4	The site is easy to use
Q5	The site has an attractive appearance
Q6	The design is appropriate to the type of site
Q7	The site conveys a sense of competency
Q8	The site creates a positive experience for the user
Q9	The site provides accurate information
Q10	The site provides believable information
Q11	The site provides timely information
Q12	The site provides relevant information
Q13	The site provides easy-to-understand information
Q14	The site provides information at the right level of detail
Q15	The site presents the information in an appropriate format
Q16	The site provides helpful instructions
Q17	The site provides the necessary forms to be downloaded
Q18	The site provides necessary transactions to be completed on-line
Q19	The site can save citizen's time expense

It was necessary to analyze whether the respondents of Q1 to Q19 had identical characteristics or not. We used the Kruskal-Wallis test to compare the different attributes (age, highest education, and type of job) of groups of respondents' data for all of the above questions. The following formula is an equation to calculate the value of the Kruskal-Wallis test:

$$H = \frac{12}{n(n+1)} \sum_{i=1}^k \frac{R_i^2}{n_i} - 3(n+1)$$

Where,

H = Kruskal-Wallis test

n = Total number of observations in all samples

R_i = Rank of the sample

Kruskal-Wallis test statistics are approximately a chi-square distribution, with k-1 degree of freedom where n_i should be greater than 5. If the calculated value of the Kruskal-Wallis test is less than the chi-square table value, then the null hypothesis will

be accepted to say that the samples are from identical populations. If the calculated value of the Kruskal-Wallis test H is greater than the chi-square table value, then we will reject the null hypothesis and say that the sample comes from a different population.

For the groups of questions that have a significant difference in the level of users' response in relation to the difference in the respondents' attributes, we adopted the correspondence analysis technique to analyze simple two-way tables containing the response of level of agreement to the questions and the correspondent attributes. The correspondence analysis is a statistical visualization method for picturing the associations between the levels of a two-way contingency table.

Data Analysis

Table 4 shows the descriptive statistical evaluation result containing the value of minimum, maximum, average and standard deviation of all of the questions. We examined whether the difference in the evaluation result is seen in the difference of the attribute by Kruskal-Wallis Test (K-Independent Sample Test) statistical analysis with 5 percent significance level. Table 4 shows a sample of the result of the test of the Q1.

Table 5 shows that under the level of significance 5%, the difference of the evaluation result was not seen in educational background, but there was a significant difference result in the difference of the respondents' generation and occupation. Table 6 shows that most of the respondents' answers were distributed across all generations.

Table 4: Descriptive statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Q1	296	1	5	3.68	.865
Q2	296	1	5	3.54	.912
Q3	296	1	5	3.56	.877
Q4	291	1	5	3.64	.878
Q5	296	1	5	2.91	.963
Q6	294	1	5	3.07	.930
Q7	295	1	5	2.87	.958
Q8	296	1	5	3.45	.952
Q9	296	1	5	3.31	.889
Q10	296	1	5	3.44	.841
Q11	296	1	5	3.23	.956
Q12	296	1	5	3.25	.969
Q13	292	1	5	3.54	.916
Q14	296	1	5	2.80	.977
Q15	292	1	5	3.18	.859
Q16	292	1	5	3.29	.904
Q17	294	1	5	3.24	.945
Q18	294	1	5	2.78	1.070
Q19	296	1	5	3.49	1.089
Q20	296	1	5	3.29	1.140
Valid N (listwise)	287				

Table 5: Sample of Kruskal-Wallis test result of Q1**Test Statistics^{a,b}**

	Age	Sex	Education	Job
Chi-Square	13.694	6.841	6.846	10.940
df	4	4	4	4
Asymp. Sig.	.008	.145	.144	.027

a. Kruskal-Wallis Test

b. Grouping Variable: Q1

Table 6: Distribution of the Response of Q1**Age * Q1 Crosstabulation**

		Q1					Total
		1	2	3	4	5	
Age	<=20	1	8	12	12	1	34
	21-30	3	5	22	53	21	104
	31-40	1	3	21	56	10	91
	41-50	0	2	10	18	8	38
	>=51	0	5	10	14	0	29
	Total	5	23	75	153	40	296

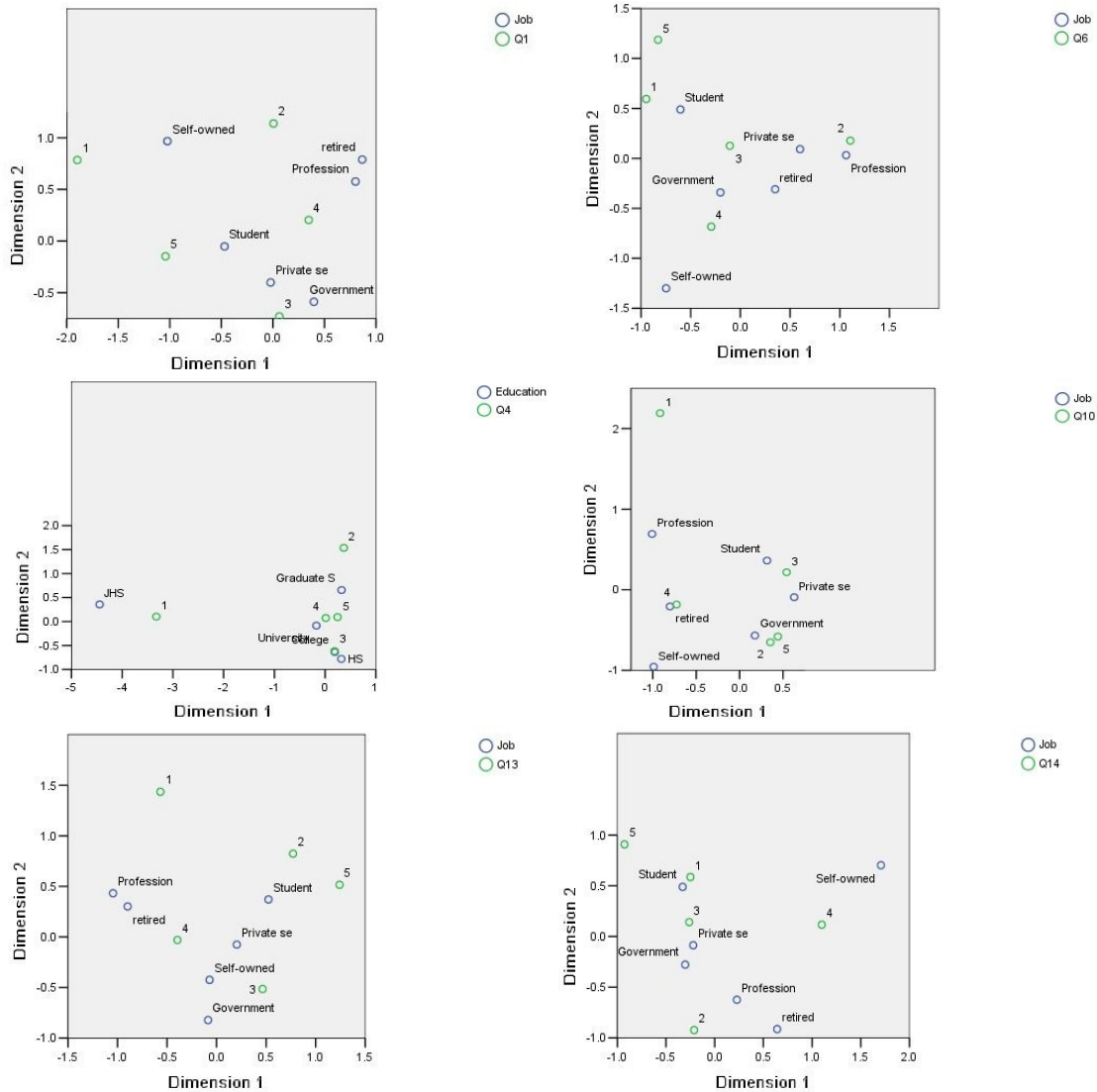
The following table shows the result of the Kruskal Wallis Test with 5% significance level for all of the questions. The cells marked “O” indicate that there is a significant difference result in the difference type of the respondents’ attributes. The cells marked “X” indicate identical respondents, so the difference of the evaluation result is not seen in the attribute.

Table 7: Kruskal Wallis test result

Question	Value of Asymptotic Significance			Testing Result		
	Age	Education	Job	Age	Education	Job
Q1	0.008	0.144	0.027	O	X	O
Q2	0.127	0.051	0.031	X	X	O
Q3	0.654	0.680	0.390	X	X	X
Q4	0.104	0.016	0.093	X	O	X
Q5	0.000	0.073	0.148	O	X	X
Q6	0.457	0.335	0.003	X	X	O
Q7	0.055	0.056	0.325	X	X	X
Q8	0.613	0.585	0.195	X	X	X
Q9	0.002	0.818	0.024	O	X	O
Q10	0.064	0.091	0.001	X	X	O
Q11	0.021	0.091	0.275	O	X	X
Q12	0.021	0.902	0.001	O	X	O
Q13	0.198	0.479	0.040	X	X	O
Q14	0.000	0.229	0.000	O	X	O
Q15	0.001	0.259	0.014	O	X	O
Q16	0.002	0.020	0.004	O	O	O
Q17	0.186	0.077	0.066	X	X	X
Q18	0.000	0.004	0.031	O	O	O
Q19	0.576	0.382	0.077	X	X	X

Figure 2 shows the statistical visualization of the correspondence analyses for picturing the associations between the levels of a two-way contingency table, which is level of response and the respondents' attribute.

Figure 2: Visualization of the Correspondent Analyses.



Findings

For understandable and clear interaction (Q2), appropriate design (Q6), believable information (Q10), and useful information (Q13), the difference of the evaluation result is not seen in educational background and the generation gap, but there is a significant difference evaluation result in the difference of the type of occupation. Regarding the

evaluation for usability (Q4), it may be said that there is a significant difference evaluation result in educational background, but it is not seen in the generation gap, and the type of occupation.

Regarding ease of operation (Q1), accuracy of information (Q9), relevant information, appropriate information details (Q14), and appropriate information format (Q15), the difference of the evaluation result is not seen in the difference of educational background, but it may be said that there is a significant difference evaluation result in the generation gap and the type of occupation.

In regards to the attractiveness of appearance (Q5) and the timely information (Q11), the difference of the evaluation result is not seen in the difference of educational background and occupation, but it may be said that there is a significant difference evaluation result in the generation gap. Regarding the evaluation for helpful instruction (Q16) and online transaction (18), it may be said that there is a significant difference evaluation result in educational background, the generation gap, and the type of occupation.

The correspondence analyses for the ease of operation (Q1) and usability (Q4) show that it is easy for professional employees, private enterprise employees, and students to operate the e-government websites. However, it is difficult for self-employed people, housewives, and unemployed or retired people to operate the sites. Based on a classification of age, the visualization of the correspondence analyses shows that it is easy for people from 21 years old to 40 years old to operate the government websites, but is difficult for people over the age of 41 years old or citizens under 20 years old. Based on the highest educational background, it is difficult for those people who are graduates from a junior high school or lower to operate the websites.

Conclusions

The Indonesian government has been greatly concerned with the implementation of their e-government program of *Telematika*, which by its nature is the utilization of all kinds of ICT in government administration, to support good governance, and to maximize both the quality of services and the participation of Indonesian people in government processes, in order to accelerate the implementation of the democratic process.

Our study indicates that the users of the Indonesian e-government come from different social backgrounds and different generations. They have different perceptions and satisfaction with the contents of the e-government websites. To improve the usability, accessibility and effectiveness of e-government services for citizens, it is necessary to gather the opinions of the e-government websites' users through regular questionnaires on whether the websites offer an appropriate design and provide useful

information. To make much clearer the current status of e-government development in Indonesia and its impacts for the citizen, we consider that it is necessary to conduct other studies with different frameworks and parameters, such as the level of infrastructure, access speed, scale of database, category and type of contents released, web user interface and so on. In addition, study and evaluation of the impact of e-government development in capacity building and in providing better quality of services are needed. It is also necessary to study the e-government at the province and district level of local government in Indonesia.

References

- Dahlan, Nariman. 2008a. "An Evaluation of Information Quality of e-Government in Indonesia." *Proceedings of the 4th International Conference on e-government*. RMIT University, Melbourne, Australia: Academic Publishing International.
- _____. 2008b. "Development of e-government in Indonesia: A Strategy Model and Its Achievements." *Ritsumeikan Journal of Asia Pacific Studies* 24: 35–46.
- _____. 2009. "Evaluating Websites Services with a Political-Economic Approach." *IEEE Computer Society, The 3rd International Conference on Complex, Intelligent and Software Intensive Systems*. Fukuoka, Japan: IEEE Computer Society.
- Djoko, A. H. 2004. "Developing e-Government, The Case of Indonesia." Paper presented at e-Government Workshop APECTEL29 in Hong Kong.
- Higashigawa, T., S. Kubo, and T. Shimada. 2006. "Empirical Study of e-government Progress Level on Local Government." *Journal of Socio Informatics* 18–2: 59–69
- Kojima, S., T. Atsuhiro and J. Adachi. 2002. "Structural Analysis and Grouping of Web Pages." *The Journal of Japan National Institute of Informatics* 4: 23–35.
- Lewis, R. James. 2006. *Research-based Web Design and Usability Guidelines*. Washington: US Department of Health and Human Services.
- Munaf, D. R. 2001. "Digital Divide and Cultural Diversity in Indonesia: Information Policy." *Proceedings of International Congress of Information: Information, Knowledge and Society Challenges of New Era*. Havana.
- Patricek, V., T. Escher, I.J. Cox, and H. Margetts. 2006. "The Web Structure of e-government—Developing a Methodology for Quantitative Evaluation." *Proceedings of ACM International Conference on World Wide Web (WWW 2006)*. Edinburgh: ACM
- Technology, Ministry of Communication and Information. 2005. *e-Government in Indonesia 2005: Country Report*. Ministry of Communication and Information Technology: Tokyo.
- Technology, Ministry Research and. 2004. *The Strategic Policy of National Science and Technology Development*. Ministry Research and Technology. Jakarta.

- Telematics, Directorate General of. 2003. *The Strategy in Implementing e-government, a presentation document*. Directorate General of Telematics, State Ministry of Communication and Information Technology. Jakarta.
- United Nations. 2008. *United Nations e-government Survey 2008: From e-government to Connected Governance*. The Department of Economic and Social Affairs of the United Nations. New York.
- UNDESA. 2003. *World Public Sector Report 2003: e-Government at the Crossroads*. The United Nations Department of Economics and Social Affairs. New York.
- UNPAN. 2003. *World Outlook of Global IT Application*, United Nations Department of Economic and Social Affairs Division for Public Administration and Development Management. New York.
- _____. 2005. *UN Global E-Government Readiness Report 2005: From e-Government to e-Inclusion*. United Nations Department of Economic and Social Affairs Division for Public Administration and Development Management. New York.
- _____. 2008. *UN Global e-Government Readiness Report 2008: From e-Government to Connected Governance*. United Nations Department of Economic and Social Affairs Division for Public Administration and Development Management. New York.
- Wang, L., S. Bretschneider, and J. Gant. 2005. "Evaluating Web-based e-government Services with a Citizen-centric Approach." Pp. 129b–129b in *Proceedings of IEEE the 38th Hawaii International Conference on System Sciences*. Hawaii: IEEE.
- Wangpipatwong, S., W. Chutimaskul, and B. Papasratorn. 2005. "Factors Influencing the Adoption of Thai e-Government Websites: Information Quality and System Quality Approach." Pp. 14.1–14.7 in *Proceedings of the Fourth International Conference on eBusiness*. Bangkok.
- Wood, F. B., E. R. Siegel, E. LaCroix and B. Lyon. 2003. "A Practical Approach to E-government Web Evaluation." *IT Professional* 5–3: 22–28.