ENHANCED E-GOVERNMENT TRANSPARENCY THROUGH LINKED OPEN DATA

การเพิ่มความโปร่งใสของรัฐบาลอิเล็กทรอนิกส์โดยการเชื่อมข้อมูลแบบเปิด

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Abstract

Transparency is an important issue for government. Even after the transformation to e-Government the issue of transparency remains in question. The Government has converting the traditional process into an online process e-Government aims to increase access and enhance transparency. However some activities that lead to corruption are still able to occur intentionally or unintentionally. Sometime these activities can occur even prior the process. E-Government collaboration can reduce some of these illegal activities. This paper proposes an approach to improve transparency effectively through e-Government collaboration, using Linked Open Data to link data from different documents together. A case study of transparency improvement in provincial budgeting in Thailand is presented to verify the effectiveness of the proposed approach.

Keywords: E-Government Collaboration, Linked Open Data (LOD), Transparency, Document Similarity, Provincial Budget Request

บทคัดย่อ

ความโปร่งใสนับเป็นประเด็นสำคัญสำหรับรัฐบาล ซึ่งความโปร่งใสนั้นก็ยังเป็นคำถามแม้ว่าจะได้มีการเปลี่ยนรูปแบบเป็นรัฐบาลอิเล็กทรอนิกส์ โดยการปรับเปลี่ยนกระบวนการทำงานแบบเดิมให้เป็นรัฐบาลอิเล็กทรอนิกส์ ซึ่งทำงานในรูปแบบออนไลน์เพื่อเพิ่มการเข้าถึงข้อมูลและความโปร่งใสในการทำงาน แม้กระนั้นกิจกรรมบางอย่างที่ชักจูงไปทางคอรัปชั่นก็สามารถเกิดขึ้นได้โดยตั้งใจหรือไม่ตั้งใจ ซึ่งบางครั้งกิจกรรมเหล่านั้นอาจจะเริ่มก่อนที่กระบวนการจะเกิดขึ้น การทำงานร่วมกันของรัฐบาลอิเล็กทรอนิกส์สามารถช่วยลดกิจกรรมที่ไม่ถูกต้องเหล่านั้นได้ บทความวิจัยนี้นำเสนอแนวทางในการปรับปรุงความโปร่งใสอย่างมีประสิทธิภาพผ่านการทำงานร่วมกันของรัฐบาลอิเล็กทรอนิกส์โดยการใช้การเชื่อมต่อข้อมูลแบบเปิด (Linked Open Data) เพื่อเชื่อมต่อข้อมูลต่างๆ เข้าด้วยกัน แนวทางที่นำเสนอได้นำไปใช้ในกรณีศึกษาในการปรับปรุงความโปร่งใสของการของบประมาณของจังหวัดในประเทศไทย

คำสำคัญ: การทำงานร่วมกันของรัฐบาลอิเล็กทรอนิกส์ การเชื่อมต่อข้อมูลแบบเปิด ความโปร่งใส ความคล้ายคลึงกันของเอกสาร การของบประมาณจังหวัด

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Introduction

Transparency in Government information and process has always been an issue for government credibility. Transparency in government is not only concerned with information but also concerned with the process that undertaken by the government; (Chen, 2009) because citizens are also concerned with how the decisions have been made by the government. Transparency is essential because it helps re-engineer processes and systems to be more effective in reducing opportunities for corruption. It also provides the public with the opportunity to urge the government to rationalize and simplify rules and bureaucratic procedures (Fan, Zhang & Yue, 2009). The general public will be more aware of information and will better understand what is happening in the process and how decisions are made.

Transparency is a vital element, by increasing the participation of citizens in government activities will result in the reduction of corruption within the government sector. Many governments are using Information and Communication Technology (ICT) in their transformation to e-Government with the aim of promoting and enhancing their own effectiveness and efficiency. The transformation also leads to greater dissemination of information and improved service delivery which causing the government to become more accountable to its citizens (Wescott, 2001). The transformation is providing opportunities for direct public participation, such as providing ideas and suggestions in forums online, and helps increase the transparency of the decision-making process (Mehmet, 2001; Ndou, 2004).

However, even if the government undertakes the transformation to e-Government and publishes information online, the issue of transparency will still not be eradicated. Questions arise as to whether the information and process are indeed actually correct and transparent or have some details been held back by the government (Albornoz, Esteban & Vanin, 2009). With information that has been provided and published by the government alone, without public participation, the public may feel it is possible that some information might be hidden. Moreover, corruption is still able to occur even prior the process, through favoritism or the locking-in of a specific vendor/company in e-Government's procurement process. This problem is hard to uncover as everything had been pre-arranged before information is published online and therefore leads to skepticism as to whether the government has published all the factual information.

Even e-Government collaboration has been enhanced effectively and efficiency by preventing duplication and conflict of documents or projects. The study helps reduce the duplication of projects, whether it occurs unintentionally or intentionally, which also helps reduce corruption (Na Lamphun & Wuwongse, 2012). However, a problem still exists because the data is limited to one data source or data within that province only. With an insufficient amount of information, this can lead to poor decision making. Citizen awareness is also a problem

because sometimes information that was provided by the government alone might not be accurate. It requires information from other sources as well, to make information reliable. Information comparison is sometimes needed to check whether the information is accurate or reasonable. However, information comparison is difficult due to a large amount of information. Therefore, this research study is needed to study the factors that can lead to illegal activities and how to reduce those factors in e-Government. Without the inter-linking of the data to other sources of information, it is not possible to make comparisons as to whether the data provided is accurate and reasonable or not.

This current study focuses on increasing the transparency of government information and process, by increasing citizens' awareness, through interlinked data across the government sectors. The study will only focus on the transparency of information and process, omitting regulations as they involve political considerations. The study involves the expansion of information though Linked Open Data (LOD) by inter-linking data from different sources. Inter-linking data enhances it, making it more useful or meaningful by enabling cross comparisons between different sources of information. This leads to more effective transparency enhancement.

Problems in Government Transparency

It is necessary that Government information is transparent and accessible by all citizens, including the government budgets that are needed to complete governmental projects. This remains the case even after Government has converted to e-Government (Bhatnagar, 2003). However, negative or adverse information that might affect the government may be hidden from the public and the public might not be cognizant of this at all (Albornoz, Esteban & Vanin, 2009). Consequently, acts of corruption are often pre-arranged prior to any official process being undertaken. This may be arranged though connections between government officials and specific vendors and involve favoritism, locked-in price, locked-in vendor, etc. (Mehmet, 2001). Such acts might be hard to recognize due to insufficiency of information. By having insufficient information, this leads to low probability that such action will be discovered by others which is one of the two major factors that can contribute to corruption that discussed by Bhatnagar (2003).

These problems are also major problems that are currently prevalent in Thailand. There are 77 provinces in Thailand that are allocated funds from the annual government budget. Consequently each province submits around 700 requests for budgets to undertake government projects throughout the fiscal year. Na Lamphun & Wuwongse (2012) discussed the current inefficient and cumbersome document management of government budget requests and how the implementation of an online system can help enhance the process. Limited and insufficient information is likely to lead to use of budget resources to purchase items more expensively than they should be. This

could very well occur unintentionally due to lack of information or intentionally which is a guise for corruption.

Related works on LOD in e–Government

Government units start to realize the potential of linked data as well because it is based on open Web standards and they begin to put their data online (Berners-Lee, 2006). LOD allows different government units to communicate their data while still maintaining full control of the original data. This increases citizens' awareness. They can use generic tools to access and visualize data as well as search engines can provide better data to service users. It also provides a way of publishing and interpreting government data as meaningfully as possible (Thacker, 2011).

Research Methodology

The system focused on increase e-government transparency by linked data from several sources together. In order for the system to be able to link information, it needs to support data or information in multi-platforms and understand the content. So the architecture from the previous research study is still needed along with the new technology which is Linked Open Data to interlinked data.

Approach and Architecture

The approach that uses to increase transparency effectively in e-government information and process in this research study is through Linked Open Data (LOD) to inter-linking data in the semantic web using Uniform Resource Identifiers (URIs) and Resource Descriptive Framework (RDF) (Berners-Lee, 2006). Linking the data from one source with data from other sources will expand the data greatly, in similar and related fields. By using URI as a name and including links to other URIs, we allow others to look up those names and discover more related items.

To link data from one source to other sources, the system needs to support data from multi-platforms. Architecture to support multi-platforms is developed by using Open Document Format (ODF) due to its open standard, which guarantees the accessibility to a document even though they are created with different platforms or different versions (Oasis, 2002). Data from various sources can be linked and accessed, which enables users to access and compare easier.

Ontology is also needed in this study for the system to be able to understand the relationship between terms so that it can identify whether those terms are related or not. Ontology is used to relate terms or objects so the system is able to understand, to a certain extent, their contents and relationships (Ju & Zhang, 2008; Hu & Liang, 2008; Charalabidis & Metaxiotis, 2009).

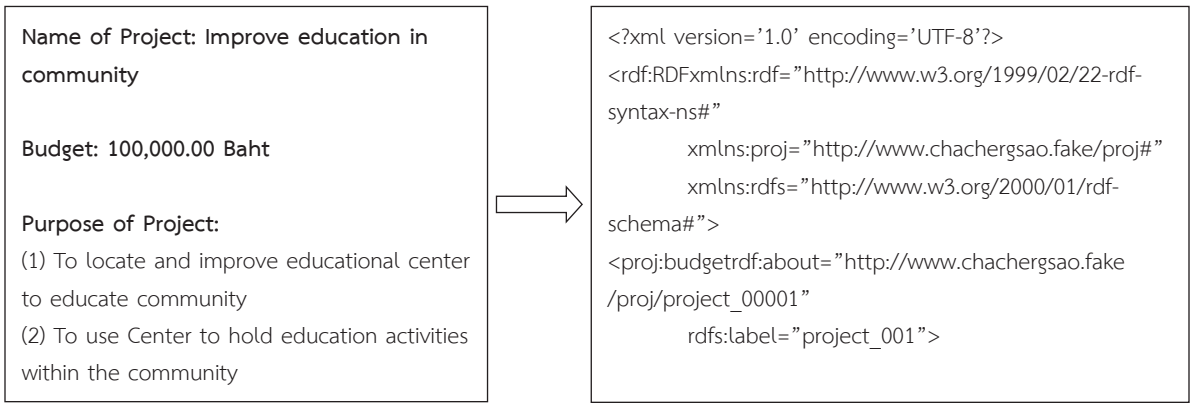

Figure 1 Original data to RDF

The purpose of using LOD in the research study is to link data together. Information from one department can be linked to other departments. The information can also be linked to other open sources of information such as online translation or online applications. This will enhance the transparency and the system's capability. The data from one source can link with other sources in the same field of work to create greater information. For example, the information from one government department can be linked with that of other government departments to enable users to compare information or documents across government departments. Users will gain by being able to access related information.

From a transparency perspective, the public will be able to access and retrieve information and then compare it with information from other sources through LOD. Providing alternative or related information for the public to compare with government data will enable them to understand more clearly. More accurate information will enable the public to recognize whether the information is reasonable. This will increase information awareness and reduce corruption.

A Case Study of Budget Request

The government of Thailand has transformed into e-Government and published information and presented processes such as e-procurement online to promote government transparency. However the current process for requesting government project budgets remains off-line. Other government units submit the project proposals and budgets to city hall for approval. However with the large number of submitted projects, this can prove difficult to substantiate whether the details are reasonable or not.

Mostly users use information from within the province only and fail to compare it with information from other provinces/regions. For example, the project to renovate the road for 10 kilometers in one province might cost 1,000,000 Baht while nearby province the same project might cost 800,000 Baht. Because the information was not linked, the first province

failed to check the standard price and has outsourced the contractor to complete the project at a higher price. Similar cases can happen even if the city hall is aware of the standard price but wants to favor a specific contractor. They block other contractors from participating and thus corruption is imminent.

Linked Information

Information about government projects is linked among provinces so that users gain the necessary knowledge of the project undertaken by government. By linking information, the limitations of the information sources are reduced and users are able to view related information from various sources. Users can then view and compare information from other sources to help support decision making. With linked information the probability that undesirable actions by government officials will be discovered by others will be enhanced and result in reduce corruption and increase transparency in the government.

Information Comparison

As a result of linked information citizens are able to compare information of a project with similar projects from other areas or provinces as shown in Figure 2. This information benefits both the government and the individual citizens. From the Government perspective the information gives city hall enhanced knowledge of the projects that it can use to its advantage and help support decision-making by compare the information of the project to similar projects in other provinces to check whether the price is reasonable, or whether the method and quality meets the standard.

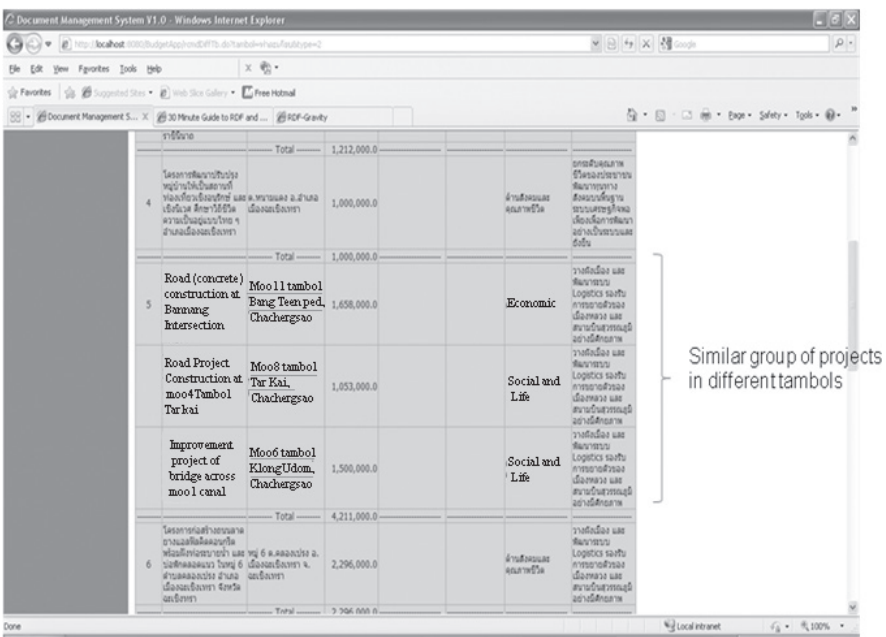

Figure 2 Group of similar project for comparison

Linked to Open Source Application

Information can also be linked to other applications. By linking to other applications, the capability of the system can be improved to achieve more features and suit the needs of more users. In this research study the system is linked to Google in order to use several open source applications such as Google maps and charts. This enhances the system's capabilities in terms of transparency and views of the projects available for users. This information can be used to pinpoint the location of the project. Using only the description of the location does not provide clarity and the exact location of the project might not be clear. Also sometimes it is hard to determine the similarity, whether projects are the same or not, which might give rise to opportunities for corruption. By integrating Google maps, the location of the project can be marked as shown in Figure 3.

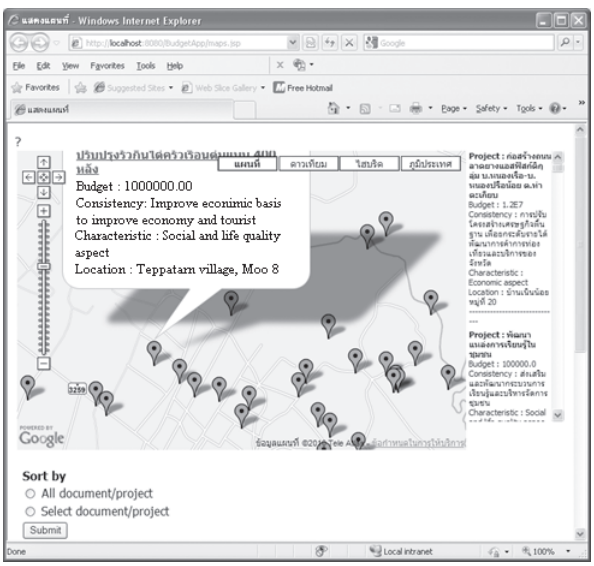

Figure 3 Linked to Google maps to pinpoint project on the map

Evaluations and Results

There are several works that focus on e-Government transparency criteria including Chen (2009), which stated that government should concerned with anti-corruption, accessibility, accountability, predictability, participation, reliability, and openness. Blöndal (2003) focuses on the transparency of data, roles, and activities of stakeholders. In this research study, the evaluation will be developed based on South Africa's Country Report: Fiscal Transparency and Participation in the Budget Process, which is most related to the research. The method follows the IMF Code of Good Practices on Fiscal Transparency

Evaluations

The system was tested on whether it helped increase transparency around July 2011. There are 120 participants from 2 provinces;

60 participants from the government, 60 participants from business sectors such as contractors, business partners, consultants, etc. The participants were invited to join in a demonstration of the system at the city hall and then afterwards they were asked to evaluate the system on transparency issue through the questionnaires.

Results

The results of the transparency evaluation by using the system are shown in table 1. On the issue of information transparency, after the demonstration and using the system to gain information the majority of users strongly agree that linking the information to other sources has increased information transparency. They are able to gather necessary information from other provinces to gain knowledge or support for decision-making. Through linked information, users are able to compare the data with other provinces. The information can be viewed in various ways through linked data to open source application. Transparency has been enhanced because the users are able to compare information in details of the similar projects in other areas. This gives users knowledge of necessary information such as standard price. This will reduce opportunities for corruption from vendor lock-in, intentionally duplicated projects, etc.

On the issue of Process Transparency, after the demonstration and using the system the majority of users strongly agree that the system has increased transparency of process. Users are able to check the status of documents process and the result. The users are able to track the project for progress and budget used.

Table 1 Transparency evaluation result

Types	Questionnaires	Strongly Agree (%)	Agree (%)	Neutral (%)	Disagree (%)	Strongly Disagree (%)
Information transparency	Does the system provide information of budget, comprehensive budget, and actual expenditure information?	49.17	31.67	12.50	5.83	0.83
	Does the system provide information in a timely and reliable?	62.50	18.33	11.67	7.50	0.00
	Does the system provide an explanation for calculation and aggregation as well as the coverage of the data?	41.67	39.17	14.17	5.00	0.00
	Does the system provide internal checks that prevent over-expenditure or illegal expenditure?	50.83	41.67	4.17	3.33	0.00

Table 1 Transparency evaluation result (cont.)

Types	Questionnaires	Strongly Agree (%)	Agree (%)	Neutral (%)	Disagree (%)	Strongly Disagree (%)
	Is budget information easier to access and compare through the system?	43.33	35.83	15.00	5.83	0.00
	Does the system allow users to explore information freely?	35.00	37.50	17.50	10.00	0.00
	Are users able to view specific information as needed?	36.67	35.83	16.67	10.83	0.00
	Does the system provide information or document in accessible form or format?	50.83	33.33	10.83	5.00	0.00
	Does the system provide accounted information?	36.67	37.50	24.17	1.67	0.00
	Is the information open to all who are interested?	56.67	26.67	10.00	5.00	1.67
	Are users able to participate and access information at anytime?	25.00	52.50	8.33	12.50	1.67
	By sharing the information online, will corruption be reduced?	41.67	33.33	20.83	1.67	2.50
Operational transparency	Does the system provide information of process or operation?	29.17	37.50	19.17	11.67	2.50
	Are roles and responsibilities between levels of government and involving person(s)/party(s) clearly identified?	30.83	31.67	8.33	25.00	4.17
	Is the information of process or operation accountable?	34.17	32.50	15.83	15.83	1.67
	Is the information of process or operation reliable?					
	Is the process open to all and can be accessed at anytime?	37.50	43.33	16.67	2.50	0.00
	Does the system enhanced decision making process?	40.00	29.17	17.50	7.50	5.83
	Can decisions or outcomes be monitored?	32.50	36.67	10.83	12.50	7.50
	By present the action of process on line, will corruption be reduced?	43.33	36.67	15.83	3.33	0.83
	Overall, the transparency has been enhanced effectively?	41.67	39.17	13.33	5.83	0.00

Discussions and Conclusions

By using Linked Open Data (LOD) in the system to link data from one source to another, transparency of government information and process have been increased effectively. The information can be linked to other government units which enhance the information by enabling users to conveniently access and compare information across the provinces. This capability also helps prevent some illegal activities such as projects being agreed at higher than usual costs. It is also creates fairness; anyone who would like to participate in government project bidding can easily access information on the supplier company, the price and product.

The proposed system can help increase transparency in e-Government effectively. The system increases the probability that the illegal action of government or others will be discovered by using document comparison and linked data. This enhances the data as users are able to gain more related information. The information that is linked is not limited to similar information from other government sectors but can be from various sources. This will help support decision making and make it easier to identify illegal activity.

Future Work

The current system increases the performance of e-government with LOD and ontology. However the ontology and the linked are still in the area of budget development of city hall. There are still other area of works that city hall is concerned such as provincial management, health, utility, and many more. The data/information of those areas of works are needed to be linked as well to provided better information for comparison or for more knowledge that user needed to complete the task. The next step is to expand LOD to cover more areas of work that city hall involved to link more relevant data.

References

Albornoz, F., Esteban, J. & Vanin, P. (2009). *Government Information Transparency.* Retrieved October 8, 2009, from http://ssrn.com/abstract=1407162

Berners-Lee, T. (2006). *Linked Data.* Retrieved March 3, 2009, from http://www.w3.org/DesignIssues/LinkedData.html

Bhatnagar, S. (2003). *Transparency and Corruption: Does E-Government Help?.* Retrieved July 8, 2009, from http://www.iimahd.ernet.in/~subhash/pdfs/CHRIDraftPaper2003.pdf#search='can%20egovernance%20curb%20corruption%20in%20tax%20departments

Blöndal, J. R. *(2003).* Budget Reform in OECD Member Countries: Common Trends. *OECD Journal of Budgeting, 2*(4), 7-26.

Charalabidis, Y. & Metaxiotis, K. (2009). *Ontology-Based Management of e-Government Knowledge. IGI Global.* Retrieved March 3, 2010, from http://www.semic.eu/semic/view/documents/Ontology-Based-Management-Charalabidis.pdf

Chen, X. (2009). *Towards Transparent E-Government Systems - a View from Formal Methods.* PhD thesis, Japan Advanced Institute of Science and Technology.

Fan, Y., Zhang, Z. & Yue, Q. (2009). *'E-government, Transparency and Anti-corruption'.* Paper Presented at 2009 International Conference on Management of e-Commerce and e-Government. September 16-19, 2009. Nanchang, China.

Hu, C. & Liang, M. (2008). *Ontology-based Framework for E-Government Knowledge Collaboration Service.* Paper Presented at 4th International Conference on Wireless Communications, Networking and Mobile Computing, Dalian, China.

Ju, C. & Zhang, C. (2008). *A Collaboration Model for E-government Based on Semantics and Multi-agent.* Paper presented at International Symposium on Electronic Commerce and Security (ISEC2008), Guangzhou, China.

Mehmet, B. (2001). 'Corruption, Connections and Transparency: Does a Better Screen Imply a Better Scene?'. *Public Choice*, *107*(1), 87-96.

Na Lamphun, P. & Wuwongse, V. (2012). 'Inter-Governmental Collaboration Through E-Document Computation: A Case Study of Provincial Budgeting in Thailand'. *IJICTHD 4*(1), 1-23.

Ndou, V. (2004). 'E-Government for Developing Countries: Opportunities and Challenges'. *The Electronic Journal on Information Systems in Developing Countries, 18*(1), 1-24.

Oasis. (2002). *Open Document Format for Office Applications (OpenDocument).* Retrieved April 4, 2009, from http://docs.oasis-open.org/office/v1.1/OS/OpenDocument-v1.1-html/OpenDocument-v1.1.html

Thacker, M. (2011). *Open Linked Data to Inform Policy and Improve Services.* Retrieved January, 2012, from http://www.epractice.eu/files/European%20Journal%20epractice%20Volume%2012_3.pdf

W3C. (2008). *SPARQL Query Language for RDF.* Retrieved October 9, 2009, from http://www.w3.org/TR/rdf-sparql-query/

Wescott, C. (2001). 'E-Government in the Asia-Pacific Region'. *Asian Journal of Political Science, 9*(2), 1-24.

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