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Preface

Assalamu'alaikum warohmatullohi wabarokatuh.
Welcome to ICENTRISA 2013! Welcome to Yogyakarta!

It is our pleasure to welcome you to the International Conference on Enterprise Information Systems and Applications (ICENTRISA) 2013. ICENTRISA 2013 is a scientific forum for presenting new research results and exchanging advanced ideas on enterprise information systems and applications, which ranging from theoretical and experimental to practical issues. We have invited scientists, researchers, engineers and practitioneers in the domain of interests from around the world to participate in this international conference.ICENTRISA 2013 is organized by Department of Informatics, Universitas Islam Indonesia.

The committee of ICENTRISA 2013 received 17 submissions from 6 of countries: Australia, India, Indonesia, Malaysia, Poland, and Taiwan. Each submission was reviewed by two reviewers. Based on the reviewers' recommendations, the Programme Committee accepted 10 papers (59% rate of acceptance) of which 5 papers were registered and appears in this proceedings.

We thank to all the members of the Programme Committe that contribute to the reviewing process. The PC members are from 8 countries: Australia, Bulgaria, Indonesia, Malaysia, Netherlands, Norway, Sweden and Thailand. We thank to the keynote speakers: Prof. Vilas Wuwongse (Thailand) dan Prof. Richardus Eko Indrajit (Indonesia).We also thank to all the members of the Organizing Committee for making ICENTRISA 2013 successful.

Last but not least, we sincerely thank all authors and speakers for their excellent contributions and the attendees for their participation.

Wassalamualaikum warohmatullohi wabarokatuh.

Yogyakarta, June 8 2013
Program Chair of ICENTRISA 2013

Dr. R. Teduh Dirgahayu

University Vice Chancellor Greeting (Welcome Message)

Welcome to the 1th International Conference on Enterprise Information Systems and Application (ICENTRISA-2013). An applied, multi-disciplinary field such as Enterprise information systems (EIS) demands interaction and collaboration between practitioners and researchers. ICENTRISA is expected to be one of premier forums in this field.

ICENTRISA is hosted by Department of Informatics, Universitas Islam Indonesia (UII) in Yogyakarta, Indonesia. The conference is in line with university vision to become a mercy to the worlds, aspiring to become an internationally recognized university. It has been our primary commitment in developing and disseminating science, technology, culture, literature, and art by promoting community development toward a just and prosperous of Nation's life.

Yogyakarta is renowned as a centre of classical Javanese fine art and culture such as batik, ballet, drama, music, poetry, and puppet shows. It became a major tourist destination in Indonesia thanks to the temple of Borobudur and Prambanan. Several other places of interests are Sultan (King) palace, Water Castle, Batik Center (Java traditionally made cloth) and Mount Merapi (one of the world's most active and dangerous volcanoes).

We wish to acknowledge all conference participants and thank them for their contributions. The collaboration between practitioners and researchers continues with each extending the boundaries of quality research and practice. We thank you all for your contribution in establishing Enterprise information systems (EIS) as a multidisciplinary field and pushing research to be even more useful and practice oriented.

We thank all the members of the program committee who worked diligently reviewing papers and providing valuable feedback to the authors. Their rigorous and timely reviews contributed greatly to this exciting program. Finally, we wish to thank all the authors for their high quality submissions and patience with delays and system glitches.

We hope you enjoy ICENTRISA 2013 conference and your visit to Yogyakarta.

Keynote Abstract
RDF: a language for EIS

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Abstract. ICENTRISA 2013 defines Enterprise Information Systems (EIS) as a study of seamless integration of business processes and information flows within an enterprise and inter-enterprises. The study includes technical, organizational and social aspects of the integration, as defined by The International Federation for Information Processing (IFIP) TC 8 WG 8.9 Enterprise Information Systems. EIS may also refer to information technology (IT) artifacts that enable and support the integration. This talk will demonstrate that the Resource Description Framework (RDF) could be used as language for the design and implementation of EIS. RDF could represent business processes as well as information and its flows within an enterprise and between enterprises. It could also model IT artifacts needed for the integration of business processes and information flows. In addition, RDF is a formal language and hence is equipped with some computational mechanisms. These mechanisms would facilitate the integration and its validation and maintenance. RDF database engines and its query language, SPARQL, have already been developed. Therefore, RDF could also be employed to implement EIS.

Understanding Success and Failure of E-government Development in a Developing Country from Actor Network Theory Perspective

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Abstract. As a complex technological innovation, e-government needs a suitable framework to understand its success/failure. For its ability to capture the complexity of the interaction between the socio-cultural components as well as the involvement and the need to align the technical and political factors involved in e-government initiative, Actor Network Theory was chosen to understand the success/failure of e-government in a developing country. This paper provides evidences on the contribution of Actor Network Theory in such success/failure. The paper also recommends strategy for better design and implementation of the e-government**.**

Keywords: e-government; actor network theory; developing country; e-government success; e-government failure

1   Introduction

E-government is a broad-based transformation initiative, facilitated by ICT to deliver public services, manage constituent relationship and support the economic and social development [24]. However, most implementation of the e-government in developing countries fail with 35 % being classified as total failures (not implemented or implemented but immediately abandoned), and 50 % as partial failures (major goals were not attained and/or resulted in undesirable outcomes) [1]. This is a disturbing fact, especially given that developing countries have a limited number of resources and cannot afford to wastefully spend large amounts of money for such ICT based projects.

Though challenges, strategies and tips have been provided by many researchers and practitioners to help the development of the e-government in developing countries, there has been limited studies that employ comprehensive approach using relevant theoretical framework. As a complex socio-technical systems that involves many issues and actors ([13],[6],[3]), e-government could be conceptualized from different perspectives and assumptions. One promising perspective is offered by Actor-Network Theory (ANT) as used by some researchers [3],[4]. It is because ANT provides framework to capture the complexity of the interaction between the socio-

cultural components as well as the involvement and the need to align the technical and political factors.

This paper aims to fill this gap by using ANT perspective to provide a more comprehensive understanding of two e-government projects in Indonesia. By using this perspective, the development of the e-government in developing country could be better analyzed in such a way that its development could be more successful.

2   Literature Review

Mapping E-government Success and Failure in Developing Countries

Using the 'design-reality' gap framework [1], there exists a simple framework to comprehensively mapping the failures of e-government in developing countries. E-government implementation failure could be classified into one of the three gaps, namely, 'Hard-Soft', 'Private-Public' and 'Country-Context' [2].

1)Hard-Soft Gap

Hard-Soft gap refers to the difference between the actual technology (hard) and the reality of the social context (people culture, politics, etc.) in which the system operates (soft). This argument is also concurred by several research findings such as [3] that technology is just one aspect of heterogeneous socio-technical elements that must be managed in the information systems project. This is supported by the fact that the success of e-government in Kerala India depends on resources, skill-level, values, beliefs and motivation of those involved in the project in question [4]. It means that lacks of training, skills and change management efforts would all affect the rate of failure, as they create a wide gap between the technology and its social context.

Therefore, it is imperative for e-government projects to establish the service and information needs for the benefit of the served community; and the technology itself should be developed in collaboration with the local staff. Most importantly, local administrative and political actors should be involved, or otherwise the possibility of failure would likely increase [5]. This would considerably decrease the Hard-Soft gap, and create a sense of local ownership. It is also important to involve the people most closely related to the project by improving local awareness of the project through some promotional campaigns [6].

The issue of change is also part of the Hard-Soft gap, as an e-government initiative constitutes the realignment of working practices and government functions. Since public sector must change and reengineer its processes to adapt to the new technology and culture of an e-government, this can be problematic and may result in some stakeholders political conflicts due to their reluctance to share information, hence perceived as a reduction of their authority [7], [8]. In the developing countries where corruption and rents are abound, the realignment of information flows and the underlying power structures are heavily resisted by actors with vested interest. That is why developers of e-government systems have to contend with politics, power struggle, and conflict, although the literature that deals with this is to date sparse [9], [10]. If

the resistance is not dealt with by using change management or similar initiatives [11], the gap between the technology and its social context cannot be bridged.

2) Private-Public Gap

Private-Public gap refers to the difference between the private and public sectors, due to gaps between systems designed for the private sector and the reality of the public sector into which the systems is transferred. A common problem associated with the public sector is uncompetitive rates of pay as compared to the private sector. The prevalence of this situation impedes the recruitment of high quality IT professionals [12], which leads to a lack of public sector skills. As a result, e-government projects are often outsourced to the private sector, fuelling a clash of culture and values, as well as leaving even larger gaps between the design and the reality [1].

Some governments try to adopt private sector approach that brings consequence to change their view of the recipients of these e-government projects from citizens to customers. This represents a substantial paradigm shift and many developing countries face difficulties with e-government application. Reference [13] identifies numerous problems with seeing a citizen as a customer. A customer needs market mechanisms, and the right to choose between different alternatives. This is not possible for an e-government application that operates as a monopoly. Furthermore, the private sector sees customers as a means to increase profitability and it introduces price discrimination and similar mechanisms to create inequalities between customers. In the meantime, the government must provide an equal service to all customers (citizen) to create a successful e-government platform.

3) Country-Context Gap

Country- Context gap refers to the difference that exists when applying the e-government systems for both developed and developing countries, which arises from the gap between systems designed for one country and the reality of a developing country into which the system is transferred. Developing countries often have a poor ICT infrastructure, which constitutes a further obstacle for the implementation of the e-government [14]. This lack of infrastructure can cause problems if an e-government model from developed country is adopted in its entirety by a developing country. One of the benefits of the e-government in developed countries is cost reduction in terms of the transfer of information and online transactions. However, due to a lack of infrastructure in most developing countries, the telecommunication costs can be high, thereby nullifying this benefit. In situation like this, it may be more appropriate to look at low-tech solutions that fit in with the existing infrastructure [5].

Though there were many researches on e-government success-failure, studies on the political consideration thereof is still rare [15], [9]. By political consideration, it means the way in which different stakeholders in an e-government project relate to one another via political processes such as coalition and conflict. This may happen as most e-government research attempts tend to draw more from the IS (Information Systems) discipline rather than from the domains of governance such as political theory and public administration [16]. However, following the notion of IS development paradigm, the sparse research on political factors of e-government might be caused by the way how e-government is conceptualized. If e-government was conceptualized as

actor-network, it might entail the important of political and alignment process in e-government research. It is in accordance with what [3] concluded that 'the application of ICT is an inherently political process and that a successful outcome requires continuous incremental action and improvisation to address the ongoing issues as they emerge.' Further, reference [1] and [2] conclude that the success-failure of IS development is much affected by its design process then ANT is seen as having a potential and promising theoretical framework for the design and implementation of e-government. Additionally, reference [17] points out that one of the key success in e-government initiative is to make coordination among actors who have different interests.

Actor Network Theory (ANT)

Some specific characteristics of ANT need to be mentioned to lay foundation to use as research framework.

- ANT perceives social reality as a complex network of relationship that always involves human and non-human entities [18].
- It holds radical assumption that neither human nor non-human should be given a privilege in determining the stability of certain social reality.
- It rejects essentialism and instead embraces "relational" point of view by stating that both human and non-human entities are just an effect or outcome of a network (in relation to one another) [19].
- ANT refers all entities (human or non-human) involved in this complex network of heterogeneous element as "actors" or "actor-network" [18].

ANT labels a stable actor-network as a black box so its analysis may focus only on its inputs and outputs. Since a black box is an actor-network then its stability is also influenced by all material involved. The black box could be opened up and analyzed as an actor-network by tracing all its relevant actors and their relationship [21].

In opening up a "black box" of reality, ANT uses the notion of translation [22] to make sense why certain social reality finally becomes stable/ unstable over time. Translation could be described as a process in which actor(s) mobilizes resources or another actor-network to form allies that result in a stabilized actor-network. Therefore, translation explores the ways in which the networks of relations are composed, maintained, and made more durable over time. The translation process involves four moments (phases) as follows [23]:

1) *Problematization*. In this moment, one or more key actors define the nature of the problem and the roles of other actors to fit the proposed solution. The solution is offered in such a way that all actors participated will be subjected to some centralised control mechanism labelled as an "obligatory passage point (OPP)."

2) *Interessement*. Here, all actors identified in the first phase are given specific roles and identities and the strategies that need to be acted upon which will attract them. This attraction is the interessment device that will lead them to the next phase.

3) *Enrolment*. The success of the strategies related to the interessement device will result in the enrolment of actors to establish a stable network of alliance. However, the stability of this alliance depends on the negotiation process to define their roles in the network.

4) *Mobilization.* Once the proposed solution gains wider acceptance, then an even larger network of absent entities are created through some actors acting as spokespersons for others.


3   Reserch Methodology

Data used for this interpretive case study were gathered in 2009 to 2010 from two e-government projects in Indonesia. Yogyakarta Cyber Province Initiative (YCPI) and Sragen One Stop Service Initiative (SOSSI) projects were selected. These two projects are the appropriate cases since the first is considered as problematic but the second is a successful one. Data gathered include factual (numerical), textual, audio, and visual event. Data were collected by conducting some observation at the two project sites, inspecting archival documents, browsing their websites, and recording semi structured interviews. The interviews were conducted in local language and involved 22 and 15 personnels respectively. All interview sessions lasted from 30 to 90 minutes. Recorded interviews were transcribed fully before they were analyzed thematically. Twenty themes were used to code data and were developed mainly from ANT translation processes, e-government development elements, and some related social issues such as prosperity, values and beliefs.

4   Case Description

A. Case 1 : Yogyakarta Cyber Province Initiative (YCPI).

Realizing the potential contribution of ICT to improve the low quality of public services from the provincial administration of Yogyakarta, YCPI aimed to promote a new model of managing province that would transform the way the state government efficiently and effectively delivered its services to public. The model aimed to enable the provincial government to serve public better and to speed-up/expedite the state development by intensively using ICT. To solve this transformational problem, YCPI involved many actors. The actors's roles, interest and conditions could better be described by a network of interests owned by each actor as presented in Figure 1. This network may represent the fact that government transformation would only happen if an alliance occurs as follows. (a) The head of various offices want to fully participate in government reform program to serve people better; (b) Province Information Office (PIO) staffs are consistently willing to manage the implementation of YCPI; (c) The Governor of Yogyakarta keeps wanting to serve people better; (d) ICT infrastructure functionally operates well; (e) Team for Innovation and Change (TiMPII) is continuously supporting change initiatives; (f) Partnership for Government Reform Organization wants to make governance reform successful.
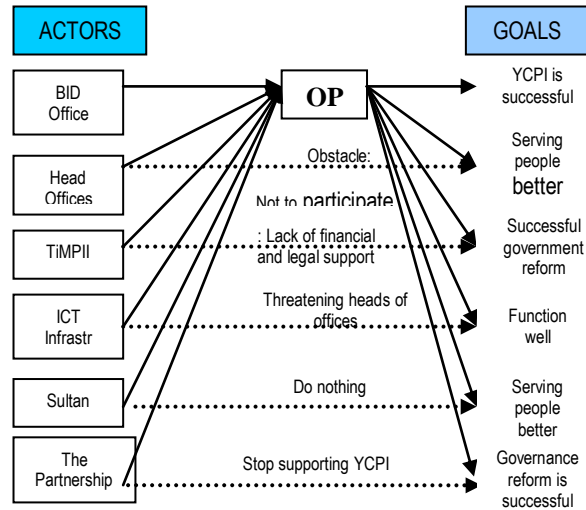
Fig. 1. Actor-Network of YCPI

To solve the problems, YCPI involved six offices to develop its own service of excellence as follows:

1) Education Office: To improve education quality through Yogyakarta learning gateway, regional digital library and knowledge center network.
2) Industry and Commerce Office: To improve revenue and welfare of the society by enhancing commercial growth. It is achieved by increasing access to global as well as regional market and building SME (Small Medium Enterprise) business center.
3) Agriculture Office: To improve farmers' welfare through agro-business programs by providing information on agro-business and market.
4) Transportation Office: To improve regional economic activities through the development of a good transportation services.
5) Tourism Office: To improve people's welfare and competitiveness through tourism promotion.
6) Fishery Office: To facilitate the development of fishery community and their competitiveness.

Staffs of PIO expressed differently in perceiving the progress of YCPI ranging from being realistic to pessimistic. Those who were realistic consider YCPI as a long term dream and it would automatically be successful as public's readiness and demand increases over time. Those who were pessimistic argued that such similar initiatives had been introduced many times long before the notion of e-government existed and had never been successful. One of PIO staffs who had been actively involved in developing computer-based application for government sectors expressed his pessimistic stance by having this to say:

"Though there are many small-scale IT applications that have been used to support government activities like SIMPEG (personnel records system), but after waiting for a long time many people keep questioning what the real contributions to society of all these initiatives are?"

Among the six services of excellence, only education and commerce programs were considered moving to achieve their goals. The education service of excellence even received support from Ministry of Communication and Information through a Japan-funded project to strengthen school ICT-readiness by distributing computers and connecting school computers to the province's library network. The industry and commerce service of excellence program managed to set up and maintain the so-called Yogyakarta Business Service Center (YBSC) to help business community easily get support from and exchange information with government agencies and business communities. This center offered several services to SME (Small Medium Enterprise) in the form of advice, consultation, and training in the area of marketing, management, ICT adoption, and partnering.

Although the Governor of Yogyakarta officially launched the *Agricenter* (the service of excellent of Agriculture Office) on July 1st, 2009, less than one year later (May 2010) *Agricenter* was down and could no longer be accessed. When the staffs managing the website in Agriculture Office were interviewed, one of them explained thus:

"… honestly we have no competence to manage this. Now we have only one non-permanent staff who has ICT background and we are still planning to hire one more staff."

Meanwhile. the Transportation Office planned an ambitious transportation information system by integrating it with IP-based digital camera installed in some crowded main road in Yogayakarta. The system was projected to provide real time vehicles traffic situation in some main roads in down town Yogyakarta. Unfortunately, until March 2010 the transportation information systems had never been implemented. The head of Transportation Office explained why its service of excellence could not be successfully implemented as follows:

"Obstacles from our office to implement our service of excellence include low understanding, readiness and commitment of our staffs. We also face organizational and financial problems. Besides, I think for the last 4 years of implementing YCPI, the even bigger problems were found in the provincial level…"

The tourism service of excellence program has been developing a good website to promote tourism in Yogyakarta. The website published information on some tourist destination sites, hotels, events, and the tourism activities. It also published news related to tourism and tourism office activities. Unfortunately, the website was written only in the Indonesian language with which many foreigners were disappointed and felt cheated since the name of the website was in English *www.visitingjogja.com*. Though the published information was very interesting and could help tourists when visiting Yogyakarta, they were neither accurate nor complete as reflected by many visitors' complaints in its guest book.
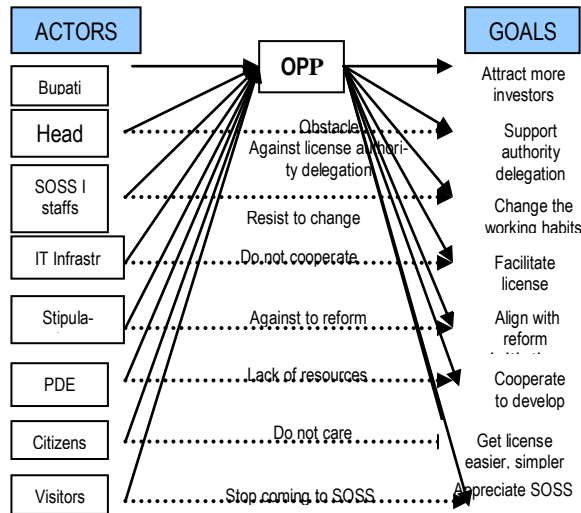
A promising result from fishery service of excellence was the development of Fishery Business Center. It was a website (http://fbc.perikanan-diy.info/home.php) to effectively connect buyers and suppliers of fish products. Buyers could easily distribute their demand via SMS (Short Messaging Systems) to Fishery Office that subsequently distributed them to all registered suppliers. Conversely, anytime a supplier could send information about their available products by sending massage to Fishery Office that will forward it to all registered buyers. Although the initiative was in line with the formulated service of excellence from Fishery Office, the number of users of this facility was very limited. As of March 2010, there were less than 20 registered suppliers and less than 15 registered buyers. More importantly, the recorded activities of selling and buying fishery products were limited and were not done daily.

Not only did those implementation failures affect YCPI performance, but the introduction of government regulation No. 41/ 2007 also made YCPI uncertain. This regulation that limits the number of offices in the province as well as in local administration level had eventually been used to dissolve the existence of PIO and was finally reduced into just a section of the Transportation and Communication Office.

B. Case 2: Sragen One Stop Service Initiative (SOSSI)

The main idea of establishing SOSSI was very simple but fundamental, namely how local administration of Sragen regency fulfilled its mandate to better serve public license inquiry by providing simple, transparent, accountable, and one-stop service. This new kind of service tried to replace the common practice of government service where citizens had to undergo complicated and unclear process as passing through several different office red-tapes. Using this idea, the local administration of Sragen tried to implement not only an effective and efficient government administration but also a new paradigm of work culture that focused on treating citizens as government's customers.

The most crucial part in establishing SOSSI was to get support from various heads of offices who were currently holding authority to issue licenses. It was common that not only the head office but also some lower-level government staffs abused "power" and authority to manage, control, and complicate the issuance of licenses for their personal benefits. Another problem was how to efficiently run the one-door service just like a private entity. To manage this situation, the head of Sragen regency (the "Bupati") conducted many meetings to promote, explain and solicit support by involving related heads of offices, some important personnel from his own office and other local legislative bodies. He then problematized the establishment of SOSSI by defining the roles of each involved actor. Figure 2 provides the description of the roles and relationship of some important actors involved in the problematization process. This description precisely portrays that the establishment of this one stop service involved complex actor-network of heterogeneous elements.

ACTORS

Bupati
Head
SOSS I staffs
IT Infrastr
Stipula-
PDE
Citizens
Visitors

OPP

Obstacle
Against license authority delegation
Resist to change
Do not cooperate
Against to reform
Lack of resources
Do not care
Stop coming to SOSS

GOALS

Attract more investors
Support authority delegation
Change the working habits
Facilitate license
Align with reform
Cooperate to develop
Get license easier, simpler
Appreciate SOSS

Fig. 2. The Problematization Network of SOSSI

The Bupati attempted to influence and stabilize all the actors he defined in the previous step by introducing several attractive programs. These programs extended and materialized the hypothesis he made concerning the success of SOSSI which include the following:

(a) License inquiry should be simple, fast, and transparent,

(b) Offices involved should support the new process of delivering licenses by returning its authority back to Bupati,

(c) SOSSI staffs could be transformed to become professional workers,

(d) ICT and private sector practice could be fully adopted,

(e) Excellent license services would attract more investors.

Using these hypotheses, Bupati implemented three new important interessement devices which are:

(a) Granting SOSSI unit an authority to issue licenses after retracting that authority from various offices.

(b) Facilitating SOSSI to adopt corporate work culture and management equipped with new reward system.

(c) Providing incentives to members of the business community who wants to initiate operation in Sragen.

Some indicators could be attributed to account for the success of SOSSI. From the citizens' point of view, the simple, transparent, and accountable services are found satisfactory for them. Based on service satisfaction survey with 150 respondents conducted twice a year, the customer satisfaction index increased from year to year. On the last two surveys, the customer satisfaction index scored 83.995 % and 84.005%

respectively. One customer who was also an entrepreneur justified SOSSI performance by saying thus:

> *"This SOSSI is very beneficial for business since I always get help whenever I apply a business license. To get a business license I do not have to wait for a long time, I am provided with convenience facilities and served excellently by SOSSI staffs. Based on my experience, I just needed less than one week to get license to start my business."*

From some government and non-government organizations' point of view, SOSSI has also been considered as a good model of a quality public service provider. It did not come as a surprise that SOSSI then obtained some recognition from different parties starting from non-government organization, local government nation-wide, to the president of Indonesia. Moreover, the central government of Indonesia had chosen SOSSI as the best practice public service agency in Indonesia and encouraged other local governments to use it as a model. Consequently, many times Sragen had been appointed by the central government to be the consultant in developing some government stipulations on public services. Sragen was also consulted by Indonesian Commission on Anti-Corruption because the way SOSSI promoted transparency was reportedly able to minimize corruption practices.

From the Sragen local government point of view, SOSSI was indeed something to be proud of. Now, local government and people of Sragen were so proud of having at least two visitors coming to SOSSI every day doing comparative studies. Being proud as a model of service excellence, staffs in SOSSI eventually instilled their confident that they were able to contribute good things not only to the people of Sragen but to people and government of Indonesia at large. This kind of accomplishment also happened particularly every time Sragen was invited by other local governments to help the establishment of similar services. Staffs of SOSSI now started believing that employing new paradigm of work to serve public and not to be served was really meaningful and rewarding.

From the economic point of view, SOSSI has managed to directly and indirectly increase revenue and investment to local government. In 2002 Sragen's revenue was only IDR 22.56 billion but in 2006 it rose to IDR 72.77 billion. Similarly, total investment to Sragen was only IDR 592 billion in 2002 but it increased to IDR 1.2 trillion in 2006.

In promoting SOSSI, Bupati stressed that ICT would be intensively used. In many occasions Bupati unintentionally became a rightful spokesperson of voiceless ICT too especially when he himself frequently used ICT to present his ideas. He removed over-head projector (OHP) from his meeting room to condition all his staffs to used laptop and viewer projector instead. Bupati also acted as a legitimate spokesperson of ICT when he strongly encouraged KPDE to come up with a computer-based system which enabled him to digitally monitor all office performance at any time.

5   Discussion

By holding ontological assumption of e-government as actor-network, the main concern of its development is maintaining its dynamic association or relationship among involved heterogeneous entities. As outlined by Callon ([2]), maintaining these relationships will definitely relate to the above mentioned four moments of translation.

The stage of problematization is very important in the translation process. This stage is not only important to rightly define how to include actors and proposing problems to solve but will also affect the understanding of the subsequent stages, especially in the interessement stage. In the YCPI case, the very broad problem as how to serve public better does not guarantee that the problematization process will result in direct enrolment of government actors, especially when there is no clear benefit to government actors. Although using the same notion of improving better public services, SOSSI addressed a clearer and simpler problem of how to make various license processing easier and faster. This simpler problem resulted in easier actors identification and interessement strategies formulation.

Although the problematization in both YCPI and SOSSI involved human as well as non-human actors but SOSSI had more non-human actor than YCPI. SOSSI also included office technology, such as the CCTV, local regulations and ISO standards in addition to the ICT infrastructure as non-human actors. YCPI only involved the ICT infrastructure in its problematization.

Interessement can be defined as a mechanism or strategy used by actors to attract other actors to participate in their problematization network. This stage is not easy to formulate in a government setting since it cannot be easily based on economic and organizational measures, such as efficiency and customer satisfaction. It is because government agency is not a business entity. Therefore, the interessement strategy formulation should be more based on the assumption that e-government is a network of heterogenous actors having diverse interests. Using this assumption, the interessement formulation should account for the sociological perspective in which the actors' interest relates to their sociological interrelationship, such as trust, political alliance, resource access, and power sharing. In the SOSSI case, the interessement strategies were more sociologically-oriented than in YCPI because they accommodate many aspects of social life: economic (incentive salary), managerial (ISO standards), technical (ICT infrastructure and its system), legal (local and central regulation), as well as spiritual (the notion of '*ikhlas*') and ideal ('coloring' Indonesia).

Related to the role of non-human entities involved in the interessement strategies of SOSSI, the new reward system, the ISO standards, the ICT, the local regulations, and the office technology, such as the CCTV, have all contributed significantly to the network stabilization, as ANT assumes that durability of a network depends to the durable materials participating in the interessement strategies. This findings help explain why the SOSSI network was more stable than YCPI network since YCPI had fewer durable materials in the interessement strategies.

Enrolment as a result of successful interessement is then can easily be explained. The sociologically comprehensive interessement strategies in SOSSI finally enrolled all related actors. On the contrary, weak and limited interessement strategies in YCPI failed to enroll most actors especially heads of offices though their offices had been

appointed as parts of the excellence service program. Interestingly, the comprehensive interessement strategies in SOSSI also resulted in more committed staffs since they involved the spiritual aspect, namely the notion of 'ikhlas.' Many staffs gave assurance that they were happy if they could serve public better. Their enrolment to SOSS was not be based merely on the benefits they got but was attached to something deeper within their belief.

As all relevant actors enrolled faithfully to the SOSSI network, some of them became spokespersons and they represented the rest. Through this representation all involved actors were easily mobilized by those who acted as spokespersons. This representation involved different actors for different mobilization. However, most of the time, the Bupati represented many other actors, both human and non-human.
Although the success and failure of an e-government initiative is a problematic notion (Dada,2002), here in this present study they refer to the situation in which the stated objectives of the initiative can be, or cannot be, achieved significantly. Looking at both cases, SOSSI has been more successful than YCPI. Not only that finally the SOSSI project can serve the public better in processing their licenses but SOSSI has also received a lot of recognitions from various parties and has resulted in increased revenues. Meanwhile for YCPI, there was no apparent benefit to the public except that they could get free internet access and some schools received computer sets and access to the local government's library.

As presented in the preceding section, many findings supported the fact that weak problematization of YCPI resulted in limited and weak interessement strategies. As such, YCPI subsequently failed to enroll actors and consequently made it difficult to mobilize them in order to stabilize the network. On the contrary, in the SOSSI project, the clear and simple problematization equipped with comprehensive interessement strategies resulted in faithful enrolment of many actors who became legitimate spokespersons so that, in turn, they could mobilize other actors to stabilize the network. To sum up the discussion, Table 1 presents the comparison of the four moments of translation processes happened in YCPI and SOSSI respectively.

Table 1. Translation Process Comparison Between YCPI and SOSSI

Stage	YCPI	SOSSI
Problematization	The very broad problem as how to serve public better did not result in direct enrolment of government actors, especially when there was no clear benefit to government actors. It also made difficult to formulate interessement strategies.	SOSSI addressed a clearer and simpler problem of how to make the processing of various licenses easier and faster. This resulted in easier identification of actors and formulation of interessement strategies
Interessement	There were limited interessement strategies and they were focused only on the aspect of formal and legal approaches.	The interessement strategies were more sociologically-oriented for they accommodate many aspects of social life.
Enrolment	The limited interessement strategies failed to enroll most actors especially heads of offices though their offices had been appointed as parts of the excellence service program.	The sociologically comprehensive interessement strategies finally enrolled all related actors.
Mobilization	Involved actors were difficult to mobilize because of limited legitimate spokespersons.	All actors were effectively mobilized because leadership was unintentionally exercised using de-centered notion of power.

Using success/failure framework ([2]) to interpret these findings, the success of SOSSI and the partial failure of YCPI could be categorized in the hard-soft gap. In the case of YCPI, the social context (people, culture, and politic) was not appropriately managed and aligned while in the SOSSI, it was well managed along the project life cycle. In both cases, ANT translation process has helped pinpoint how and to what extent the hard-soft gap occurred.

6 Conclusion

Learning from these two cases, the ANT translation process has helped explain why YCPI was a problematic initiative and SOSSI was a successful one. This conclusion may provide guidance to e-government designers to use the ANT translation as a development framework. Using this framework, designers of the e-government should pay attention on how to formulate appropriate problem to address, identify the relevant actors, determine suitable objectives, and propose a set of strategies to attract all rele-

vant actors to participate in the project. Moreover, they should make sure whether the created network can produce some legitimate spokespersons representing the rest of the actors so that the mobilization process can effectively take place.

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Toward a Classification Model of Enterprise Architecture Frameworks

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Abstract. Studies on the focus of (and issues faced by) IT managers over the years that have been conducted by the Society for Information Management (SIM) indicate that information systems strategic planning (IS Strategic Planning) and enterprise architecture (EA) have received much attention from IT managers. In addition, "IT and business alignment" has also been valued and this reflects the recognition from businesses that business strategies require the assistance of information technology. Based on the demand for organization-wide IS strategic planning, this paper stresses the role of enterprise architecture in presenting the business value of information systems. Stevenson's 4-dimension model of enterprise architecture was adopted to analyze enterprise architecture concepts and methods. This study proposed a classification model of EA for clarifying the different orientation of EA frameworks.

Keywords: Enterprise Architecture, Classification Model, IS Planning, Business Transformation, Strategic Alignnsment

1 Introduction

Enterprise architecture (EA) is gradually becoming one of the IS disciplines that has most extensively studied the importance of developing and maintaining IS architecture in an organizational context [18]. The EA method offers a broad and unifying approach to the management and planning of IT in organizations by balancing corporate IT investments, services and maintenance expenditures [17]. The EA method aims to align information systems strategies and enterprises' goals, to optimize organizations, to use open-minded thinking to evolve operation models, and to distribute resources reasonably to lead the development and integration of each information system. Generally, the primary value of the EA methods is to embrace the planning and management of all IT assets and their architectures together with organizational structures and processes [7-8, 17-18].

Based on top-down planning and bottom-up implementation concepts of BSP, contemporary EA frameworks deliver a blueprint view of an organization that is understood by an organization's stakeholders from the business level to the IT level [17-18].

In addition, EA frameworks are regarded as organizational transformation approaches that model the current state of an organization's business and its IT mission and capabilities in developing a transitional plan to implement new technologies in response to changing mission needs.

There are a many EA frameworks and methods that operate in different organizational contexts. Across the literature, the EA discipline remains immature and lacks convergent concepts and practice. It is important to adopt meta-level models to analyze and review the core components of EA frameworks. In this paper, a classification model of EA framework is proposed for practitioners and researchers to clarify thought processes and to improve the scholarly understanding of EA.

2　Studies on the Practices of Enterprise Architecture

In recent decades, SIM has been systematically and coherently studying issues that IT managers have focused on and its studies have had great reference value for industrial and academic studies alike; we were able to both discover changes in significant issues in academia and in organizations' burgeoning needs to cope with rapid environmental changes [1-5]. In this line of study, Niederman et al. proposed a classification scheme to classify and rank those important issues [6]into the following 4 groups:

1. Business Relative Issues. This group includes issues such as data, resources, alignment of information technology and strategy, strategic planning, investigation of the role and contribution of information technology, organizational learning, competitive advantages, business process restructuring (reengineering), etc.
2. Internal Effectiveness Issues. This group includes issues such as systems development, IT human resource management, IT effectiveness measurement, system transfers, etc.
3. Technology Infrastructure Issues. This group includes issues such as information infrastructure, distributed systems, enterprise architecture, communication networks, etc.
4. Technology Application Issues. This group includes issues such as built by users, computer-aided software engineering, executive/decision systems, office automation, group support, etc.

In this scheme (Figure 1), business relative issues was highly focused upon; enterprise architecture played a core role as a blueprint of enterprise information planning that continued business transformation and spearheaded future systems development.
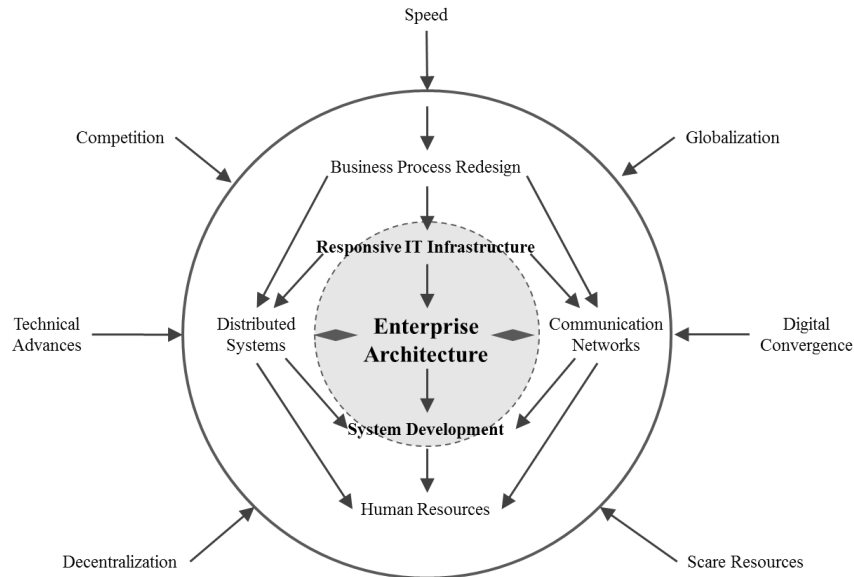
Fig. 1. Classification scheme of issues that IT managers focus upon

IS strategic planning and enterprise architecture have been the core issues that enterprises have been focused upon. In the studies of the MIS Key Issues Survey conducted by Dickson et al. in 1983 and Wetherbe in 1986, the "Building Enterprise Architecture" issue was not focused upon by IT managers in the studies before 1986; remarkably, this issue had become the most important matter in the 1990 survey conducted by Brancheau, Jams and Wetherbe. This reflected enterprises' recognition of enterprise architecture and their gradual needs in that direction[1,2].

The summary undertaken by the researcher regarding SIM's studies concerning issues that IT managers focused on over the years indicated that "IT and business strategy alignment" was one of the core issues that received the most attention from IT managers over the years. In surveys over the past 8 years, it ranked as the most important 6 times; however, related issues – such as business process reengineering, IT strategic planning and enterprise architecture – were also subjects of IT managerial focus (Figure 2) [3-5]. Among these, business architecture was the important branch of information systems strategic planning and had become the core technology of information systems planning. According to the studies of recent years, the development of enterprise architecture has become a significant issue that has received a significant amount of attention; in addition, this also reflected its close relationship with information systems planning.
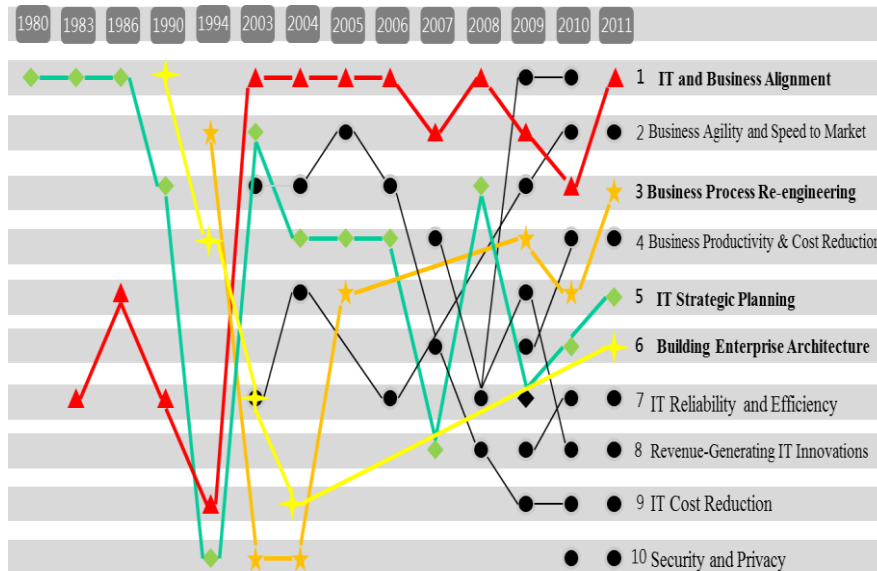
Fig. 2. Summary of IT managers' focus of business relative issues by SIMs

3 Dimension of Enterprise Architecture

This study used Stevenson's 4-dimension model of enterprise architecture, including form, content, method, and infrastructure to analyze enterprise architecture (EA) [11] and to create the basic framework for reviewing EA concepts and methods.
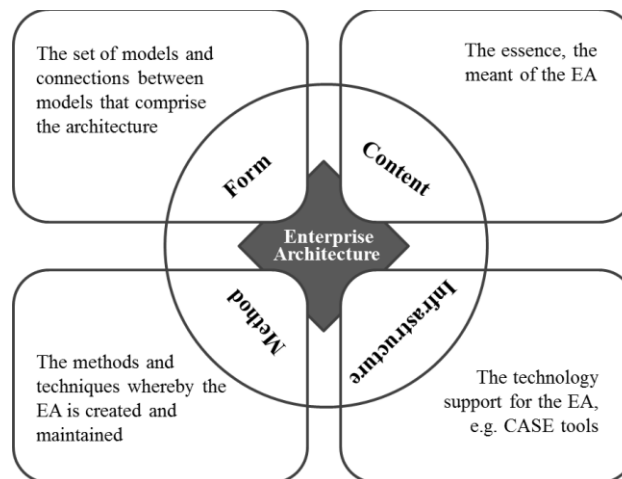

Fig. 3. The 4-dimension model of enterprise architecture

3.1 Form and Content: A set of model and the relation with the model

In the Form and Content dimensions, the important frameworks include Zachman's framework, Finkelstein and Perkins's enterprise architecture framework and The Open Group Architecture Framework [8].

Enterprise architecture is regarded as a master blueprint with a comprehensive scope that must cover a wide variety of viewpoints, deliverables, and processes across the organization (Bernard, 2004). Certain segments of the EA literature has a technical focus on entire information systems, including software, data, and infrastructure. Conversely, other analyses have a more holistic focus on the entire organization to act as a collaboration force between aspects of business and IT [8, 15, 18].

In 1987, Zachman published "A Framework of Information System Architecture" in IBM Systems Journal (Zachman, 1987). He referenced the concept of the blueprint for rethinking organization-wide information systems planning. The three fundamental architecture domains – data, function, and network – were proposed in this initial stage. Zachman was continuing to extend and evolve the content of the EA framework in 1992 and 1993. Other domains of EA, such as people, time, and motivation, are integrated into the EA framework for representing the integration and interoperability of EA. Zachman worried that the misleading "enterprise architecture" term would lead to focusing only on IT issues. He published the standard "Zachman Framework" meta-model in 2005; hopefully, that will serve to clarify the orientation of EA as a business issue [21]. In this new framework, What, How, Where, Who, When, and Why were adopted to replace the original domain terms of data, function, network, people, time, and motivation (22). In addition to the new domains, the Zachman framework depicts business architectural principles by clearly defining that the top three rows address business ideas, whereas the bottom three rows address operations reality. This change further moved EA away from the IT domain and shifted it back into the business domain from which EA had emerged.

The Zachman framework included complete dimensions and covered all types of perspectives on enterprises' internal and external processes; therefore, it was helpful to analyze the interactive components of organizational processes. Finkelstein and Perkins's EA framework was developed by the Visible, which amended the Zachman framework according to its practical use. Its domains are identical to Zachman's but the wording is different; its dimensions were referred to as environment, data, process and infrastructure.

TOGAF was an open industrial standard to design, evaluate and develop enterprise architecture [8]. It aligned with an enterprise's vision and strategy by which to lead the development of the four basic domains of enterprise architecture, i.e., architectures of business, data, application, and technology. For illustrating the content and form of EA, TOGAF proposed the meta-model of EA and Architecture Content Framework. In the meta-model, TOGAF describes the set of models and the connections between them. In the Architecture Content Framework, there is a set of deliverables (outputs) and the relationships among them.

Forrester Research (2009) reported the most important parts of the EA program and found that infrastructure, security, application, integration, information, and business architectures were addressed by IT professionals. Infrastructure architectures are the most-addressed and implemented domain of EA. Infrastructure models are the foundations that support the application and information architectures, which enable the business model of enterprise. In this practical survey, business architecture is relatively less addressed [14].

3.2   Method and Infrastructure: a Set of Technologies and Methods to Build and Maintain EA

Feurer (2012) surveyed enterprise architects' criteria when evaluating the EA framework and the results showed that the most important factor was whether it used the top-down concept and method (24%), i.e., whether it used an enterprise's vision and strategy and developed its EA according to those features; another important factor was process (or procedure) (23%) which provided phases and step-by-step guidance for the development of EA and could plan and design all aspects of EA systematically and concretely. Lastly, architecture governance commanded 17% of the evaluation weight. Architecture governance is the key process to manage organizational change and to keep aligning with an enterprise's vision and strategy [13].

TOGAF could assist in building enterprise architecture, optimizing management processes and systems, aligning with strategies, and providing a basic framework (blueprint) for strategy, business process, and IT structural design. The Open Group was an NPO promoting open standards; therefore, TOGAF was widely supported by international professional communities of IS and was verified in practice. Currently, it has been widely applied worldwide in top 500 companies, including over 60% of the Fortune 50 and more than 80% of the Global Forbes 50 businesses have used TOGAF [8].

TOGAF Architecture Development Method (ADM) was a step-by-step method to develop and maintain EA [8]. Architecture vision was the beginning premise, it next confirmed information systems and technology architectures after business architecture was planned, and it then applied current information bases and aligned with an enterprise's strategic goals, business processes and IT architecture. The development process covered business transformation that could be decomposed as the following: (1) defining vision and mission, (2) defining opportunity for improvement, (3) analyzing pros and cons, (4) analyzing current (AS-IS) processes, (5) analyzing future (TO-BE), and (6) developing the design of future (TO-BE) processes. Next, a movement project was planned; according to the priority of the adaptive solution, we evaluated a dependence model and the extent of each project, the movement cost and benefit, and then framed the actual planning. We next implemented governance, offered suggestions for each implemented project and built up architecture regulations to manage all processes of implementation and deployment to ensure the consistency of the architecture of the implemented project and related projects. Lastly, architecture change management focused on the changes and development of business goals, environ-

ments and technologies and provided reference for determining whether a new architecture evolution cycle should be activated or planned.

4 Classification of Enterprise Architecture Framework

The EA frameworks claims to take the entire enterprise into account are often associated with IS planning, development and management, IT governance, and strategic rethinking to create competitive advantages. According to the functions of EA and the nature of the methodology of information systems planning, a classification model of an EA planning framework was proposed to be grouped into 3 types for further understanding:

1. Integrated Planning Framework. This type focused on the planning of the overall needs of an organization, and the major form was convection planning cycle. For its methodological purpose, it emphasized the extraction and integration of internal information needs, and enterprise architecture was an integrated blueprint and distributed resources [8, 15-16].
2. Aligned Planning Framework. This type mainly used top-down planning cycles for planning and information systems strategy was fully connected with the organization. Its methodological purpose was to support an enterprise's current strategy [8, 15-16].
3. Impacted Planning Framework. This type's primary form was an inside-out and outside-in cycle, and it included information systems into an organization's strategic planning process to obtain competitive advantages. Its methodological purpose was to support an enterprise's rethinking and define its strategic opportunities by understanding the role of information systems [8, 19-20].
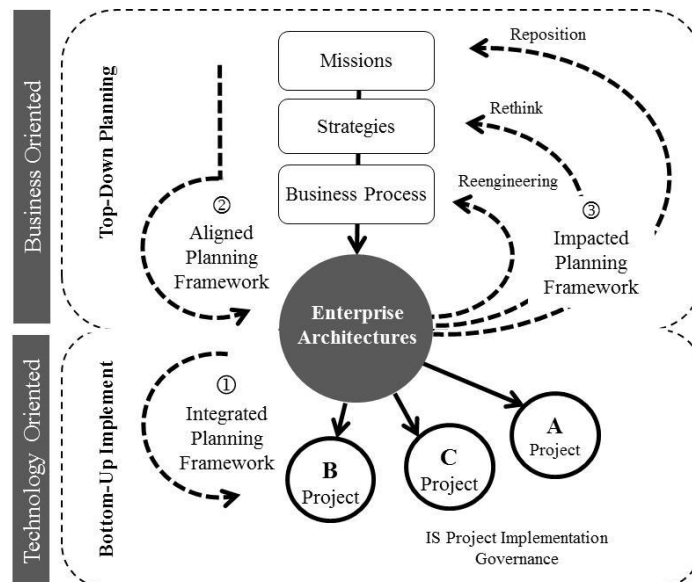

Fig. 4. Classification Model of the EA planning framework

The core concept of the enterprise architecture framework was to link itself with an enterprise's vision to align with its strategy upwards and to integrate and lead future development of information systems downwards; it mainly used enterprise architecture as its core, integrated all of the dimensions of operation, optimized an enterprise's management processes and systems, focused on the overall planning and design of strategy, and further provided a basic framework and strategic blueprint for strategic, business framework, and IT structural design.

However, only considering the top-down planning concept could not match the nature of business dynamics; therefore, enterprise architecture should have an adaptive nature to enable a flexible modification of the integrated framework [10] to cope with the derived needs and the strategic application systems after organizational changes. In addition, Lyytinen proposed that enterprise architecture should show the natures of openness and evolution [9]. To cope with changes, enterprise architecture must adjust to the methodology of positioning and development.

For business management, enterprises emphasized rethinking the operational system anew and redesigning the changes of business architecture; therefore, business process reengineering, business strategy rethinking and business repositioning could be classified as "impacted planning methods" that were different from top-down alignment and integration and which emphasized reshaping bottom-up business process and strategy.

In 2009, Forrester surveyed the "State of EA" and sampled up to four hundred IT executives with EA experience. The top three primary drivers for EA are "Better Strategic Planning", 'Consolidation of Technology", and "Improve Business Agility" [14]. This survey showed that "Better Strategic Planning" is the most common choice among business-oriented drivers. All of these primary drivers are fulfilled by the EA planning frameworks. For example, an Integration planning framework can help application projects deliver on time and on budget through consolidation of technology. Aligned-planning frameworks help IT to align with business strategies by which to enable organization's greatest strategic value. A matrix table of primary drivers and EA planning frameworks are proposed to illustrate the level of relationship between them.
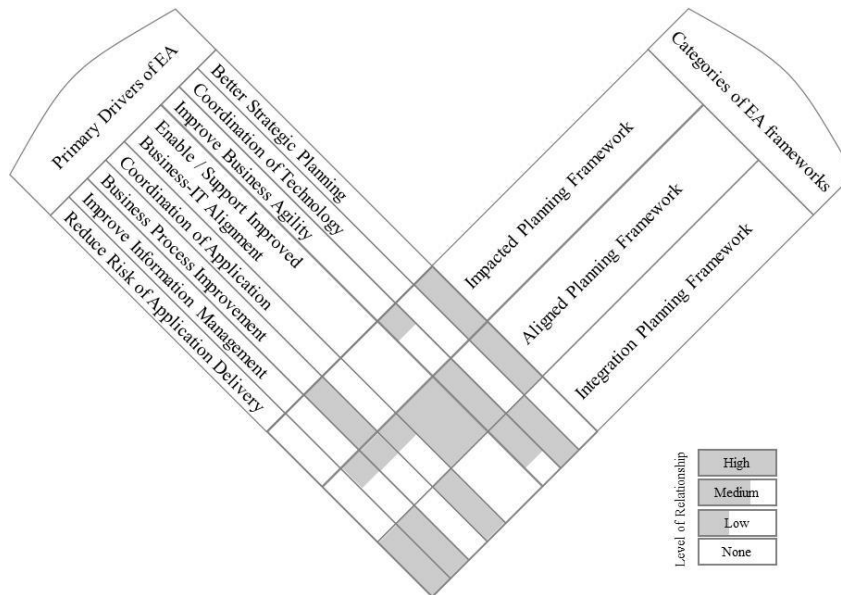
Fig. 5. Matrix of the EA planning frameworks and Primary Drivers

5 Conclusion

As the broad scope of most EA literature illustrates, EA is regarded as a blueprint for organization-wide information for the integration, alignment, planning, and management of business and IT in organizations. Moreover, the absence of consensus and a common classification model of EA has led to major disagreement on what EA should do, how to do it, and what to achieve. This study used Stevenson's 4 dimensions of enterprise architecture (i.e., form, content, method, and infrastructure) to explore the elements of enterprise architecture frameworks, added the important concepts of repositioning and reengineering into the basic thoughts of enterprise architecture (top-down alignment with strategy and vision) with the assistance of theories of business transformation, and lastly formulated a classification model of the EA planning framework. This model could provide a basis to position and classify related EA theories and act as a reference for future studies.

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System ICT Security Policy Implenmention Of Local Authorities in Malaysia : A Case Study (Marang District Council)

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Abstract . ICT Security Policy is a common topic that is being discussed in the public sector, because security incidents happen to organizations that offer online services to the public. These problems or incidents are also affecting the IT Department (BTM) at Marang District Council (MDM), as we also provide computer and internet facilities to our users. Based on the research findings,including inputs gathered from the respondents from Marang District Council, these problems can be reduced by providing a computerized ICT Policy document guideline, creating user awareness programs and by enforcing these ICT Policies. The purpose of this project is to investigate and resolve problems related to the implementation of the security policy in Marang District Council. Furthermore, the ICT Security Policy System is to be designed, developed in order to assist the Information Technology Department (BTM). IT Department also acts as Marang District Council's ICT Security Secretariat in providing a good and complete ICT security policy document thus ensuring the implementation of ICT security policies are implemented in totality. In addition, these documents must be compliant to the ISO 27001 standard and the Information Technology Security and Communication Policies for the Public Sector, which is developed by MAMPU. The ICT Security Policy System is a web based system and can be accessed from the Internet, providing convenience to all levels of management, IT administrators and users in providing effective and better ICT services.

Keywords : Organisations; Policy implementation; ICT Security Policy

1   Introduction

The rapid development of Information Technology in this country proves how fortunate our generation nowadays. As a result, we have a world without boudaries. Information, Communication and Technology (ICT) does not only serve as a

communication agent, it also acts as a bridge for user to benefit as part of the routine and the necessities of life.

The security of ICT is closely related to ICT assets and information protection. This is because the hardware equipment and software components that are part of the ICT assets in government organisations are large investments and need to be protected. In addition, the information stored in the ICT system is valuable because a lot of resources are required to produce it and the information will be difficult to be regenerated in a short period of time.

Furthermore, certain information that has been processed by the ICT system is deemed to be sensitive and classified. Unauthorized disclosure or information leakage could harm the national interest. Any usage of government's ICT assets apart from the outlined purpose and intention is considered as misuse of government's resources. ISMS survey which was conducted by **CyberSecurity Malaysia** in the month of October 2011 on 100 organizations had revealed that normal attacks are viruses (87%) and mail spamming (83%). In addition, more than 68% of the organizations have little knowledge on ISMS. Moreover, 37% of the organizations do not have any security policy at all.

From time to time, in order to address these risks, Government's ICT Security Policy will be consistently defined through ICT Security Standards which covers guidelines and ICT security measures. The usage of all these documents as an integrated whole is recommended. This is because the formulation of policies, standards, rules, outlines and security measures are oriented in order to protect data confidentiality; information and the conclusion that can be made out of it.

2 Literature Review

2.1 Incidents Trends Q1 2012

Incidents were reported to MyCERT by various parties within the constituency as well as from foreign, which include home users, private sectors, government sectors, security teams from abroad, foreign CERTs, Special Interest Groups including MyCERT's proactive monitoring on several cyber incidents.

From January to March 2012, MyCERT, via its Cyber999 service, handled a total of 3143 incidents representing 4.40 percent decrease compared to Q4 2011. In Q1 2012, incidents such as Denial of Service, Fraud, Vulnerabilities Report and Malicious Code had increased while other incidents had decreased.
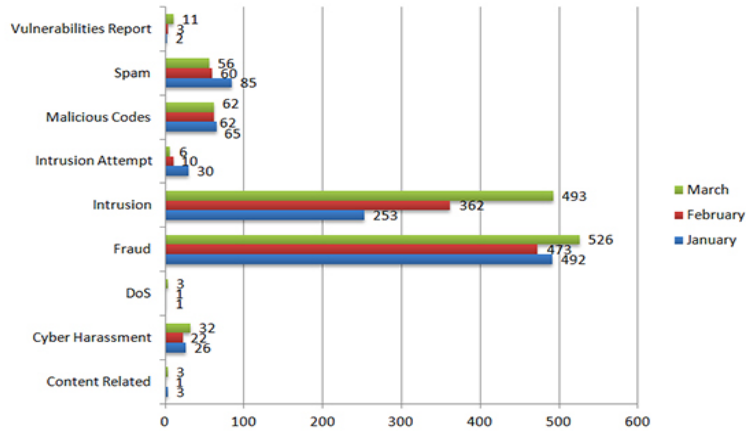
Fig. 1. illustrates incidents received in Q1 2012 classified

In Q1 2012, a total of 1108 incidents were received on Intrusion representing 18.34 percent decreased compared to previous quarter. The Intrusion incidents reported to us are mostly web defacements or known as web vandalism followed by account compromise. Based on our findings, majority of the web defacements were due to vulnerable web applications or unpatched servers involving web servers running on IIS and Apache.

In this quarter, we received a total of 689 .MY domains defaced belonging to various sectors such as private and government hosted on local web hosting companies. MyCERT had responded to web defacement incidents by notifying respective Web Administrators to rectify the defaced websites by following our recommendations. Figure 2 shows the breakdown of domains defaced in Q1 2012.
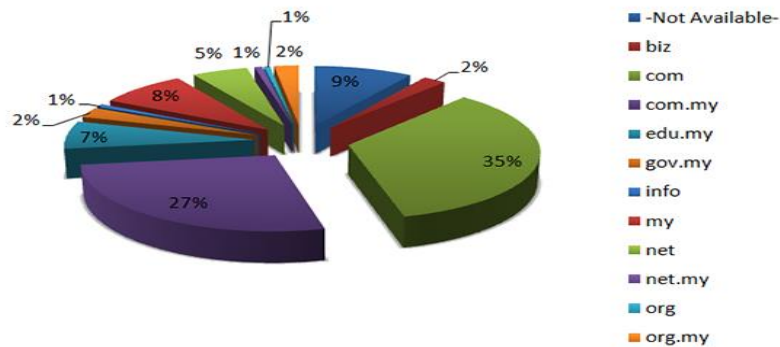
Fig. 2. shows the breakdown of domains defaced in Q1 2012

3   Background and Initial Study

The role of MDM's Information Technology Division is to ensure that all organizations in MDM have security policies for their assets monitoring. In this case, it is good if they have the ICT Security Policy written and documented. This will help MDM's Information Technology Divison, in particular and MDM's organizations in general in identifying and monitoring ICT Security. Each policy must include common rules that are easily understood and are tailored according to the needs of MDM and any other organizations. In addition to that, the policy must consists formulas that can oversee and quantify the security of all ICT assets.

MAMPU is the highest management level which started ICT Security in public sector. MAMPU acts as an initiator and maintains the Security Policy Framework. It also serves as a reference to public sector's security issues. Issues related to ICT security can influence the effectiveness and service of an organizations. Having said that, ICT management level should be more focus on developing each requirements related to security and ICT issues.

A. *The objectives of this project are as below:*

- To conduct a research and build a prototype based on existing ICT Security standards, following the guidelines provided by MAMPU and ISO 27001.

- To obtain information and suggestions on ICT Security Policy from the ICT Security Policy System (ISPS) and officers involved in the management of ICT MDM.
- To create and produce documents on ICT Security Policy. This will be used generally for Information Technology Department and specifically for MDM

- using the developed ICT Security Policy system.

B. *Project Scope*

- To analyze and review ISO 27001 security standards and Information Technology Security Policy and Communication for Public Sector and the circular issued by MAMPU.

- The research will be carried out towards MDM, Information Technology Division, whom act as MDM's ICT security secretariat.

- ICT Security Policy system will be implemented to assist MDM's Information Technology Division to prepare ICT Security Policy documents. To develop this project, PHP and My SQL will be use as the system's database.

- Following are the users of the system, whom will be directly involved in implementing ICT Security Policy:
  a. IT Manager (Information Technology Division)

b. MDM's IT Officer (Management Division, Information Technology Division and Finance Division).

4 Standards Of Security Policy

4.1 Accentuation in ISO 1333 Part 3(2000) :

"Once the objectives of an organization have been firmly set, IT security strategy need to be implemented based on the organization's corporate IT security policies. The implementation of corporate IT security policies is important in ensuring that the risk process management is exact and effective. Security management assistance offered by Information Technology Division should be across organization for effective policy implementation. Of course, they must be align in ensuring that its approach to IT security can cross the gap in security systems that have been implemented by MDM."
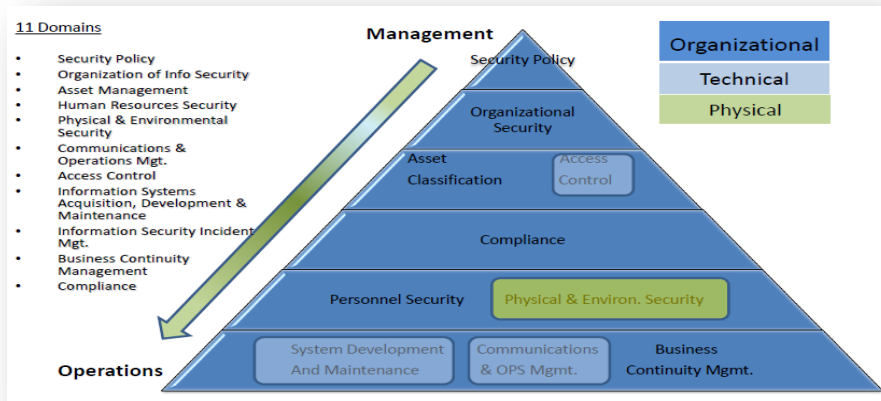

Fig. 3. Domain in ICT Security Poicy

5 Methodology

The development of the application system is based on Rapid Application Development (RAD) strategy. Study on the need of Information Technology, MDM and users have been conducted to improve the quality of services provided. The basic idea of this strategy is to involve the system's users in the process of analysis, design and implementation of the system.

RAD method is simple and focuses on specific activities in system development against user's involvement, analysts, designers and system developers. It can also expedite the requirements analysis and design phases. Furthermore, this method is used is to reduce the system implementation time.

A. Studies on the Organization

Based on the organization chart, which was made available since 2007, the structure for Information Technology Division (BTM) and its services provided to users across MDM has been clearly outlined. Generally, there are four main units in BTM; namely Web Development and Management System Unit, Services and Infrastructure Unit, Training and Consultation and Planning and Security Studies.

The main function of **Web Development and Management System Unit** is to focus on the major applications development in MDM.

In addition, **The Services and Infrastructure Unit** provide information technology infrastructure facilities, such as provision of the computer network for the entire MDM, computer facilities and servers. It also provides computer maintenance activities, for example servicing the computers, printers and so on.

The two other special units, which are the **Training and Consultation,** provide IT facilities and trainings for the staff of MDM, while **Planning and Security Studies** focuses on the study of new technologies in information technology and communication. Results of the studies will then be use in the development of university's applications. The unit also implements standards, monitor and benchmark its services to the customers.

B. From the results of a questionnaire distributed to staff MDM is as follows:

(i)   80% staff involved were aware about the ICT Security Policy.

(ii)   20% had seen and understood the ICT Security Policy

(iii)   30% used the ICT Security Policy at the basic level (development system), 10% at mid-level (network, communications and computer services) and 5% using the advanced level (firewall security and administration of proxy server).

(iv)   All staffs did not use the ICT security software available in the market. The main reason was that they did not have the skills and exposure in operating the software.

(v)   The main features of the desired ICT security policy software are :

- Easy to use
- Web-based
- Not complicated
- Easy to find and access the required policy.

(vi)   The main activities that the staff would like to know in the system are in the following order
- Implementation
- Monitoring
- Planning

The study found that most of management and implementation activities in MDM were based on the circulars and guidelines from MAMPU. Some were from the readings in the Internet. The employees said that they only required ICT security policy software that was easy to use and could guide them in the safest way to operate

a computer. The findings show that the users preferred web-based applications. Themanagement was more interested in the process of preparing comprehensive documents on policy standards, which could be used by MDM employees. On the other hand, BTM required a system, which could measure the level of security policy in MDM.

C. ICT Security Policy Compliance Report

For each Security Domain assessment, the system will produce a report showing the percentage level of compliance. Figure 4 below shows the results of security domain compliance.
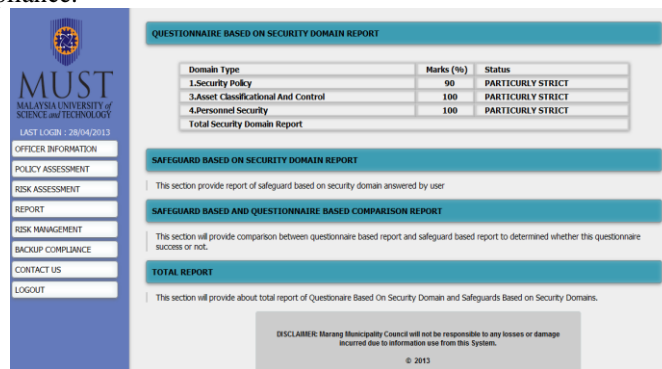

Fig. 4. Security Domain Assessment in Percentage

Similar to Security Domain Assessment, a report showing the assessment percentage will also be available for Safeguard Based. Example is as in Figure 5 below.
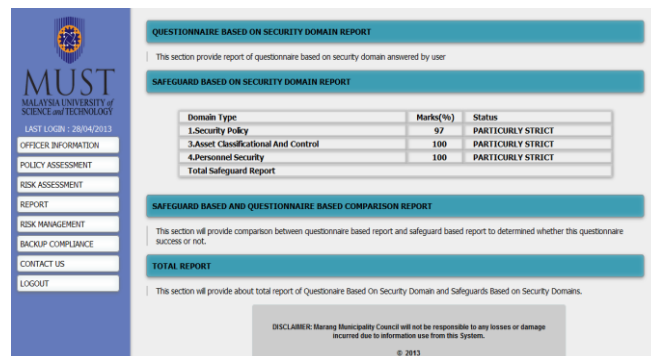

Fig. 5. : Safeguard Based Assessment

The success rate of the evaluation, done by the authorized officer, is highly dependant on the Safeguard Based and Security Domain Comparison. If there is any fail status during the evaluation, the overall evaluation is considered unsuccessful.

The officer will then need to re-evaluate the ICT Policy Security Assessment after 3 months. Figure 6 illustrates the sample of comparative report.
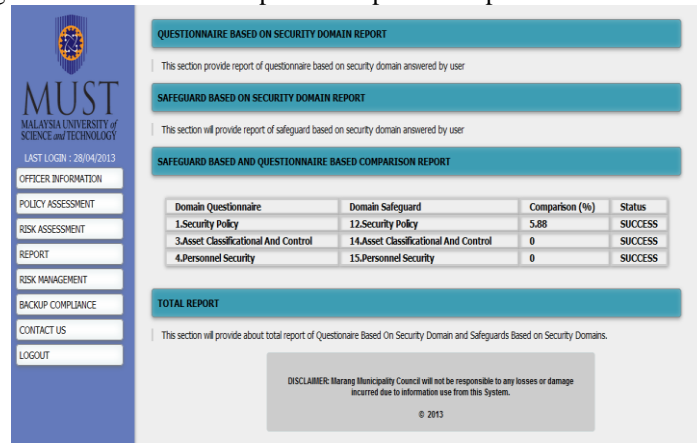

Fig. 6. Safeguard Based and Security Domain Comparison Report

6 Achievements

Fulfilling the project objectives and solving the issues raised during the feasibility study were among the key success factors in this project. In addition, appropriate selection of technologies, tools and techniques to support the analysis and development, also contributed to the success of this project. The database was designed systematically to ensure that it could support the needs on collection and analysis of data. Proper database design was essential for high-performance application. In addition, it also helped to ensure that the ICT Security Policy System is flexible and easy to manage and maintain.

Information is an asset to an organization and must be secured and protected. Moreover, the development of the system must ensure that the system was secured, the confidentiality was preserved, integrity and availability of information were properly addressed. The interface was easy to use and developed based on user requirements.

The software development process has been continuously improved based on the modules offered by the system.

A. Benefits of the System

The ICT Security Policy System was developed based on the feasibility study conducted on the organizations' business processes and issues faced in managing the policies. The focal point of the system is to meet the objectives and solve the issues raised by the users. Among the benefits of the system are as follows:

1. Access and permission to the system are based on user groups where users are assigned to groups of ICT Administrator, IT Managers or normal users.

2. IT Administrator is capable to assign the permission in the system. In addition, IT administrator can also control the logins and is able to lock and unlock user access.

3. Information such as ISO 27001: 11 domains of Information Management and circulars from MAMPU were entered into the system. This is to ensure that all ICT policies are in accordance with the ICT Security Policy Framework and government security directive.

4. The system is a web-based application; therefore, users are able to access the system from anywhere and anytime as long as they have the internet access. Web based application has evolved significantly over recent years with improvement in security and technology, making it more reliable and highly deployable.

5. All information on policy activities are divided into four stages, (i) Preliminary, (ii) Planning, (iii) Implementation, and (iv) Proposal to ease the process of project monitoring.

6. Each stage is represented by percentage activities, selected or used from the overall domain, making it easier to monitor each stage of selected domain monitoring policy.

7. For each ICT Security Policy Compliance assessment, the questions are based on the number of policies used by the users.

8. Human resource activities are carried out easily and quickly with the help of real time and online information.

9. Standardization of ICT Security Policy ensures that certain processes are performed consistently. In addition, by standardizing these policies, the monitoring process of other agencies will become easier.

10. The system also produced suitable reports tailored for management needs. For example, there is a list of selected policies, recommended policy as well as other ad-hoc reports generated from time to time.

B. General Benefits of MDM and Local Authorities

1. The development blueprint of the ICT Security Policy System in MDM can be a basis or guideline for implementation at other Local Authorities.

2. Provide assistance to MAMPU in monitoring the implementation of the ICT Security Policy.

3. Evaluation on ICT Security Policy compliance can be handled by the agencies itself.

7   Conclusion

The development of the ICT Security Policy System in MDM has been important, as it has been in any other organization in this country. The system provides a strategic framework and define common rules to be followed by everyone within MDM. The development of the software policy covers four important activities, namely management policy, evaluation policy, process governance policy and

compliance improvement policy Evidently, the ICT Security Policy system has been developed to improve the services offered by Information Technology Division (BTM). The system has also supported the IT management in preparing ICT Security Policy System and ensuring compliance of the ICT Security Policy throughout BTM in particular and MDM in general.

Acknowledgement

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The Development of Academic Data warehouse as a Basis For Decision Making

A Case Study at XYZ University

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Abstract. In this paper, the authors report the development of academic data warehouse which consist of students' performance in high school, their university entrance test scores, and their grade point average (GPA) in university. The data warehouse was developed based on Student Admission Information System (SAIS) and Academic Information System (AIS) of XYZ university. To validate the usefullness of the data warehouse as a basis for decision making, the warehouse has been analyzed using OLAP technique and tested to several users. In addition, the data resulted from the warehouse has been mined using Weka data mining tools to test whether the data can be utilized as a basis for decision making.

Keywords: academic data warehouse; decision making

1 Introduction

The result of National Examination (NE) for Indonesian high school students in year 2010 statistically decreased. There were 267 high schools in Indonesia whose students 100% failed [1]. These failures were responded variously by students. Among of them showed destructive responds either to themself or their environment [1]. It can be easily understood that in the context of some students, fail in NE is similar to fail in life. Therefore, they perceive that committed to suicides is a solution.

On the other side, several state and private universities declared that students who passed entrance tests in those universities but failed in NE are eligible to follow the lecturer after submitting credentials in a certain period [2]. The fact implicitly showed that these universities believe that students who were failed in NE potentially capable to continue their studies in higher educations.

The previous mentioned facts rise a question about the relation between high school students' performance and their academic performance in higher educations. Driana [3] proposed a study of policy in NE through several mechanisms, for example

by organizing researchers from universities to study the implication of NE towards the readiness of students in pursuing higher educations.

This idea can be initiatied by studying the relationship between high school students performance and their academic performance in higher educations by using data warehousing and data mining techniques. Previous studies in data warehousing and data mining showed that data warehousing and data mining techniques have been used to understand students and their academic environments better. Baranovic et.al. [4] reported an implementation of data warehouse for the Higher Education Information System in Croatia. Ramaswami and Bhaskaran [5] studied the usefullness of data mining to predict result of elementary and high school students in India using CHAID Prediction Model. Bravo and Ortigosa [6] elaborated their research on student activities in e-leaning media to detect symptoms of low performance using production rules. Vialardi et al. [7] presented a recommendation in higher education using data mining techniques. Azimah and Sucahyo [8] have developed a data warehouse and performed data mining of academic data in "Nasional" University. Ernawati [9] performed data mining to find quantitative association rules of students' academic performance and their genders as well as their entrance tests in higher education. Haryanto and Rosa [10] performed a prediction towards admitted students who are not enrolled. Wirati and Rosa [11] presented the classification of students' performance based on their university entrance test scores.

Eventhough several researches in students' performance have been carried out, none of it discusses about the relationship between high school students' performance and their success rate in higher educations due to the facts that the data are not available electronically.

XYZ University is a private University in Indonesia that has developed its own information system since 1996. Among of its systems are Student Admission Information System (SAIS) and Academic Information System (AIS). SAIS was developed to handle student admission from application process up to the process of deciding which applicants will be admitted. On the other hand, AIS was developed to handle academic process after students have been officially registered. Although the two systems were operated in the platform of university's local area network, they are not integrated. Due to this fact, authors' preliminary survey in XYZ University showed that Head of Study Programs had difficulties in finding comprehensive view of students' performance in high school and their academic records during study in higher educations, which is needed in making decisions related to students. For example, during admission process, Head of Study Program might need information about university students' success rate based on high school study area of students from a particular high school.

Therefore, this paper elaborates the development of data warehouse to handle high volume of data that were extracted from the Student Admission Information System and the Academic Information System of XYZ University. The result of the study is an integrated data warehouse which is usefull for users and ready to be utilized as a basis for decision making.

2 SUBJECT AND DATA

2.1 Subject

The subjects used in this research are the students batch 2007 and 2008 of four study programs in XYZ University who are registered in the second semester of 2010/2011. The students admitted through two types of admission namely: (1) outstanding student admission, and (2) regular admission. The outstanding student admission will select eligible students by using students' grades in high school, while regular admission will select students based on entrance test scores.

2.2 Data

The data were extracted from two sources of XYZ University: (1) the Student Admission Information System (SAIS) and (2) the Academic Information System (AIS). All data are gathered from the system in the form of database format. The two systems were not integrated as a single system. It causes difficulties for novice users to access comprehensive knowledge from the two systems. Table 1 describes the data used in this research.

Table 1. Data Source

Data Name	Period	Source
The entire database table of Student Admission System from all admission types, which contains all fields	Student Admission in 2007-2008	SAIS
Complete data of all active students in 4 Study Programs, which contains all fields	Active student in second semester 2009/2010	AIS
Course taken by all students	Course taken by all students from academic year 2007/2008 up to 2009/2010	SAIS
Data dictionary containing the meaning of all data in SAIS and AIS	Lifetime of SAIS and AIS.	SAIS and AIS

3   Data warehouse Development

The data warehouse design was performed based on nine-step methodology as proposed by Kimball [11]. Following are the step of the data warehouse development:

1. *Choosing the process.*

Data warehouse to be constructed is intended to conduct an analysis of students' performance. The subject of data warehouse is student. From the whole system of XYZ University, two processes are selected to develop the warehouse, namely student admission process and student assessment process.

2. *Choosing the grain .*

The selected grains in this case are: (1) student admission report which consists of students' performance in high school and university entrance test score report; (2) result of study in university which consits of students' Grade Point Average (GPA) for each semester.

3. *Identifying and conforming the dimensions .*

Following are possible dimensions that are chosen: gender, admission type, study program, high school name, high school district, and students' study area in high school.

4. *Choosing the facts .*

Following are the facts that are incorporated in the warehouse: (1) identity of admitted students, (2) students' score in high school, (3) students' entrance test score, (4) study program, (5) subjects taken by students, (6) students' grade for each subject.

5. *Storing pre-calculations in the fact table.*

In this case, a pre-calculation to find GPA of each student for each semester were required. The GPA will then be stored in the fact table together with other facts elaborated in step 4.

6. *Rounding out the dimension tables .*

The information in dimension table were completed if needed.

7. *Choosing the duration of the database.*

Data to be loaded and analyzed are students of academic year 2007/2008 up to 2009/2010.

8. *Tracking slowly changing dimensions .*

There is no changing dimensions in this case.

9. *Deciding the query priorities and the query modes.*

After the fact table was defined, the following OLAP queries were designed to present data from the data warehouse:

(a) Examining the average of students' high school grades and GPA based on the study program and school dimensions for all students from outstanding track.

(b) Examining the average of entrance test score and GPA based on the study program and school dimensions for all students from regular admission track.

(c) Examining the average of students' high school grades and GPA based on the school dimension for all students from outstanding track.

(d) Examining the average of entrance test score and GPA based on school dimensions for all students from regular admission track.

(e) Examining the average of students' high school grades and GPA based on the study area dimension for all students from outstanding track.

(f) Examining the a average of entrance test score and GPA based on study area dimensions for all students from regular admission track.

4   Results and Analysis

4.1   Online Analytical Processing (OLAP)

Once the data warehouse is constructed, the author carried out an analysis using OLAP techniques. The atributes used as the analysis is the students' high school grades, NE grades, university entrance test score, GPA1, GPA2, GPA3, and GPA4, which will be viewed from the following dimensions: high school, admission type, study program, gender, study area, and high school district. Fig. 1 shows the star schema which is designed for OLAP.
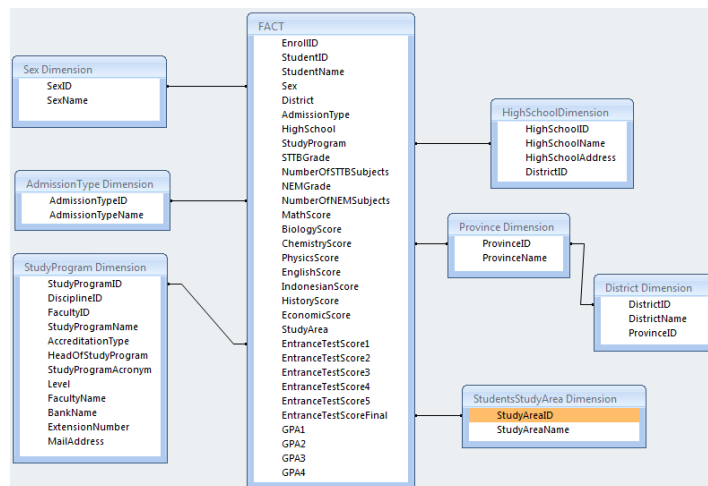

Fig. 1. Star Schema Design

Analytical results obtained by using OLAP techniques which generate XML documents . Users could select the focus of their attention. The possible measures to be analyzed are the average GPA, the average university entrance test scores, the average students' high school grades on several subjects (Indonesian Language, History, English, Mathematics, Physics, Chemistry, Biology, and Economy). The analysis might based on high school, admission type, study program, gender, study area, and high school district. The following are examples of the interesting possibilities of multidimensional analysis:

(a) Examining the average of students' high school grades and GPA based on the study program and school dimensions for all students from outstanding track.
(b) Examining the average of entrance test score and GPA based on the study program and school dimensions for all students from regular admission track.
(c) Examining the average of students' high school grades and GPA based on the school dimension for all students from outstanding track.
(d) Examining the average of entrance test score and GPA based on school dimensions for all students from regular admission track.
(e) Examining the average of students' high school grades and GPA based on the study area dimension for all students from outstanding track.
(f) Examining the average of entrance test score and GPA based on study area dimensions for all students from regular admission track.

Fig. 2 shows a sample report of multidimensional analysis example point a above. Several parts of the report are blocked due to the confidentiality of the information.

To generate the report in Fig. 2, average of students' high school grades were calculated from the fields of fact table by using average (AVG) aggregate function. For example, the average of MathScore field in Fig. 1 was stored as Mathematic field in Fig. 2. While the average of each GPA was calculated by using average (AVG) aggregate function to be stored as the following fields: AVG_GPA1, AVG_GPA2, AVG_GPA3, and AVG_GPA4. Data aggregate were calculated based on six dimensions namely high school, admission type, study program, gender, study area, and high school district.

Fig. 2. Sample Report from OLAP

OLAP multidimensional analysis resulted from the data warehouse has been demonstrated to four Head of Study Programs. A questionnaire to evaluate the result were also distributed to them. The results of the questionnaire are presented on table 2.

Table 2. Users' Evaluation

Statement	Strongly Agree	Agree
The information generated from the data warehouse facilitates Head of Study Programs to thoroughy view high school grades and GPA of the students from outstanding track, based on the school dimensions	80%	20%
The information generated from the data warehouse facilitates Head of Study Programs to thoroughy view university entrance test score and GPA of the students from regular admisssion track, based on the school dimensions	100%	
The information generated from the data warehouse facilitates Head of Study Program to get student profiles and to make decisions related to the student	80%	20%
The user interface of the data warehouse is easy to use	100%	

Thus in general it can be concluded that the data warehouse has been able to integrate the student academic record in high school, the university entrance test scores, and student academic performance in university.

4.2 Data Mining

Data extracted from the datawarehouse that has been saved in a spreadsheet format (. csv) were tested further using Weka data mining tools to evaluate whether it could be utilized as a basis for generating knowledge potentially usefull for decision making. Table 3 in the following are the examples of possible data mining towards the data.

Table 3. Result of Data Mining

Goal	Algo-rithm	Rules	Accuracy
Classify GPA based on NE scores	Id3	If $6.73 \leq$ NE score < 7.63 then GPA < 2.5 If NE score ≥ 8.54 then GPA ≥ 3.0	53. 27%

		If 7.63 NE score <8.54 then GPA< 2.5	
		If 5.82≤ NE score < 6.73 then GPA< 2.5	
		If 4.92 ≤ NE score then GPA< 2.5	
Classify GPA based on universi-ty entrance test score	Id3	If entr_tes < 23 then GPA < 2.5	55.14%
		If entr_tes > 71.8 then GPA < 2.5	
		If 59.6≤entr_tes< 71.8 then GPA>3.0	
		If 47.4≤entr_tes< 59.6 then GPA<2.5	
		If 35.2≤entr_tes< 23.0 then GPA<2.5	
Classify universi-ty entrance test score based on NE scores	Id3	If NE score < 4.92 then 35.2≤ entr_tes < 23.0	32.71 %
		If NE score ≥ 8.54 then 47.4≤ entr_tes < 59.6	
		If 7.63≤NE score <8.54 then 59.6≤ entr_tes < 71.8	
		If 75.82≤NE score <7.63then entr_tes < 23.0	
		If NE score <4.92 then entr_tes < 23.0	

Eventhough the accuracy is not high enough, we could find rules relating NE scores, university entrance test scores, and GPA. To improve the accuracy, further refinement of the parameters need to be investigated. However, it has been proofed that the datawarehouse is ready to be mined. In addition to the above examples of data mining, other data mining techniques such as clustering and asssociation might be applied to the data extracted from the warehouse.

5   Conclusion

Academic data warehouse of XYZ University has been successfully designed and implemented using the star schema. Analysis of academic performance can be seen with various measure of the average GPA, average university entrance test score, average NE score, and the average students' high school grades in several subjects. Analysis can be viewed from various dimensions namely high school, admission type, study program, gender, study area, or high school district, based on the interest of the user. Users' evaluation showed that the information generated from the data ware-house facilitates Head of Study Program to get student profiles and to make decisions related to the student. Analysis results in the form of spreadsheet format can also be stored separately and subjected to data mining.

Further research to be done is performing more comprehensive data mining to-wards data extracted from the data warehouse to get valuable knowledge from it. In addition, the presentation of multi-dimensional analysis for novice users might be improved so that it will be more user friendly.

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Business Intelligence for Government Financial Performance Measurement

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Abstract. The government financial reformation in Indonesia gives more authority and responsibility to local governments to manage their financial performance. However, various data that are needed for analysing financial performance are currently not well organised. This makes difficult for the governments to obtain comprehensive financial indicators. In this paper, we present a model and prototype of business intelligence (BI) to support local governments in measuring the financial performance, i.e. independency, effectiveness and efficiency ratios.

Keywords: business intelligence; data warehouse; government performance; financial performance measurement

1   Introduction

Policies on the financial balance between central and local governments (e.g. Law no. 22/1999, 25/1999, 32/2004 and 33/2004) marked the government financial reformation in Indonesia. Local governments are given more authority and responsibility to manage their financial performance [1]. At the same time, local governments are expected to improve the effectiveness and efficiency of their financial performance in order to grow the economic development in their areas of authority. This local growth must be directed to drive the national economic development [2]. Consequently, local governments have to be able to measure the dynamics of their financial performance.

Currently, various data needed for analysing financial performance, i.e. annual data of programme and budget planning and realisation, are not well organised. These data are stored on printed documents or electronic files in different locations. This makes difficult for the governments to obtain comprehensive financial reports that are meaningful for analysing historical trends of economic growth. The availability of these trends will benefit in planning the programmes and budget for next years.

Performance measurement is an evaluation process of the progress of activities against their objectives. This measurement may include indicators of the effectiveness of performed activities to achieve the objectives, the efficiency of resource

usage/allocations, and the quality of resulted products [3]. Performance measurement requires clean, historical, consolidated, and timely information, including information that is unstructured and distributed in different locations [4].

Business intelligence (BI) can be implemented for supporting the measurement of government financial performance. BI can help in collecting, organising and presenting data in meaningful ways for decision makers. BI provides visual analytical tools, such as interactive graphics and dashboard. BI can hence help to improve government performance by improving financial performance and, in turn, better services to society [5].

The objective of this paper is to present a model and prototype of BI that supports the measurement of financial performance of local governments. The model uses the data of planned budget and its realisation, i.e. actual revenue and expenditure. The prototype implements the model and provides a simple dashboard to visualise the measurement results, i.e. independency, effectiveness and efficiency ratios. As a case study, we use financial data of the Province of Central Java from 2008-2011.

This paper is further structured as follows: Section 2 presents briefly government financial performance and its measurement. Section 3 presents the concept and architecture of business intelligence. Section 4 describes the method used to develop our BI. Section 5 discusses financial performance measurements that are facilitated by the BI. Finally, section 6 concludes this paper.

2   Government Financial Performance

The government financial reformation in Indonesia has introduced several paradigm shifts in the management of government budget. The shifts, among others, are from vertical accountability to horizontal accountability; from traditional budgeting to performance-based budgeting; and from regular financial audits to financial and performance audits [2].

The financial reformation has an important role in the development of local autonomy. The main objective of local autonomy is to accelerate the distribution of economic growth across the country. In turn, it will lessen the role and load of the central government in developing the country and nation [1]. Two main characteristics of local autonomy are [2]:

- Capability of the local government to manage its financial sources for maintaining the government execution.
- Minimum dependency to the central government. Local revenue must be the largest financial source.

In order to evaluate whether a local government has the characteristics of a local autonomy, the local government has to periodically measure its performance.

Government performance is multi-dimensional, i.e. a number of indicators are needed to measure the performance comprehensively. From the financial perspective, the indicators can be as follows [6].

- *Budget analysis*, which compares budget to its realisation. This results is in either positive (favourable) or negative (unfavourable) variance.

- *Financial ratios*, which include liquidity ratio (capability to fulfil short-term obligations), solvability ratio (capability to fulfil long-term obligations), activity ratio (effectiveness of resource usage) and market ratio (growth of organisation values).
- *Performance audit*, which is based on the principles of economic (how much saving; expenditure realisation is compared to its budget), efficiency (expenditure to obtain revenue is compared to revenue) and effectiveness (revenue is compared to its budget).

3   Business Intelligence

BI is a concept of improving the quality of business decisions based on data [7]. BI has been broadly used in many non-profit organisations, including governments. The objectives are to support the provision of better public services, financial efficiency and programme effectiveness.

BI allows an organisation to monitor its performance easily [8]. Performance is typically measured using *key performance indicators* (KPI), either in terms of money or level of service. BI can be designed to deliver accurate KPI achievement.

A generic BI system architecture is depicted in Fig. 1 [9]. It consists of four main components: (i) data sources, (ii) ETL process, (iii) data warehouse and (iv) analytical tools. Typically data sources are operational databases whose data are needed to make decisions. ETL is a process that *extracts* operational data, *transforms* those data into information that is meaningful for decision making processes and then *loads* the transformed data into a data warehouse. ETL can also be used to integrate or consolidate data from multiple sources. A data warehouse is a dedicated database to store summarised information for supporting decision making processes [4].
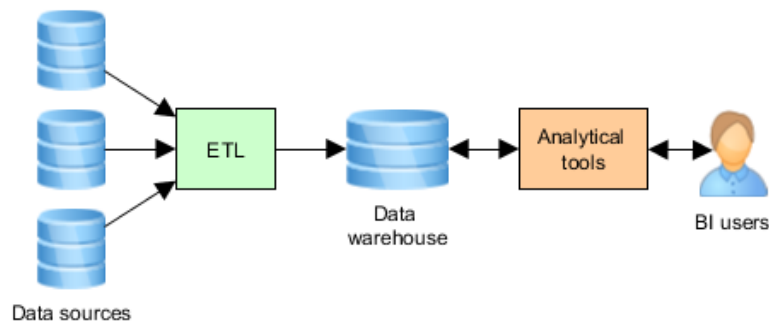
Fig. 1. BI system architecture

Data in a data warehouse is organised in a multi-dimensional model called *cube*. Analytical tools allow BI users to interact with and use those data for making quality business decisions. Operations that can be done using these tools are roll-up (to aggregate data by reducing dimensions), drill-down (to see detailed data by adding dimensions), slice-and-dice (to select sub-dimensions) and pivot (to rotate the

coordinates of dimensions for alternative/better presentations) [10]. These operations are also referred as OLAP (*online analytical processing*).

4   Development Method

We developed our BI model and prototype in five main phases as follows [11].

1. *Data warehouse design*, which includes the determination of information, cube dimensions and measures that are required for decision making processes.
2. *Data integration*, which includes the identification of data sources and the design of ETL process.
3. *Development of analytical services*, which consists of the creation of cube, dimensions and calculated measures.
4. *OLAP*, which organises data into a multi-dimensional cube.
5. *Delivery*, in which outputs are designed as a dashboard and reports that presents visual data to decision makers.

Our interest is on financial performance measurement at a local government. Financial performance data includes budget, administration and accounting data. Currently, those data are on different data sources (operational databases).

Our BI system architecture is depicted in Fig. 2. Two types of measures are designed in the data warehouse, i.e. basic and derived measures. Basic measures refer to budget and realisation data or facts. Derived measures are obtained from calculating basic measures, i.e. realisation percentage, local revenue, total revenue, expenditure, independency ratio, effectiveness ratio and efficiency ratio. These measures are analysed in five dimensions, i.e. organisation, programme, financial account, month and year. The first three dimensions are further detailed into sub-dimensions. For example, the dimension of financial account is further detailed into five sub-dimensions, i.e. account, group of accounts, type of accounts, object account, and detailed object account. We have implemented three analytical tools i.e. OLAP, KPI and reporting. In this paper, we focus on KPI only.
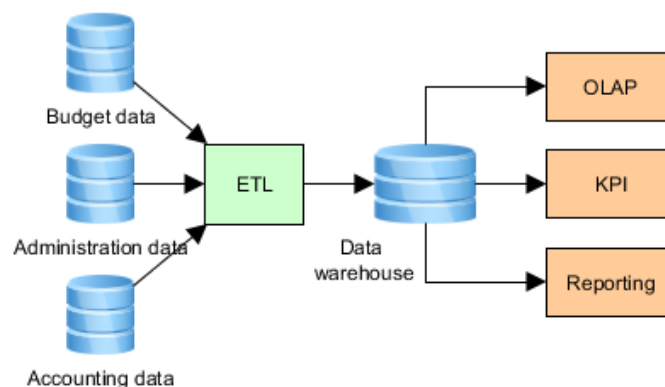

Fig. 2. Our BI system architecture

Based on the measures and dimensions, we designed and implemented the galaxy or fact-constellation schema [10] as the schema of our data warehouse. Fig. 3 depicts this schema implementation. This data warehouse is implemented in SQL Server 2008 using SQL Server Management Studio (SSMS).
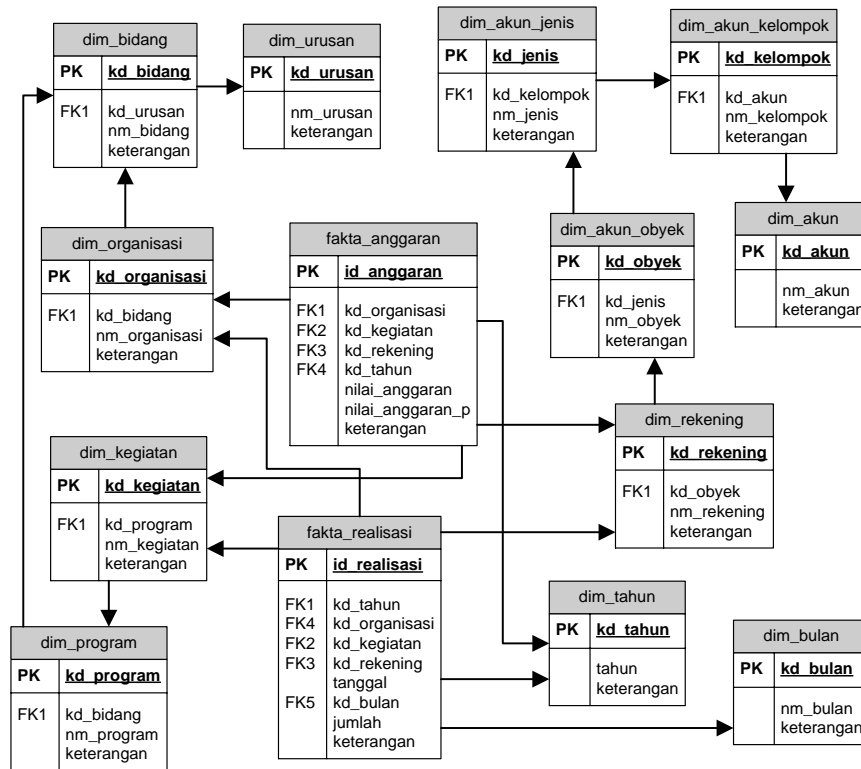

Fig. 3. The galaxy schema of our data warehouse

We developed two kinds of data integration, i.e. dimension data integration and fact integration. For this, we identified a mapping from data sources to the model in the data warehouse. Examples of such mapping are depicted in Fig. 4 and Fig. 5. Operation 'CONCAT' transforms several string parameters into a single string. For example, Kd_urusan = "1", Kd_bidang = "03", Kd_program = "15" and Kd_kegiatan = "05" in table MD_KEGIATAN are transformed into Kd_kegiatan = "1.03.15.05" in table DIM_KEGIATAN. Operation '→' loads data from source to data warehouse as they are, but the data may be placed under different field name. Only relevant data in sources are extracted, transformed and then loaded to data warehouse.

Our BI is then implemented using a tool named Business Intelligence Development Studio (BIDS).

Sources	Mapping	Destinations
Table: MD_PROGRAM		Table: DIM_PROGRAM
- Kd_urusan	CONCAT (kd_urusan, kd_bidang)	- Kd_bidang
- Kd_bidang	CONCAT (kd_urusan, kd_bidang, kd_program)	- Kd_program
- Kd_program	→	- Nm_program
- Nm_program		

Fig. 4. Example mapping in an ETL process

Sources	Mapping	Destinations
Table: MD_KEGIATAN		Table: DIM_KEGIATAN
- Kd_urusan	CONCAT (kd_urusan, kd_bidang, kd_program)	- Kd_program
- Kd_bidang	CONCAT (kd_urusan, kd_bidang, kd_program, kd_kegiatan)	- Kd_kegiatan
- Kd_program	→	- Nm_kegiatan
- Kd_kegiatan		
- Nm_kegiatan		

Fig. 5. Example mapping in an ETL process

5   Financial Performance Measurement

In our BI, financial performance measurement is implemented using KPI feature on SQL Server. The measurements that we focus on are independency, effectiveness and efficiency ratios.

A measurement has a goal and value. A goal is the objective that a local government want to achieve. A value is the measure of actual achievement done by the local government.

5.1   Independency ratio

This ratio is calculated using Eq. 1. Total revenue is the sum of local and non-local revenue. This ratio indicates the financial capability of a local government, according to the characteristics of a local autonomy (as described in Section 2).

$$Independency\ ratio = local\ revenue\ /\ total\ revenue \qquad (1)$$

The value of this ratio is categorized into four levels that denote the relationships between the central and local government. The levels and relationships are shown in Table 1.

Table 1. Relationships between central and local government

Levels	Ratio (%)	Relationship
Very low	0 – 25	Instructive
Low	25 – 50	Consultative
Medium	50 – 75	Participative
High	75 – 100	Delegation

In instructive relationship, the role of central government is more dominant than the local government. The local government cannot be considered as a local autonomy. In consultative relationship, the role of central government is reduced, because the local government is able to perform some portion of autonomy. In participative relationship, the role of central government is greatly reduced. The local government is becoming a local autonomy. In delegation relationship, the local government is already a local autonomy. The central government do no intervention in the local government.

5.2 Effectiveness ratio

This ratio is calculated using Eq. 2. It indicates the capability of a local government to realise local revenue that is targeted. The higher the value of this ratio, the more effective is the financial performance of a local government.

$$\text{Effectiveness ratio} = \text{local revenue} / \text{local budget} \qquad (2)$$

5.3 Efficiency ratio

This ratio is calculated using Eq. 3. The lower the value of this ratio, the more efficient is the financial performance of a local government.

$$\text{Efficiency ratio} = \text{local expenditure} / \text{local revenue} \qquad (3)$$

5.4 Visualisation

These ratios are presented visually as shown in Fig. 6. In year 2010, the value of independency ratio (*Rasio Kemandirian*) is 72.21% which is lower or worse than the goal 75% (0.75). The value indicates that the relationship between the central and local government is participative. The value of effectiveness ratio (*Rasio Efektivitas*) is 122.7% which is higher or better than the goal 100% (1). The value indicates that the local government has a very effective financial performance. The value of efficiency ratio (*Rasio Effisiensi*) is 26.74% which is higher or worse than the goal 1% (0.01).
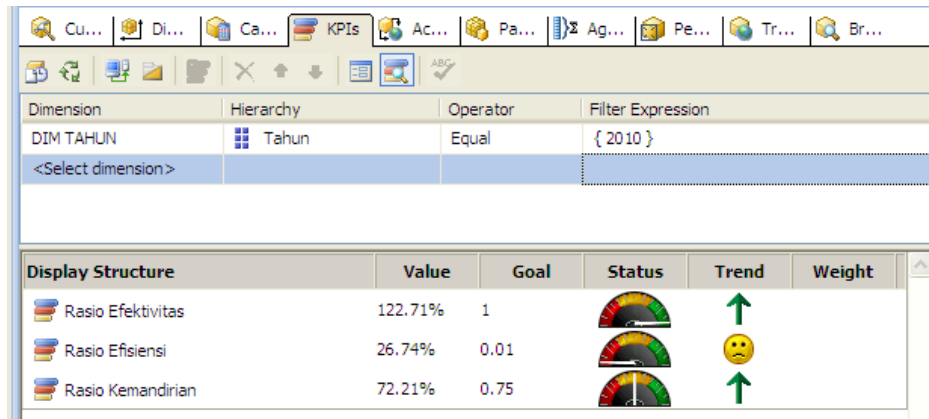
Fig. 6. Performance measurement in visual

For each measurement, we add a trend indicator to see whether the financial performance is getting up or down compared to the performance of previous years. Fig. 6 shows that the trends of independency and effectiveness ratios are getting up. The efficiency ratio is about the same as the ratio of previous years.

6   Conclusions

We have modeled and implemented a BI system for measuring government financial performance, especially in local governments. Using our BI, a local government can easily monitor its independency, effectiveness and efficiency ratios.

In the future, we will include more performance indicators so local governments can get more comprehensive financial information.

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