

INFORMATION SYSTEMS INTEGRATION FACTORS IN ORGANIZATION: TOWARDS GOVERNMENT INFORMATION SYSTEMS SUSTAINABILITY

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ABSTRACT

An Information Systems (IS) change to meet the changing organizational environment is crucial in e-Government (e-G) implementation to give it competitive advantage. Unfortunately research showed that though e-GIS implementation leveraged the IS integration concept, e-GIS does not using the benefits of resource integration to provide strategic information and reuse of knowledge to sustain. Aiming on the beneficial capabilities of e-GIS integration implementation to facilitate IS sustainability (ISS), this research revealed challenges and 15 factors contributing to the needs of e-GIS integration and identified 4 factors of e-GIS integration implementation that contribute to the ISS in organization. This study then suggests a comprehensive support of e-GIS integration implementation using Work System Theory, Diffusion and Innovation Theory and Knowledge Based Theory in organization and at the same time using benefit of ISS explained by Belief-Action-Outcome framework. The four prominent factors are business and systems stakeholder collaboration, organizational operation transformation and organizational memory system. This study also proposes an e-GIS integration implementation model towards ISS.

Keywords: *IS Integration, Organizational Memory, Organizational Memory System, IS Change, e-G Integration, IS Sustainability*

1. INTRODUCTION

Government transformation in service delivery has gone through changes as a result of economic challenges and global uncertainties. Government transformation not only caused changes in the structure of public bureaucracy and its operation, but they also altered the nature of government service delivery and its role in the society. Evolution of government services since 1990s has seen radical changes from getting rid of red tape bureaucratic practices to knowledge-based practices in administration, and from speed up approval processes to mobile government services [1]–[3].

Transformation of government services is actualize through the implementation of e-Government Information Systems (e-GIS) which recently has been driven by the transformation of effective service delivery focusing on paperless government and measurement on results based performance [4], [5]. These initiatives are to leverage the effectiveness of e-GIS especially in online services and to portray that government is globally competitive [6].

Services provided by e-GIS encompass the entire process of government administration and functions of organizations – human resource, finance, information technology, infrastructure development and specific services for the wellbeing of citizen such as education, health and others. Meanwhile information systems integration is defined as an organization's information system which has the capability of automation, electronic exchange of data and information of various formats without involving the user in the work system of organization or the specific information system [7], [8]. This process can occur at different stages of information systems such as data level, information or applications level and processes level or at all levels at the same time [9], [10]. The success of information systems integration becomes the bargaining agent for seamless service delivery between government organizations and e-GIS success implementation [11]. Sustainable online service delivery needed public information systems to be strategically integrated [12][13] to give a seamless and excellent services which aligned with the government current mission and goals.

Information systems sustainability (ISS) concept even though not so explicit in its definition, it includes the term 'sustainable development' which implies change and improvement and the term 'sustainability' that indicate that we want to keep what we have now [13]. Adopting Boudreau, Chen and Huber (2008) definition of ISS, it means "the design and implementation of information systems that contribute to sustainability of business processes" [13], [14]. However, government is still facing problem in utilizing strategic information and organizational knowledge through e-GIS in business processes especially in supporting efficient valuable services and appropriate and equitable decision[4], [15]–[18].

Scrutinizing the constant changing scenario, especially in the government's procedure and structure, for example in the issuing of business license, different government departments handled issuance of multiple business licenses and the information and knowledge of these processes are at each department itself. Even though integration of processes in multiple IS happens within an organization of each department, integration of business license issuance failed to sustain because of issues in process streamline, legality, structural, system architecture and standardization of data integration between different departments. These problem occurs because of lack of collaboration between organizations that involves stakeholder, organizational knowledge and transformation of processes in the integration environment [19], [20]. These issues can be addressed by taking advantage of resource integration [21]–[23].

Historically, implementation of e-GIS integration is influenced by involvement of top management or stakeholder, organizational valuable resources and process reengineering [19], [24]–[27]. In contrast, Duarte & Costa (2012) found that the transition from declining IS to a new IS for the same organizational process, not necessarily need to involve top management or strategic approach if organization are happy with the IS performance [27]. When organization are not happy with the IS performance because of e-GIS integration loss, it will cause misfortune to sustainability. For instance, the government will be seen as not investors friendly globally because of the inefficient services in managing business approval.

Recent studies in IS sustainability by Melville [28] and Hasan et. al [13] gave a glimpse of hope

when they found that the realization of IS sustainability benefit can be one of the goal to encourage the implementation and use of IS integration. Benefit such as streamlined, monitored, captured, and utilization of organizational data and metadata in improving operational efficiency, information flow and knowledge value creation to meet the need of organizational change. Therefore, other than realizing the benefit of e-GIS integration in view of efficient and effective services, in this paper we introduce an alternative means to sustain e-GIS by realizing e-GIS integration factor and ISS benefit at the organizational level. Section 2 explains the problem, issues and research gap in e-GIS integration implementation in changing organizational environment.

In Section 3 we identify the integration factors that contribute to the e-GIS integration need by categorizing e-GIS integration factors based on the benefit of e-GIS integration. Apparently this has not been done before; therefore the categorization factor is one of our contributions. Section 4 discusses the importance of e-GIS integration implementation in relation to ISS in the government, based on argument discovered in related work of IS integration theory and ISS concept. In section 5 the research model is advocated. Our main contribution is in the speculation that ISS is influence by IS integration which will lead to the optimization use of government resources in IS, and contribute to the reuse of organizational knowledge within government in changing environment. We present our conclusion in Section 6.

2. PROBLEM STATEMENT

The transformation of e-GIS service delivery triggered many research in the area of e-GIS functions, role and nature of services integration in the changing environment. Several theoretical model of IS integration – Enterprise Resource Planning (ERP), Enterprise Information System (EIS), Electronic Data Interchange (EDI) – include the requirement of organization changing environment at process level [29], [30], application/data level [26], [31], [32] and IT project lifecycle [24], [33]. All of the above studies focus on the organization impact such as risk and performance. Only two studies encapsulate the essence of sustainability in the implementation of e-GIS integration. Butler (2011)[26] mentioned the need to incorporate different type of organizational information at application level to ensure decision making takes into considerations the environment

sustainability. Whereas McGinnis and Huang (2007)[33] is concern on the sustainability of e-GIS project by incorporating knowledge and deliverables of the project as means of organizational continuous project resources. None of the study discusses e-GIS sustainability from the perspective of organizational business process. Though IS integration studies still focus on the efficiency of business and organization administration, recently the focus has changed towards how IS sustainability makes a difference to organizational performance [34]–[37] and how effectively e-GIS are adapted to a changing environment [38].

IS integration studies shows Integrated Information system (IIS) has the capabilities of improving work process efficiency, information flows, utilization of data and metadata, and knowledge value creation in organization [19], [24], [27], [39]–[41], leveraging in collaborative environment to facilitate a SMART government e-GIS. A SMART government e-GIS should be able to provide services with capability of highly personalized, citizen friendly services and ability to co-create with government [42]–[44], that contributes to e-GIS sustainability from the perspective of organizational business processes. Capabilities in IIS can optimize the use of IS in information delivery via mobile service; policy action driven by analytics of huge government data; individualization of communication and transaction by using analysis of complex and different services data; enable businesses to use data to innovative new services; and resilient and trustworthy services in government organization [42]–[44] whose environment is constantly changing.

Despite the capabilities of IIS, previous research shows there are challenges to meet the need of work process efficiency, agency collaboration, knowledge usage, and sustainability [45]–[47] in government IIS implementation. For example, under management of efficient analysis and decision making processes that involves using structured information generated from e-GIS and semi structured data such as organization's knowledge [45] to sustain the organizational memory [48]. Another example is the lack of stakeholder's e-GIS proficiency and capabilities affect their judgment and understanding of the complexity involved in sustaining organizational information and knowledge in e-GIS [49], [50]. Likewise, lack of synergy in complex information system to cater automated business processes with the ability of organizational memory and informational systems to provide sustainable and intelligence in building taxonomy of each resource

[46] for government services in e-GIS. These challenges indicates IIS benefit of strategic information is not used effectively [46] and e-GIS is not sustain.

Several studies in e-GIS integration model concentrated on a work process, application and data level of organization and systems integration individually. In view of work processes level, these models suggested incorporations of IS that integrated business processes from perspective of IS project implementation and improvement lifecycle [30], inter-organization element (technology, structure, strategic) [29] and information processing approach [51] which involves the collaboration of different business stakeholder.

In view of application level, researchers concentrated on architecture of application namely service integration such as online community service, content sharing and collaboration service among different service provider [31] and information service integration for decision making and business value [26], [31] to achieve the need of organizational goal changes.

In view of data level, recently researchers studied how to integrate organizational knowledge with existing IS where the organizational data is the source of knowledge and IS as the data collector [32], [52]. Both studies show that integration of organizational knowledge or organizational memory at the data level will benefit organization management performance and knowledge reuse in organization current activity. Their suggestion is to leverage on reengineering of current process flow by using taxonomy of knowledge content and key performance indicator as a workflow platform [18].

Although several organizational factors have been confirmed as predictors of IS integration in all models, a solid understanding of the process underlying the relationship of e-GIS integration to the ISS is still unclear. Transformation of organizational operation with the support of stakeholder [19] and organizational knowledge integration could be a plausible explanation to this relationship [28], [53]. Based on the gap and problem identified, there is a need to see whether or not studying business stakeholder and system stakeholder collaboration, organizational change, and organizational memory system contributes to the capabilities of e-GIS integration implementation to facilitate a SMART government e-GIS that contributes to e-GIS business process sustainability. Studies showed IS integration at work process, application and data level of organization, and

systems integration individually, [26], [29] [30] [31] [32], [51] [40] did not achieve IS integration benefit because of the challenges in IIS implementation. Therefore to facilitate SMART government e-GIS, IIS implementation may need to include business stakeholder and system stakeholder collaboration, organizational change, and organizational memory system altogether to achieve e-GIS sustainability. The organizational approach is to fulfill the need of e-GIS transformation from information-digital era to become SMART government in providing quality and valuable service to the Malaysian citizen and other customer globally.

3. IS INTEGRATION AT ORGANIZATION LEVEL

The transformation of e-Government services into citizen centric and integrated government also dictate the necessity of organizations to need an integrated e-GIS in supporting inter-agencies capability and competencies collaboration and optimization of e-GIS use to serve as a SMART Government. According to Gartner [42], IDC report [43] and Malaysian Government [44], a SMART government e-GIS should be: able to have the capability of highly personalized, citizen friendly services and ability to co-create with government; information delivery via mobile service; policy action driven by analytics of huge government data; individualization of communication and transaction by using analysis of complex and different services data; enable businesses to use data to innovative new services; and resilient and trustworthy services.

3.1 e-GIS Integration Need

From previous study of e-GIS integration in public sector, we discovered 15 factors contribute to the need of e-GIS as shown in Table 1.

Table 1: Factors Contributing To Integration Need In e-GIS.

Category	Factor	Sources
1	System & Business Process Efficiency	
	1. Information flow & access	[11], [49], [54]–[62]
	2. Decision & policy making	[50], [54], [57], [59]
	3. Business process & Service delivery	[47], [50], [56]–[58], [60]–[64]
	4. Inter & intra-agency communication	[58], [59], [63]
	5. Employee performance	[59]

	6. Operation cost	[11], [50]
2	Collaborative Environment	
	7. Public participation	[49], [56], [62]
	8. Agency collaboration	[50]
3	Operational Change	
	9. Continuous development	[57]
4	Enrichment of knowledge	
	10. Knowledge dissemination & mutual learning	[60], [62], [65]
	11. Knowledge worker	[65]
5	Sustainability	
	12. Accountability & transparency	[49], [57], [58], [60], [63]
	13. Responsiveness	[49], [56]–[58]
	14. Quality services	[42], [44]–[46], [49], [51], [55], [56]
	15. Sustainable services	[58], [66]

The factors are group in 5 categories based on the benefit of e-GIS integration. The most discussed factor by researchers is Category 1, *System and business process efficiency*. Public sector modernization of government administration through e-GIS such as information flow, decision making and policy enablement has been a catalyst to the transformation of internal government processes towards effective and efficient performance in service delivery through online services. Furthermore, e-GIS integration empowers the inter-agency and intra-agency communication through seamless and paperless processes to boost the employee performance therefore able to lower the cost of operation.

In achieving harmonization of complex processes for multiple organizational functions, government vote Category 2, *a collaborative environment* to promote the agency collaboration, and coordination. The collaboration is to gain public participation in giving their responses on the citizen requirement. For example of collaborative environment is based on Malaysian government feedback system i-SPAAA manage by Public Complain Bureau. The system has an integration service that enables 23 government agencies to manage public complain seamlessly and collaborate in taking action and giving feedback to citizen. The action taken by government is to ensure the quality of public services and continuous quality development such as public amenities [68]. The participation of key stakeholders in public sector decision making also leads to agency collaboration. Category 3, *operational changes* indicate the continuous development of government services as one government shows government commitment in

making continuous changes in its operations to meet the current public needs.

The received feedback from public and stakeholder is one of the valuable evaluations that enabled organizational learning in the process of *knowledge enrichment* which is Category 4. Integration of e-GIS with a capability of providing organizational knowledge in the process of dissemination, transaction and analysis is equivalence to using organizational memory, knowledge storage or documentation. This is to ensure the improvement of IT literacy of knowledge workers through integrated work processes in e-GIS is achievable.

Organization and knowledge worker that have the motivation to reuse organization knowledge will have the ability to bring *sustainability* (Category 5) in government services. e-GIS integration that portray a quality service inclusive of accountability, transparency and responsiveness will be able to sustain in the uncertainty of environmental and technological development change in the future.

Therefore, this analysis found four factors of IS integration benefits to an organization that are 1) work processes and collaborative environment, 2) operational changes, 3) organizational knowledge and 4) sustainability in the implementation of e-GIS.

3.2 e-GIS Integration Implementation

Challenges

Information systems integration in e-Government is agreed to be very important, therefore government have to face the challenges in fulfilling those needs. Difficulties of e-GIS implementation in government organization to meet the need of internal efficiency, agency collaboration, knowledge usage, and sustainability are discussed as challenges in recent studies. The analysis of challenges is categorized into 3 elements of work process in the organization. The categorizations are depicted in Table 2.

Analysis of previous research in e-GIS integration revealed nine internal challenges of government in sustaining e-GIS services. We find that e-GIS integration, benefits strategically to organization (*Category 1*) in bringing forth strategic information as a whole to oblige the organization efficiency. The benefit of strategic information somehow is not used effectively [46] because of the under management of efficient analysis and decision making processes that involves using structured information from e-GIS, knowledge from semi structured data such as report, performance evaluation, spreadsheet, presentation and others [45] to sustain the organizational knowledge also known as organizational memory (OM)[48]. The decision made is also a new knowledge created within an organization. There is lack of strategy to incorporate OM as part of e-GIS.

Table 2: e-GIS Challenges In Meeting e-GIS Need

Category	Challenges	Sources	e-GIS need/benefit
1	Strategic		
	1. Information (electronic records, semi structured data, digital document) has not been managed appropriately as strategic resources.	[46], [49], [54]	internal efficiency knowledge usage sustainability
	2. Lack of strategy in knowledge function (storing, integration and reuse) to support decision making in the organization and environment sustainability.	[46], [65]	knowledge usage sustainability
	3. Innovation applied as a norm in information systems changes but did not encourage change behavior towards the direction of sustainability.	[46], [55]	internal efficiency sustainability
	4. Organization fail to grasp the full benefits of IS integration in transforming business operation to fill organization strategic goal.	[18], [50], [56], [69]	internal efficiency agency collaboration sustainability
2	Organization		
	5. Lack of IT managerial knowledge in understanding the complexity involved in sustaining organizational information and knowledge in IS.	[49], [50]	knowledge usage sustainability
	6. Lack of commitment and support by top management in nurturing organization innovation.	[54], [65]	internal efficiency agency collaboration
3	System		
	7. Information systems did not have full ability to manage electronic records, semi structured data and digital archive	[11], [54], [55]	internal efficiency agency collaboration

	leads to inefficient information flow across all business functions.		
	8. Information systems did not built to create synergy between the physical and informational components system in line with sustainability.	[46], [56]	sustainability
	9. Lack of knowledgeable IS personnel to ensure maintainability and availability of system due to rapid changes of organizational needs.	[56], [63]	knowledge usage sustainability

According to Watson et al. (2011) it is different between doing things right (efficiency) and doing the right things (effectiveness). They also agreed that building sustainable physical system that synergize with informational system including knowledge is a challenging task. Failing to use strategic information and knowledge such as project deliverables and technical know-how as an input to innovate and transform internal processes during e-GIS upgrade or change request will not assist in sustainable information and services. Therefore the advantage of having collaborative working environment that involve top management and expert teams [70][71] or stakeholder is crucial challenges to be addressed when carrying out organization changing goals especially in translating strategic intent into operational services in e-GIS.

The 2nd category indicated, for an organization to gain benefit of innovation in managing change in e-GIS integration implementation, internal stakeholder such as chief information officer, employees accountable to make decision, should be given opportunity to upgrade their e-GIS proficiency on their own or learn formally in the organization. According to past researcher, the lack of its capabilities in stakeholder will affect their judgment and understanding the complexity involved in sustaining organizational information and knowledge in e-GIS. It is parallel with committed organization innovation derived which may explain the advantage of an organization in deep understanding of public service customer needs and translate this comprehension into government systems. Innovation orientation approach gives an edge to the superiority of technology to anticipate future needs. Therefore the lack of commitment and support from top management will result in organization losing momentum in the implementation of the IS innovation to go beyond usual e-GIS design.

A major challenge for system developer is to build an integrated complex system (*Category 3*). An example of complex system is an information system that can cater automated business processes

with the ability of organizational memory (stored general knowledge, action knowledge, employees' knowledge and operational knowledge) [18] at the same time have the ability of informational systems (electronic records, semi structured data and digital archive) synergistically. e-GIS integration is one of strategic approach in integrating all three functions with ability to provide intelligence in understanding taxonomy of each resource, provided that information architecture and data standardization has been put in place. This capability is possible by using analytical tools such as business intelligence. Business intelligence systems combine operational data with analytical tools to present complex and competitive information to planners and decision makers, and through their analysis into knowledge [45]. The system will be able to provide huge data for analytics means (statistics, trends, data warehouse, and data repository) to drive policy action by government.

Watson et al. (2011) believe the importance of synergizing physical and informational components system of government services in e-GIS for it to be sustainable. Four informational components are (i) the availability of ready information to increase the value of service(ubiquity), (ii) the capability to find the best match and precise information or resources to organization or user unique needs(uniqeness), (iii) Minimal variation in the unification method of accessing resource to ensure procedural consistency (unison), and (iv) informational system is design to be able to translate correctly between different integrated business process systems (universality).

For example, Malaysian government nowadays provides innovation in monitoring and managing policy meeting and its decision using 'MyMeeting' system. The system is able to automatically generate reports on decision, status and development of project. However MyMeeting is not integrated with any project management system, budget monitoring system and government policy such as relevant circular, procedure or project evaluation reports. Therefore MyMeeting as of now did not have 'ubiquity' in using ready information from existing system, 'uniqeness' in specific

project status, ‘unison’ in getting project information across business activities and does not incorporate ‘universality’ in presenting project status by different type of project. Due to the scenario presented in the example of MyMeeting, by incorporating sustainability and innovation conscious mind, developer will be able to predict tomorrow’s need by incorporating all 4 components in enhancement of MyMeeting. Therefore it is also important for the government to ensure retainment of proficiency and capability of IS personnel to ensure maintainability and availability of system due to rapid changes of organizational needs.

All the challenges show the gap in e-GIS integration benefit in the rapid changes of organizational needs. The gap shows that innovation environment and e-GIS benefit is very important to internal organizational factors such as strategic, organization, system, and knowledge appertaining stakeholder involvement (business and IS), services transformation and knowledge function contributing to e-GIS integration.

3.3 e-GIS Integration Factor

This study is suggesting a holistic approach for all the adversity in e-GIS integration

implementation by drawing upon the benefit of ISS and capabilities of e-GIS in improving efficiency of work process, information flows, utilization of data and metadata and knowledge value creation in organization, leveraging in collaborative environment to facilitate e-Government transformation.

e-GIS integration and ISS interconnect in facilitating IS as an organizational means in influencing belief and action formation and outcome assessment in the government transformation activities to support new practices in line with sustainability [28]. The importance of synergizing sustainable development in e-Government towards services that leverage on sustainability in integrated processes is also mention by United Nation in their report of e-Government Excellence Assessment 2012 [6]. Therefore we categorize organizational factors based on 3 elements of organizational work system that benefited e-GIS integration namely strategic, organization and system. Based on literature, 6 prominent papers discuss factors of e-GIS integration at organization level. The analysis of factors influencing e-GIS integration is shown in Table 3.

Table 3: e-GIS Integration Implementation Factor

e-GIS Integration Implementation Factor	Author					
	Arshah, Desa & Hussin (2008) [24]	Zhigang & Huiping (2009) [39]	Huanchun (2010) [40]	Hong-xia, Bin, & Gang (2010) [41]	Besson & Rowe (2012) [19]	Duarte & Costa (2012) [27]
STRATEGY						
Strategic Collaboration	✓					✓
CIO Role					✓	
Business Integration		✓	✓	✓		
Organizational Transformation					✓	
IS continued use						✓
ORGANIZATION						
Business process Integration	✓	✓	✓	✓		
Informational System					✓	
Knowledge management & Reuse					✓	✓
SYSTEM						
System Integration	✓	✓		✓		
Technical Assurance	✓	✓	✓			
System Lifecycle			✓			✓
IT manager role					✓	

Table 3 shows the evolution of factors which indicate that strategic, organizational and system factor is prominent in the e-GIS integration implementation. However recently the importance of information and knowledge function and usage in the e-GIS integration implementation has been recognized [19], [27]. The significance of knowledge function is also suggested by Maruster et. al (2008) that it will be able to sustain investment of e-GIS integration implementation in time, energy and money in order to make it success [53].

4. RELATED WORK

Understanding the theoretical foundation and role of e-GIS and its integration importance in relation with ISS at organizational level will give an overview on the influence and contribution of each factor.

4.1 Theoretical Foundation

According to Work System Theory (WST) introduced by Alter in 1999 [7], organizational information system is distinguish by the concept of 'work system' and 'information system' in organization. By understanding elements of a work system (processes and activities, participants, information, and technologies) and work system's environment such as strategies, infrastructure, environment, services and customer, provide useful focal point for understanding the operation and significance of specific information system. The position of IS and work system by Alter compared to the degree of usefulness to organization information system is illustrated in Figure 2.

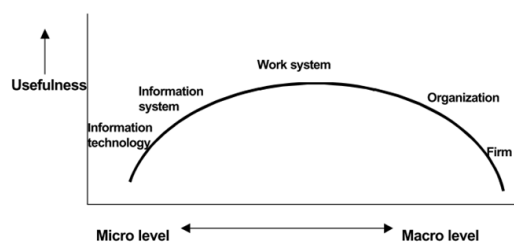


Figure 1: IS Position In Relation With Work System
Source: Alter (1999) [7]

The relationship of work systems element in e-GIS integration environment is explained by Pollalis (2003) in his model Organization Systems Integration (OSI) focusing on intra-organizational processes and integration of structure, strategy, and technology. Recognizing Pollalis idea, several researcher further emphasize on the importance of functional integration and holistic systematic

approach rather than contingency approach in managing organizational and e-GIS changes dependencies [31], [72], [73] to sustain. Furthermore, Alter's assumption [30] that service system evolution is based on the combination of formal planned projects and unplanned adaptations of work systems change, intensify the suggestion that for information system to sustain, organization need to transform its business processes to align with organizational goal.

The acceptance of changes in organization through adaptation and use of innovation initiatives is explained by Rogers (1983) in the Diffusion of Innovation Theory (DOI) [74]. One of the elements of DOI is communication channel which can be interpreted as channel of process where organizations create and share information with one another in collaborative environment. Therefore innovation in process transformation is important in driving the continued use of e-GIS services and nurture optimal use of organization information and knowledge in integrated environment.

The assurance that e-GIS services sustainability in organization, involves different set of stakeholder from the decision makers such as business stakeholder and IS stakeholder [53], [74]. Changes of organizational processes to solve wide range of user's problem might lead to changes of organization structure and personnel. These changes will effect on the modification of e-GIS during implementation in consequence of stakeholder's lack of detailed knowledge about the new process[74].

Advancement of stakeholder and employee's proficiency and capability is required in organization procedures, workflows and management changes [16] involved in e-GIS integration. On the other hand organizations also need to retain history of goals in order to measure progress toward their achievement [75]. The information about events that triggered decision on changed goals and information about the organization's response to the decision is in the employee's mind and experience and they alone have the ability to retain the information. The stored information is called organizational memory if it has the capabilities to be accessed and used on present decisions [48]. The kind of rare information that can be called as general knowledge, action knowledge, employees' knowledge or operational knowledge [18] depends on either it is views as a resource or a process. Both views of knowledge is

explain by Knowledge-Based Theory (KBT) that recognized it as a strategic resource of an organization [76].

Merali et. al (2012) and Rowley (2011) speculated that knowledge organizations drive the changes in the organization for e-GIS integration implementation and increase the value and efficiency of government services and delivery systems [20], [77]. Basaruddin et. al (2011) agreed and suggest that OM system (OMS) should be integrated with e-GIS and should be the only place of organizational accumulation of knowledge in collecting and preserving as well as reuse of knowledge. The accumulation of knowledge will involve process of capturing, finding, searching and disseminating of knowledge.

The idea of knowledge reuse can be achieved through embedded knowledge process for employees proficiency improvement. Stakeholder are more likely to involve and accept new processes if information is easy to access, experience of others is easy to trace, and procedures are easy to follow [16]. Furthermore it also interpreted and mapped to the workflow and task of the new processes in e-GIS. The collaborative environment and the ability to work as a team will nurture knowledge creation, reuse of knowledge and the richness of OMS [26]. Meanwhile knowledge creation process is only needed for tacit knowledge but not explicit knowledge that has been created digitally [52].

In terms of system, various intelligent information and expert system can accommodate the integration and reuse of knowledge. The simplest example is analytical and collaborative tools that use human knowledge captured in a computer to solve problems. Similar solution by using case-based reasoning system inferring solutions in solving future problems that uses collection of the historical information and knowledge base [16]. For instant e-Syariah, one of the Malaysian e-Government system that deal with Islamic jurisdiction that enables judges to recall previous cases, which may be identical to the new ones but usually are not and referred the case to support their judgments. These examples shows OMS supporting decision making for continued enhancement and improvement in the organization, practices being learnt, intelligent database and integration of e-GIS systems [52] which has been indicated by Maruster et. al (2008) [53] as

sustainability of knowledge that contribute to the sustainability of IS.

Therefore, according to Rogers (1983), implementation of process transformation such as reengineering, business improvement and process streamline in organization could assist on the e-GIS integration especially in IS role to create knowledge and awareness to persuade the attitude of stakeholders towards adapting the new processes [74]. This is supported by internal characteristics of transformational organization describe in DOI: stakeholder power to control the changes of work systems(centralization); availability and accessibility of organizational knowledge in aiding employees proficiency(complexity); adherence to the governance in place(formalization); collaboration and team work between business unit(interconnectedness); and the percentage of manual processes and manual resources(organizational slack).

Regarding the role of e-GIS as service oriented and integrated government in a changing environment, e-GIS integration may possibly be the leader of a new sustainability strategy [78]. e-GIS integration is seen in terms of e-GIS interactions and system and data interdependencies; providing consistency and simplicity function and services; and creating space for agility and innovation in system modification and change request [79]. Sustainability also means the degree of innovation continues to be used after e-GIS integration adoption [74], [80].

4.2 IS Sustainability

The study of ISS is motivated by introduction of sustainable development by Brundtland Report (1987) that emphasis on the need of future generations that must be sustained by present generation. ISS has been discussed by researchers in different term such as Green IT, Green IS, Green IT/IS, Green ICT, Sustainable IT/ICT and IS for eco-sustainability. Some of the studies are represented in Table 4. The need of expeditious changes to government processes explains the role of e-GIS integration is congenial to ISS. An answer to how ISS can facilitate e-GIS integration implementation is shown in Figure 1.

Organizational changes in public administration and services pursue e-GIS integration by upgrading existing system functionalities or introducing new system capacities. Thus, innovation solution that can provide simple interfaces to hide procedural complexity and integrate resources (data,

information and knowledge) across different systems is desired. ISS is suggested to be able to motivate innovation in finding solution for organizational changes [82]–[85].

Table 4: ISS Terms Use In Research
Source : Ijab (2010) [12]

References	Green IS	Green IT	Green ICT	Green IT/IS	Sustainable IT/ICT	IS for eco-sustainability
Boudreau et al. 2008	√					
Chen et al. 2008						√
Chen et al. 2009				√		
Daly & Butler 2009		√				
Elliot & Binney 2008					√	
Elliot 2007					√	
Erek et al. 2009		√				
Fuchs 2008			√			
Hilty et al. 2006			√			
Jenkin & McShane 2009				√		
Jenkin, Webster & McShane 2009				√		
Mann et al. 2009		√				
Maruster et al. 2008						√
Melville 2010						√
Molla 2009		√				
Murugesan 2008		√				
Sacchero & Molla 2009			√			
Sayeed & Gill 2008		√				
Watson et al. 2010	√					

Such a system should ensure take up in system usage and able to sustain and reuse the organizational tacit and explicit knowledge which has been created digitally stored in OMS. Usually the proposal of e-GIS modification is done by informing stakeholders the reason changes take place and motivate them to take action in achieving organization strategic goals. By accentuating changes benefit tailored to stakeholder value, the decision makers will be more appreciative on the system benefit to them rather than bounds to the technical abilities of the system [86]. ISS can be one of the benefits of e-GIS integration implementation in the impact of its action on economic and environmental sustainability [28] aligned with organizational strategic transformation [87]. The dominance of informational systems drive with respect to unison, e-GIS integration that leverage on ISS benefit will take into consideration of the minimal changes to the stakeholder of the system even though it involves major transformation to the complex procedural underneath.

ISS capabilities can be explained using Melville Belief–Action–Outcome (BAO) framework. The framework emphasizes informing beliefs, enabling actions, and transforming outcomes for e-GIS. The framework’s components are societal structure, organizational structure, beliefs about environment, behaviour of social system, behaviour of organization, and sustainability actions. [28], [34]. The ISS capabilities mention by Hasan et. al (2012) are:

- Broaden informational usage to inform public about scientific finding such as climate change.
- Building knowledge repositories and use IS to make huge sets of research data.
- Introduce crowd sourcing of information and solutions by empowering end user and the individual that leads to the democratization of knowledge and seen as the co-creation of knowledge.
- Businesses efficiency, cost saving and innovative through automating, equitable information flows and organizational transformations.
- Decision support improvement for organization sustainable development by using e-GIS to model future scenarios using Geographical Information Systems tools and intelligence system that can work across multiple business areas.
- Intensify IS role in reducing reliance on paper.

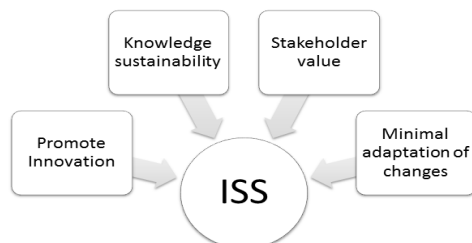


Figure 2: Facilitation of ISS in e-GIS integration

- Raising green environment consciousness in systems development and modification of existing system such as online service, open source software and green cloud.
- Changing attitude and behaviour of employees through information and utilize long distance technology in e-GIS to collaborate and reduce traveling.

The capabilities of ISS indicate the seriousness of using e-GIS integration in transforming organizational services.

5. RESEARCH MODEL

Research model shown in figure 2 is based on theoretical lens as clarified in the related work. The constructs and variables are as follows:

- i) Business process stakeholder collaboration is defined as collaboration of individuals and agencies who are responsible for ensuring compliance with policies and regulations, and enhance organizational performance through the following tasks: i) providing strategic direction, ii) ensure goal achievement; iii) ensure that all risks are addressed effectively, and iv) ensure that all resources are used efficiently. This is according to the suggestion by Maruster et. al (2008) and Rowley (2011) that the role of business process stakeholder is closely related to the work system of organization. Examples of business process stakeholders are CIO, business process experts and other government agencies related to the business function [53], [77].
- ii) System stakeholder collaboration is defined as collaboration of individuals or team who is responsible and has a strong leadership towards the implementation of e-GIS integration project to align with the needs of system objectives, strategies and organization goals. They are also responsible in implementation of develop system, reduce system's risk, manage system resources and manage performance of the system. Examples of system stakeholder are technical project team, project manager, systems developers and programmers [53], [77].
- iii) Organizational changes is define as structural, organization procedures, workflows and management [16], and nature of government service and service delivery change [1]. Changes in the organization's operations also

involve operational transformation processes [19] before and after the implementation of an e-GIS integration through re-engineering process, improvement of work processes and change management.

- iv) Organizational memory system is defined as a platform to store, combine and integrate scattered information in various sources to facilitate organization in getting immediate and easy access to organizational memory. Organizational memory is a process of knowledge stored and usage in e-GIS that involves the acquisition, retention, maintenance, search and reuse of organizational knowledge. Organizational knowledge can be embodied in the form of individual or organization paper files and digital file, culture, processes, structure, individual memory and the role of organization [48], [75], [88].

Factors mentioned above are independent variables whereas e-GIS integration implementation is the dependent variable of this study. Though there are many methods to measure IS sustainability as an outcome, this study will use list of capabilities mentions by Hasan et. al (2012) to measure ISS.

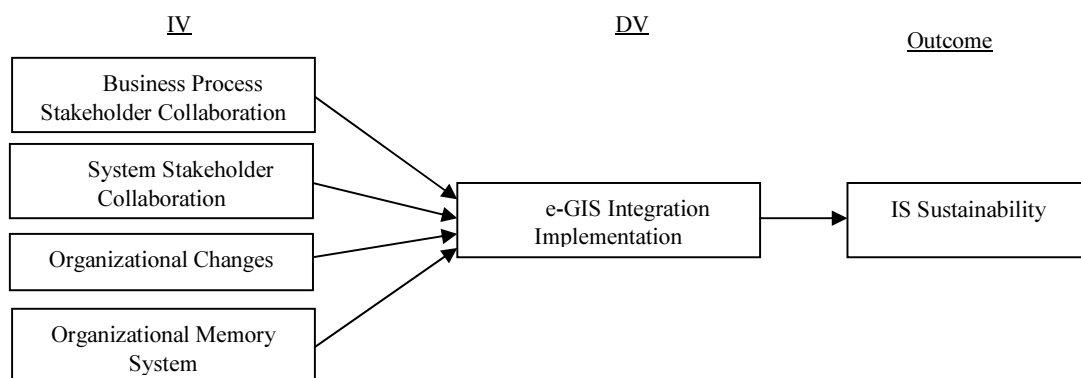


Figure 3: Theoretical Framework Of e-GIS Integration Implementation

6. CONCLUSIONS

Studies on e-GIS integration have developed models which integrate IS domain and sustainability domain. Researchers have made improvement to the system integration model by introducing the organizational changes factor from the perspective of process level; application/data level; and IT project lifecycle. Most of IS integration studies focus on the efficiency of business and organization administration, but some recent study shows focus change towards the benefit of ISS and how e-GIS adapted to changing environment. Past research revealed that OMS integration in e-GIS is able to drive process and system change that contribute to the continued use of e-GIS and support re-use of organizational information and knowledge. Re-use of knowledge in appropriate and equitable decision leads to valuable services that meet the government current needs. This research has study on the 4 factors: business stakeholder and system stakeholder collaboration, organizational transformation, and OMS that influence the implementation of e-GIS integration by realizing ISS benefit at the organizational level. The validated model can help Malaysian government to understood better the need of organization in optimizing the work system and e-GIS integration to ensure IS sustainability. The model could also serve as a guideline for Malaysian government in developing and innovation in e-GIS business service architecture for end-to-end e-GIS business service development and improvements under the initiatives of paperless government in the Government Transformation Programme (GTP). This is significant to achieve the need of

measurement on results based performance through e-GIS for monitoring performance of National Key Results Area (NKRA) to achieve Malaysian Vision 2020 in global competitiveness.

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