# Conceptualizing IS Sustainability Benefits in Transforming Government Services

Siti Istianah Mahdzur and Juhana Salim
Faculty of Information Science and Technology, National University of Malaysia, Bangi, Selangor, Malaysia
Email: istianah73@gmail.com, js@ukm.edu.my

***Abstract*—The transformation of e-Government to Smart Government services triggered many research in the area of business process change, information use and nature of business integration in the changing work system environment to realize organizational benefits. This paper addresses the question, "How can IS sustainability (ISS) benefits be conceptualized in the transformation of Government services?" This study build on the Belief-Action-Outcome (BAO) Framework that leverage on the Information System Integration (ISI) and Work System Theory (WST) and suggest that organizational memory and informational system's ability to achieve organizational knowledge sustainability in realizing ISS benefits. The study couple this theoretical understanding and previous research on ISS benefits embedded in ISI under grids the explanation of our approach to measure an organization's ISS benefits. Our measurement approach considers (1) the ability of organizational memory and informational system's integration in the business processes that enable ISS realization, (2) the collaborations of stakeholders in business and system change, and (3) the organization's ability in maintaining the equilibrium between work system elements. The research contributions is on ISS and government service transformation in specifying a conceptual model that link ISS benefits and ISI building upon BOA framework and WST, simultaneously giving adequate understanding of the implication and realization practice of ISS benefits during business change and government service transformation. In sum, the study provides insights into social and organizational perspective of sustainability, i.e. organizational knowledge as a valuable asset in sustaining government services.**

***Index Terms*—IS Integration, Government service transformation, IS Sustainability, Benefits realization**

## I. Introduction

In the information systems (IS) studies, information systems sustainability (ISS) means "the design and implementation of IS that contribute to the sustainability of business processes" [1][2]. ISS is known to motivate innovation in the organizational changes [3]–[6] in achieving organization strategic goals. Organizational changes in the government services pursue information system integration (ISI) by upgrading existing system functionalities or introducing new system capacities [7][8]. A complex integration of Government Information Systems (GIS) has transformed government services to meet the need of Smart Government. A Smart Government actualize through GIS and ISI by empowering open data; innovative organizational information and knowledge value services; and render highly personalize and seamless service experience that touches citizen's everyday lives [9]. Thus, ISI solution that can offer effortless interfaces that conceal the intricacy of procedural and data, information and knowledge integration across different systems is desired [10]. GIS with capability of ISI will be able to sustain and reuse the organizational tacit and explicit knowledge which has been created digitally stored in organizational memory system (OMS). The nucleus of transformation in GIS integration is paperless government or digitization of public sector services [11] which is also the core of ISS. In sum, GIS integration that empowers strategic function and usage of organization information and knowledge (OIK) to transform GIS services in ensuring its sustainability, will achieve Smart Government goals.

The advantages results of business process transformation that tailored to GIS stakeholder and meets Smart Government goals are benefits [12][13]. Emphasizing business changed benefits that meet the stakeholder value, the decision makers will appreciate more on the GIS benefits to them rather than the technical abilities of the system [14]. ISS can be one of the benefits of GIS integration implementation in the impact of its action on environmental sustainability [15] aligned with organizational strategic transformation [16].

The literature indicates that scant attention has been paid to the ISS benefits in the transformation of GIS integration [11][17]. The interdependencies of change and benefit, increase the probability of realizing all benefits [18] transpired during transformation of government services. The relationship of GIS integration and ISS benefits may be explained by understanding the measurement of sustainability of GIS integration in government service transformation.

The focus of this study is on the change that occurred in organization business process, which can motivate sustainability outcome in information system studies, and how it can contribute to ISS benefits realization. Despite the lack of attention, GIS Integration of OIK have shown the potential of streamline flow and optimize usage of OIK in improving organization operational efficiency and knowledge value creation [8][19]–[21] during service transformation. The integration of OIK involves organizational environment and social issue [22]. The

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solution of integrating service-oriented architecture (SOA) [23] and utilization of Web 2.0 technology [9] as an effort in GIS integration to sustain GIS services, often poses more technological solutions. The shortcoming of SOA and Web 2.0 integration approach in this context will draw back empowerment of OIK in service transformation.

Unfortunately empirical study in GIS transformation improvident to the need of sustainability in GIS integration given their focus on business process reengineering [8][24][25] and change management [16][26]–[29]. Only few studies undertake the OIK as a measure in sustaining IS services [30]–[32], and none of them examined from the aspect of GIS integration in service transformation. Our study reported in this paper seek to address this gap in the literature by conceptualizing an assessment of ISS benefits realization by leveraging on GIS integration in service transformation in view of ISS benefits (G-ISSB).

The focus on ISS benefits dimension originates from the social and organizational perspectives. The social perspective includes the fact that GIS integration are people made and operated by people and people's actions follow from an individual knowledge [22]. Nonaka (1994) assert that organizational knowledge is the knowledge shared by individuals [33]. The organizational perspective includes GIS integration as a work system [34] that provides the IS platform with analytic capability for handling multidimensional data and complex information [2]. The analytic and systemic power is used by organization in coordinating their employees and stakeholder into distinct roles and tasks [15] in the GIS integration in service transformation. Against this background, the Knowledge Based Theory (KBT), Work System Theory (WST) and Belief-Action-Outcome (BAO) are chosen as theoretical underpinning for the conceptualization of G-ISSB model. The theories focus on supporting the integration of OIK in the GIS integration in service transformation. This study develops integrated sustainable OIK actions that align with the changes of organizational work systems element in realizing ISS benefits.

The remainder of this paper is structured as follows. First, the study review background literature of knowledge regarding ISS benefits, GIS integration in service transformation and social and organizational perspectives of ISS benefits. Later, the conceptual modeling of ISS benefits in integrating OIK within GIS service transformation is discussed. The paper concludes with summary and future work.

## II. Background Literature

ISS benefits concept from the social and organizational perspective will be discuss in conjunction with the concept of belief formation of sustainability actions, organizational knowledge as a means of attaining sustainability in government business process through equilibrium of work system elements in GIS integration. Above concepts will be explained in the following subsections.

### A. Information System Sustainability Benefits

Benefits opportunities are actualizing through changes in the way business activities performed and information is used [18][30]. Benefits or advantages results are provided to specific group or individual that meets organizational goals and objectives sets by stakeholders [13]. Benefits can also mean the changes effect of current business process [12]. Benefits realization is refers to realize potential benefits of output or outcome from the use of IS that aligned with organizational goals and objectives [12][30].

Empirical study by Ward, De Hertogh and Viaene (2007) showed that after 11 years (1996 to 2007), organization still fail to take full benefits of business. Their findings indicated the negative increment (-3%) in the practice of reviewing benefits delivery during implementation of business change. This result raises some doubt to the capability of organization in understanding the implication of benefits realization during implementation of business change and service transformation. Their suggestion that benefits realization should integrate organized and synchronized organizational resource such as OIK in the organizational change process has their own merit.

Researchers also emphasized the importance of embedding IS sustainability practices in business processes and organization social system in enhancing knowledge usage [13][31]. Furthermore Melville (2010) claims that IS sustainability can covers both micro factors which involves human behavior and macro factors that involves social, organizational, and environmental context [15].

This study chose theoretical framework that explained the relationship for macro and micro factors which is capable of integrating them with the outcome of ISS benefits. Melville's BAO framework was found befitting for this purpose. The social and organizational perspectives of sustainability in IS integration implementation has been studied to include understanding of social adaptation such as stakeholder roles (business and systems), organizational knowledge, organizational change (business and systems) and ISS benefits [15][22][32][33]. The link between social and organizational contexts is integral in explaining benefits realization and dynamic relationship between people who experience the process of GIS integration and transformation in organizations' service [32][33].

GIS integration capability that enable ISS benefits can be found in three area namely capability of automation to upgrade efficiency; informational capability to increase effectiveness; and capability of transformation to create new business [35]. The benefits of service transformation will involve all three GIS integration capabilities where automation will bring benefits of less number of manual processes; and informational capability benefits the business change in the process of strategy and performance analysis; and explicit benefits to service transformation showed at the stage of implementation of new business. These concepts complement the understanding of service transformation in the Work

System Life Cycle (WLSC) model based on WST [34][35] and sustainability action and outcome in BAO framework [15].

Table I summarizes the literature of GIS integration and the organization benefits that embedding ISS and provides possible indicators to define G-ISSB. The indicators are categorized based on the four elements of GIS integration work systems (explain in *Section C*).

TABLE I. SUMMARY OF LITERATURE ON EMBEDDING ISS BENEFITS IN GIS INTEGRATION

| Indicators of embedding IS sustainability benefits in GIS Integration | References | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | [13] (2011) | [12] (2012) | [36](2013) | [41](2013) | [42](2013) | [43](2014) | [44](2014) | [45](2015) |
| Stakeholder (Business Process and GIS Integration) | | | | | | | | |
| Value-based assessment and evaluation | ✓ | | ✓ | | | | | |
| Knowledge-based decision making | ✓ | ✓ | ✓ | | | | | ✓ |
| Strategic planning and implementation | | | ✓ | | | | | |
| Flexible learning development | | ✓ | | | | | ✓ | |
| Organizational knowledge value | | ✓ | | | | | | |
| Collaborative management | | | ✓ | | ✓ | | | |
| Organizational Information and Knowledge (OIK) in GIS | | | | | | | | |
| OIK usage, storage & dissemination | ✓ | | ✓ | ✓ | | | | |
| Knowledge accumulation & retrieval | | ✓ | ✓ | | | | ✓ | |
| Faster access and reuse of knowledge | | ✓ | | | ✓ | | | |
| Knowledge match-making | | | | | | | ✓ | |
| Information elimination | | | | | | ✓ | | |
| GIS Processes and Activities | | | | | | | | |
| Business information value | ✓ | | | | | | | |
| Innovative service &improved motivation | | ✓ | | ✓ | | | | |
| Synergy in service development | | | ✓ | | | | | |
| Seamless process flow | | | ✓ | | ✓ | | | |
| Standardized procedure | | | | | ✓ | ✓ | | |
| Reduced administrative burden | | | | | | ✓ | | |
| Adaptation of flexible learning | | | | | | | ✓ | |
| GIS Integration Architecture | | | | | | | | |
| Complex integration (IS and organization) | ✓ | | | | | | | |
| Database as explicit knowledge resource | | ✓ | | | | | | |
| Enhanced workflow of business | | ✓ | | | | | | |
| Automation of business process | | | | ✓ | | | | |
| System Interoperability | | | | | ✓ | | | |
| Electronic and smart service platform | | | | | | | ✓ | |
| Enterprise agility | | | | | | | | ✓ |

Based on the summary, this study synthesized that GIS integration in services can embed sustainability in all element of work system from various GIS stakeholder action that use OIK from GIS and develop GIS integration [12][13][31]; in overall process of OIK stored and usage in GIS [12][31][38]; in GIS business processes and activities [31][37][38]; and in GIS design to implement integration between IS and organization [12][13][36]. These suggest that G-ISSB touches all dimensions of work system change and service transformation indicator. The nucleus of ISS in GIS integration for service transformation lies on the benefits realization that focuses on the use of OIK and generation of new knowledge in organization's adjustment to changed environment.

### *B. Social Perspective*

The social perspective of ISS benefits were discussed in terms of organizational knowledge which is the knowledge shared by individuals [22][33] in an organization. An individual is part of organization [46] that use interpreted information and knowledge and apply it in reasoning, decision-making, or performing actions to become organizational decision or action that incorporate sustainable services in business change. By reviewing the literature, Sun (2015) and Rowley (2011) highlight the importance of stakeholder engagement and their roles in the success of GIS services [9][42]. Thus G-ISSB involves stakeholders in government business process and GIS integration in service transformation. The study categorized GIS stakeholders based on roles [47] as business process stakeholder and GIS integration stakeholder that involves in the service transformation.

The stakeholders' decision in the transformation of GIS services must leverage on the digital architecture and OIK capability to realize the benefits of knowledge sustainability [8][10]. Maruster, Faber and Peters (2008) introduced knowledge sustainability concept by guiding all knowledge processes to lead to the development of new knowledge to sustain. The three knowledge processes involves are: (1) knowledge adaptability where organizational knowledge are preserved to meet the need of service transformation (i.e. in organization culture and regulations, organization history, competitive issues and technical development) [22][43]; (2) knowledge evaluation where the validity of knowledge are evaluated in terms of the grounds of knowledge claim (i.e. data, facts, evidence, considerations and features) [49]; and (3) knowledge offloading where GIS stakeholder involved in preserving environment resources in their action in

articulating the sustainability of government services (i.e. sense-making, strategy-forming, and decision-making) [22][43].

Spender (1996) postulate in KBT that organizations' knowledge is a strategic resource [50]. As a strategic resource, organization must have the capability to evaluate the realized benefits of OIK implementation and sustainability [51] involving GIS stakeholder. The OIK is procured and processed by individual or people in the organization from databases, documents, shared knowledge or undocumented discussion and events [48]. Recently the concept of 'big data'(BD) is capitalized to assist organization in their reasoning and decision-making [52]. BD analytics deliver smarter, more insightful data analysis of business and customer [53]. Since a lot of GIS services now days are channelling and receiving feedbacks through social media, BD is considered as part of OIK. These actions involved human behavior and the use of OIK in their belief of its power to transform GIS services and realize ISS benefits. Therefore conceptualization and measurement of G-ISSB is needed.

### *C. Organizational Perspective*

The organizational perspective of ISS benefits were discussed in terms of organizational work systems [34] that provides the IS platform with analytic power in handling multidimensional and multi-scale data and information analysis [2]. Implementation of GIS integration intensify the capability of automation, data electronic exchange and various formats of information without intervention from other systems or human [29][35]. According to Ward, De Hertogh and Viaene (2007) benefits are associated with business change in the way business process is done and the use of information [18][30]. For example GIS integration enable analysis of OIK to be used in coordinating distinct roles and tasks in the transformation of GIS services. GIS integration as a service system transformed through an association of incremental and radical changes [48][54].

The link between GIS integration and service transformation is proposed by Besson and Rowe (2012) that distinct the process changes of business and organization [8]. Business process changes happened to a stable IS that need improvement to its efficiency and effectiveness without changing the business model, where the concept of incremental changes is applied. In contrast, an organizational change is more aligned to the concept of radical changes that happened to the structure of an organization involving individual, group or organization that perform its business activities.

This is similar to WSLC model introduced by Alter (2008) that define a service system and IS are a work system. Therefore GIS integration is also a work system and the changes of GIS integration in an organization involved balancing elements of processes and activities, participants, information, and technologies. Adopting Alter definition, GIS integration work system elements are: (a) integration processes that involves in the government administration and functions such as human resource, finance, information technology, infrastructure development, education, health and others; (b) the participants are business process experts, GIS Integration system design and people that use the OIK from GIS; (c) OIK in the GIS; and (d) GIS integration architecture and tools that perform processes and activities to produce services for customers. The other five elements of work system (product & services, customer, environment, strategies and infrastructure) fill out a basic understanding of service transformation in the government business process. A change in any particular element of GIS integration except possibly the customer, usually requires a corresponding change in other elements in order to maintain its equilibrium [40] especially during service transformation process.

Giving services mean organization need to applied organizational knowledge and employee's skills through actions, processes, and performances [48] embracing all elements of GIS work system mentioned above. Ward, De Hertogh and Viaene (2007) indicate that "realizing benefits will depend on achieving a fair balance of benefits between organization and its stakeholders". Therefore GIS services work best when stakeholder using insight, sense-making and forecasting in materializing the ISS benefits.

Their roles in understanding process of business workflows and their commitment in using their knowledge, skills, experience and judgement in performing GIS integration activities is most important in the formation of new knowledge within an organization [33]. New knowledge is one of the realized benefits for ISS. An example of new knowledge given by OIK power in Smart Government services are in the form of individual and personalize citizen services to transact and co-create with government; information delivery via mobile service; policy, law and regulations action driven by analytics of huge government data; innovative new services using business data; and resilient and trustworthy services[55].

Given the complexity and challenges in the transformation of GIS services [8], integration of OIK, and organization business process changes [26], the sustainability measurement of GIS integration service transformation is critical. In addition, the organizational benefits of new processes and transformed services are difficult to quantify [24][32], since it involves human behavior in the context of social and organizational changes.

As argued above, a clear gap in literature is the lack of a comprehensive and integrated view on ISS benefits realization that incorporate OIK in transforming GIS integration services. By leveraging on the GIS integration from the organizational business and work systems element, the ISS benefits are realized. The model that this study propose is derived from knowledge sustainability perspectives as the organizational strategic resource in order to leverage the use and reuse of organization existing knowledge and revise it against the background of GIS integration in service transformation. The aim is to close this gap with the GIS service sustainability benefits model. The next section discusses the proposed model.

## III. Sustainability Benefits in Government Service Transformation (G-ISSB)

A main objective of this paper is to give an understanding of achieving Smart Government goals through GIS integration by leveraging on OIK in the realization of ISS benefits in the transformation of government service. As an alternative, the realization of G-ISSB is introduced by adopting BAO framework to understand the linkages between organizational change, ISI and sustainability. The human behavior and social perspective of knowledge sustainability process is embedded in the GIS integration and transformation process in realizing ISS benefits.

The links of social and organizational context of human beliefs and their influences on sustainability actions and subsequent outcome is explained by BOA framework. The outcome affects social and organizational systems. Therefore it links macro-level factors (social and organization) with micro-level factors (human) to study the role of knowledge sustainability and its stakeholders for ISS benefits. This implies that stakeholder beliefs in the power of OIK that embedded in their mind lead to sustainable action in the design and implementation of GIS integration that eventually leads to ISS benefits realization. This study has therefore identifying ISS benefits in GIS integration during service transformation by focusing on macro and micro level in organization. The consequences of this can results in a better success in sustaining government services.

Together with BAO, the cause and effect relationship between GIS integration work system elements can be used as theoretical underpinnings in developing G-ISSB dimensions [15][43]. Organizations, by focusing on the benefits realization of ISS capability, will be able to understand how sustainability actions affect social and organizational systems in GIS service transformation. The action of service systems participants, apart from business process experts also includes GIS integration designer and developer, given the known attributes such as roles and responsibility, benefits and goals [38]. Another social perspective of ISS is that GIS are made and operated by people, and people rely on their knowledge [22] and beliefs [15] to formulate their attitudes towards an issue to make decisions. Three phenomena explained by BAO are: (1) how beliefs of sustainability emerge; (2) actions of organizations and individuals regarding sustainability practices and processes; and (3) sustainability benefits as an outcome [15]. This shows that in using BAO's sustainability phenomena for ISI, it would be necessary to make adaptations so that the measures are suitable to cover benefits identified in Table I.

BAO explicitly include the contexts of social (OIK) and organization (GIS stakeholder and organizational change) in organizational belief formation to affect organization sustainability action. Organization sustainability action combined will affects behavior of the social system such as citizen engagement in government policy through co-creation. Co-creation brings citizen together to produced valuable information on government issues.

Behavior of organization is affected in the way GIS integration delivering smart services; culturing new knowledge creation and routinization of sustainability practices in daily tasks. Routinization of sustainability practices in GIS means design and implementation of GIS that contribute to sustainability of business processes [1]. In the case of this study, the adapted BAO framework is able to explain formation of organizational belief from the power of OIK integration, usage and reuse of knowledge [22] to enhance GIS integration in service transformation.

The actualized outcome is achieves by leveraging on the changes which were categorized based on work system elements (processes and activities, participants, information, and technologies). GIS stakeholder observes the changes and transformation of GIS service in the digitization activities of government's transaction every day. The implementation of GIS integration leads to a belief that OIK empowerment (i.e. knowledge adaptability, knowledge evaluation and knowledge offloading) can be achieved by Smart Government goals intersecting GIS integration and ISS in organizations.

The adopted BAO framework implies organizational beliefs at three work systems element which are:

- Organizational beliefs that organization operations need to change to meet the need of Smart Government GIS goals that will affect the design and implementation of GIS integration in integrating knowledge process leading to the development of new knowledge in transforming GIS services;
- Organizational beliefs that OIK will provide GIS integration services with the capability of knowledge creation, knowledge claim evaluation [49], knowledge integration and application (use and reuse) that will affect the design and implementation of GIS integration in supporting knowledge lifecycle and knowledge used in decision making; and
- Organization also beliefs that stakeholder (business process and GIS designer and developer) collaboration in organization's sense-making, strategy formation and decision making to maintain equilibrium between work system elements, organization and IS will affect the role of stakeholder in the design and implementation of GIS integration in transforming government services.

The incorporation of knowledge sustainability processes in the BAO framework and the categorization of social and organizational structure based on the work systems element are shown in Fig. 1. According to Ward et al. (1996; 2007), the assessment of changes implications that involved in the benefits realization process derived from business and service systems changes, must be done during GIS integration implementation to quantify the potential benefits of IS sustainability. The effect of organizational change in GIS

integration must be measured and evaluated after the implementation of GIS integration. This is to determine if the desired IS sustainability benefits have been achieved in practice.

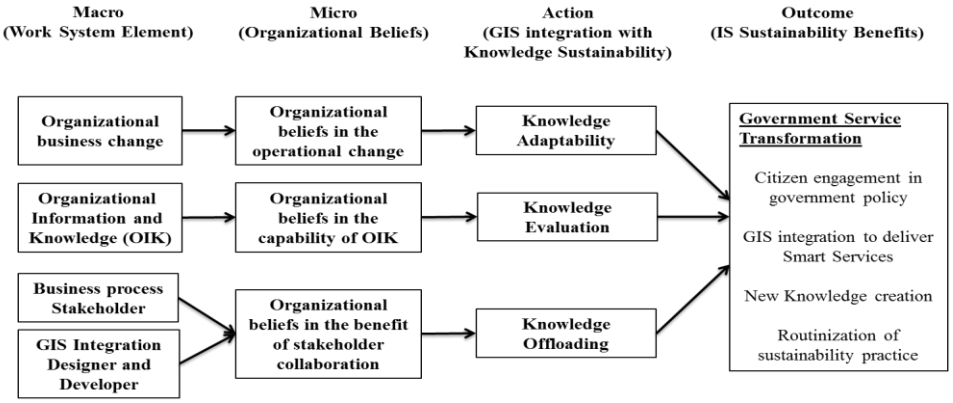


Figure 1. Organizational beliefs that lead to sustainable action that leads to IS sustainability benefits.

## IV. Result & Discussion

Based on the model, questionnaire was developed as an instrument to measure the ISS benefits that leverage on GIS integration and work system change in organization. The instrument was pilot tested by 32 respondents representing stakeholders involve in business process and IS integrations that are familiar with e-Government information system. The aim of pilot study is to determine the feasibility, validity and reliability of the questionnaire. The results indicated minor alterations in item wording and proved the effectiveness of the questionnaire that elicit measures of OIK integration in service transformation with Cronbach's alpha ($\alpha$) > 0.863 for all constructs [56].

This research breaks new ground in understanding the practice of benefits realization of ISS in the implementation of GIS integration in service transformation. The transformed GIS services actualize the need of GIS service sustainability in facilitating Smart Government goals in empowering open data, information and knowledge value services to serve citizen with highly personalized, citizen friendly and seamless service for their wellbeing. To this end, the study have defined: the constructs of organizational work system changes; the attributes of OIK process in GIS integration; process of benefits realization associated with organizational construct; alignment between organizational construct and OIK process that permits the realization of benefits from knowledge sustainability action in GIS integration implementation. Future work will include full survey of the G-ISSB model for evaluation in practice.

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**Siti Istianah Mahdzur** is a PhD student, Master of Computer Science in Networking (Universiti Putra Malaysia). Bachelor of Computer Science (Universiti Putra Malaysia).

**Juhana Salim** is a professor at the Faculty of Information Science and Technology, PhD (Information Science – National University of Malaysia), Masters of Science in Librarianship (Western Michigan University, Kalamazoo). Bachelor of Arts (Western Michigan University, Kalamazoo).