

Inter-Organizational Development Methodology for Collaborative E-Government Project Management - A Case Study



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ABSTRACT: *Lack of good inter-organizational development methodology often leads to failure in establishment of interoperability platforms needed for streamlining operations among government agencies. To overcome the challenge, this paper proposes a collaborative methodology and management approach that emphasizes the establishment of strong political support from highest-level policy decision makers; well-functional inter-agency collaboration and engagement; clear future processes, data and services blueprints to be achieved; and systematic project management based on the enterprise architecture concept.*

Development of an agriculture-related disaster relief information system (Aggie DRIS) is described as a case study to illustrate this concept. The Aggie DRIS is an information management system collaboratively developed and implemented among seven public agencies and one government bank for handling timely financial assistance to farmers suffering from natural disasters. The Aggie DRIS manages and streamlines the processes including applications submission, information validation, data cross checking, approval, transferring financial assistance to farmers' bank accounts and also status tracking. Effective management of information interoperability enables data integration and better coordination among government agencies resulting in timely and reliable public services to farmers in time of natural disaster crisis.

Keywords: Inter-organization Information Systems, Inter-organization Development Methodology, Collaborative E-government, Interoperability, Agriculture Information Systems, Project Management

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1. Introduction

Governments around the world look for opportunities to improve their public services by better facilitating her citizens. In many cases, to receive a specific public service [1], a citizen usually needs to physically interact with several government offices with heavy and duplicate documentation requirements and cumbersome transactions. More efficient internal and interoperable operations within and among government agencies, normally enabled by better information and communication technology, can improve and provide better joint-up services to citizens. However, lack of good inter-organization development methodology often leads to failure in establishment of information exchange and interoperability platforms among various government agencies.

To overcome the challenge, we propose a collaborative methodology and management approach that emphasizes the establishment of strong political support from highest-level policy decision makers; well-functional inter-agency collaboration and engagement; clear future processes, data and services blueprints to be achieved; and systematic project management based on an enterprise architecture concept [2].

An interoperability platform development is described here as a case study to illustrate this concept. An Agriculture Disaster Relief Information System (Aggie DRIS) is an inter-organization information management system collaboratively developed among seven public agencies and one bank for managing timely financial assistance to farmers who suffer from natural disasters. The Aggie DRIS manages and streamlines the processes from applications submission, validations, data cross checking, approval, transferring financial assistance to farmers' bank accounts, and also status tracking by several relevant government authorities. Effective management of information and interoperability enables data integration and better coordination of government agencies resulting in timely and reliable public services to farmers in time of natural disaster.

The subsequent sections of this paper are structured as following. Section 2 provides the literature survey and contexts related to inter-organization information systems development approaches, especially in Thailand. Section 3 presents the problems and issues related to our case study of assisting farmers facing natural disasters. Section 4 discusses about the inter-organization collaborative approach, and issues related to reforms that were proposed, analyzed and agreed among key stakeholders such that farmers can be assisted with better coordination and efficient information management from and among different regulatory and facilitating agencies. Section 5 analyses impacts, and lessons learn from this collaborative platform. The proposed inter-organization collaborative management methodology is proposed in Section 6. Summary and conclusions are provided in Section 7.

2. Literature Survey

2.1 Interoperability Levels

A comparative study of e-government interoperability models by Carnegie Mellon University in 2011 [3] proposed a model for interoperability in the e-government context starting from the basic goals of interoperability and then map these goals to different levels of interoperability. According to this paper, there are three primary goals associated with achieving interoperability in any systems namely data exchange, meaning exchange, and process agreement.

2.1.1 Data Exchange - This goal deals with whether data can be exchanged between two computer systems in terms of data types, size of data exchanged and their data structures.

2.1.2 Meaning Exchange – This goal deals with the exchange of meaning i.e. all participants in a given communication must agree and assign the same meaning to data that are exchanged and interpreted their meaning of data in the same way.

2.1.3 Process Agreement - This goal of interoperability is the agreement on how or which process to act on information/data that has been exchanged. All participants must agree in advance about what to do with the data they receive in the exchange.

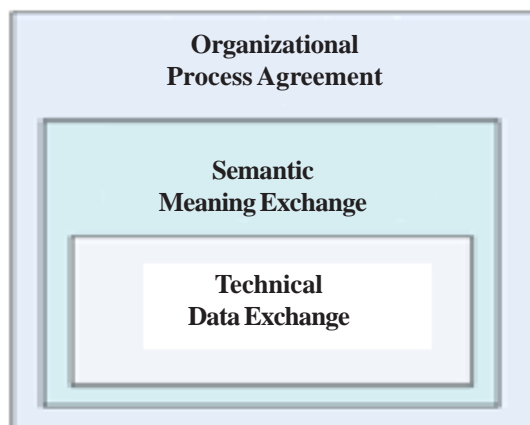


Figure 1. Interoperability levels

On the basis of those interoperability goals, Figure 1 shows the required interoperability levels. The Technical Interoperability level maps to the goal of data exchange and is placed at the base level of interoperability since systems with technical interoperability can exchange data regardless of their meanings. The Semantic Interoperability level maps to the goal of meaning exchange and is placed above the technical interoperability level since systems with semantic interoperability can exchange meaningful data. The Organizational Interoperability level maps to the goal of process agreement and is placed at the top level since systems with organizational interoperability shall participate in multi-organization business processes. All these three levels of interoperability, for example not just emphasizing only in technical interoperability issue, need to be articulated for establishing any successful e-government interoperability development [5]. The mechanisms to develop all these interoperability levels are also emphasized in this paper.

2.2 Thailand e-Government Interoperability Framework

In Thailand, an e-Government Interoperability Framework (so called TH e-GIF) [4] was initiated in 2006 in response to the policy of Ministry of Information and Communication Technology (MICT) for promotion of interoperability between different public agencies and to achieve the better one-stop public services to her citizens. It was firstly developed by the e-Government Promotion and Development Bureau of MICT as the TH e-GIF version 1.0 and later improved with version 2.0 in 2010. The TH e-GIF is a framework that aims to push forward policies and practices in the development of e-government interoperability for cross-agency e-transaction interconnection. It suggests ways to develop integrated e-government systems for effective online services to consequently achieve the country's smart collaborative e-government initiative. Some basic principles and guidelines of the TH e-GIF are highlighted as following:

- To support and encourage the development of citizen-centric e-government services that facilitate citizens to be able to access a range of streamlined services from a single point enabled by e-government interoperability systems,
- To appoint lead agencies for implementing different joint-up e-services applications by applying a common e-government interoperability framework at the national level,
- To establish and foster inter-organization stakeholders and collaboration platforms, and also to inspire them to willingly adopt and deploy the holistic concept of enterprise architectures and guidelines recommended within the TH e-GIF framework,
- To encourage the inter-organization collaborative stakeholders to apply a systematic project management methodology by emphasizing also on business process analysis and reforms, data harmonization and services design,
- To support and encourage the development of e-government interoperability systems to activate electronic document exchange by defining national standardized data set and document formats, and
- To promote the use of open and international standards for developing inter-organization e-government interoperability broadly allowed for connected online transactions both at national levels and cross-border international levels.

Guidelines and approached proposed in the TH e-GIF have been utilized in the case study as clarified further in this paper.

3. Existing Process and Problems of the Case Study

In the year 2011, Thailand suffered from several natural disasters, especially the flood event during the last quarter of the year. The agricultural sector was heavily damaged from these natural disasters. Ministry of Agriculture and Cooperatives estimated the impact of this specific disaster on agriculture that farmers suffered a total of 1,464,790 cases. Crop areas and livestock were damaged, including 4,571,960 acres (total area of crops and fisheries) and animals were affected at the total 24,118,419 (Source: Ministry of Agriculture and Cooperatives, as of November 4, 2011) [5]. The Government has the regulations to assist farmers who suffer from natural disasters by compensating with financial assistance. However, farmers who suffer from natural disasters have to travel to several government offices and need to fill their information into several application forms, as illustrated in Figure 2. For example, if the farmers have both planted crops and livestock damaged by the natural disaster, they will have to travel several times to two or more different government offices. Government authorities need to validate those data provided in the application forms and attached documents before sending to the relevant government agents with more internal cumbersome transactions.

The process for assistance to farmers suffering from natural disasters is tedious because government authorities must validate data in the applications with various sources. The current process is difficult to validate data, e.g. checking for duplication assistance as the farmer's spouse may also request for assistance but for the same duplicative cases as filed but her husband. At the same time, there are several other complicated procedures but the government authorities have to speed

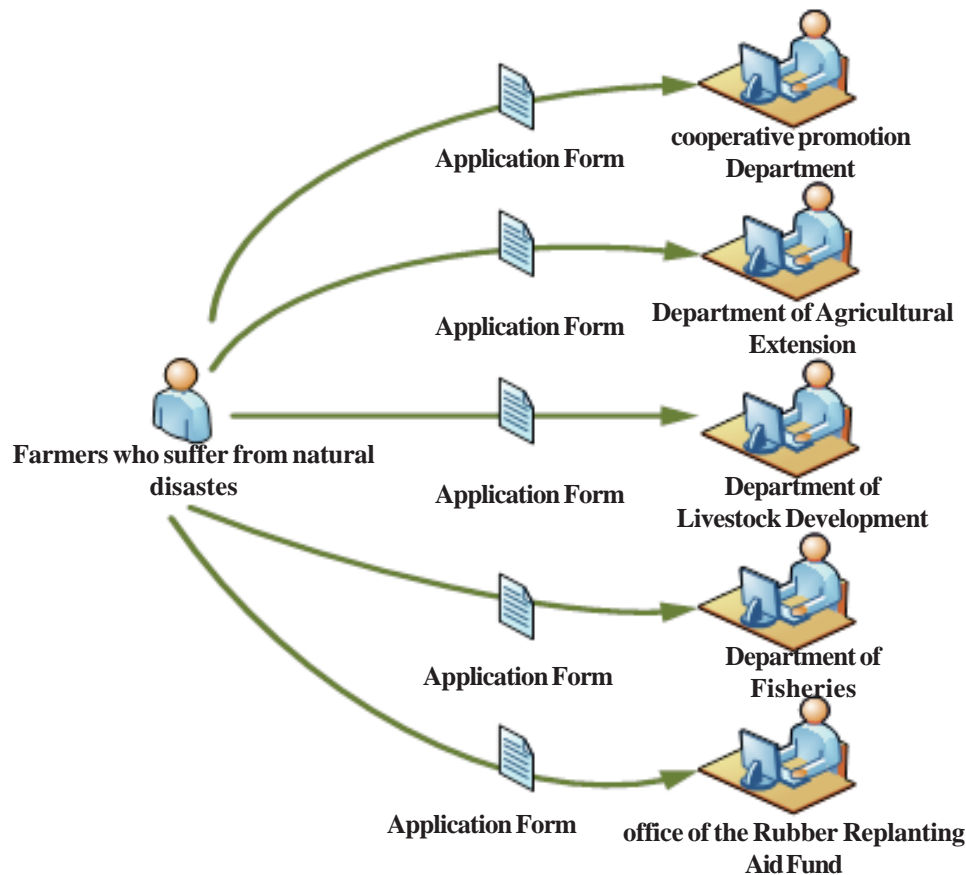


Figure 2. Existing cumbersome processes and duplicated documentations for assisting a farmer suffering from a natural disaster

up their operations to provide timely assistance to the farmer in urgently-needed assistance.

Government authorities have recently mandated that all registered farmers must inform and register their crops and agriculture investment of each season of cultivation. Again, these data must be filed by farmers to different government agencies depending upon the different types of farming, i.e. Department of Agricultural Extension (DAE) for the plant-related farms, Department of Fisheries (DOF) for fisheries/aquaculture farms, and Department of Livestock Development (DLD) for livestock-related farms.

In current assistant processes, farmers who suffer from natural disasters have to file their application forms to different government authorities at different service points of each department. For example, animal farmers have to travel to the local office of the Department of Livestock Development to file the request application forms for their animal-related disaster issues. But then if the same farmers at the same time planted some agriculture crops, and perhaps some fisheries also, they need to travel and submit their application forms to other two offices as governed by different government departments, i.e. DAE and DOF. Moreover, the government authorities have some difficulties to re-check the related information of each other for compliance with complicated rules.

Ideally, automatic information exchange between government authorities will assist relevant government agents to perform their tasks more accurately and efficiently, e.g. improving accuracy and reducing time for data validations directly with the authorized sources, and also for other automatic workflow transactions along the whole chain of operations.

4. Inter-organization Collaboration and Process Reform

Assisting farmers more effectively with a better inter-organization information management system, the following critical success factors have been pursued and established.

4.1 Strong Political Will for Collaboration Among All Concerned Parties Created

In this case, a memorandum of understanding is established by the Heads of all relevant government agencies and the government financial institute as the a commitment for this endeavor. The relevant government agencies have agreed to sign a Memorandum of Understanding to collaboratively render assistance to farmers suffering from natural disasters through mutual establishment of policies for implementing new processes and electronic collaborative transactions with actual operations.

4.2 An Inter-organization Collaborative Platform Comprising Members From All Concerned Parties Established

All seven relevant government agencies as well as the government bank have established an inter-agency collaboration committee to be in charge for the development of new and more effective operations by cooperation, analysis, and agreement on the future environment, development plan, and other related work engagement. For example, within this inter-organization collaborative platform, current “*as-is*” work processes are analyzed and designed into more efficient “*to-be*” work processes enabled by electronic information, transactions and exchange.

The consultant team with expertise in developing information exchange and interoperability has been commissioned to assist the detailed groundwork of this system, starting from study of the current business processes and data including the current technological environment of each government agency. After that, the consultant team proposed a new work process based on the principles of enterprise architecture which includes new data assets and management for assisting farmers. The design of application interfaces and technology for system development is also proposed and refined. The system is developed on the basis of open standards and technology to enable interoperability among different information technology (IT) systems from several government agencies.

As shown in Figure 3, the Aggie DRIS is the interoperability system collaboratively developed and implemented among 7 public agencies: the Office of Permanent Secretary of Ministry of Agriculture and Cooperatives (as the centralized cooperation center); Department of Agricultural Extension; Department of Livestock Development; Department of Fisheries; Department of Cooperative Promotion; Office of the Rubber Replanting Aid Fund; and the Bank for Agriculture and Agricultural Cooperatives, for handling timely financial assistance delivered to farmers in natural disaster situation. The Aggie DRIS manages and streamlines the processes from the application submission, consideration and approval to the actual financial transfer to the farmers’ bank accounts.

4.3 Analysis and Simplification of Related Documents, Including the Semantics and Formats of Their Data Elements

The Aggie DRIS is developed to enable data interoperability among those seven public agencies. Farmers can submit the electronic requests once to seek for all applicable public assistance from several agencies using these interoperable data, instead of several duplicate paper documents. The database of registered farmers in different agencies are connected electronically and can be mutually used by different offices for online check of data integrity and correctness, such as farmers’ registration, residential areas, bank account status for financial transfer, so that the officials will process assistance for farmers more effectively in a transparent and appropriate manner.

Many to-be process scenarios and required information have been proposed and refined among to the inter-organization stakeholders in several iterations, starting from a high-level concept as shown in Figure 4, to more detailed process flow and data elements with several exceptional cases.

4.4 Blueprints of Functions and Services to Be Provided By the Electronic Information Management System Proposed, Refined, and Agreed.

Several scenarios and diagrams were used to visualize the conceptual designs and then more detailed concrete design, e.g. conceptual screen design and status tracking reports, have been utilized for better understanding, verification, validation and refinement among the key stakeholders.

From this case study, we found out that several technical issues can be solved directly from the direct collaboration with IT technical teams of each agency.

5. Benefits and Lessons Learned

The Aggie DRIS renders automated information exchange system providing real-time information and reports of operations

for Government agencies at several levels of management and operations, which have never been achieved before. For example, status tracking reports can be automatically generated at the overall country level, the provincial level, and individual government agents in charge of specific small areas. The system is further designed by adding maps with coordinated data to illustrate clearly harvesting and farming areas.

One important lessons learned from this Aggie DRIS development is that the government agencies could not focus this endeavor just only on technology issues, but rather focusing more on high-level and strong policy support and inter-agency collaborative work such as analysis and design on reforms among concerned parties from the beginning of the project.

The difference of data structures and their meanings used by each government agency is another important obstacle in information exchange between various government systems. Hence, the challenge of this data-related issue cannot be underestimated, therefore in this it took more time for consideration rather than for reaching any quick fix and conclusion too soon.

The transition from the current work process to the new work process took quite some time also because government authorities and their agents need to fill comfortable and gradually adjust to the new work processes and operations. The Heads of government agencies need to provide support and push seriously such that government authorities can operate effectively with the system in good time.

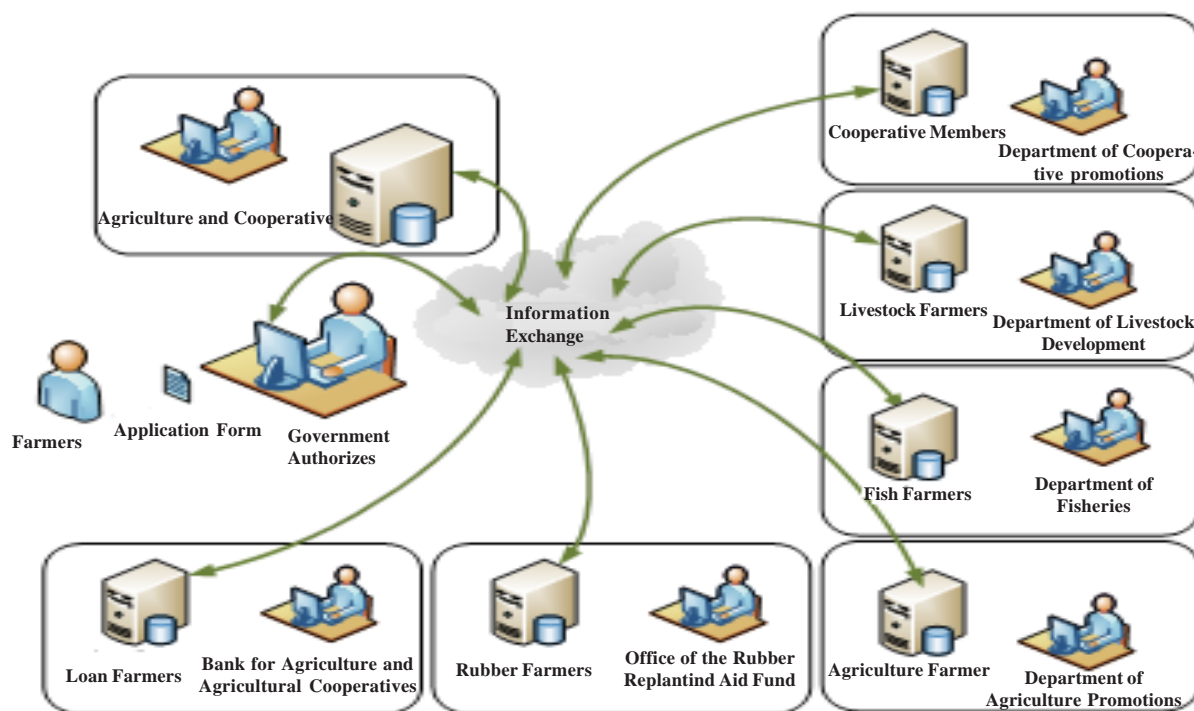


Figure 3. Key parties work collaboratively through the Aggie DRIS

For strengthening the management of e-GIF-related projects and handling problems well from various aspects and different contexts of society, politics, culture and economics, a comparative analysis of 30 countries (2011) [6] conducted by CS Transform to learn the implementation of national e-GIF in 30 countries is explored. The report presents the major common obstacles that most work on e-government interoperability suffered from. The three major obstacles that draw back e-government interoperability development were identified as following:

1. Over-engineering: E-Government interoperability development approaches in many countries focus too much on technical detail which nowadays is unnecessary due to the matured markets of solutions, and pay less attention on other more important issues, such as driving policy, creating mechanisms for cooperation, organizational reform for IT reduction.

2. Lack of focus on Government-wide business transformation: The development was normally focused very much around improving the efficiency of each individual agency and much less focused on transforming the relationship of citizens with the government as a whole.

3. Inadequate Implementation: A published e-government framework was often found difficult to translate into sustained and transformational change in practice.

The above study provided the rational and guides that are in line and support with the findings and lessons learned from the case study in this paper. Since the first two obstacles above have already been briefly addressed in this paper, therefore for the third obstacle, a systematic project implementation methodology will be further discussed.

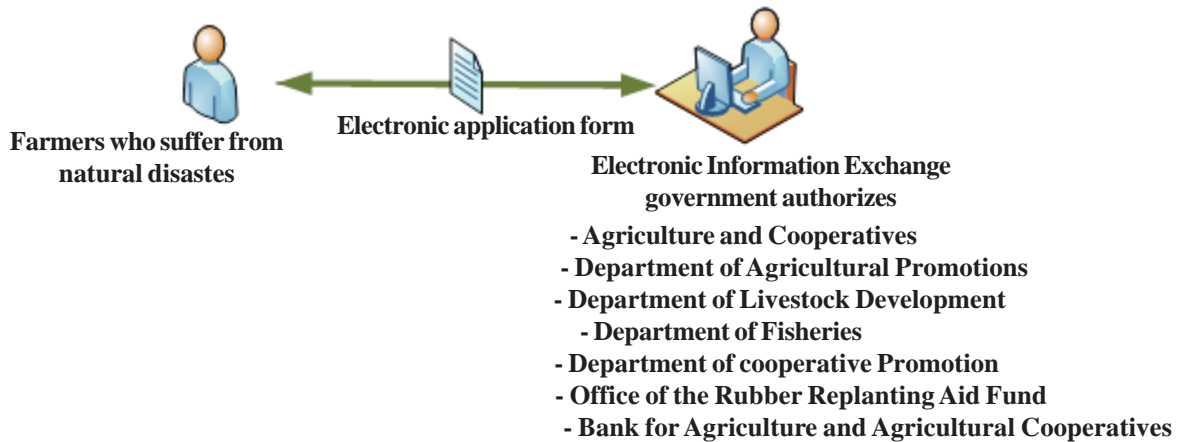


Figure 4. Electronic application forms and information exchange among governments authorized for assisting farmers suffering from natural disasters

6. Proposed Management Methodology

The development and implementation of e-government interoperability is inter-organizational in nature, involving various key players from various sectors. To cope with such challenges, it is suggested to bring in collaborative project management principles to support for successful e-government interoperability project implementation. The project management methodology as illustrated in Figure 5 divides the project into five phases as following:

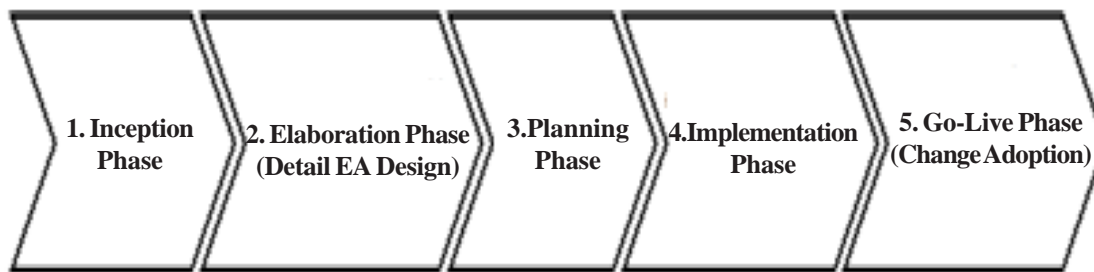


Figure 5. Five development phases

Phase 1 - Inception Phase

The primary goals of the inception phase are to achieve consensus among all stakeholders on the project's initial concept, objectives and to obtain the buy-in from the key organizations. The primary focus is the initial and preliminary planning processes.

The project starts by conducting a conceptual feasibility study on e-government interoperability implementation using the

Enterprise Architecture methodology [7] [8] to cover at least the four architecture domains of potential development, which are the business architecture, the data architecture, the application architecture and the technology architecture.

1. The business architecture describes the service strategy, and the organizational, functional, process, information, and geographic aspects of the business environment. Key elements of the business architecture need to be carried out; for example, the enterprise mission, vision, strategy, and goals may be documented as part of some wider business strategy or enterprise planning activity that has its own lifecycle within the enterprise.
2. The data architecture describes data elements, data structures, and data types for data interoperability across organizations. It enables the business architecture and the architecture vision, while addressing stakeholder concerns.
3. The application architecture describes components and sub-systems, and their functionalities of online e-government interoperability systems.
4. The technology architecture describes characteristics of infrastructures such as computer networks, computer server systems, software, and correlation of components to group transactions. It introduces new technology building blocks or re-defines existing technology building blocks to ensure interoperability and fit-for-purpose within the specific technology architecture.

At the end of this conceptual feasibility study, the decision by key stakeholders and high-level executives should be concluded whether this inter-agency collaborative platform is feasible and worth the next detailed and serious engagement. Preferably, the strong political commitment and their endorsement should be secured by the end of this phase or at the early timing of the next phase, e.g. MOUs signed among the Heads of the involved government agencies.

Phase 2 - Elaboration Phase

The primary goal of the elaboration phase is to conduct the detailed architecture design for the system to be developed. The point is to ensure that the team can actually develop a system that satisfies the requirements.

The objective of this phase is to study, analyze, design and mutually agree among stakeholders on new business process based on new requirements, new document formats, potential IT systems and e-document exchange systems based on legal implication and technological standards and features and the detailed application architecture.

Phase 3 - Planning Phase

The planning phase involves creating of a set of migration plans to manage the implementation tasks, time, cost, quality, change, risk and issues. The reasonable plans can guide the management of stakeholders staff and the implementation team, to ensure that the project is delivered on time and within budget.

This phase is also about planning technical requirements and specifications, size, capabilities and volume of hardware, software specifications and budget, based on the details of new business process, new document formats, and so on that are agreed upon in phase 2 (Elaboration). In most cases, more resources including budgets need to be proposed, approved and secured.

Phase 4 - Implementation/Construction Phase

The focus of the implementation phase is to develop the system to the point where it is ready for pre-production testing. It is the phase where system developers work technically in more detail to design technical solutions, implement and install the required interoperable systems, networks, software and hardware.

Phase 5 Adoption Phase

The adoption phase describes the acceptance and adoption of new environments and functions by all stakeholders. E-government interoperability systems shall be enforced by policy makers and introduced for all stakeholders, concerned parties and citizens to widely adopt and seriously deploy them. The authors find that several government entities in Thailand have always underestimated the change adoption challenge by providing inadequate resources into this important ultimate step.

7. Proposed Data Harmonization for Supporting Collaboration Among Government Agencies

During development phases of the Aggie DRIS system, the key stakeholders have to join in analyzing and designing of the semantics and schema of information and documents related to the work process. The information needed concerns farmers who suffer from natural disaster, and also other related context e.g. farming registration, finance, approval, operational status and reports, etc. In the current situation, various physical documents and forms from different agencies, are different and difficult to exchanged automatically. Parties, especially farmers and also government staff, spend much time preparing the data, filling in the documents and submitting them. The major obstacle is that when data requirement are not harmonized and standardized, each government agency and each document may have different requirements. In physical papers, data are understood in various ways, and may not have the same meaning.

Data harmonization concept [9] becomes necessity. Initially, all stakeholders make agreements on the data elements. They have clear data definitions and clearly understand how data entities are utilized by the related to-be business process. Then, it improves the consistency in the use of data elements in terms of their meaning and representation format. This step was undertaken at the semantic level before considering the document structures. Later the message syntax can be created from standard naming rules that may be part of some standard technical specifications [10]. This ensures the message syntax is also harmonized when derived from the semantics using some naming and design rules as part of standards-based technical specifications.

This concept reduces the complexity of information requirements by eliminating redundancies and duplications, and making the submission of data easier. It also improves the quality of the data and reduce errors. Information checking and data exchange can also better ensure interoperability.

8. Conclusion

In achieving the development of any inter-organization interoperability and information exchange platforms, it is essential that these four critical success factors shall be taken into account:

1. Political commitment from highest-level policy decision makers for the vision to be clearly articulated, commonly agreed and endorsed.
2. Inter-agency collaborative platform established to engage all key stakeholder agencies for best functions in leadership, management and actual operations.
3. Agreement on clear future business processes, data exchange at the semantic level, and services of the new environments.
4. Systematic project management based on the enterprise architecture concept

The change adoption phase is quite a challenge in our case study since this new information management system involve government staffs of all districts and provinces in the country. A systematic change adoption methodology for people involved in this new establishment is worth for further research.

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