Implementation of Financial Management Information Systems:

Mongolian Ministry of Finance

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Abstract

Over the last two decades, several public financial management projects have been implemented in Mongolia, with support from international financial institutions, to enhance interaction with its constituents for information sharing. Thus several ad hoc developments and deployment of computerized government financial management information systems emerged at Ministry of Finance. In recent years, efficient and effective government financial operations have discussed. Due to this, it is of high importance to integrate those independent information systems for purpose of efficient and effective.

The objective of this study is therefore to investigate the current circumstances for the implementation of financial management information systems and how independent FMISs impact on the relationship between Mongolian Ministry of Finance and budget entities and its employee’s job performance. In order to achieve this objective, the thesis is based on three research questions: 1) What are the key factors that contributed to the success and failure of the previous financial management information systems projects?; 2) Does government strengthen inter-sectoral institutional collaboration through the introduction of financial management information systems, and thereby improving the quality of policy decision-making?; and 3) Do the independent financial management information systems contribute to the improved job performance of the staff of the Ministry of Finance and its tier organizations?

In order to answer the research questions, a literature review, semi-structured interviews and document analysis are performed. The purpose of literature study is underpin in broader sense in government financial management information system integration; in detail; the agency theory is used to understand the behavior of different government entities at various stages of information systems implementation and integration, and how the establishment of FMIS is interpreted in agency theoretic terms, support decision making by eliminating information asymmetry between principal and agents in public sector sphere. Technology acceptance model is also central to the study of the relationship between financial management information system and end-users. This model studies how separate information systems influence public staff job performance.
One of the key findings of the study was the existing independent FMISs can be improved through greater integration with each other while expansion of the ISs stated otherwise.

Furthermore, it was found that the proper project preparation, unstable legal and political environment, poor ICT knowledge and skills, weak end-user involvement, high rate staff turnover and poor knowledge management are identified as key aspects that hinder or promote successful implementation of FMIS projects in Mongolia.

In agency theory perspective, the MoF departments made good progress that strengthening inter-sectoral institutional collaboration. Nevertheless, as main purpose of FMIS is offering huge opportunities for removing many of the barriers to the communication between dispersed government entities, in practice multiple FMISs not works full potential which entails another problem. Findings from research and document review have highlighted that the FMISs supports policy decision making in the Mongolian Ministry of Finance, but could not confirm at budget entities level.

Moreover, analysis reveals that FMISs do not share data with one another, and the systems have been introduced in a fragmented fashion that increases the data exchange problems, and create gaps and overlaps in function. According to the Technology Acceptance Model, the independent financial management information systems increase demands on staff time and reduce capabilities of the public staff.

Finally, the Organizational Interoperability Maturity Model applied to reveal current interoperability level of Mongolian Ministry of Finance. The findings suggest that current maturity level is Collaborative (level 2). The main explanation for this is that the various departments of MOF autonomously made decision to adopt new software without any consideration of interoperable with other systems.
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CHAPTER I: INTRODUCTION, RESEARCH PURPOSE, AND STRUCTURE

1.1. The objectives of the thesis

The purpose of this thesis is threefold: firstly, to investigate the current status of financial management information systems interoperability; secondly to indicate the factors which influence the adoption of financial management information systems in Mongolia; and thirdly, to identify the inter-organizational information systems integration at the central administrative body that may improve all level of budget entities performance.

1.2. The statement of the research problem

e-Government has a significant impact on harmonization of public policy and at the same time, it depends on an integrated IT system (United Nations, 2016). Theoretically, the public policy-making process can be disaggregated into five stages. The phases of policy making begin with an agenda-setting, it moves to policy formulation, and then to public policy decision making. In the policy implementation, government agencies establish procedures, writing guidance documents, or requesting loan from donor organizations. Finally, the government attempts to determine whether or not the policy has been effective in the policy evaluation stage. (Howlett, Ramesh, & Perl, 2009). The thesis covers policy implementation which is one of the stages of public policy-making process. It investigates that how Mongolian Ministry of Finance (MOF), “state central administrative body responsible for finance and budget matters” (Budget Law, 2011), using Information and communications technology (ICT) as a tool to achieve its goals and provide its tier budget offices with professional and methodological management while putting the policies into effect.

Mongolian Ministry of Finance has been undertaking public financial management (PFM) reforms over the past two decades with significant support from the World Bank (WB), Asian Development Bank (ADB), International Monetary Fund (IMF), Korea International Cooperation Agency (KOICA) and other development partners. The consecutive public financial management reform projects were conducted by both central state organization and partner organization, mostly supporting regulatory and
institutional changes simultaneously with technological changes (Shiilegmaa, et al., 2015).

It was difficult to make rational decision making for the Government, due to the constraint of receiving more up-to-date, accurate and consistent financial information from budget entities. To meet these challenges, the government faced with the need of government financial management information systems (FMIS) that should be simple and straightforward to use. The government recognizes the need for information sharing to be delivered faster, accurate to the policy decision makers. Thus several ad hoc developments and deployment of computerized information systems emerged at MOF, such as Government Financial Management Information System (GFMIS) and Debt Management and Financial Analysis System (DMFAS) at Treasury Department; E-Balance online financial statement system at Accounting Policy Department; Procurement Management, Monitoring and Information system at Procurement Policy Department. In the short term, these separate ad hoc development and deployment of software solutions relevant to their particular needs but without adequate attention to the overall need of interaction among the diverse information systems (IS) in order to share, exchange and re-use data. Whereas these independent ISs have ability to process and capture raw data and information, a problem arises when the systems have to be employed in transforming the raw data into useful information which can be utilized in decision making and which needs to be disseminated across other government entities. Moreover, the independent information systems partially fulfill goals of the initiator, there is a need to collaborate key functions as an Enterprise Resource Planning (ERP) management information system which aggregates many functionalities into one service window or merge and exchange the data between the information systems to reduce workload for staff at every level of budget entities. Due to these separate independent information systems, there is additional tasks to end-users everyday chores and staff have less time to work on their real “policy” issues (Gerel, 2011).

Since 1998, several PFM projects have been implemented at MOF, with support from international financial institutions, to enhance interaction with its constituents using ICT, and automating their business processes and functions. Appendix 1 shows the list of information systems currently employed by MOF departments respectively. In most of the cases, MOF departments autonomously make their decisions to regarding acquisition of new software without any discussion with information technology
specialists. Once the systems are delivered, the majority of them are partially functional and overlaps in function, and do not share data with other existing software. When demand for data integration arises, the one way of solving problems due to fragmented systems is usually by use of small interface application (in-house software development), requested by various departments of MOF to the Financial Information Technology Division or outsourced to the domestic IT company or local consultants hired by the departments. Consequently, MOF is currently in a situation where autonomous applications and heterogeneous information systems suffer from integration problems. (Ray, Gulla, Dash, & Gupta, 2011).

The aim of Information System Projects (the flagship of the MOF online system GFMIS which is considered successfully implemented IT project) in Mongolian MOF is to start managing treasury and budget data registry and processes throughout state organizations. By using a standard framework, the IT projects were aimed at digitizing data registry and to perform all activities in a digital environment. However, some projects (such as BPIS, HRMIS) did not reach the expected level of success because the data infrastructure was not standardized and did not meet the data requirements of other information systems within the organization; and many other barriers that the government institutions of different countries have never been easy or free from challenges.

The philosophy and major advantage of e-government can be:

- Reduced workload for staff;
- Improved management of government resources;
- Improvement in quality of decision making;
- Simple and more integrated processes;
- Less double handling and avoidance of human error (Imran, Turner, & Gregor, 2017).

The above-mentioned e-government advantages contradict the current circumstance of independent information systems employed in MOF and its tier institutions; they increase workload for staff, disparate software and decisions made based on error-prone data.
Thus, the aim of this paper is to investigate the factors which influence the design and implementation of financial management information systems in MOF; identifying current situation of financial management information systems interoperability; how the information systems interoperability at central level can contribute to decrease the burden of workload of end-users (Here, the term of *end users* used in this thesis means all level of budgetary and treasury entities’ staff who uses information systems administrated by MOF and other government institutions).

### 1.3. Research questions

In this thesis, the overall research question is:

*Investigate the current circumstances for the implementation of financial management information systems and how independent FMISs impact on the relationship between MOF and budget entities and its employee’s job performance.*

The present thesis seeks answers to the following three main questions:

The first research question seeks to analyze the key factors that contribute to the success and failure of the IT projects that have already taken place, it might further be used as a guide to follow up on the projects. This research question is borrowed from *(Financial Management Information Systems: 25 Years of World Bank Experience on What Works and What Doesn't, 2011)* seminal inquiry.

**Sub research question 1:** *What are the key factors that contributed to the success and failure of the previous FMIS projects?*

The next research question focuses on how FMIS supports the decision-making in the various levels of the government:

**Sub research question 2:** *Does government strengthen inter-sectoral institutional collaboration through the introduction of FMIS, and thereby improving the quality of policy decision-making?*

My final research question pursued in this thesis is to identify whether the independent FMISs eases the workload of public staff or not. If public staff’s workload could be decreased by using the systems, then they might spend more time working on real
policy issues, such as effective cash management, financial supervision functions and improving the legal framework for public financial management.

Sub research question 3: *Do the independent FMISs contribute to the improved job performance of the staff of the MOF and its tier organizations?*

Due to the fact that information systems have been used for broader public sector, therefore we have to clarify and limit the scope of this study. According to different types of e-government (Nemat, 2011), various departments of MOF are administered to communicate to other government entities (G2G), private organizations (G2B), and/or interact directly with citizens (G2C).

Both theoretically and practically, e-Government is often misinterpreted to mean the public service that solely caters for businesses and individuals, often forgetting about the existence of another channel, other government entities. The misinterpretation probably comes from the fact that G2B and G2C are seen more pro-actively to the public’s eyes. This is proven that in practice, G2B and G2C spheres are more studied and succeed in fulfilling their goals, such as e-Kiosk machines for Public services can be a good example of successful G2C project in Mongolia (Chinzorig, Enkhtuya, Tsetseg, & Ariunaa, 2016). In the academic world, (Scholl, 2005) calls it “iceberg phenomenon” of e-government research, see Figure 1 below. As he points out that most research has been dedicated to the “above surface phenomena” which is G2C and G2B, see Figure 1 below. The G2C and G2B sections are the most visible occurrence and artifacts of e-government (e.g., government websites, and budget transparency portal where citizens can monitor how the government budget is being spent) (Imran, Turner, & Gregor, 2017, pp. 25-26).

In the thesis, I assume that G2G relation is less studied, specifically, a relationship between MOF departments and its tier organizations (e.g., ministries, agencies, a municipality (aimags) and districts (soums) or other government entities). Therefore, the main research target is to focus on the interaction between government agencies (G2G).
1.4. Methodology

This thesis is structured in a top-down approach meaning that it begins with general overview of the theoretical study of e-government interoperability, review existing literature with respect to the adoption of financial management information systems; and then narrow down to the analysis of the specific field of the study within the selected country context.

This research builds upon two sources. Firstly, reviewing pre-existing research in the field and key documents such as e-government interoperability publications and various desk reviews, for instance, reviewing documents related to deployment of FMIS. Secondly, examining the information systems integration process at the Mongolian MOF. It is based on the Implementation Completion and Result Reports (ICR) of World Bank projects, and practical guide and working papers published by IMF and WB. Published articles, reports, working papers and books used in this thesis were accessed through a variety of research databases, such as World Bank Projects & Operations, JSTOR, and EBSCO. The analysis was done through performing interviews with different stakeholders in the chosen research field, FMIS projects in Mongolian MOF, while the document review was used for background framework.

In order to find the answers to the research questions and the hypothesis, this study is going to undertake qualitative research design due to the scarce literature on the current
situation of FMIS in Mongolian MOF context relying on qualitative assessment is more likely to provide clear picture of current situation of integration of FMIS.

It is crucial to gain supplementary information from important stakeholders, analyze the current status and answer the questions. Also, literature review, especially existing reports and analytical work of international development organizations can be utilized for reinforcing or questioning the current problems and form a useful source of background information on the topic. In order to obtain perspectives when answering the questions, the analysis was done through interviews with the officers and a former project team leader of MOF. Furthermore, review of policy documents, articles in publications, handbooks and guidelines in e-government interoperability, integration of FMIS, and published reports by various international financial institutions, and ministerial resolutions which served as secondary sources of information.

1.5. Hypothesis

I hypothesize that (i) the integrated FMIS at MOF helps lessen the burden of day-to-day work chores of end-users who are real victims of interoperability gaps at all levels from MOF staff to lowest level of budget entities; and (ii) FMIS improves the data gathering and processing at top level, leading to efficient decision making based on more accurate and less human error-prone information.

1.6. The studied areas

As (Wikipedia, 2018) mentions, Mongolia is one of the most sparsely populated countries in the world with 3.1 million people living in the 19th largest country by land in the world. About 68.3% of the population live in the capital city while other 31.7% is living in rural areas (21 aimags). The country has three levels of sub-national government – 21 aimags (provincial level government) and the capital city (Ulaanbaatar) which has the status of a province, 329 soums (or 9 districts in Ulaanbaatar) which are sub-units of aimags, and baghs that are sub-units of soums.

The government of Mongolia has 14 ministries, 27 agencies, and around 5000 budgetary entities (Government of Mongolia, 2018).

The (United Nations, 2016) E-Government Survey carried out in 2016 ranking member nations based on their ability to transform public service using IT places Mongolia at
84th out of 193 countries with a value of 0.5194. This is categorized as High E-government Development Index data.

1.6.1. The Ministry of Finance

The Ministry of Finance (MOF) is a central organization authorized to manage, direct and coordinate the financial affairs and to plan, allocate and oversee budgets for the Country. Its mandate includes provision of revenue; engage in loan arrangement, disburse government funds, and service the national debt. The Ministry is headed by the Minister with Deputy minister and state secretary. Each department managed by a head of department. The ministry has following departments: (1) Fiscal Policy and Planning Department, (2) Economic Policy Department, (3) Law and Legal Department, (4) Accounting Policy Department, (5) Financial Policy Department, (6) Investment Budget Department, (7) Development Financing Department, (8) Public Administration and Management Department, (9) Treasury Department and (10) Budgetary Control and Risk Management Department. Currently, MOF staffed by 187 public servants and project local consultants in 10 departments.

1.6.2. The Finance and Treasury Unit

This thesis includes Finance and Treasury Units (FTU) that constitute the local government, which carries out budgetary activity guidance from the budgetary central government – Mongolian Ministry of Finance.

The central treasury department is located at MOF but each of the 13 line ministries, 21 provinces and 329 lower level units (soums) have their own finance and treasury units. The finance and treasury units are usually operating with 9-10 staff composed of head of the unit, general accountant, treasury senior officer, budget officer, accounting officer, payments and settlement officers, capital investment officer, financial control and internal auditing officer, and public and local government properties officer. The total number of staff is about 900; 44 at central level, 771 at sub-regional level (aimags/soums) and 86 at district level.

1.6.3. The existing information systems in Mongolian Ministry of Finance

Investigation confirms that the MOF is making extensive use of ICT. The Ministry has LAN where there are computers, servers, handheld input and output devices connected
with domain-oriented network. Currently, 10 information systems, software, and reporting tools are in use at various departments of the Ministry (see Appendix 1).

The key ICT division is the Financial information technology division and its tasks are (i) establish, improve and expand the integrated information system of the Ministry, to ensure its optimal and reliable operation, to strengthen the link between users, to develop information systems and to introduce technological progress; (ii) implement a project on the establishment of information systems, software and databases required for the ministry, and the introduction of information technology advancement to ensure the reliability of databases and reliability in all other aspects of information technology; (iii) develop the Ministry's external web site, use of regular internal portal web site for work needs, provide routine network connecting central and local government funds, to provide maintenance for the use of equipment used in the office, maintain the optimal functioning of the office IT requirements (MOF, Mongolia, 2017). Financial information technology division is currently operating with eight staff composed of head of the division, senior specialist, system administrator, software developer, network specialist, call center, two help desk support and three project consultants.
CHAPTER II: LITERATURE REVIEW: E-GOVERNMENT INFORMATION SYSTEMS INTEROPERABILITY, ANALYSIS, AND CONCEPTUALIZATION

2.1. Introduction

This chapter reviews literature pertinent to e-government information systems interoperability with a specific focus on Government financial management information systems. The literature review is divided and analyzed in two parts. The first part deals with the theoretical framework underpinning this study. The following concepts are central to this thesis work; agency theory, technical acceptance model and e-Government interoperability, and other related variables and terminology, which we consider in turn. The second part is a review of literature on the implementation of FMIS. The chapter concludes with a summary of the literature review and discussion of the literature gap.

2.2. Theoretical Framework

2.2.1. Agency Theory

The theory was promoted and popularised by Jensen and Meckling and is based on the assumption that the co-operating parties are involved in an agency relationship defined "as a contract under which one or more persons (the principal(s)) engage another person (the agent) to perform some service on their behalf which involves delegating some decision making authority to the agent" (Jensen & Meckling, 1976, p. 308). When a principal engages an agent, the principal-agent problem arises where there is incomplete and asymmetric information condition between the two parties. The agent may exploit this information gap to pursue private benefits at the expense of the principal. Jensen and Meckling have also defined a concept of agency costs that concerns the extra cost the principal incurs as a result of monitoring the agent because the two have different and conflicting goals. The agent has more information than the principal who cannot directly ensure that the agent always acts to maximize the principal’s value.

(Eisenhardt, 1985) considers the contract form as presented in the agency theory to be embedded in all spheres of control in cases where one person (the principal) delegates work to another (the agent). In another paper (Eisenhardt, 1989), the concern of the agency theory is said to be the provision of a solution to two problems. First, agency
inter-relations is considered as a quite problematic to both principal and agent because parties have different goals, moreover, it is further complicated and costly for the principal to control the agent’s performance. When goals are incompatible, the agent is assumed to have a divergent set of stimulus structures from the principal; the agent will use up perquisites out of the principal's resources and make suboptimal decisions. These activities result in efficiency losses to the principal. To counter these losses, the principal designs contracts to align the goals at the lowest possible costs. Costs can arise from providing incentives and from monitoring to ensure compliance. Secondly, when the principal and agent have different attitudes toward risk, the problem of risk sharing comes up. The usual assumption about the attitude towards risk is that the principal is often considered risk neutral while the agent is risk averse. Here the trouble is that the principal and the agent may prefer certain activities because of the different risk preferences.

Agency theory can offer insights into information systems (Ang, 2005). First, information is regarded as a commodity. It has a cost, and it can be purchased in agency theory (Eisenhardt, 1985, p. 139). Implied in this statement is a very important role played by information systems. Using the information system, the otherwise invisible behavior of the agents can be monitored and controlled. A well-designed information system, therefore, gives organizations (principals) more control over the staff (agents). It is therefore important for an organization to invest in a well-designed information system.

Fundamentally, relevant knowledge which is fed into central decision making is dispersed among many people (Hayek, 1945). In other words, the different levels of parties have different access to information, they possess all the relevant information and interact strategically (Milgrom, 1981). Thus, management information systems serve organizations by reducing information asymmetry between parties and providing information for good decision making in terms of the overall organization’s objective (Olson, 2001). Budgeting system, treasury system, and online communication systems are examples of controlling devices that can be adopted to ensure that agents behaviors are aligned with principal interests. Second, information systems experts themselves usually engage in agency relationships with other stakeholders within the organizations and agency problems may arise. Systems design and implementation, or end-user computing is an example such agency relationships (Ang, 2005).
- Systems design and implementation

As principals, end-users usually take part in information system development by engaging information system experts as agents to establish information systems on their behalf. Goal contradictions may arise between the two participants because of a lack of perception and knowledge of each other's domain. To minimize agency costs, one or both parties must try to narrow down objective discrepancies. IS experts can invite end-users in order to involve them more actively throughout the system development lifecycle. This gives the end-users more opportunities to verify requirements and ensure that the final system is aligned with end-user needs. Furthermore, end-users may request that the information system generate custom-made reports so that controlling is much easier and more available to users.

- End-user computing

End-user computing allows end-users to create their own in-house tools without getting help from a programmer. In other words, end-users develop in-house tools or small interface applications themselves with little information system engagement. End-user computing, interpreted in agency theory terms, is a mechanism for resolving agency problems by eliminating the agency relationship between the user and information system experts.

To conclude, the domain of the agency theory is mainly the examination of the relationship between the principal and the agent engaged in co-operative behavior but having different objectives and attitudes regarding risk. From the point of view of information systems in agency theory, principal devises information system to reduce the information asymmetry (the agent having more information) between chief and agent and monitor the agent’s processes (actions). In this sense Information technology (IT) is an enabler for efficient decision-making (Wall, 2008).

2.2.2. Technology Acceptance Model

The most commonly referenced theory relating to information systems implementation is the Technology Acceptance Model (TAM) by Eija’s research on what models are used by the most quoted publications to analyze and understand ICT system implementation and adoption (Eija, 2011).
Davis (1986) introduced a technology acceptance model (TAM) which predicts and accounts for end-user behavior by determining factors which drive potential users to either accept or reject the use of certain information technology. TAM is derived from the Theory of Reasoned Action (TRA). *Perceived usefulness* and *perceived ease of use* are identified as the two main determinants of system use and can predict user’s willingness to use the information technology. *Perceived usefulness* is defined as “the degree to which person believes that using a particular system would enhance his or her job performance”, while *perceived ease of use* is defined as “the degree to which a person believes that using a particular system would be free of effort” (Davis, 1989, p. 320). However, while the two constructs are influential in decisions to use information technology; *perceived usefulness* is more influential than *perceived ease of use* in driving usage behavior. Although *ease of use* was regarded as being less influential it still had a significant effect on intentions to use technology as well, although this effect was found to decrease with time (Davis, Bagozzi, & Warshaw, 1989).

(Venkatesh & Davis, 2000) came up with and tested an extended technology acceptance model styled TAM2, which uses social influence and cognitive instrumental process to explain perceived usefulness and attitude toward the usage of IT. Under this model both social influence and instrumental processes considerably influenced user acceptance of the information systems. (Venkatesh & Morris, 2000) further extended the original TAM, and added independent variables such as social influence, gender, qualification, income and prior experience with computers.

2.2.3. e-Government Interoperability

2.2.3.1. e-Government

Although a number of definitions of e-government have been put forward, there is no commonly accepted definition (Gottschalk & Solli-Sæther, 2009). The following are some of the definitions of e-government proposed by various international and national institutions as:

“The use of information and communication technologies, and particularly the Internet, as a tool to achieve better government” (OECD, 2003, p. 23). This definition emphasizes the use of the Internet to improve government performance.
EU definition is “eGovernment supports administrative processes, improves the quality of the services and increases internal public-sector efficiency” (EC, 2016). eGovernment aims to enhance government efficiency by lowering cost through electronic information management and communications, and institutional changes that eliminate information silos by reducing administrative barriers to the flow of information. The eradication of information silos allows for exchange of information between government entities allowing for common access and use (Davies R., 2015).

Mongolia defines the term National electronic government in clause 2.1.1. of government resolution of 2012 as “Electronic Government means reporting government activities as open and transparent, faster service delivery; support the collaboration of citizen, business entities, and government entities; and enhance their participation through the use of advanced ICT technology facilitate the electronic services as organizing activities of domestic, foreign relation and function of governance” (Government Resolution of Mongolia, 2012, p. 2). This definition is detailed enough to encompass different contexts in current priorities in Mongolian ICT sector. The implication of this definition is that citizens and businesses can get public service fast but also Government enhances its productivity by use of recent and advanced ICT.

In terms of iceberg phenomenon of e-government research, online public service delivery to the citizen and businesses is visible to everyone, but in the broadest sense, it refers to the technology-enabled transformation of government to governments relation. The goal of e-government is to reduce costs not only in delivering public services to their citizens, but also reducing costs for inter-agency dealing. Great efficiency in public administration can be realized using e-government components such as treasury management system, budgeting system, and integrated FMIS. This can include the integration of expenditure and receipt data, control of expenditure, intelligent audit through data analysis and the disclosure of financial data (Basel Institute on Governance, 2017).

The use of e-government helps in identification of how the government interacts with its key stakeholders namely citizens, private firms (business) and public institutions (government). E-government entails ICT enabled delivery of information, interaction and transactions achieved through front and back offices channels within the public
service. Public servants who are in the G2C and G2B interaction serve in the front office for citizens and private organizations while processes between G2G interaction goes in the back office (Bekkers, 2007).

The thesis focuses on the relationship between and within government agencies where government activities take place in the back office. In practice, G2G interaction is inefficient and ineffective and quite often fails to meet the general purpose of e-government. In order to deliver services to citizens and businesses efficiently and achieve the goals of e-government, the back-office operations need to be integrated.

To conclude, there are similarities in above-mentioned definitions and other definitions in academic literature, all definitions have one central theme; the use of ICT by government agencies. The differences seen in the definitions are due to differences in levels of e-government maturity across the different nations. In its relative infancy stage, the priority of e-government is on the distribution of public services, data processing, and coordination of stakeholders. While in countries whose use of e-government has matured, the e-government definitions encompass all aspects of government activities and focus is on effectiveness, efficiency, and accountability of government.

2.2.3.2. e-Government Interoperability

Just like e-government, there are multiple definitions of e-government interoperability which varies according to country prioritization. In this sub-section, the author emphasizes how international financial institutions redefined the concept of interoperability through the recognition of nontechnical factors (organizational and semantic) in addition to technical factors. The following are representatives of e-government interoperability definition:

“Interoperability means the ability of information and communication technology (ICT) systems and of the business processes, they support to exchange data and to enable the sharing of information and knowledge” (EC, 2004, p. 5).

“Interoperability is the ability of organizations (public administration units) to interact towards mutually beneficial goals, involving the sharing of information and knowledge
between these organizations, through the business processes they support, by means of the exchange of data between their ICT systems” (EC, 2017, p. 5).

Interoperability in the public sector is defined as the use of common standards to facilitate sharing and integration of information (UN, 2012). In this definition, we could say that more recently common standards are the precondition of information systems interoperability. The fragmentation and lack of standardization are the main problems of interoperability in the developing countries (United Nations, 2016).

In perspective of e-government interoperability, a collaboration between government entities (G2G) is considered the main domain of e-government (Figure 2). Unless the governments improve the internal workings of public sector processes, considering other domain yield no success.

*Figure 2. Focal Domains for eGovernment Initiatives*

As mentioned in the above definition, the lack of data standardization hinders interoperability, especially in the developing economies. Data standardization is one of the preconditions of e-government interoperability, for example, standardization of chart of accounts (COA) is one of the most critical elements of integrated government financial management information systems (Cooper & Pattanayak, 2011). Therefore,
the author argues that to achieve the government goal (achieving citizen-centric service) relevant to each individual, the government organizations should strive to verify business processes of their back offices, and then interoperate their fragmented ICT systems.

2.2.3.3. Influencing Factors for e-Government Interoperability

The success and failure factors of earlier ICT projects can act as a guide for establishing country-specific solutions for successful implementation of current and future e-government projects. Thus, researchers (Eynon & Margetts, 2007), the governments (Archmann & Kudlacek, 2008) and international financial institutions (Dener, Watkins, & Dorotinsky, 2011) have evaluated and analyzed projects and come up with recommendations for public administrators on how to implement e-government projects successfully.

(Archmann & Kudlacek, 2008) in their analysis on interoperability, compiled European cases of good practice from which they identified key aspect that hinder or promote interoperability. The key aspects associated with positive results are; use of digital signatures, political commitment, engagement and involvement of all stakeholders from the initial stages of development, and time constraints. On the other hand, the main obstacles to interoperability are; sensitivity of data, interdepartmental cultural differences, issues of trust, lack of cooperation between agencies, organisational inflexibility, timing, technology and technical problems, unsatisfactory workflows, convincing stakeholders of the importance of the system, leadership failures, human resources, data and information integration, legal issues and also the importance of political support and funding.

Work of (Eynon & Margetts, 2007) in their paper "Organizational Solutions for Overcoming Barriers” present seven barriers to e-Government identified through an online survey conducted by the Oxford Internet Institute; leadership failures; digital divide and choices; poor coordination across institutions; workplace and organizational inflexibility; lack of trust; poor technical design, and financial inhibitors. They further propose the following solutions to the top four barriers as mentioned above:

1. Political and management leadership failures. Lack of leadership during the initial stages of e-Government implementation can result in slow and patchy
work. This leadership failure can occur during project initiation, implementation, promotion and ongoing support of developments. The proposed solution to this barrier establishment the Chief Information Officer (CIO) role as major participants in government organizations management. The involvement of a strong and competent CIOs leadership has a positive influence on the success of e-Government projects.

2. Digital divides. The digital inequalities demarcated by age, gender, culture, geographical location, motivational support, low level of ICT use and other factors. Segmenting the users and strengthening their IT skills is a solution to overcome this barrier.

3. Poor coordination. Lack of coordination within an institution, and across central and sub-national government was considered a very major obstacle. A solution to mitigate this barrier is to initiate change management programs.

4. Workplace and organizational inflexibility. Lack of ICT skills among public staff and resistance to change by public staff can block and constrain the appropriate use of ICT. Thus, regular seminar, workshop or digital literacy training encourages public staff to use ICT.

(Dener, Watkins, & Dorotinsky, 2011) reviewed FMIS project documents to also determine the factors which affect the success or failure in implementation of government financial management information system projects between 1984 and 2010 in 51 countries.

(Sulehat & Taib, 2016) identified the following factors as hindrance to information system integration; top management support, data and information integration, security and privacy, business processes, cultural attitudes and among others. In the same study, commitment by government entities, high-level e-government interoperability goals, and customer focus are identified as the key enablers of information system integration.

The main barriers and success factors that are frequently mentioned most relevant to this thesis are as follows:

- Unsatisfactory workflows between two core modules;
- Political and leadership commitment;
- Human resource capacity;
- Data and information integration;
- Cultural differences between implementing agency and software vendor;
- Digital inequalities;
- Weak coordination between project initiator and end-users.

The success and failure factors of the World Bank-funded FMIS projects and the Mongolian case will be discussed in the following section – 2.2.3.3 and 3.4 respectively.

**2.2.3.4. The Benefits of e-Government Interoperability**

The mission of the Financial Information Technology Division of the Department of Public Administration and Management at the Ministry of Finance is:

_To establish, improve and expand the integrated information system of the Ministry, to ensure its optimal and reliable operation, to strengthen the link between users, to develop information systems and to introduce technological progress._

We can derive the benefits of achieving e-government interoperability from the stated purposes and mission of e-government initiatives. To reach the stated goals requires the integration of government information resources and processes. Consequently, the interoperability of independent or heterogeneous information systems is essential (Gottschalk & Solli-Sæther, 2009).

UNDP noted the benefits of e-government interoperability in its guidebook for e-Government interoperability. First, there is better decision-making due to accurate and timely data generated from integrated information systems. Second, e-government interoperability allows for better coordination among government institution programmes and services, thus policy decision makers can design better programmes for stakeholders. Third, interoperability leads to cost savings through interfaced or integrated systems (Lallana, 2008).

**2.2.3.5. Organizational Interoperability Maturity Model**

(Clark & Jones, 2011) developed an organizational interoperability maturity model, which is an adaptation of five levels of Information Systems Interoperability Reference model, namely _independent, ad hoc, collaborative, combined_ and _unified_. Table 1 illustrates the organizational interoperability maturity model;
Table 1. Organizational interoperability maturity model

<table>
<thead>
<tr>
<th>Level</th>
<th>Preparedness</th>
<th>Understanding</th>
<th>Command Style</th>
<th>Ethos</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>Complete - normal day-to-day working</td>
<td>Shared</td>
<td>Homogeneous</td>
<td>Uniform</td>
</tr>
<tr>
<td>3</td>
<td>Detailed doctrine and experience in using it</td>
<td>Shared comms and shared knowledge</td>
<td>One chain of command and interaction with home org</td>
<td>Shared ethos but with influence from home org</td>
</tr>
<tr>
<td>2</td>
<td>General doctrine in place and some experience</td>
<td>Shared comms and shared knowledge about specific topics</td>
<td>Separate reporting lines of responsibility overlaid with a single command chain</td>
<td>Shared purpose; goals, value system significantly influenced by home org</td>
</tr>
<tr>
<td>1</td>
<td>General guidelines</td>
<td>Electronic comms and shared information</td>
<td>Separate reporting lines of responsibility</td>
<td>Shared purpose</td>
</tr>
<tr>
<td>0</td>
<td>No preparedness</td>
<td>Communication via phone etc</td>
<td>No interaction</td>
<td>Limited shared purpose</td>
</tr>
</tbody>
</table>

Source: (Rezaei, Chiew, Lee, & Ali, 2014)

At Level 0 (Independent) the interaction between independent organization limited. These organizations performed their tasks in a way that excludes any interaction with one another and do not share common goals and only need to interoperate in scenarios with no precedent which eventually results in unanticipated and unplanned arrangements. Although no formal frameworks present at this level, communications still happens through personal contact in meetings, fax, and telephone.

Level 1 (Ad hoc) the organization at this level has a limited framework to support ad hoc arrangements. A set of guidelines are provided to explain how interoperability can be achieved, but basically, there are no planned specific arrangements yet. At this organizational interoperability level, there are some overarching shared goals, however, individual organization aspirations take precedence, and the organizations still retain their independence.

Level 2 (Collaborative) at this level of interoperability, there are recognized frameworks in place to support interoperability, and identifiable shared goals. In addition, roles and responsibilities are assigned as part of on-going responsibilities,
however, organizations are still independent. Knowledge sharing and training might occur at this level. The individual organizations’ frameworks yet carry significant influence. For example, interoperation between the MOF and the General Department of Taxation, or between Customs General Administration for data exchange.

Level 3 (Combined) at this level there is shared goals and value systems, a common information model and service catalogs, and a formal arrangement to interoperate. Interoperability is prepared and practiced, although, there are residual attachments to a home organization so far. Organizations show willingness to bear the developmental costs even in cases where the benefits may be realized in another agency.

Level 4 (Unified) organizational share goals, value systems, command structure/style, and knowledge bases across the system. Organization inter-operates on a continuing basis with very little impediments. This is the ideal level with virtually no impediment in the organizational frameworks to full and complete interoperation. This happens only in very homogeneous organizations.

There are four attributes that define the five levels of organizational interoperability maturity model as follows;

The Preparedness this relates to how well prepared an organization is to interoperate and included doctrine, experience, and training.

The Understanding this refers to extent of communication and sharing of knowledge and information within the organization and how the information is used.

Command Style this relates to the management and leadership within the organization (how decisions are made and how roles and responsibilities are allocated and delegated).

The Ethos this is concerned with the culture and value, goals and aspirations of the organization including degree of trust within the organization.

The applied attributes of the model determine the degree of organizational interoperability maturity in a specific government organization or two cooperating government organizations.
2.3.4. Government Financial Management Information Systems

This section reviews practical guides, the sector studies series, working paper, study paper such as (Rodin-Brown, 2008; Diamond & Khemani, 2006; Davies, Hashim, & Talero, 1993; Hashim, Allan, & Garamfalvi, 1994; Hashim & Allan, 2007; Dener, Watkins, & Dorotinsky, 2011) and among others.

The World Bank and other international financial institutions, (in particular the IMF, ADB, and USAID) have played a critical role of supporting and shaping financial management systems in developing countries through projects initiated to provide technical assistance, training, financial resources and procurement support to partner governments (Diamond & Khemani, 2006; Rodin-Brown, 2008). Through this initiatives the organizations have come up with a lot of literature on this subject. These publications are generally intended to provide enough information to functional processes and ISs architecture; critical success factors; evaluate and monitor FMIS implementation; reasons why commercial off-the-shelf (COTS) software packages are generally more attractive than in-house built software; and the country case studies. In addition to these publications, the authors embedded a number of countries case studies, such as (Diamond & Khemani, 2006) Ghana, Kenya, Malawi, Tanzania and Uganda; (Rodin-Brown, 2008) Iraq, Kazakhstan, Kosovo, Slovak Republic, Uganda, and Vietnam; (Dener, Watkins, & Dorotinsky, 2011) Albania, Guatemala, Mongolia, Pakistan and Turkey.

2.3.4.1. What is Government Financial Management Systems?

Management information systems generate accurate, timely and organized information, which assists managers in decision making, solving problems, supervising activities, and tracking progress of work (Imran, Turner, & Gregor, 2017). Thus, a fully functioning FMIS leads to improved governance by providing real-time and accurate information that can be used to, effectively administer programs, formulate budgets, and manage resources (Rodin-Brown, 2008; Gottschalk & Solli-Sæther, 2009). An FMIS lacking the right functionality or partially functioning modules can hinder the exploitation of the whole system and lead to problems such as lack of real-time budget, reports and duplicate data entry work (Diamond & Khemani, 2006; Joshi, Srivastava, & Nguyen, 2015).
Financial management information systems (FMIS) support automation of government planning, execution and monitoring of budget through prioritization, implementation, and reporting. Generally, budget preparation and execution systems form the core of FMIS. FMIS solutions can lead to increased predictability, participation, transparency and accountability in government administration resulting in increased efficiency and equity in government operations. The use of modern FMIS can assist the government to comply with domestic and international financial regulations and adoption of internationally recognized standards. At the same time, it offers an opportunity for many authorized budget users and entities to access the system which supports decentralized operations through centralized web-based solutions. The integration of core and non-core systems to allow for sharing of databases for recording daily financial transactions, increase reliability in support of consolidated decisions, monitoring of performance and web publishing constitutes an “integrated” FMIS (Dener, Watkins, & Dorotinsky, 2011). Thus, FMIS is considered an important element of any effective PFM (Public Financial Management) reform by supporting informed decision making with respect to policies and programmes and facilitate control of financial activities and increase reliability of published reporting on budgetary performance (Joshi, Srivastava, & Nguyen, 2015; Dener, Watkins, & Dorotinsky, 2011).

In some countries FMIS projects, core Treasury systems are called GFMIS. In Mongolia, the core treasury systems are called GFMIS or Freebalance system.

2.3.4.2. Types of Government Financial Management Information Systems (GFMIS)

In this subsection, I will review types of FMIS to provide framework for this thesis analysis. (Davies, Hashim, & Talero, 1993) defined the different information systems based on the GFM business process as systems for (i) supporting macro-fiscal planning; (ii) assisting in budget preparation, monitoring and evaluation; (iii) management of public sector programs; (iv) management of public debt; (v) management of donor funds; (vi) revenue administration; (vii) human resource management; (viii) government accounting (ix) supporting auditing.

The subsequent working papers for "Information systems for Government Fiscal Management” by (Hashim, Allan, & Garamfalvi, 1994; Hashim & Allan, 1998; Hashim & Allan, 2007), discussed essential characteristic of the systems and identified
core and non-core modules of overall FMIS. The term "module" implies element or subsystem in the FMIS.

(Dener, Watkins, & Dorotinsky, 2011) distinguished the independent information systems as core and non-core modules. Budget execution, budget preparation, and public investments information system forms the core part of the system while debt management, human resource management, revenue administration form the non-core part which supports the core system through provision of vital data and help in reconciliation of data.

**Figure 3. A modular approach for building FMIS**

Source: (Dener, Watkins, & Dorotinsky, 2011)

Figure 3, above illustrates the linkages between the core and non-core functional processes.

The types of FMISs (modules) are briefly described below (Hashim, 2014).

- **Treasury system**

Treasury system makes use of data fed from the budget preparation system to control budget implementation. Budget execution system supports the functional processes associated with implementing the budget, which includes: (a) procurement of goods and services in line with budget estimates; (b) capturing of all government transactions; (c) Generates periodic reports used in monitoring overall flow of expenditures during
the year; (d) highlighting of major variations between planned and actual budget expenditure and suggesting corrective measures; (e) disbursement of funds for spending by agencies; (f) the monitoring of cash flows and expected cash requirements; (g) issuance and redemption of government securities for financing public programs. All these transactions have to be made by use of the Treasury system. Integration of the budget preparation system and the treasury system enable sharing of databases which eliminates the need for separate transfers as the approved budget is automatically picked by the treasury system for implementation.

- **Budget preparation system**

Budget preparation system including budget planning, medium-term frameworks, public investment management and program based budgeting. The MOF uses the prior year’s budget actuals and the proposals for new funding received in coming up with the overall draft budget which becomes the annual approved government budget after approval by parliament. However, the budget proposal has to be agreed between MOF and the line ministries. The approved budget information is then transferred from the Budget preparation system to the Treasury system.

- **Debt management system**

The debt management system forms part of the non-core module and keeps a record of all contracted public debt on an individual loan basis. Information on debt servicing liabilities is extracted from this system then forwarded to the treasury system for implementation. The system also facilitates the economic and policy analysis of debt implications used in different fiscal and deficit financing policies by preparing projections of debt service commitments. Loan and Grant Receipts are deposited in the TSA (Treasury Single Account) and recorded in the Treasury system.

- **Tax and Customs systems**

The systems support the activities related to the revenue administration function. They capture information on the actual levy and collection of revenue including taxes and duties; the valuation and collection of non-tax revenues. Tax and customs revenues collected during the year are deposited in the TSA and recorded in the Treasury system.
- **Auditing systems**

These systems make use of information on transactions gathered from databases to carry out their audit functions. They help in analyzing and scrutinizing public, financial, and other transactions to ensure compliance with government policies and procedures, and ensure that public funds are used cost-effectively in accordance with overall government priorities.

- **Human resource management system**

The payroll system interfaces with the FMIS to support human resource management including controlling pay and pension and their fiscal impact. The processes for payroll and pensions information for civil servants and retirees and then passes the data to the Treasury system to effect payments through the TSA to employee and retiree bank accounts. The payroll system should use the establishment control system to ensure that payments are made only against authorized and budgeted positions.

### 2.3.4.3. Government Financial Management Software Options

It is crucial to choose appropriate application software for GFM reform from (i) in-house developed or bespoke software and (ii) commercially available off-the-shelf software. This section discusses which option is preferred over another one.

The first option, locally developed software (in-house developed software) is more preferable in terms of limited time and resources required for developing an application in the emergency situation. Also, custom-developed software implementation develops the core features initially and other features can be added later with lower cost. The downside of this option is that custom-developed software can be very risky, due to lack of extensive software business process analysis. The system is quite often built by people lacking specialists skills and experience in implementing such systems and who have limited knowledge on government functions. Another issue is that such system development tends to go over budget and takes a long time to cover all government processes as it follows piecemeal building of modules. Generally, this type of software can provide most basic functionality for a limited number of users, but it is very time consuming to enhance the modules to a fully functional system, and seldom gets delivered on time. However, in situations where functional processes have not been
clarified, the custom-developed software with few end-users helps in maintaining new system business processes development.

The second option is the COTS solutions available for use in the area of PFM, such as debt management and revenue management. The advantages of using this type of solution are: the software providers have already designed the systems to be consistent with international standards and the software provider is responsible for system maintenance. Since the sellers are responsible for solving most of the common problems faced in system development stages, the FMIS project team can concentrate on the customization of functionality required for country-specific needs. COTS packages are usually modular and allow for bundling of further custom addition of modules to meet country-specific requirements. The disadvantages of using COTS solutions are; it is costly and requires payment of license fees and attract extra costs for each additional configuration. Although implementing COTS with a country-specific solution is costly, experience suggests that such application packages can result in significant savings in the long term in both time and money compared with the in-house developed application packages. Another factor that discourages the use of this type of software package is that it tends to force the government to organize as a standard structure around the business processes of the solutions instead of customizing the system to suit existing government business processes. Generally, the use of COTS solutions speeds up implementation of a fully functional system, provides continuous maintenance and support from the software provider; and most importantly good documentation and training.

2.3.4.4. GFMIS projects implementation and Critical success factors

This section is devoted to examining key factors influencing FMIS projects and lays out steps to delivering FMIS projects successfully.

(Rodin-Brown, 2008) noted in their practical guide that once the decision is made to implement a new FMIS the following uncertainty issues have to be considered; (i) legal framework, (ii) functional processes, (iii) organizational structure, (iv) budget classification structures, (v) unification of chart of accounts, (vi) change management, (vii) system specifications, (viii) system development, (ix) tendering for software and hardware, (x) configuration of software and hardware, (xi) data conversion and migration, (xii) testing and training and (xiii) corruption issues. These issues need to
anticipated and planned for. Unless much attention is devoted to each uncertainty issues, it may lead to hinder successful FMIS implementation.

The World Bank financed 87 FMIS in 51 countries between 1984 and 2010. Thus, the bank prepared an FMIS review report that highlights the achievements and challenges observed during the implementation of the projects and which provides guidance on how to improve the performance of future projects. The bank’s report is based on project documents, literature reviews, official evaluations, and interviews with project team leaders and state sector representatives. The seminal inquiry includes in-depth analysis of success and failure factors of the ICT project implementation that is based on the experiences of the 25 years in World Bank-funded FMIS projects (Dener, Watkins, & Dorotinsky, 2011). The factors contributing to project success were identified as; providing capacity building and training, close bank supervision of the project team, political stability and commitment of leadership to the project, project management flexibility, pre-existing enabling environment (ICT, HR, accounting), sufficient preparation and clarity of design, good project management and coordination among the implementing agency and the software executor and external environment (Dener, Watkins, & Dorotinsky, 2011, p. 42). The leading failure factors are; poor human resource capacity in the implementing agency, resistance from employees of the institution, unclear delineation of authority to implement among others. (Dener, Watkins, & Dorotinsky, 2011) concludes that the following factors lead to successful FMIS projects:

1. The political commitment and ownership of the borrower matter.
3. Careful prioritization of FMIS and sequencing.
4. Early development of internal client capacity.
5. Presence of a dedicated FMIS implementation project team.
6. The type of FMIS solution being implemented.
7. Supervision by an ICT expert from World Bank team.
8. The number and complexity of software packages being procured.
9. Disbursement of funds at a later stage of FMIS projects.
10. Identification of ICT related risks at the initial stage.
The full FMIS project lifecycle takes about 7-10 years during which most countries have at least one national election. The lifecycle runs from the definition of objectives, system specifications, system procurement, configuration, testing, and rollout. Political election events slow decision-making processes in most of the project activities with an impact on reform in the institutional change, especially the key government staff being replaced in the public institution and delay in passing of key legislation. Therefore, this change affects the continuity of the FMIS project. The key elements of the system are; functional and technical aspects and human resources. These constitute the “FMIS prerequisites” which should be completed before sketching the design to mitigate against risks during system development (Dener, Watkins, & Dorotinsky, 2011; Rodin-Brown, 2008).

2.3.4.5. Implementation Phases

(Rodin-Brown, 2008) offers steps to successfully delivering an FMIS project based on knowledge of past successes and obstacles. Each step highlights key features that must be taken into account and techniques common in successful installation that can lead to better design and management of FMIS projects to achieve intended results. The first step is needs assessment. Needs assessment entails clear definition of basic requirements and the evaluation of available software packages. (Slovak Republic) a good definition of needs leads to delivery of the system in the planned fiscal year. The team conducting the needs assessment should consist of skilled project manager, public finance economist, IT systems expert, qualified accountant familiar with government functional processes, a business process analyst, a change management consultant, training and logistics experts. Change management and training workshops should involve all staff including executives, elective officials, and public servants. The second step is to create a roadmap. A strategic plan should clearly outline the needs of a coherent IFMIS solution. It is important to consider the following; objective and scope of the system, expected impact and benefits, critical milestones and key project success factors, implementation methodology, risk assessment and mitigation strategy, estimated cost of each phase, and the project financing arrangements. The third step is the modified tender approach. Before procuring the system, the stakeholders estimate the cost of the exercise including software and hardware costs, the licensing fee, annual maintenance costs and support fees. The fourth step is the implementation of IFMIS. The implementation team should comprise of members from diverse fields as set out in
step one. The role of the steering committee is to oversee progress through regular meetings and resolve any issue arising smoothly and in a timely manner. Pilot-testing of the software modules with real data and users in real budgetary unit (through recording of real transactions, and producing real report) can mitigate future problems and speed up go-live.

(Dener, Watkins, & Dorotinsky, 2011) defined the FMIS project phases with detailed timeline and tasks as (i) preparation and design period, (ii) effectiveness period, (iii) implementation period, (iv) procurement period.

(i) **Preparation and design period** refers to the time between the concept note and the board approval which normally takes about 16 months on average. This time is usually dedicated to assessment of the legal basis, institutional capacity, and business processes including the existing ICT infrastructure. The end result of this process is a detailed preparation plan which covering reform actions, deadlines, implementation and procurement plans and a disbursement schedule. This period is usually long due to the large number of inputs required, changes in political leadership and the need for complex design and inclusion of independent components can further prolong the period.

(ii) **Effectiveness period** – refers to the time between the receiving board approval and the actual start date of the project and normally takes 6 months on average. Once the project is approved by World Bank’s Board of Directors, signing of the loan agreement and ratification by Parliament often stalls the project performance due to bureaucratic procedures, or changes in government. This usually leads to delay in the signing or ratification of the loan.

(iii) **Implementation period** – this is the time between the start of the actual implementation of the project and its actual closing date usually lasts up to 6 years on average.

(iv) Change in scope or components of FMIS solutions and long *procurement period* for ICT solutions may contribute to the extension period. This is the time between the originally planned closing date and the actual closing date usually projects extend by about 2.2 years on average.
It is recommended based on the experiences learned from the World Bank-funded FMIS projects to do the following to enhance the quality of FMIS design and implementation. First, assess the existing PFM capacity and needs of the government, define the functional FMIS modules, and come up with a conceptual design. Second, develop customized solutions, based on the assessment of existing ICT capacity, functional and technical specification. The final stage is strengthening institutional capacity to manage project activities effectively. This stage involves, forming a Project implementation group, composed of key managers from all stakeholder groups and Project Implementation Unit within the implementing organization to support administrative and procurement activities.

2.3.4.6. User acceptance of GFMIS

By reviewing the previous research on the information systems acceptance and adoption there are significant literature reviews have been conducted in this area. (Abugabah, Sanzogni, & Poropat, 2009) conducted a literature review on IS (Information System) impact on end-user’s performance and productivity, and identified that most the important factors are; system quality, information quality, technology factors, user characteristics and evaluative factors affect user performance directly and indirectly within IS environment. The authors proclaimed that some studies confirmed that information systems increase productivity and improve performance and outcomes of while other studies have stated otherwise.

(Rana, Williams, & Dwivedi, 2012) find that most studies on e-government have adopted the supplier perspective or analysis of government-oriented supply of information and services. However, the end-users perspective has been relatively lacking and much less research has been carried out on the aspects of public servant’s demand.

(Sawlha & Abu-Shanab, 2015) explored the factors that affect public employee’s acceptance of Jordanian GFMIS using extended TAM and concluded that social influence and perceived usefulness were the two main factors affecting Jordanian MOF employees’ intention to use GFMIS.
2.5. Summary of Literature Review

The literature discusses the agency theory, technology acceptance model and organizational interoperability maturity model that underpin in broader sense e-government interoperability and integration of information systems. In this thesis, the agency theory is used to understand the behavior of different government entities at various stages of information systems implementation and integration, and how the establishment of FMIS is interpreted in agency theoretic terms, support decision making by eliminating information asymmetry between principal and agents in public sector sphere. Technology acceptance model is also central to the study of the relationship between FMIS and end-users. This model studies how separate information systems influence public staff job performance. The chapter has also critically discussed the empirical literature related to the implementation of FMIS.

Majority of the publications have focused on the benefit of FMIS, and its design and implementation; in-depth analysis of influential factors of the successful FMIS projects in developing countries, but no one study has studied how these partially operational FMISs influence job performance of public employees who use the system most regularly and whether the system support government institutions collaboration in policy decision-making. This necessitates the need for ongoing studies on the effect of FMIS as a support for government institutions collaboration and public employees’ work performance on better policy decision making in the e-Government.

Figure 4. Theoretical Background
CHAPTER III: THE IMPLEMENTATION OF GOVERNMENT FINANCIAL MANAGEMENT INFORMATION SYSTEM IN MONGOLIA

3.1. Introduction

The third chapter is disaggregated into five sections. The first part reviews the research methodology used in this thesis work. The second section reviews the implementation of FMISs at Mongolian Ministry of Finance. The next three sections are devoted to thesis research questions relating to the identification of key factors of implementing financial management software; and how the independent FMISs affects delivery of public services between public entities and its employee’s job performance. To answer the first sub-question, World Bank’s independent projects Project Appraisal Documents (PADs), Implementation Status Reports (ISRs) and Implementation Completion Reports (ICRs) and are used for secondary information and enriched with the result of interviews carried out. The last two sub-questions constructed with an analysis based on outcomes from the interviews with relation to the agency theory, the technology acceptance model.

3.2. Overview of research methodology

In order to find the answers to the research questions and the hypothesis, this study explores through the review of the relevant archival documents enriched with the outcome of interviews, the framework of the implementation and integration of FMIS in Mongolia: the current circumstances for the implementation processes of FMIS; the independent FMISs’ impact on delivering public services between government entities and its employee’s job performance that cannot be derived from the publicly published documents. Also, the interview with participants provided valuable input which helped to widen my view on behind-the-scenes history of the processes as learned from the personal experiences.

The interviews were conducted between October 2017 to April 2018 along with relevant literature review. The thesis envisioned nine interviews with selected people from the Ministry of Finance, Treasury units’ end-users, the software provider representative of two core systems, unfortunately, after sending the interview questions, six participants did not respond to the questionnaire. The interviews were therefore conducted with three interviewees from the Fiscal Policy and Planning Department
(Interviewee 1), Treasury Department (Interviewee 2), and former project team leader (Interviewee 3) of the Ministry. The interviews were semi-structured via “skype” calls and social media platforms, and the answers for each interview were received by e-mails from interviewees.

The research outcomes of this thesis are primarily based on the ministry’s website news; the relevant laws and regulations; the reports published by international organizations; specifically, the PADs, ICRs and ISRs of individual World Bank projects which has been implemented since 1998 in Mongolia; and complemented by interviews with public sector staff and project leader. While scanning the documents to identify relevant data, there was scarcity of publicly published data on FMIS in Mongolian language.

3.3. Financial Management Information Systems in the Ministry of Finance, Mongolia

MOF instituted several reforms which included new computerized systems within the framework of enhancing public financial management. This section discusses the case of core and non-core FMIS implementation in Mongolia from documents and case studies by researchers of international financial institutions. GFMIS, DMFAS, HRMIS, BPIS, and E-Balance are the most notable and well-documented projects. The objective is to establish the performance of these projects and analyze key aspects that hinder or promote successful implementation of these projects. The details provided here were obtained from project documents and interviews conducted with staff that are associated with these IT projects.

3.1.1. Treasury system

The term GFMIS is used as a synonym for core Treasury system in Mongolia and in this thesis, core FMIS generally refers to budget preparation and execution system; and other non-core information systems. Treasury system primarily deals with automating the financial operation of treasury units.

The treasury system is usually built first and forms the core upon which all other systems are built around. Treasury system supports the main budget execution functions, such as accounts payable and receivables, commitment and cash management, and the general ledger and financial reporting, debt management, and
public investment management modules. The non-core systems sometimes linked to core treasury system include Human Resources Management Information System (plus payroll), revenue administrations (mainly interfaces with tax and customs systems), inventory, property management, and public procurement.

Based document review, the WB supported PFM reforms in Mongolia implemented since 1998 include: the Mongolia Fiscal Accounting Technical Assistance Project (1998–2005), the Economic Capacity Building Technical Assistance Credit Project (2003–2011), the Governance Assistance Project (2006–2012) and the Multi-Sectoral Technical Assistance Project (2010-2017) and Strengthening Fiscal and Financial Stability Project (since May, 2017). Other donor organizations also supported in a number of areas relating to governance and improvement of public financial management, such as e-procurement system funded by KOICA (Damdin, 2013).

The first PFM project in Mongolia was designed by the WB in consultation with ADB and IMF in 1998 under Fiscal Technical Assistance Project to enhance the efficiency and accountability of Government through designing and implementing an improved computerized treasury and debt management system. The WB and the Government instituted two other projects subsequently; the Economic Capacity Building Technical Assistance Credit (ECTAC) initiated in 2003, and the Governance Assistance Project (GAP) initiated in 2006 and currently the follow-up Strengthening Fiscal and Financial Stability Project is ongoing having been initiated in June 2017 with the assistance of World Bank and is aimed at completing the installation, expanding, rolling-out, and upgrading of the GFMIS.

The objective of the first project was to enhance the efficiency and accountability of the Government through establishing an improved public financial management information system. The focus of the project was improved budget preparation and execution by use of a computerised government budgeting, accounting, and management information system. Based on a defined needs assessment, the project provided computer equipment and new software for Treasury and Debt Management systems with associated IT advisory support and training to staff. The process of GFMIS deployment involves; (i) Establishment of the Treasury Single Account (TSA) system which is the most important preconditions of the GFMIS; (ii) Development and application of a unified COA (Chart of Accounts) conforming with International Public
Sector Accounting Standards; (iii) Adoption of software to the Mongolian environment in budget controls, language, and financial management set up; (iv) Provision of training to government staff; and (v) Assistance with change management.

The following shortcomings led to project delay: (i) there were five successive changes in government during implementation which led to a complete overhaul of senior managers in MOF; (ii) insufficient IT knowledge in the MOF staff and low computer literacy level among finance staff in local governments; (iii) a lack of experience in the preparation of bidding documents which was in part responsible for 3 failed ICT tendering processes which took two years; (iv) a lengthy delay due to slow government signing and ratification; (v) the Project Coordinator and Treasury Advisor were not appointed until 1 year after project approval; (vi) lack of a consistent COA; and an ineffective PIU (Project Implementation Unit) location affected work on GFMIS. The IT and human capacity in the MOF was insufficient which proved problematic for MOF to finalize technical specification and tender documents. The government resolved this with the help of external consultants. The external consultants (KPMG) worked with staff from the Treasury Department to finalize the technical specification and bidding documents with a view to successfully implementing GFMIS. KPMG reported that an agreement was reached between World Bank and the government of Mongolia on the procurement method and plan, and in the end, the IBM/Freebalance Canada was awarded the tender and entered into a contract in June 2003 with the MOF (Joshi, Srivastava, & Nguyen, 2015). This marked the beginning of the software deployment and customization and which carried is phases beginning with the installation of the GFMIS system at the central government entities.

The COTS solution from FreeBalance required customization to tailor it to the Mongolian functional and reporting requirements. A decision had to be made on whether to (a) tailor the COTS solution to the organization’s improved processes or (b) tailor the organization’s practices to the COTS solution. In the end, the Mongolian government settled for a middle ground which entailed customizing the software slightly and altering certain organizational practices. It took a couple of months to change the existing business processes and there was extensive dialogue between senior specialists, ordinary public servants, all the ministries, and agencies to reach an understanding and agreement on the new business requirements.
Initially, the project plan was to implement the system first at MOF and two pilot institutions, in hindsight, the government decided to extend the implementation in all ministries and later upon successful piloting, the system was deployed and operated in more government entities.

GFMIS was installed successfully and became fully operational to provide necessary services to MOF and the government as whole on January 3, 2005. The system is centralized and deployed at Treasury department of MOF but with access given to all aimags, all ministries, across Ulaanbaatar city and all districts. Later at the end of 2012, the rollout of the GFMIS in all soums beyond the initial plan of 50 soums and training workshop for system end-users was done under Governance Assistance Project. The Governance Assistance Project financed the first 50 soums, and the rest was financed by the state budget.

Prior to this no budget entity or soums were connected to the GFMIS, the government entities had to prepare and physically present all documents to their respective treasury offices to execute expenditures and the transactions had to be entered into GFMIS manually. Although all expenditures are executed through GFMIS, not all budget entities or soums are connected to the system, and their reporting formats differ from the consolidated GFMIS reports. This led to delays in the preparation of end year consolidated reports by adding significant staff time at the Treasury for reconciling reports form budget entities in line with the consolidated financial statements. In order to overcome these difficulties, the government requested the WorldBank to assist with the roll-out of GFMIS to all government entities in order to improve control, reporting, and consolidation, whilst maintaining requisite MOF oversight over financial management. Online connectivity to governments entities result in: (i) significant cost reduction in terms of time and effort for budget entities; (ii) reduced staff time spent on data capture releasing treasury to focus on strategic cash management issues; (iii) reduced bureaucratic steps in budget execution.

Provision of training and manuals in native language for GFMIS important to the end-users, especially those new to the system. Training courses were organized and delivered by the software executor for the super users of the Central Treasury and numerous end-user training were conducted by the super users for regional Treasury staff, including the Ulaanbaatar city and its districts, and the 21 Aimags in the
operation of the system. Initially planned user training was not sufficient and system operations required much more trainings for end-users. In the first few months of the application period, there were all sorts of failures, difficulties, and mistakes due to unfamiliarity and the need for fine-tuning during the learning-by-doing period, and the system was deployed throughout the country and distant network was built for the first time in Mongolia. However, the system reported good progress toward smooth operations by tremendous hard effort of central, regional treasury staff and IT staff following extensive trainings to operate the system.

The establishment of the functional TSA system which is the most important preconditions of the GFMIS and the full rollout of the GFMIS has greatly enhanced the Treasury's expenditure controls and improved payment processing through connection to a payment settlement system at the Bank of Mongolia. Specifically, vendor payments can now made promptly and reliably which has minimized the stock of arrears (less than 1 percent of total expenditures) (World Bank Group, 2014). The implementation of the system has also stemmed the proliferation of bank accounts, and aggregate cash balances and flows are now being accurate, timely managed and reported, and strengthening budgetary oversight and monitoring (Dener, Watkins, & Dorotinsky, 2011). Benefits include real-time transfer of revenues in central and local treasury accounts, real-time budget execution reports, and stronger expenditure controls. However, the full potential of the GFMIS has not been realized due to the limited functionality of GFMIS COA as a result of inconsistent budget classifications.

In the first phase of PFM reform project, GMFIS function was providing monthly budget reports of the General government at Central Treasury in the first week of the next month and produces daily reports of Treasury cash balances for MOF senior management.

In the subsequent phase of PFM reform projects were focused on improving budget execution process through the full roll-out of the GFMIS (PAD ECBTAC, 2003). GFMIS was not only effective tool for MOF but also regional governments due to the support of decentralization and participatory budgeting of government entities. This is proof that one of the biggest user of the GFMIS - Ulaanbaatar city Treasury unit - noted in interviews in February 2006 that the system is helpful and it allows for “very good budget control.” The system produces timely and accurate reports for the users who
appreciate the fact that they can produce “important reports whenever we wish” as compared with the earlier process of producing the same reports manually. Further, previously, any reports production took “time and sometimes not accurate,” but at present “end-year balance was accurate and timely for the management.” The system provides users with daily budget balances that proves to be a highly efficient tool for budget control at each level of spending agencies, for example, at the line ministry, local government level, etc.

Overall, the GFMIS is an effective tool for MOF to manage and monitor national finances, enhancing budgetary controls and strengthening the government’s fiscal discipline. Currently, central treasury office, 21 aimags and its all 329 of the soums, Ulaanbaatar municipality, and its 9 districts have access to GFMIS v7 and licensed software users number is 900. More than 5,000 distinct budget entities, such as schools, universities, hospitals and cultural centers, in both central and local governments use the Treasury system.

3.1.2. Debt management system

Official debt records were dispersed in every sector ministries and agencies with no proper classification and storage. Consequently, there was no knowledge of what was owed and to whom. The installation of UNCTAD’s DMFAS was completed in November 2001 and became operational in the MOF’s Debt Management Division since May 2002 and Treasury department has been using in their daily work (UNCTAD, 2002). Later, DMFAS upgrade from 5.2 to 6.0 completed under GAP. It had become an necessary tool for MOF staff to record all public debt, loan contracts or agreement with lending terms and report all Government outstanding debts (external and domestic debt), providing projected disbursements and debt services for all loans as well as allowing analyses of impact on government debt services due to foreign exchange movements. It is also the repository for all public loan official records which are also stored in electronic forms in the debt database. Furthermore, MOF staff are able to produce reports on demand for monitoring, analytical and statistical purposes in standard forms or user-defined reports on regular basis. This had proven its value during the negotiations for the rescheduling of the country’s debt to the Russian Federation. The software provided reliable debt data and generated debt sustainability
analyses for the Ministry during its negotiation with the Russians and contributed to the successful resolution of the country’s sovereign debt rescheduling exercise.

It was the first international IT project at the MOF, therefore, the MOF staff learned installation, configuration, and customization of the computerized system while working with the international consultants. When the system upgraded, the Debt management staff had international and local trainings for use of the software effectively. In terms of network infrastructure, it was easy to implement the project because hardware and software were installed and configured only at the MOF. However, data collections for loans especially on-lending loans were very difficult. It was better to be prepared prior to the system implementation.

As result of implementation of the DMFAS at MOF, the public sector debt management has improved significantly through the system produces timely and reliable reports by different categories, time frame, and donors.

3.1.3. Financial statement system

Under the Improving Public Financial Management component of Multi-Sectoral Technical Project, the online financial statement system upgraded successfully. This is the only system that used for the relation between the MOF and business enterprises (G2B).

Private entities are required to send their financial statement files (accountants are allowed to upload data file in XBRL format) electronically through the E-balance system, which is administrated by the Accounting Policy Department of MOF (IFRS Foundation, 2015). Then, the department approves, consolidate and analyses the received reports.

The old version of the E-Balance system had inefficient template accordance with International Financial Reporting Standards (IFRS), and lack of capacity and poor performance causing delays and system downtime, thereby private entities struggled to submit their financial statement electronically. All these issues resolved as the templates used for financial reporting in accordance with IFRS were improved and the E-Balance system was upgraded and implemented without any hindrance in Quarter 1 of 2013. The conversion of data between 2002-2012 to the new E-balance system was done in December 2014. As of Quarter 3 of 2014, out of 80,000 entities subject to
financial reporting, only 8,000 (10 percent) electronically submitted their financial statements using the XBRL file format.

Now, the system is fully operational with access to past years financial statement database over 100,000 enterprises that registered in the state registration to perform analytics. All non-state enterprises above a certain size operating in Mongolia are now submitting their financial statements through the online E-Balance system of the MOF.

Approximately 2750 nationwide accounting professionals of Small and Medium Enterprises (or more than 15 percent of nationwide accounting professionals) had trained through the provision of the IFRS training workshops (more than 100 training) conducted by Accounting and Auditing Standards Committee members, and other regulators between 2012-2016.

The latest IFRS implementation assessment survey report of 2017 suggested 93 percent of the respondents indicated using the E-Balance system has significantly reduced their workload.

3.1.4. Human resource management system

Personnel records of government employees are separately maintained in each of the more than 5000 budgetary organizations (schools, clinics, primary health centers, etc.) in Mongolia. Each budgetary organization is in charge of collecting and managing personnel records and monthly payroll information and sends once a year to the MoF, Ministry of Social Welfare (MoSWL) and Civil Service Council (CSC) respectively, and, but there are significant differences in the personnel data in these three organizations, which is poor quality of data (Shiilegmaa, et al., 2015).

The World Bank analytical work on Civil Service Reform in 2009 that recommended the Government should have a new automated, centralized HRMIS to control and manage public service employment and linking public service employment with its financing in which would complement with treasury and budgeting systems (WB, 2009). Thus, implementing an HRMIS task embedded as another objective of ECTAC project. The system envisioned to be operational in all central budget agencies, two aimags, and Ulaanbaatar city and its districts’ treasury offices (WB, 2003). The local consultants were hired by both MOF and Civil Service Council to develop the system (WB, 2013). In light of the institutional fragmentation of payroll and personnel
management that would have made such a system very difficult to implement (WB, 2009). The main reasons for the failure of this information system project were challenges in cooperation between key agencies - MOF, CSC and MoSWL; and inadequate bidding and design documents for HRMIS. However, establishing an HRMIS was not achieved, a detailed document on user requirements, technical design and business specifications for the system, and demonstration software which produced by the consultants may provide a more solid basis for a future design and development of HRMIS (WB, 2013).

3.1.5. Budget preparation system

There was no on-line web-based budget planning information system existed for budget preparation and different chart of accounts are used for budget planning (FISCAL 6.0 offline budget planning system) and execution (GFMIS) systems. Thus, the web-based Budget Preparation and Information System (BPIS) introduced under the Multi-Sectoral Technical Assistance Project to prepare budget proposals and allocate expenditures. The MoF opted for Freebalance Inc, Canada as its BPIS application software provider and the contract was signed in January 2009 with an original completion date of December 2009.

The testing and piloting of a BPIS took longer than originally planned in light of communication challenges between key divisions at MOF and software vendor; and additional time needed to fix technical problems found during the piloting stage, delaying follow-up activities such as the training of end users. BPIS is a COTS solution of FreeBalance Inc and when the error occurs during the implementation, fixing the error took time due to system developers or business analysts located in different time zone, such as in India or Portugal.

Introducing BPIS system is making a steady progress as a pilot training covering the all subordinate budget entities of chosen two general budget governors (aimag level) was conducted successfully the period from June to July in 2015. Following up the end-user training delivered for 19 aimags and Ulaanbaatar city excluding 2 pilot aimags between March to August in 2016. As a result of this training, all local budget governors (aimags and soums) were able to use the system for their local budget planning process. Technical and business processes problems were identified during the piloting process had been resolved and now the system is in use for local budgeting planning cycle for
fiscal year 2016 and 2017, but not yet at the central level which means planned outcome was only partly accomplished. Interfacing the system with the FISCAL 6.0 system (the currently used non-web-based system) had completed and interfacing with the GFMIS 7.0 (the treasury information system) is under process. Entry of 2016 budget data of local government started in August 2015 and the system was under a support stage for the 2016 local budget planning process (budget proposal entry, submission, revision, control, and approval) simultaneously with FISCAL 6.0.

On the one hand, the implementation of the BPIS has been a much longer and more difficult process than envisioned in this and other World Bank projects in Mongolia. On the other hand, the BPIS appears to finally be getting off the ground in Mongolia and has now been generally piloted successfully at the subnational level. Currently, the Government also determined to achieve operationalization of BPIS both at the central and regional government levels. Adopting the BPIS countrywide has been a key component under the follow-up Strengthening Fiscal and Financial Stability (SFFS) Project of the World Bank, which is expected to be fully functional and is used for budget planning both at the central and local government level by 2022.

The closing date of the first project had been planned on June 30, 2001, but it was extended four times and finally closed on September 30, 2005. The subsequent second project - Economic Capacity Building Technical Assistance Credit – envisioned closing date was September 30, 2007, but it was extended 3 times and ultimately closed on March 31, 2013. Third Governance Assistance Project’s original closing date was January 15, 2012, and extended until December 31, 2014. The fourth Multi-Sectoral Technical Assistance Project extended by 2.5 years.

Table 2. Total duration of projects (1998-2017)

<table>
<thead>
<tr>
<th>Projects</th>
<th>(A)</th>
<th>(B)</th>
<th>(C)</th>
<th>(D)</th>
<th>(F)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fiscal Accounting Technical</td>
<td>2-Jun-1998</td>
<td>30-Jun-2001</td>
<td>30-Sep-2005</td>
<td>7 years 4 months</td>
<td>4 years 3 months</td>
</tr>
</tbody>
</table>
### Assistance Project

<table>
<thead>
<tr>
<th>Project Description</th>
<th>Start Date</th>
<th>End Date</th>
<th>Duration</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Economic Capacity Building Technical Assistance Credit</td>
<td>24-Jun-2003</td>
<td>30-Sep-2007</td>
<td>31-Mar-2013</td>
<td>9 years 9 months</td>
</tr>
<tr>
<td>Project</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Governance Assistance Project</td>
<td>23-May-2006</td>
<td>15-Jan-2012</td>
<td>31-Dec-2014</td>
<td>8 years 7 months</td>
</tr>
<tr>
<td>Multi-Sectoral Technical Assistance Project</td>
<td>28-Jun-2010</td>
<td>31-Dec-2014</td>
<td>30-Jun-2017</td>
<td>7 years</td>
</tr>
<tr>
<td>Strengthening Fiscal and Financial Stability Project</td>
<td>09-Jun-2017</td>
<td>31-Jan-2022</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>


The ICT projects extensions are consistent with the viewpoint held at approval that “improving overall public sector performance will take over 7-10 years” (Dener, Watkins, & Dorotinsky, 2011). See Table 2 and Column D.

### 3.4. Key Factors Affecting Implementation of core and non-core Financial Management Information Systems in Mongolian Ministry of Finance

This section intends to answer the question as what are the key aspects that hinder or promote the earlier FMIS projects?

Better understanding the success and failure aspects of integration and interoperation will be of great importance to further practice and guide to implementing agencies. (Scholl & Klischewski, 2007).

To answer above question, I primarily examined World Bank’s individual project Implementation Completion Reports and Project Appraisal Documents enriched with the outcome of interviews and based on my own experience worked for both MOF and software executor Freebalance Inc.

During the preparation and implementation of the FMIS projects, the counterparts should consider experiences from previous similar operations to avoid contingent
consequences. Investigating key factors that influenced the designing and implementing core and non-core financial management information systems in MoF, Mongolia may constitute basis of future ICT projects of the public sector.

The reports and documents, and outcomes from the interviewees on what are the influencing factors in implementation and integration of FMIS in Mongolian context are listed as follows:

- **Inadequate project preparation**

A recent example of this is the BPIS and HRMIS projects encountered the difficulties in developing stage. The bid documents and design documents for both systems were inadequate and were a major reason for the significant project delay as the vendors did not have a clear understanding of the system’s design.

- **Inter-linkages in PFM reforms**

PFM reforms are inter-linked and changes to one area create issues in another. A good example of this is maintaining a functional and unified Chart of Accounts (COA). Interviewee 1 support the statement that the budget preparation system should have same COA as treasury system, then two would share databases and however each has separate interfaces. This required changes to the COA was not realized until the PFM reform, leading to resistance from stakeholders (and in this case central treasury staff). Another example is during the BPIS project, the passage of the IBLaw occurs simultaneously, hence needs to change business process which had already agreed and documented by the team in the initial stage of the work.

- **Limited IT project management capacity**

Large IT system projects are complex institutional reforms that require significant project management capacity in the implementing institution and the software executor, a point that is emphasized in the Bank’s assessment of Financial Management Information System projects (Dener, Watkins, & Dorotinsky, 2011). Success is contingent on close coordination between the implementing institution and the software executor so that functional requirements are clearly understood and problems mutually resolved; which can only be achieved through a dedicated project team on site with full-time project managers from both the implementing institutions and the software
executor. During the work of treasury system implementation, the MOF and Bank staff were carried out monitoring and reporting activities diligently and their constant efforts to bring the project to a successful end, while these key ingredients were lacking in the BPIS implementation, specifically, at earlier stage and were a major reason for the unsatisfactory performance of this activity. The BPIS project manager from the MoF’s side was a former Fiscal Policy department specialist from the functional side. Thus, it may be viewed as an IT project.

- **Poor end-user involvement in information system development process**

As the first step of system development, to define and test the functional requirements of the system, it is crucial to include a joint working group of the software executor and implementing institution. The working group should compile all levels of end-users’ comments and proposals into the terms of reference and bidding documents, either detailed or summarized. But, in practice, the coordination has been weak between the key counterparts involved in development and implementation work related to FMIS development. The main shortcomings included the weak coordination between implementing agencies and user involvement in systems design (i.e. between MoF and the Government Service Council; and between the Budget and Treasury departments in MoF; between the FTU and MoF departments). Interviewee 1 stressed following statement during the interview about MOF and user involvement in introduction of the BPIS system:

"However we had tried to involve all level of users in all implementation stages of the system, during the pilot training we realized that the system functional processes are not customized well, specifically for local level users. Thus, BPIS training team had prepared survey with general closed questions, and open questions to allow respondents to identify new issues during the pilot and not captured in the closed questions. Upon every pilot training, the survey session conducted to leave comment and feedback to improve the system further. There was a problem that needs to solved – supervision – people tend to discuss the issue in the training room, but when we asked to leave the comment on the survey paper – left open question part empty. If trainer discussed together with local public servants the issues are facing the piloting system and help to write down the comment, they tend to freely express their thoughts and comment. Unless
respondents tend to answer open questions in different dimensions or left it blank which usually leads inefficiency of the survey.

This implies that it might be the local financial specialists are not aware of their role for development of computerized information systems.

To this problem, Interviewee 1 suggested that to overcome user involvement challenges, the implementing agency, software executor and end-users should work closely together and ensure that the system designed for all levels users requirements.

Yet, on the contrary, Interviewee 3 provided another perspective to the user involvement in the COTS solution customization. He or she commented the following:

„When end-user had a request to change workflow or bug to fix them, they were not able to directly communicate the system analysts or software developers, due to the language and location problem. This is the one of the biggest hindering effects of the system customization and gets delivered on time.” - Interviewee 3

Moreover, Interviewee 3 provided an example of why in-house developed software are still in use of the Fiscal Policy department activity successfully, specifically FISCAL 6.0 application. The software developer is a local consultant at the Department and gets feedback from end-users free to effort, then the system is tailored immediately for the few end-users demand with lower cost. However, this type of system was appropriate in the initial stages of PFM reform which was suitable for an only limited number of users, and it is very vulnerable – in other words, this system operation is fully dependent on a single person.

- Effective project leader

Good leadership through assigning an staff in charge of liaising between the client and contractor and taking necessary actions on time during the system development and piloting stages may contribute significantly to the project success. Implementing the system is always collaborative process between MOF and software executor. As just one recent example of this influencing factor for the IS, implementation is the BPIS project managers. The managers from the MoF’s side was a former Fiscal Policy department specialist from the functional side, and software executor’s manager was
specialized as professional IT project. However both managers appointed later stage of the project, both viewed the project as not only IT project but also PFM reform.

- **High rate staff turnover**

Generally, FMIS project team operating with 7-8 staffs composed of MoF team and software vendor team. MoF team consists of project leader, local consultants and public staffs while software executor team consists of country project manager, functional and technical support specialist. The local consultants are embedded in the implementing departments. On one hand, there are grounds to argue that the local consultants who embedded in the implementing departments are likely to flying-in and flying-out or shift to the departments of MOF as public servants. Thus, new staff hired and requires a training or coaching in knowledge of the system development history. On another hand, in some cases, MoF staff promoted as project team leader and that turned into an advantage for the project. Over the past years of system development, MOF staffs and local consultants had lack of experience in implementing large ICT system, preparing tender documents for Supply, installation, and customization of the IS which have been prepared by international consultants with collaboration of local consultants. But now, assuming that the implementing institution has enough human capacity and learned how to install and document the business process by themselves.

- **The political commitment and strong government ownership and a stable political environment matter**

Needs and requirements of the Government of Mongolia have been changed from time to time due to election results. In last fifteen years, Mongolia has passed four Parliament elections in 2004, 2008, 2012 and 2016 respectively. After each election, a structure of the Government has been changed substantially as well as its policies and priorities. The newly elected government or existing government frequently declare a new public administration strategy or pass new legislation taking the reform in different direction. Further, there was a significant increase in patronage based recruitment in the civil service. Thus, in light of institutional change, especially the key staff being replaced with new individual. These unstable circumstances have significant impact on design and implementation of such projects, such as in light of institutional change the business process of IS needed to change; and it took time to take over existing ICT project.
- **Poor knowledge management system**

The Mongolian government organizations have common shortcomings of knowledge management and reporting. Thus, to improve exchange of knowledge in the inter-organizational relationship requires establishing e-filing and standard of documentation for solid foundation for future design and development of e-government project.

- **The lack of sufficient ICT skills in the project team and public institutions**

Developing organizational capacity and technical skills is essential to ensure the punctual and successful e-government projects. Strengthening human capital of MOF and other financial sector institutions through regular workshops and seminars for financial sector policymakers, rank-and-file public servants on use of IT systems and business processes or demo of the information systems. As confirmed by the Interviewee 1, there is no coherent information system policy or interoperability framework; and each department made decisions to introduce the new system without any effort to integrate other systems; and the most crucial issue is Financial Information Technology division, MoF has poor internal capacity, for example the division is lacking a staff of business process developer.

At last but not least, based on my own experience worked for both MOF and software executor Freebalance Inc as National IT consultant and Functional Support specialist respectively. Being worked as an IT specialist both in public and private sectors where government organization act as a client and private company act as a contractor for the information system development, I have faced with problems of communication, specifically, cross-cultural differences between bureaucratic organization and foreign company, human resource management, and business ethics. These problems hinder effective and efficient management of the projects.

Based on the FMISs development experience at Mongolian MoF, the main influencing factors are related to the management issues. Thus, it is important to consider above-mentioned key factors for future expansion of the system, design, and implementation or integration of another FMIS project.

I believe that the above-mentioned major factors of the software implementation are widely discussed amongst both MOF, software executor and the system users. While
there may be some that I have not mentioned, I would claim these are the key factors implementing IT system at Ministry of Finance, Mongolia.

3.5. The independent FMISs’ impact on coordination between public institutions

In order to answer the question of the independent information systems’ impact on coordination between public institutions, specifically, between MoF departments and FTUs; and I use insights from an agency theory.

According to agency theory, organization (MoF departments) responds to information asymmetry by establishing an information system to get an more accurate information from the agents (FTU). However, the treasury system rolled out only at the central level and all the expenditures are executed through the system, there was difficulty to implement expenditures of around 5000 budget entities. At the time of no budget entity or sub-national government are connected to the Treasury system, the government entities had to prepare and physically present all documents to their respective treasury offices to execute expenditures and the transactions had to be entered into GFMIS manually. To overcome this problem, the MoF decided to roll out GFMIS to all line-ministries, aimags, and soums. The remote connectivity to governments entities resulted in significant cost savings in terms of time and effort for budget entities where manually generate and physically transport information to the designated treasury offices.

When the Government delegates some residual decision-making authority to the agent, all spheres of control is needed. The Government of Mongolia enacted integrated Budget Law in 2011 and significant decentralization of expenditure responsibilities to sub-national governments.

„4.1.26. local budget means the total of budget approved by aimag, the capital city, soum and district’s Citizens’ Representative Assemblies to be mobilized and executed by the respective general budget governors”(IBL, 2011)

Thus, the information system, specifically, Budget planning information system needed to be customized in a way that local Financial and Treasury Units possible to approve their budget through the FMIS. Thus, the BPIS became functional for the local budget
planning process cycle for fiscal year 2016 and 2017, but not yet at the central level which means planned outcome was only partly achieved.

According to the principal-agent problem, the cooperating parties have different goals and the more information dispersed among many budget entities (the agents), the MoF departments cannot directly ensure that its agents always act to maximizing the principal’s value as long as the principal cannot observe the agents behavior. Within this realm, there is an argument that well-designed FMIS can play a critical role in decreasing information asymmetry of public expenditures between central administrative body – MOF and FTUs. Whilst, poor crafted FMIS can result in negative consequences for both the MOF and budget entities’ employees. Interviewee 1 made an example, the problem of “ghost public servants” revealed through the system feature Input Based Calculation during the BPIS end-user training for aimags and UB city in 2016. In light of absence of HRMIS, such kind of problems existing in the PFM, and due to lack of control or oversight of the Ministry, maybe the budget entities reconcile information between personnel records and payroll data.

The consolidating dispersed knowledge of the different levels of agents is essential for good decision making in terms of the overall organization’s objective. In that sense, practically MoF departments developed a variety of disparate information systems to support PFM, such as Treasury department using GFMIS 7.0, DMFAS and E-report; Fiscal policy and planning department using BPIS and FISCAL 6.0 respectively. However, these independent IT systems are usually developed in specific needs of such departments, there is lack of integration with one another. Consequently, these heterogeneous information systems are little or no capacity for data sharing, sometimes overlapping functionality and provide incomplete coverage. In terms of overlapped functionality of the systems, currently there is a discussion between MoF and KOICA to implement Medium Term Fiscal Planning System (MTFPS) which has overlapped functionality with BPIS and FISCAL 6.0, and this project is financed from KOICA’s grant aid and get delivered by October 2018. Addition to this example, upon approval of new government structure, a department of Ministry of Economic development merged into MOF, including devolved the Public investment management system which overlaps functionality with BPIS.
To conclude this section, the multiple FMIS that MoF currently employing can strengthen only such departments capacity in light of designed those systems as their initial needs. Thus, those system works as assisting only MoF departments.

Answers provided by the Interviewee 1 and Interviewee 2, the core FMIS are not tailored to strengthen to government financial institutions collaboration sufficiently, thereby the generated data from these systems fed into decision-making processes only internally within MoF.

“The separate systems generate similar data due to its overlapped functions. These data can be used for various purpose. In practice, only employees of Fiscal policy and planning department (FPPD) use FISCAL 6.0 at the stage of budget submission to MOF and approval by State Great Khural (Parliament). This system is lack of open function that means except employees of FPPD cannot keep track budget approval processes. In light of this shortcoming, other line ministries are not able to use these data in decision making. While Treasury system is relatively open. It provides more opportunities to other government entities, such as all in year changes, tracking transactions and periodic reports to monitor overall spending, for decision making.” – Interviewee 1

“Regularly used” – Interviewee 2

In addition, Interviewee 1 states that the systems are not fully operational and automated, therefore, as long as the received information is inaccurate and that employed in decision making leads always negative impact. But if we taking into consideration that all financial procedures were carried out manually and bringing the payment requests physically to the MOF, the implementation of FMISs (specifically Treasury system) resulted in faster procedures, since all financial transactions using the system were completed electronically.

3.6. The independent FMISs’ impact on employee’s job performance

The next research sub-question pursued in this thesis is to identify how independent FMISs affect public staff’s job performance I use insights from Technology Acceptance Model.
In practice, these independent IT systems are usually developed in specific needs of such departments, there is lack of integration with one another. Consequently, these heterogeneous information systems are little or no capacity for data sharing, sometimes overlapping functionality and provide incomplete coverage.

According to the TAM model, end-user's perceived usefulness defined as „the individual believes that using a particular system would enhance his or her job performance”. If the TAM applied in the MoF pattern, the IT systems that exploited to perform the tasks greatly enhance their work assignment. Interviewee 1 supported the statement that FMISs have potential to dramatically improve analysis and management of public financial system. In this regard, information systems are suited for MOF staffs for performing their tasks but highlighted that information systems are partially operational or not well integrated with one another in the MOF is causing data exchange problems, and create gaps and overlaps in function. Interviewee 1 and Interviewee 2 stressed in the interview with the following quotation:

“The unintegrated systems entail increased technical burden to the end-users’ workload.” - Interviewee 2

“The main issue on information exchange between budget planning and execution processes. Currently, FISCAL 6.0 budget planning software (only MoF using in internal purpose) and GFMIS is integrated in a limited way. The treasury is preparing to upgrade the current GFMIS as web-based, but there is still uncertainty to how to the FISCAL 6.0 system integrate with it. Moreover, BPIS which is the web version of the FISCAL 6.0 software has been developed for some years and trying to deploy in local budgeting, but from the point of view of end-user, it is unlikely whether the system decreases the workload of end-users that now they have. During the pilot training, end-users were giving feedback that compares to the current system, it is difficult to enter their budget proposal into the new system and the system creates more task to their job performance. If BPIS is not substituted full functions of the current system FISCAL, then upgrading the GFMIS 7.0 as integrate with BPIS might create inefficiency again.” - Interviewee 1

From the standpoint of the budget entities, for example, the end-users from the FTUs are using multiple financial management software in their daily routine work. Such as
GFMIS v7; BPIS; Fiscal 6.0; Online E-Reports; E-Balance; Electronic Control Analysis and Evaluation System; HRMIS and Glass account system. Those systems do not share or transfer data with one another, therefore there is considerable re-entry of data manually. If we calculate the total number of end-users of financial management software in whole Government of Mongolia, it is around 6757 according to the section 1.5.2. The Finance and Treasury Unit. All interviewees agreed on the statement that the lack of interoperability of these systems is becoming increasingly inconvenient for end users. Furthermore, Interviewee 1 stated that provided techniques for information discovery supposed to work as improving information quality, decreasing information asymmetry and availability for decision-making; but in practice collecting data is time-consuming, manual exchange of information is error-prone and lack of software integration generates a significant cost to the Government.

Another construct of TAM model is perceived ease of use is defined as “the degree to which a person believes that using a particular system would be free of effort”. In this perspective, I would argue that ease of use was regarded as less influential on the decision to roll out the system all over the government. The reason is that e-Government IT systems tend to abided by central organizations to use in preparing their budget proposals which utilized in policy decision making in the central institutions or Parliament. But, it is important to get feedback from FTU end-users for purpose of improving the system's functionality constantly unless the existing systems equipped with outmoded processes. Another notable issue in ease of use, insufficient IT knowledge among finance staffs at MOF and FTUs affected to use of the FMISs; and dealing with the application software itself was not easy for them. Interviewee 1 emphasizes with the following quotation:

“Digital literacy practice and aspirations are crucial when introducing a new system. We conducted a survey upon every pilot training of BPIS, the majority of the end-users answered the relatively simple dissemination of information is much easier to deliver on MS-Excel sheet than interactive transactions, such as entering, modifying, submitting and receiving budget proposal. Local end-users recognize some transactions, such as submitting their budget proposal, are better delivered through other electronic channels, especially the e-mail. The reason is that they
used to employ MS-Excel or e-mail over the years and perceived easy to use.” – Interviewee 1

Moreover, Interviewee 1 noted that his or her observation during the pilot training in the subnational government that (i) senior specialists know business logic of the PFM process very well, while junior specialists tend to operate the information system faster; and (ii) seniors are less enthusiastic than juniors to use the new software, thereby probably they prefer the G2G services as call centre or in real-world offices. Thus, independent variables such as age and prior experience with computers influence user acceptance of information systems.

To conclude this section, however, the Interviewees indicated that MOF departments do have adequate information systems within the institution, the negative impact is most clearly seen in the area of local FTU. Also, based on several WB documents these systems are not maximizing its potential efficiency in light of partially operational.

In the initial phase of PFM reform, there were few systems exploited at MOF and FTU, but upon subsequent reforms, more systems established not only in the MOF but also several line ministries and agencies (Appendix 1 and 2). Such as Local development fund web-based data system, Glass accounts transparency portal system and Payroll system. These manifold information systems challenges of integration and e-government interoperability. If the FMISs integrated within MOF, the employees of FTUs and budget entities can spend more time on tasks that will help to improve public sector efficiency, rather than having to replicate data and wait for information to be sent to them from other departments.
CHAPTER IV. CONCLUSION

This final chapter intends to reflect on the overall research and evaluation of the outcome and assess the strength of the research and reflect on the limitations of the research. Based on the limitations of the paper, further research in the area would be suggested.

Since the research paper is dealing with implementation and integration of FMIS projects in Mongolian Ministry of Finance was chosen as a specific research field. First, agency theory, technology acceptance model, and e-Government interoperability discussed to underpin in broader sense GFMIS integration. Second, it was necessary to gain a comprehensive understanding of the concept of government financial management information system to find relevance to Mongolian FMIS case. Third, the study suggested a hypothesis and proposed a research question to gain a deeper understanding of the practice of FMISs in Mongolia.

4.1. Summary of the outcome

What are the key factors that contributed to the success and failure of the previous FMIS projects?

Over the past 20 years, Mongolian Ministry of Finance has undergone major changes as governments try to respond to challenges of public financial management reforms and technological change. Thus, Mongolian Ministry of Finance intends to design and implement financial management software with the ultimate goal of improving PFM and enhancing coordination between its tier constituents.

Based on the FMISs development practices at Mongolian MoF, the main influencing factors are related to the proper project preparation, unstable legal and political environment, poor ICT knowledge and skills, weak end-user involvement, high rate staff turnover and poor knowledge management. Thus, it is important to consider above-mentioned key factors for future expansion of the system, design, and implementation or integration of FMIS project under Strengthening Fiscal and Financial Stability Project.
Does government strengthen inter-sectoral institutional collaboration through the introduction of FMIS, and thereby improving the quality of policy decision-making?

The policy decision makers are usually made a decision based on the information that received from their tier organizations. Thus, information is the most valuable resources to MOF departments, thus producer the departments dependent on consumers as budget entities to deliver information, and consumers are dependent on producers to receive information. In e-government perspective, both producer and consumers archive higher benefits from information system when the resources provided by another consumer organization is accurate.

In agency theory perspective, the MOF departments (the principal) established information systems to in order to get information and control actions of budget entities (the agents). Budget execution and preparation systems are examples of monitoring and analyzing devices that can be implemented to ensure that agent behaviors are aligned with principal interests. In this regard, the MoF departments made good progress that strengthening inter-sectoral institutional collaboration. Nevertheless, as main purpose of FMIS is offering huge opportunities for removing many of the barriers to the communication between dispersed government entities, in practice multiple FMISs not works full potential which entails another problem.

Findings from research and document review have highlighted that the FMISs supports policy decision making in the Mongolian Ministry of Finance, but could not confirm at budget entities level.

Do the independent FMISs contribute to the improved job performance of the staff of the MOF and its tier organizations?

The main purpose of FMIS is offering huge opportunities for removing many of the barriers to participating actively and to facilitate everyday chores of all level of civil servants, unfortunately, in real life, it worked opposite direction.

Information systems have the potential to dramatically improve analysis and management of the PFM system. Mongolian Ministry of Finance has made good progress in this regard. However, systems do not share data as well as they might, and systems have been introduced in a fragmented fashion that increases the data exchange
problems, and create gaps and overlaps in function. Thus, financial management information systems increase demands on staff time and reduce capabilities of the public staff.

*Hypothesis:* (i) the integrated FMIS at MOF helps lessen the burden of day-to-day work chores of end-users who are real victims of interoperability gaps at all levels from MOF staff to lowest level of budget entities; and (ii) FMIS improves the data gathering and processing at top level, leading to efficient decision making based on more accurate and less human error-prone information.

Existing information systems can be improved through greater integration with each other. While there is some data sharing between the budget planning and execution systems, there is a fair amount of manual effort required to transfer data between systems, there is considerable re-entry of data, and there is no systematic way to verify that a class of data that should be the same in multiple systems is the same. Data should flow easily and in an automated fashion between systems supporting budget planning, expenditure control, accounting and financial reporting (respectively, GFMIS, BPIS, FISCAL and other in-house software). The benefits of greater integration are that data flow between systems more quickly, more accurately and with less manual effort, which has the potential to free staff to do work other than entering data and verifying its accuracy.

*Assigning the interoperability maturity level to Mongolian MOF*

Based on the information gained in the available documentation, the current level of organizational interoperability maturity level will be determined. This analysis has resulted in the creation of Table 3 in which for each attribute is assessed on current maturity level.

*Table 3. Mongolian Ministry of Finance Interoperability Maturity Model*

| 4. Unified | In this stage, homogeneous several organizations can automatically exchange data and information. I assume that once existing systems integrated at MOF level, it is possible to integrate follow up systems. State organizations define which information is available and where |

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3. Combined Business processes are redesigned to reuse available data and incorporated in the system. The CIO should bring up the departments’ specialists, end-users from local level together to sketch country-specific PFM functional processes, thereby they will understand their each others’ domain. This means that there are no longer different understandings used for the same concept. In other words, semantic problems can be eliminated. The point in this level is the business processes should be consistent with standards (such as GFS2014 standards and unified COA). In this stages, GFMS v7, BPIS, DFMAS and E-Balance systems are possible to integrate (Myanganbayar, 2018).

2. Collaborative Common data structures used for incidental data exchange. International public financial standards motivates inter-organizational collaboration. Treasury and Fiscal policy departments agreed on standardization of COA and finalized inconsistent with Internation Accounting Standards (Joshi, Srivastava, & Nguyen, 2015). As a result, two departments can exchange data and information in the daily work routine.

1. Ad hoc In this stage, some divisions started to collaborate to achieve a common goal of the department. There was no progress made towards to interoperate these systems. Instead, there were improvement and expansion of core systems due to the partially functional systems got delivered at initial stage, such as E-reporting and Plastic. As a result, each department still used its own information systems, but with more interim software was established around core systems. Due to the ad hoc development, MOF departments aware of information should be used not only internal departments but also other departments and organizations.
The department used its own GFMIS, DMFAS, BPIS, E-Balance, E-procurement system and data formats and is not able to exchange information that is created within the department with other departments within the MOF or even with other government organizations. Even, these legacy systems were partially functional only internally and therefore have no options to interact with future external systems, resulting in inflexibility in the exchange of data later stages of this model. File types and document formats differ per departments and tier budget entities.

<table>
<thead>
<tr>
<th>Current maturity level</th>
<th>Collaborative</th>
</tr>
</thead>
</table>

The current circumstance of individual FMIS is an example of inefficient e-government. The main explanation for this is that the various departments of MOF autonomously made decision to adopt new software without any consideration of interoperable with other systems. As a result, the overall maturity level is collaborative.

As we mentioned above in the first chapter, the government activities take place in the back office. Therefore, it is important to integrate back office processes to achieve a goal of E-government. In addition, data standardization is prerequisite for successful e-Government interoperability. The Ministry of Finance takes an action to integrate their existing systems under Strengthening Fiscal and Financial Stability Project of the World Bank. Therefore, in coming years MOF’s interoperability maturity level might shift towards the combined level.

I conclude by suggesting following recommendations:

- First, review current information systems for the purpose of identifying ways to improve data sharing between existing budget planning, execution systems, and other FMIS. In addition, automated methods should be introduced to verify that information in one system that should be the same in another system, for example, consistent chart of accounts of core FMIS. Based on recommendations made, Ministry of Finance should bring together functional specialists who specialized in public financial management.

- Second, prepare a multi-year systems plan in support of public financial management. The plan should identify the functional coverage of future
systems, how they may be updated over time, provide standards guiding the development of multiple systems so that they share data and work together as a whole, and a process for regularly updating the plan. An integrated financial management system under a single administrator, or designed at one time with multiple functions or modules, is not suggested because international experience shows that such systems are costly and rarely perform as planned.

4.2. Limitations and suggestions for further research

The author recognizes that there are limitations in the research in addition to the constraints including time and other resources. This study was only based on a limited number of qualitative research method in terms of methodology, and therefore, there is a potential for doing a more comprehensive mixed method including quantitative research method with an increased number of interviewees to fully represent the sectors. Thus, issues related to FMISs in Mongolia could be looked in greater breadth. Additional research may raise new topic of interest that could build upon the current study. There are limitations regarding representativeness in relation to the sample. First, the research could not cover an adequate amount of representatives which require a more capacity and resources. Second, this research is limited to the reflection of the responses obtained from select few employees representing the implantation agency, software executor, and end-users. Subsequently, this limitation can be seen as providing an opportunity for further research.
References
(n.d.).


Government_Information_Systems_Interoperability_in_Developing_Countries_The_Case_of_Jordan


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### Appendices

#### Appendix 1. The existing application and information systems in Ministry of Finance

<table>
<thead>
<tr>
<th>Major Entity</th>
<th>Application</th>
<th>Language</th>
<th>Software executor</th>
<th>Development Year</th>
<th>Major Function(s)</th>
<th>User Group</th>
<th>Numbe r of Users</th>
<th>User Interface</th>
<th>Fund</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fiscal policy and planning department</td>
<td>BPIS (partially operational)</td>
<td>Java</td>
<td>Freebalance Inc, Canada</td>
<td>2009</td>
<td>Budget Preparation &amp; allocation</td>
<td>Officers in Fiscal policy and planning department, and budget entities</td>
<td>Over 7000</td>
<td>Web</td>
<td>Loan, State budget</td>
</tr>
<tr>
<td></td>
<td>FISCAL 6.0</td>
<td>FoxPro</td>
<td>In-house development</td>
<td>2000</td>
<td>Budget Preparation &amp; allocation</td>
<td>Officers in the department, budget offices all ministries/agencies/ai mags</td>
<td>Around 50</td>
<td>Client Server</td>
<td>Grant/credit by World Bank</td>
</tr>
<tr>
<td>Economic policy department</td>
<td>MTEF (Medium Term Expenditure Framework)</td>
<td>Java</td>
<td>Software firm, Korea</td>
<td>2016</td>
<td>Budget planning in the long-term</td>
<td>Officers in the department</td>
<td>Nearly 30</td>
<td>Web-based</td>
<td>Loan</td>
</tr>
<tr>
<td>Accounting policy department</td>
<td>E-Balance</td>
<td>Java</td>
<td>Interactive BI LLC, Mongolia</td>
<td>2009</td>
<td>Online financial statement system</td>
<td>All companies</td>
<td>Around 100000</td>
<td>Web-based</td>
<td>State budget</td>
</tr>
<tr>
<td>Public administration and management department</td>
<td>Document registration application</td>
<td>C#.Net</td>
<td>In-house development</td>
<td>2007</td>
<td>Document registration and Filing</td>
<td>All employees in the Ministry</td>
<td>Over 200</td>
<td>Client-server</td>
<td>State budget</td>
</tr>
<tr>
<td>Public administration and management department</td>
<td>Human Resource application</td>
<td>C#.Net</td>
<td>In-house development</td>
<td>2013</td>
<td>Registering of Human Resources</td>
<td>All employees in the Ministry</td>
<td>Over 200</td>
<td>Web-based</td>
<td>State budget</td>
</tr>
<tr>
<td>Treasury Department</td>
<td>GFMIS v7</td>
<td>Java</td>
<td>Freebalance Inc, Canada</td>
<td>2009</td>
<td>Settlements and payments between banks</td>
<td>Officers in Treasury department and treasury units</td>
<td>Nearly 1000</td>
<td>Web-based</td>
<td>Grant/credit by World Bank</td>
</tr>
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</tr>
<tr>
<td>DMFAS (The Debt Management and Financial Analysis System)</td>
<td>Java</td>
<td>UNCTAD</td>
<td>2000</td>
<td>Debt management and financial analysis</td>
<td>MOF, BOM</td>
<td>Around 10</td>
<td>Web-based</td>
<td>Grant/credit by World Bank</td>
<td></td>
</tr>
<tr>
<td>E-report system (Fully functional, e-report system consolidates and receives financial statements of the General Governors and produces budget execution statement)</td>
<td>Java</td>
<td>Interactive BI LLC, Mongolia</td>
<td>2012</td>
<td>Budget execution consolidation</td>
<td>Treasury department and General Governors</td>
<td>Around 120</td>
<td>Web-based</td>
<td>State Budget</td>
<td></td>
</tr>
<tr>
<td>Budgetary control and risk management department</td>
<td>Leader monitoring software, with new functions such as evaluation of the Government action plan. Functional, used on a daily basis to monitor MOF staff performance.</td>
<td>C#.Net</td>
<td>In-house development</td>
<td>2013</td>
<td>Planning and reporting</td>
<td>All employees in the ministries</td>
<td>Around 200</td>
<td>Web-based</td>
<td>Grant/credit by World Bank</td>
</tr>
<tr>
<td>Financial policy department</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Department</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>9</td>
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</tr>
<tr>
<td>Law and legal department</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Public investment department</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Development financing department</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
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</tr>
</tbody>
</table>
### Appendix 2. The existing application and information systems in Finance and Treasury Unit (case of Ulaanbaatar city)

<table>
<thead>
<tr>
<th>Position</th>
<th>Application</th>
<th>Software executor</th>
<th>Major Functions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Head of the unit</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>General accountant</td>
<td>GFMIS v7</td>
<td>FreeBalance Inc, Canada</td>
<td>Settlements and payments between banks</td>
</tr>
<tr>
<td></td>
<td>E-Report</td>
<td>Interactive BI LLC, Mongolia (local software firm)</td>
<td>Budget execution consolidation</td>
</tr>
<tr>
<td></td>
<td>PLASTIC ACOLOUS</td>
<td>Local software firm reconcile</td>
<td>Once the payment is made, the payment data is obtained from GFMIS, then General accountant enters data manually</td>
</tr>
<tr>
<td>Budget officer</td>
<td>BPIS</td>
<td>FreeBalance Inc, Canada</td>
<td>Budget Preparation &amp; allocation</td>
</tr>
<tr>
<td></td>
<td>FISCAL 6.0</td>
<td>In-house development</td>
<td>Budget Preparation &amp; allocation</td>
</tr>
<tr>
<td>Treasury senior officer</td>
<td>GFMIS v7</td>
<td>FreeBalance Inc, Canada</td>
<td>Expenditure and Revenue and</td>
</tr>
<tr>
<td>Payments and settlements officer</td>
<td>GFMIS v7</td>
<td>Freebalance Inc, Canada</td>
<td>Treasury Management,</td>
</tr>
<tr>
<td>Capital investment officer</td>
<td>Transparency portal</td>
<td></td>
<td>Only used in Ulaanbaatar city. Officer enters capital investment expenditures with contract, executor by manually. The system has similar function with “Class accounts” transparency portal</td>
</tr>
<tr>
<td></td>
<td><a href="https://open.ulaanbaatar.mn/home/">https://open.ulaanbaatar.mn/home/</a></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Local Development Fund web-based database system</td>
<td></td>
<td>Local development fund’s planning, procurement, financing permission and reporting system</td>
</tr>
<tr>
<td>Financial control and internal auditing officer</td>
<td>Glass accounts transparency portal <a href="http://www.shilendans.gov.mn/">http://www.shilendans.gov.mn/</a></td>
<td>The budget entities publish their transactions, relevant budget, and name of contractor in accordance with the law and relevant regulations.</td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td></td>
</tr>
<tr>
<td>Accounting officer of the budget entities (for example schools's accountant)</td>
<td>Fiscal 6.0</td>
<td>In-house development</td>
<td></td>
</tr>
<tr>
<td></td>
<td>BPIS</td>
<td>FreeBalance Inc, Canada</td>
<td></td>
</tr>
<tr>
<td></td>
<td>E-report</td>
<td>Interactive BI LLC, Mongolia (local software firm)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Glass accounts transparency portal <a href="http://www.shilendans.gov.mn/">http://www.shilendans.gov.mn/</a></td>
<td>Interactive BI LLC, Mongolia (local software firm)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Payroll application</td>
<td>Local software firm</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Accounting applications, such as Acolous, Axplorer, Diamond, Emerald, Macs, Sitisystem, Vinitsa, and Unicus Plastic</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Online tax application software</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Online social insurance premium system</td>
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<td>Statement of changes in equity application software</td>
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Appendix 3. Qualitative research interview questions

(Translated from Mongolian to English)

Dear respondents,

I am a graduate student at Corvinus University of Budapest, Hungary and I am conducting a research for my master thesis on Implementation of FMISs in Mongolian MOF. I would like you to answer the following questions which would greatly contribute to my research paper. Thank you very much for your contribution. Your response is valuable and very much appreciated!

Yours sincerely,
Serjmyadag Jamiyan
MSc in Public Policy and Management
Corvinus School of Economics, Budapest

Interview questions:

1. How has the integration of FMISs process been performed within MOF?
2. How is the current progress with integration of FMIS at MOF?
3. What are the current issues and problems that are hindering development of integrated FMIS within MOF?
4. How would you describe the benefits of implementing integrated FMIS at MOF which may foster to information system interoperability with another public sector?
5. How is the organization’s leadership’s attitude towards integration of FMIS?
6. Do you think the departments at MOF is fully prepared to implement the integration progress/process of information systems within the sector?
7. Do you think the current independent FMIS support your job performance? If so/not, in your opinion, what are effect or impact in your job performance since you use independent FMISs?
8. Do you think the civil servants at central and local level organizations are fully prepared to engage in implementation process of FMISs? If so, how are they engage in implementation process to improve design of the information system?
9. Do you believe that the government (MOF) decided to invest and design the independent information systems in order to get accurate and timely information from its tier constituents or it is institutional pressures may be exercised by external organizations?
10. Do you believe that the information system would definitely serve as a means of decreasing the level of information asymmetry existing between MOF and its tier constituents?
11. Do you think the information systems tailored to assist managers at central level to get data from its tier constituents at the time that it was most needed?
12. Are the recommendations and technical assistance published by the international development organizations in line with the current problems faced by Mongolia? If so, how can Mongolian government work to ensure coherence with the recommendations?
13. How would you describe that the generated data via independent information systems is fed into decision making processes internally within agencies or ministries to set programme priorities in practice?