Research Article

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Exploring IT Companies in Taiwan Through Budget and Expert Capability

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Abstract

Creating an Information System is important for reaching the aims of implementing Electronic Government (E-Government). The Taiwanese government has decided to use outsourcing as a method for developing these Information Systems. In 2014, sixty percent of the Information Technology (IT) budget allocated to the Taiwanese government was used for the upkeep and management of the information systems created by external companies. The skills of IT staff and how the budget is distributed in a government agency can affect how the information system functions. Nevertheless, there is not much research available on this topic. This preliminary study employed direct observation and detailed interviews to examine an information system within a specific agency of the Taiwanese government. The findings indicated that although the IT staff possessed adequate technical skills, their exclusion from the system's development led to a lack of understanding of its technical specifics, which diminished their ability to operate and manage the system effectively. Additionally, the limited budget prioritized operational costs over system improvements. The insufficient technical understanding of the system not only affected its normal functioning but also made it challenging to create adequate budgets for the IT department. This study offers practical solutions and suggestions for future research.

Keyword: Expert Capability, IT Budget Allocation, IT Company, E-Government.

1. Introduction

E-Government has become an important issue for all countries in the world because of its ability to improve efficiency, transparency, and accountability in public services (Ciborra, 2005; Hazineh et al., 2022; Chou, 2004). In the ever-growing digital era, the application of information and communication technology (ICT) in government not only facilitates public access to public services but also encourages active citizen participation in the decision-making process (Khan & Krishnan, 2021; Qiu et al., 2023). In addition, E-Government helps reduce government operational costs, minimize corruption, and improve service quality through automation and system integration (Ha et al., 2024; Papel et al., 2024; Zou et al., 2023). Amid global challenges such as pandemics, climate change, and inequality, E-Government is also a strategic tool to ensure the continuity of public services and build community resilience (Khan, 2024; Liu & Zhang 2024). Therefore, many countries consider digital transformation of government as an important step to achieve sustainable development and improve community welfare (Ahn & Chen, 2022; Anthony Jnr, 2021).

Based on a study by the United Nations in 2018, all member nations have taken steps toward implementing some form of e-Government. The report from 2018 indicated that there has been a significant rise in the number of countries using a single platform to offer public services (Lytras & Şerban, 2020; Rehman et al.,

2018, Xin et al., 2022; Yıldırım & Bostancı, 2021). There is a general consensus that technology in communication and e-Government play a crucial role in reaching the Sustainable Development Goals set by governments (Agbozo, 2018; Zheng et al., 2019). Employing technology to create information systems is essential for achieving e-Government objectives (Hussein et al., 2007, Cordella & Iannacci, 2010; Yıldırım & Bostancı, 2021).

Information systems for any organization can be developed by their own IT team or through external services (Peppard & Ward, 2004; Soto Setzke et al., 2023). The benefits and drawbacks of using outsourcing have been extensively examined in various publications (Grover et al., 1996; Thong et al., 1994; Willcocks, 2007). Nevertheless, there is limited discussion about the difficulties organizations encounter after a system has been developed and delivered through outsourcing. This lack of attention is unfortunate, especially because outsourcing has become a global practice (Hirschheim & Dibbern, 2009; Lacity et al., 2009) and is even a policy for the Taiwanese government (Chang et al, 2012; Yang & Huang 2000). In 2014, the Taiwanese government allocated a budget of 11.9 billion US dollars for IT, with 60% of that spent on operating and maintaining information systems. Thus, we believe there should be more focus on how these information systems are managed. This research examines how the skills of IT staff and the distribution of budget impact the functioning of information systems created by outside contractors. It may serve as a groundwork for future studies.

2. The Art of Research

1. E-Government

The phrase "Electronic Government" or "e-Government" was first mentioned in the section named "Reengineering through Information Technology" in the 1993 Report of the National Performance of the USA. This report stated that Information Technology (IT) was essential for establishing e-Government (Ndou, 2004; Schelin, 2007). Since then, there has been a significant increase in research about e-Government (Chohan & Hu, 2022; Hazineh et al., 2022; Khan & Krishnan, 2021). E-Government can be understood as the way government bodies utilize Information and Communication Technologies to enhance their effectiveness and improve the quality of public services for their citizens (Ha et al., 2024; Qiu et al., 2023). Building IT systems is a crucial approach for realizing e-Government (Agbozo, 2018; Cordella & Iannacci, 2010).

According to the National Development Council's website in Taiwan, the government began its e-Government initiatives in 1998 (Hsieh et al., 2013). The first phase was about creating the network infrastructure for the government and developing systems that connect citizens with administration from 2000 to 2020. From 2001 to 2007, the second phase aimed to set up information systems within government agencies. The third phase, from 2008 to 2011, focused on merging services across different government bodies. The fourth phase, from 2012 to 2016, concentrated on providing a one-stop service model. Beginning in 2017, e-Government will be restructured based on a data-driven strategy.

The successes of the Taiwan government in creating e-government have received global acknowledgment. In a 2015 report by Waseda University in Japan, Taiwan was placed 10th in the world. In a worldwide evaluation by the World Economic Forum in 2013, Taiwan was also listed among the top 10 nations. The Open Knowledge Foundation recognized Taiwan as number one in the Open Data Index in 2015. Clearly, Taiwan's e-government has been growing at a fast pace. According to National Development Council With the recent trend of outsourcing and the significant 60% budget set aside for running information systems after they are developed and delivered, it has become increasingly important for the Taiwan government to sustain this level of e-government.

2. IT Company Outsourcing & E-Government

Information Technology Outsourcing or ITO, refers to when a company hands over some or all of its hardware and software responsibilities to external vendors instead of handling them within the organization (Peppard & Ward, 2004). The main goals of ITO are to lower expenses and to take better advantage of rapidly changing technology (Chang et al., 2017). Researchers have noted that ITO is a growing trend and a crucial approach for successful e-government initiatives (Moon et al., 2016). Nevertheless, ITO should not be viewed just as a simple purchase; it requires long-term management plans (Pati & Desai, 2005).

A lot of the current studies about e-government and ITO primarily concentrate on strategies and elements that contribute to success in ITO (Apriliyanti et al., 2021; Moon et al., 2016; Zhang et al., 2024). There is not much focus on the operational difficulties and issues that arise after the system has been established. As outsourcing is a set policy in the Taiwan government and operational expenses have surpassed half of the IT budget, research on managing operations is becoming more essential and unavoidable.

3. The Ability of Organization's & IT Expert

The skills of an organization's IT staff are crucial for the success of electronic government services (Ndou, 2004). According to Heemstra & Kusters (1996), when IT staff have limited skills, they usually focus on projects that involve low risk and are small in scale. Ndou (2001) pointed out that the limitations of IT staff skills can hinder the integration of e-government services. Chou and Yen found that the expertise of IT personnel influences how IT systems are integrated (Tiwana & McLean, 2005). These studies all highlight the significance of IT staff skills during the system design and development phase. However, none of the research addresses how these skills affect the operation of the system. This is surprising because it is clear that most information systems today are not built or developed internally, with the internal IT staff primarily handling system operations.

4. IT Company Budgeting

One of the challenges for combining e-government is money (Lulaj et al., 2022; Yang & Rho, 2007). Expenses play a major role in supporting e-government. In the preparation phases mentioned by Bowman and others, how money is shared is a crucial factor in organizing Management Information Systems (Tekin & Konina, 2019). However, running the information system created by outside contractors also needs financial support (Reich & Benbasat, 2000). Therefore, this research suggests that how the budget is shared impacts the functioning of systems developed by ITO. Figure 1 illustrates the suggested research framework for this investigation. This research examines how the skills of IT staff and the distribution of funds affect the functioning of the information system within the company.

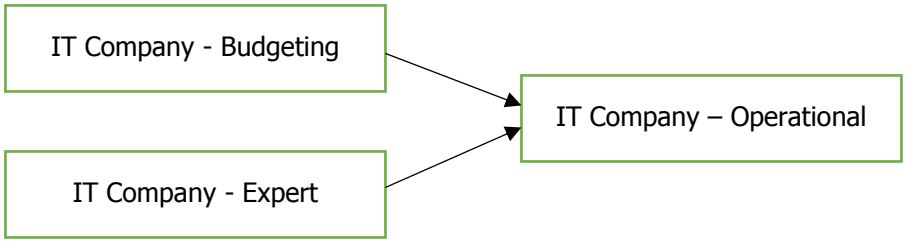

Figure 1. Research Model Design

3. Method

The aim of this study is to explore how the skills of IT staff and the distribution of funds impact the functioning of the information system created by outsourcing firms. This is a case analysis of agency X within the Taiwan government. The methods used consist of on-site research, detailed conversations, and review of documents.

1. Introduction of X Agency
   Agency X is a division of the Central Government in Taiwan. It deals with international relations and the connection between Taiwan and mainland China. In 1981, Agency X began to create and establish its own information systems. Initially, the work was completed by its own team. After 2010, Agency X invested 23.8 million US dollars in outsourcing some of its projects. The system was completed and put into use in 2011. It has been functioning for more than six years. Each year, the costs for running and maintaining it go beyond 3.2 million US dollars. There are six parts in agency X. Part X1 was previously in charge of creating and building the information systems within the organization. After the change in policy, it now handles outsourcing instead. Part X2 is in charge of system operations, which includes taking care of hardware, watching over software, and offering quick repairs if issues arise. Any new requests and needs from users will be sent to Part X1 via Part X2.
2. Data Collection.
   The primary method used in this research is field study. The researcher has actively taken part in and watched agency X over an extended period. Agency X conducts monthly meetings to talk about new needs and changes for the system. Between January 2014 and October 2018, there were 70 meetings. This research gathered and examined all the notes from the meetings as well as the logs of system activity. The procedures for solving issues and making decisions at agency X were directly observed. Detailed interviews were also held with the IT staff of agency X. The structure for the interviews can be found in Appendix 1. The individuals chosen for the interviews were selected intentionally, including both heads (A and B) of Sections X1 and X2. A is in charge of designing and developing the system, while B handles the system's operations. Two interviews took place in November 2019. The interviews were recorded with the agreement of those being interviewed. Each interview lasted around 30 to 40 minutes. After reviewing the interviews, the information relevant to the research topics was extracted and organized.
   The information from the interviews was organized by giving content codes (CC). The structure of a content code is 'CC' followed by four letters and numbers, such as CC01-A-1. Table 2 provides details on what each part of the alphanumeric code represents. A full list of content codes along with their related coding can be found in Appendix 2.

Table 1. Content Descriptions

Code	Descriptions
1st, 2nd	Serial Number
3rd	The Respondent (A, B)
	Content:
	1.Explanation of issues and circumstances associated with how the system functions
	2.Explanations of how to fix the problems
	3.Explanations of what led to the issues
	4. Additional information

4. Result

This research has examined 70 sets of meeting notes, along with observations and interviews from organization X. The issues and difficulties encountered by organization X after the completion and delivery of its outsourced system are outlined as follows.

1. The IT Expert Can't Fulfill the Needs of Users Independently

Since agency X manages foreign relations and the connection between Taiwan and mainland China, its information systems must be updated in line with changes in government policy. Aside from the existing reporting system, the IT staff often receive requests for different reports from senior leaders and Congress. At present, only the companies hired can meet all the needs for changes to the system and generating reports, as agency X's IT staff cannot do so. This may be because the IT staff lack enough knowledge and control over the system.

This research revealed that the information system used by agency X is extensive. Its database setup is very complex and frequently updated. The IT staff at agency X are unable to completely grasp the technical aspects, including programming codes, database layouts, and relationships within the database (CC01-A-1, CC02-A-1). Therefore, they rely on the contracted companies (CC07-A-1, CC08-B-1, CC09-A-1, CC10-A-1) to make system adjustments and create reports as needed (CC07-A-1, CC08-B-1, CC09-A-1, CC10-A-1). This reliance can lead to delays in fulfilling requests and may result in additional costs.

The reasons that the IT staff at agency X struggle to understand the technical aspects of the systems might be that they dedicate most of their time to administrative tasks like buying systems and managing projects (CC14-A-3, CC15-A-3). Even though they may have solid technical skills, they lack the time to learn the programming languages and database formats of the system. As a result, they must depend entirely on contractors for modifications to the system and for generating reports (CC16-A-3). Additionally, due to ongoing policy changes, the system is often updated. This frequent updating makes it harder to keep the documentation current. The absence of thorough documentation for the system weakens the IT staff's ability to manage the system effectively (CC03-A-1).

2. High IT Maintenance Requires High Cost Budget Constraints

The expense of running and taking care of the information system for agency X amounts to 3.2 million US dollars, which is roughly 70% of the overall IT budget. Each year, the total budget for the agency is set and remains the same. If the cost of maintenance rises, it becomes harder to find funds for additional responsibilities (CC17-B-4, CC18-A-4, CC19-B-4).

The IT budget must be utilized not only for keeping the system running but also for improving it, buying new tools, and even developing new information systems. Nevertheless, a large portion of the budget has already been consumed by maintenance, leaving insufficient funds to upgrade or enhance the equipment. Over time, this may result in the system becoming outdated (CC20-B-4, CC21-B-4, CC22-A-4). In simpler terms, to keep the system functioning, it may lead to delays in other crucial tasks or cause them to be overlooked.

3. Increasing Maintenance Items Can Drive Up Company Expenses

Since the IT staff at agency X really relies on outside companies, a lot of maintenance tasks must be done by those contractors. The number of things that need maintenance keeps growing, which means that expenses can only rise (CC19-B-4). This might explain why maintenance costs take up most of the IT budget (CC17-B-4, CC18-A-4). So, we can say that the more the IT staff depends on these contractors, the higher the maintenance expenses become. This might also bring some risks to how the system runs.

To sum up, if the agency's IT staff can't understand and manage the system, they will end up depending too much on contractors. This leads to delays in schedules and makes it harder to manage the budget effectively. If the budget runs low, the system's operations will be impacted. Meanwhile, the added maintenance costs will also further influence how the system operates. The results of this study are shown in Figure 2.

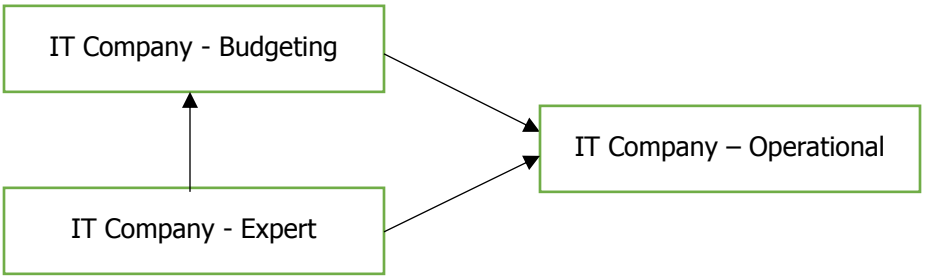

Figure 2. Research Findings

5. Discussion

A study of information systems in government agencies in Taiwan from the perspective of IT experts reveals that the country has invested significant resources to build a competent and innovative team of information technology (IT) experts. Taiwan is known as one of the world's leading technology hubs, and this is reflected in the ability of its government agencies to develop and manage sophisticated information systems. IT experts in Taiwanese government agencies are not only responsible for ensuring system security and reliability, but also for integrating the latest technologies such as artificial intelligence (AI), big data, and the Internet of Things (IoT) into public services. This expertise enables the Taiwanese government to provide efficient digital services, such as online payment systems, electronic reporting, and public participation platforms, which increase transparency and public satisfaction. In addition, collaboration between government IT experts and the private sector and academia is also a driving factor for innovation and sustainability of information systems in Taiwan.

In terms of budget, Taiwan has allocated significant funds for the development and maintenance of information systems in government agencies. This budget is used to finance technological infrastructure, human resource training, and research and development of innovative systems. The Taiwanese government recognizes that investment in information technology is key to improving bureaucratic efficiency and the quality of public services. For example, the government's "Smart Taiwan" program aims to expand the use of digital technology in various sectors, including government. The allocated budget covers not only system development but also cybersecurity, which is a priority given the increasingly complex threat of cyberattacks. With adequate funding, Taiwanese government agencies are able to maintain the sustainability of their information systems, ensure reliable public services, and continue to innovate to meet the needs of society in the digital age.

The primary objective of this study is to examine how the abilities of IT staff and the IT budget within an organization influence the functioning of information systems developed by external providers, particularly in the context of Taiwan's government promoting e-Government initiatives. This research utilizes agency X of Taiwan's central government as a case study to conduct observations and analysis. This study identified that once the contracting firms completed and handed over the system, there remained numerous requirements for system modifications due to ongoing changes in government policy or the emergence of urgent reporting requirements. Throughout the system's development, IT staff primarily concentrated on

management of the project and various administrative tasks, leading to delays in updating system documentation. This oversight resulted in the IT team's diminished comprehension of the system's technical features and generated an excessive dependence on the contractors. Such reliance introduced certain risks to the functioning of the system, including delays in timelines and additional expenses. The research further revealed that, with a constrained IT budget, the agency encounters obstacles in efficiently distributing its funds. A lack of adequate funds for maintenance can have an immediate negative effect on regular operations. Conversely, with high maintenance expenditures, the agency grapples with the challenge of either updating and reinforcing the systems or replacing outdated hardware, which could ultimately disrupt the systems' operations.

6. Conclusion

The research revealed that the proficiency of the agency's information technology staff and the distribution of funds significantly influence the functionality of the systems. Additionally, it was determined that the skillset of the agency's IT team plays a crucial role in how the agency organizes and executes its financial resources, ultimately impacting the operations of the systems.

Despite the Taiwanese e-Government's strategy of outsourcing IT, the government's IT staff must remain vigilant about the technical specifics of the information systems developed by contractors to prevent excessive reliance on them. In this case study, agency IT staff dedicated a majority of their time and effort to project management and administrative tasks while the contractors handled system construction, resulting in insufficient time to grasp the technical intricacies of the system. Therefore, we recommend involving a greater number of administrative personnel in the future to take charge of these administrative responsibilities. With this new collaborative model between administrative and technical employees, IT personnel can minimize distractions from administrative tasks and concentrate on technical elements, thereby enhancing their control over the system. Whenever modifications occur in the system, it's essential to simultaneously update the documentation to ensure alignment with the current system, which will also empower IT staff with better command. Given budget constraints, prioritizing system functionality is a natural approach. Nonetheless, the agency requires a long-range development plan. It's crucial to factor in the risks associated with the software and hardware becoming outdated and the effects of emerging technologies. Concurrently, the agency should strive to enhance their IT staff's ability to manage the system effectively to reduce reliance on contractors. This strategy will not only lower maintenance expenses but also optimize the use of the limited IT budget.

This examination is an initial inquiry that explores the impact of the capabilities of IT staff and the distribution of the IT budget within a particular organization on the functionality of information systems created by external service providers. There are likely additional factors at play. Subsequent studies could look into other firms with differing types and characteristics. Because this investigation was carried out in a single entity, agency X in Taiwan, the circumstances and results are tailored exclusively to that organization.

Acknowledgments

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APPENDIX

1. Appendix 1 Interview Outlines
   - Interviewee's Profile: Title, Annual Salary, and Position.
   - Duties of IT expert while system being built
   - Duties of IT expert while system in operation
2. Appendix 2 Interview Record Summary and Coding

Code	Item
CC01-A-1	The system is vast, and the structure of the database is intricate.
CC02-A-1	Team members can grasp the overall system layout, yet they struggle with the intricate programming aspects.
CC03-A-1	The specifications are in a state of constant flux. The coding experiences ongoing revisions, but the system documentation fails to be updated timely.
CC04-A-1	Frequently, adjustments to our system are necessary to align with changes in government regulations.
CC05-B-1	Congress regularly demands information that is absent from the reporting system, which necessitates the creation of additional reports from the database.
CC06-B-1	Our senior management frequently asks for various ad-hoc reports, which also falls under our responsibility.
CC07-A-1	Team members lack the capability to make changes to the system.
CC08-B-1	Only the contractors have the ability to directly access the databases; our team members are unable to do so.

CC09-A-1	When the reports requested by our higher-ups are straightforward, we can create them independently. Yet, if the report is more intricate, we must request assistance from our contractors due to the extensive nature of our system and the complexity of the database.
CC10-A-1	We need to request the contractors to handle system modifications since our colleagues lack the necessary understanding of the programming framework involved.
CC11-A-2	As we depend on the contractors for system alterations, there are instances when we may have to adjust our timelines.
CC12-A-2	Even when creating on-the-fly reports, the firms involved must not only estimate the time required but often face additional expenses.
CC13-A-2	When we ask contractors to adjust programs or provide data, they sometimes struggle to meet our timelines, and we ultimately have to compromise.
CC14-A-3	The IT Department also handles administrative tasks such as buying supplies.
CC15-A-3	While the consultants were constructing the system, the IT Department continued to oversee project management and conduct the final review upon completion.
CC16-A-3	Since a majority of our team concentrated on managing projects, it was challenging to grasp the programming code and database arrangement.
CC17-B-4	As the system and its components grew, the maintenance expenses have risen progressively each year. In recent years, a lack of sufficient funding has begun to pose a challenge.
CC18-B-4	Securing funding for constructing a new system or acquiring new machinery is generally more straightforward than advocating for upkeep of current systems. We often found ourselves constrained by a tight financial plan.
CC19-B-4	Due to the high volume of items that contractors must over to see, it becomes challenging to reduce upkeep expenses.
CC20-B-4	This agency's IT budget encompasses maintenance, system enhancement, procurement of new equipment, and creation of new systems.
CC21-B-4	A significant portion of the budget is consumed by the upkeep of current systems, resulting in a shortage of funds for improving existing systems or replacing outdated equipment.
CC22-A-4	A lack of adequate funding will impact the everyday functionality of the systems.