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IT/IS AS THE SECRET SCROLL OF KUNG FU: A FUNCTIONALIST EXPLANATION OF A TECHNICAL STRUCTURE FOR INFORMATION SYSTEMS DESIGN

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Abstract

A company encounters many negative social consequences and persistent problems when it adopts a specific technical structure for an information system (IS). But, why do they continue using it, not wishing to abandon it? This paper uses the functionalist explanation to interpret the contradictory phenomenon through a real case which expects to enhance work efficiency and improve business processes by developing a new IS. During IS development and implementation, the rivalry between IT personnel and users occurs while they closely cooperate. Nevertheless, a shared belief that "IT/IS as the Secret Scroll of Kung Fu", which implies IT/IS with a magic power, has been unexpectedly developed between them. In other words, both divisions believe that IT/IS would be able to solve all unintended problems to be encountered. Therefore, they still kept cooperating to develop IS, and did not admit the failure of IS.

Keywords: Functionalist Explanation, Unintended Consequences of using IT/IS, IS Failure, System Design.

1 INTRODUCTION

In an Internet era, companies try to obtain competitive advantages by using information technology. However, some large-scale enterprises encountered technology failure(Lyytinen & Hirschheim, 1987; Nash, 2000), so Sauer(1999) suggested that it is not possible without IS failures. In order to obtain the competitive advantage, a company tries to improve work efficiency and enable organizational change through developing a new IS. How the company chooses a proper technical structure for IS design should consider previous organizational idiosyncrasies and needs so that the best system development practice can be obtained(Paulson, 2001). Otherwise, the IS would fail(Lyytinen & Hirschheim, 1987). According to McGrath & Papazafeiropoulou(2007), a functionalist explanation can be applied to an awkward situation, in which an organization adopts a management structure, and cannot abandon it even when problems persist.

In this paper, we examine the persistence of this problem by focusing on a specific technical structure of IS design which intends to eradicate the problem. We use a case study of an extension education center of one university in Taiwan, referred as the alias CECC in the following context. In our case, on-line experiences of a transitional system and all requests raised by users were studied, and then the adoption of a specific technical structure was finally decided -- “common interface design“ and “significant system revision“ to develop a new IS for achieving the organizational goals. However, During IS development and implementation, the rivalry between IT personnel and users occurs while they closely cooperate. Nevertheless, a shared belief that “IT/IS as the Secret Scroll of Kung Fu”, which implies IT/IS with a magic power, has been unexpectedly developed between them. In other words, both parties believe that IT/IS would be able to solve all unintended problems to be encountered. Therefore, they still kept cooperating to develop IS, and did not admit the failure of IS.

This paper aims to explain why companies continue using the original technical structure, even when the issues persist and unintended negative consequences keep occurring. Is it regarded as IS failure? What is the explanation for such contradiction? This paper analyzes this contradiction in light of a functionalist explanation.

2 LITERATURE REVIEW

2.1 Functionalist Explanation

Functionalist explanation, a style of reasoning commonly employed in the functionalist tradition, has clear relevance in IS research contexts(Markus, 2004). The functionalist paradigm was the dominant force in sociology and organization theory(McGrath & Papazafeiropoulou, 2007). Functionalists had generally restricted themselves to the analysis of the society as a whole. Merton(1968) introduces levels of functional analysis which includes an organization, institution, group, or any standardized and repetitive social phenomenon(Ritzer, 2007).

During research on IS, Markus(1994) used email issues of a health insurance company as an example(Markus, 2004). The target employees’ email use resulted in many unintended negative social consequences. The reason was they shared the belief, “email as their major communication medium at work”, maintained the targets’ behavioral pattern of email use. McGrath & Papazafeiropoulou (2007) indicated that a company improved IT-user cooperation by relationship management, and resulted in some unexpected negative consequences. It did not solve the problem of IT-user cooperation, which became even more serious. However, they treat relationship management as a governance mechanism and could not abandon it.

Thus, a functionalist explanation was applied to elaborate on the behavioral pattern, social structure, belief system, and thought processes. After reorganizing the literature on functionalist explanations of scholars, such as Stinchcombe(1986), Elster(1983), and Mann(1984), this paper proposes analytical steps for functionalist explanation(Markus, 2004), as shown below:

Identify a problematic activity: Mann(1984) suggested that functionalist explanation aims to identify a problematic activity— to recognize the seemingly unreasonable phenomenon, usually related to social development, and then, satisfy certain social demands.

- Identify the function that explains the problematic activity;

- Identify the threats, which weakened the function;
- Identify the causal feedback loop and demonstrating Elster's(1983) five conditions of “if and only if”, which leads to a reasonable functionalist explanation.
 - Function is the consequence of structure;
 - Function benefits the social groups;
 - Function is unintentional for social groups;
 - Function (or at least the feedback between function and structure), is not recognized by social groups;
 - Function exists upon the group members' causal feedback loop; in other words, group members continuously used the structure to maintain the function. Since the function appeared continuously, group members would repetitively use the structure. Thus, function was one of the attributes of social groups, and a by-product of group members' behavior.
- A functionalist explanation subjectively recognizes (from insiders' view) and objectively analyzes(from outsiders' view) complicated interactions among individuals, groups, and organization so that the social situations could be understood(Markus, 2004; McGrath & Papazafeiropoulou, 2007). However, the concept of functionalist explanation has been criticized, since function could be changed due to different situations and explanations(Elster, 1983; Hovorka, Germonprez, & Larsen, 2008). Douglas(1986) indicated that function benefited social groups, and encouraged its members to maintain self-benefit. Thus, upon Elster's(1983) functionalist explanation, Douglas(1986) attempted to determine how latent groups survived, and demonstrated that the function of the existence of the latent group was a “conspiracy belief” in the group. The conspiracy belief was not the members' intention; instead, it was a collective product of the members' behavior pattern, as shared by the latent group which could then survive.

2.2 IS Failure

Sauer(1999) suggested that IS have involved high degrees of failure in the long term. However, in the recent decade, the IS failure was an obstacle in IS study. Lyytinen & Hirschheim(1987) generalized four types of IS failures, including correspondence failure, process failure, interaction failure, and expectation failure. They suggested that the causes of IS failures are multiple, not single. The typical example is the study of Robey & Newman's(1996). Lyytinen & Hirschheim(1987) discussed IS failures from the consequentialist perspective. In other words, the description of IS failures was based on the practical consequences. This perspective allowed us to recognize varied IS problems, understand the factors and the causes of the problems, and define the concerned groups.

Why does IS introduce failure? Generally speaking, there are lots of critical factors, for instance, the users did not participate, senior management did not support, turnover rate was high, and the quality of system design was unsatisfying (such as unfriendly user-interface)(Sauer, 1999). Only analysis of the disadvantages of the environmental conditions can identify the barriers by the logic structure of variation theory. In order to further probe into relationships between causes and outcomes of IS failure in companies, the logic structure of process theory was appropriate(Markus & Robey, 1988), as it could focus on the development & implementation of IS and carefully recognize the stakeholders' interactions and the influences of system introduction among stakeholders, groups, and organizations.

This paper aims to explain why companies continue using the technical structure to develop IS, even when the issues persist and unintended negative consequences keep occurring. The following section will analyze this contradiction by functionalist explanation.

3 METHOD AND RESEARCH SITE

This paper focuses on the dynamics of information system development through functionalist explanation and chose a case study as the appropriate research method(Yin, 1994).

3.1 Data collection

This paper targets on the extension education center of one university. The development of an academic affairs administration system was a large scale project. We used participant observations, from November 2001 to June 2002. We adopted semi-structured interviews, each lasted for 1.5 to 2

hours. The interviewees included CEO, personnel of the division of academic affairs (including the manager, the leader, 2 senior staff, and one junior), and personnel of the division of information (including the manager, the system development team, especially those who involoved in the development of the academic affairs systems). There were 9 interviewees, each was interviewed 2 or 3 times. Most interviews were sound-recorded and summaries were documented. Researchers also participated in 19 meetings in the organization. This study also collected organizational documents, system development documents, memos, etc. In addition, the researchers tried the system or invited users to demonstrate some problematic operations. In the period of participant observation, the researchers had frequent and informal contact with IT personnel and personnel of academic affairs.

3.2 Research Site

The CECC provided extension education and lifelong learning. Though CECC belonged to a university, it was independently operated and as acted more like a business organizations, emphasizing on the customer-oriented strategy and profits.

This paper was interested in the academic affairs administration system in CECC. There are two parallel divisions involved, including division of academic affairs--DAA and division of information technology--DI). In the autumn of 1999, the CEO of CECC intended to reconstruct DAA to establish more efficient business processes and improve their service quality. DAA also expected that a new academic affairs administration system could solve the old problems and enhance their efficiency.

The CEO intended to equipped the organization with the most prominent information technology advantages in Taiwan and expected DI to lead organizational change. Thus, the DI director proposed the vision of a “digital campus” in 1999. With CEO’s support, the number of personnel in DI’s development team increased from 4 in 1997 to 10 in 2001. There were total 30 personnel in DI.

The academic affairs administration system was the central system in the framework of the digital campus. Based on the concept of ERP (Enterprise Resource Management), the academic affairs administration system was called EduRP¹ which referred to the fundamental system of university operations. The design aimed to upgrade the efficiency of academic affairs administration. More importantly, it aimed to provide the students “non-stop information services”. Thus, CEO, DI and DAA all looked forward to the EduRP.

4 CASE STUDY NARRATIVE

DI and DAA cooperated with each other for the first time. DI first decided to develop the student recruitment system because this system is more independent. The student recruitment system was an indicator that reflected the basic characteristics of academic affairs: similarity and repetition of business processes, pressure of real-time and accurate data. Thus, the student recruitment system was the epitome of development of the EduRP. We elaborate on the development of the student recruitment system and show the behavioral pattern of the information system development & implementation of CECC.

4.1 Episode 1: Construction of a complete student recruitment system

CECC had a credit program and a degree program, based upon different school systems (including second-year college and master program), and school transfer examination. Within three months, it must hold six different types of student recruitment examinations, which were based on the same processes. However, students could select courses among different school systems and departments. Thus, the rules for candidates became complicated. By 1999, the student recruitment system had been continuously revised for three years.

- The system of 1999 was transitional and only met limited demand.

¹Academic affairs administration system of CECC, i.e., student recruitment, student status, curriculum, course selection and grade systems, included both new and old versions. Old version was a transitional system while new version was a new framework designed by DI through the analytical experience of old version. It became the important basic element of EduRP in the vision of digital campus. By the end of 1999, the old version was gradually eliminated.

- Although the system in 2000 was developed and completed upon the requirements of DAA (including candidate announcement function and new reports format), DAA always raised some other urgent requirement.
- In 2001, Jack, the development chief of DI, demanded the re-development of the student recruitment system. After recognizing all requirements from DAA, he led the DI team to construct a “*complete student recruitment system*” which aimed to reform recruitment processes of the DAA. In order to manage six types of student recruitment examinations, they planned a “*common interface design*” with the same interface. In the previous year, the manual grade collation was not done precisely. Therefore, in the new system, the DI asked three DAA personnel to input grades at the same time, and a comparison was performed by a program automatically to replace the original work of manual grade collation. However, it resulted in the most serious conflict between the two divisions. Afterwards, Jack sent an email to the DAA: “*although the student recruitment system this year (2001) is significantly improved, we still expect an even better system*”; and he suggested in the memo: “*after this online experience, next system will completely meet the demand*”.

In 2001, DI claimed that they constructed a “complete student recruitment system”. However, why did the DAA’s workload increase and were there serious conflicts between two parties? Why did the DI repetitively try to reconstruct an effective academic affairs operational process and system?

4.2 Episode 2: System design concept that covers all requirements

Although DAA complained the IS was complicated, they knew that DI would not reject their demands: “*they (DI) are highly self-disciplined. They will try to satisfy your demands, and thus, they will not reject...*”; they recognized the efforts of DI: “*when DI designs the system, they try to include all affairs by the latest, simplest, and the most convenient approach in order to satisfy our demands*”. DI tried to integrate different types of recruitment examinations in the same interface. The system design would be thus more difficult and complicated. The DAA manager said: “*We don’t want such complicated functions. Once a setting is wrong, the following will be incorrect*”. DAA do not want complicated system functions. The new student recruitment system was complicated and the system operations were easily mistaken.

Why did DI select difficult and complicated system designs? Amy, a senior personnel at DAA, recognized that DI might involve some new concepts in EduRP: “*now I realize that they might have higher ideals, which we cannot understand and recognize at the moment*”. Nevertheless, what were the “*ideals*” of DI?

4.3 Episode 3: More new requirements for EduRP

After the system was on-line, DAA still kept raising new requirements. However, DI tended to delay the modifications until “the next system revision” which would also incorporate some other using experiences. In addition, DI would also reviewed the shortcomings of system operation, then actively developed new system functions and services.

4.4 Episode 4: Requirement for no mistakes, but errors always occur

In fact, DAA concerned the accuracy and stability of the EduRP. Academic administration affairs were related to the students’ rights and no mistake was allowed. However, errors usually occurred during system usage.

Some errors were resulted from the program bugs although the system had been tested. Amy also complained: “*There would be usually no problem for the past data during testing. However, problems would occur once new data comes in... all systems are alike*”. Although some issues have been resolved through system testing, some new errors still occurred during system usage.

On the other side, the DI add “*tricky designs*” into the system to avoid the operational mistakes of DAA. They also designed “*data authority control*” to avoid the chain effect of the errors, but it was still not effective. Although DI added “*anti-cheating designs*” in the EduRP, they still could not avoid the data errors and problems, and they said: “*when we contribute more, they will be more careless; so we still cannot avoid the problems*”.

After finding the mistakes in IS, the two divisions would try to solve the problems. However, they suggested that the errors were not due to the “system”, and it was the problem of “personnel”. Thus,

they blamed each other and tried to solve “personnel” problems by the “system”. Nevertheless, some errors still unexpectedly appeared and even the “anti-cheating design” could not avoid these errors.

5 ANALYSIS

5.1 Identifying a problematic activity

After the DI adopts common interface design and batched revision of system, there occur some problems and contradictions:

- Common interface design: for DI, the common interface design was more complicated and difficult. For DAA, it tends to result in unfriendly usage and data errors. However, common interface design neither benefits DI nor enhances DAA.
- Expectations of “the next system revision” that meets all users’ requirements (“batched system revision”): After the system is on line, there are unexpected situations. DAA always asks DI to modify the program or propose new requirements to solve the problems. However, will “significant system revision” completely meet all users’ requirements?

It seems that the two mechanisms do not benefit DAA & DI. On the other hand, in order to maintain their professional positions, they contend with each other in order to fulfil their system requirements. , DI asks DAA to test the system functions, and, in exchange, DAA requests DI to add the recruitment management function. Sometimes DAA asks for a new system function, such as searching, and DI then expects DAA to establish the function of authority control. So, it appears the contradictory phenomenon between close cooperation and mutual rivalry.

5.2 Function

DI works hard to maintain the system, deals with various errors, and supports daily operations of DAA. In addition, the CEO assigns them as the leader of organizational change. Gradually, the belief that “*IT/IS as the Secret Scroll of Kung Fu*” unintentionally develops, and they adopt common interface design and batched system revisions trying to build a perfect student recruitment system.

DAA also believes that “*IT/IS as the Secret Scroll of Kung Fu*”. They realize that DI will not reject their requirements. DI attempts to meet all their requirements by “*the latest, the simplest, and the most useful approach about IT/IS (common interface design)*”, add system functions and adjust system interface by batched system revision. Thus, DAA depend more on DI and even ask them to assist with DAA’s daily operations and problem solving. Therefore, although there are conflicts between the two divisions, they still closely cooperate with each other in system development.

5.3 Destabilizing Threats & Unintended Negative Consequences

After DI adopts a common interface design and significant system revision, there are two threats; how DI and DAA overcome the threats and solve the following Unintended Negative Consequences, are reorganized in Table 1.

Threats	Solutions	Unintended Negative Consequences
Requirement for no mistakes, but errors always occur	<ul style="list-style-type: none"> • Increasing log record system, and tracking the business records of the system to recognize the responsibility and the problem • Anti-cheating design: controlling data authority and blocking parts of activities of DAA personnel 	<ul style="list-style-type: none"> • DI suggest that the “tricky design” of the system still cannot avoid errors; • DI cannot help but claim that no mechanism or capability can control the problems;
More new system requirements	<ul style="list-style-type: none"> • Integrating all demands of personnel of academic affairs and adopting common interface design • Significant system revision 	<ul style="list-style-type: none"> • After the system is on line, there are always new problems and demands • Deferred demands • DI usually support daily works of DAA

Table 1 Practical threats, solutions, and Unintended Negative Consequences of student recruitment system in CECC

6 DISCUSSION

From a rational perspective, CECC has problems in IS development and implementation(Sauer, 1999). For instance, because of high turnover, DAA cannot propose specific requirements; In the stage of

system design, the two divisions rarely interact with each other. When DAA recognize the gap between their expectation and the final product, there are conflicts, which may result in IS failure.

The student recruitment system of 2000 encountered expectation failure(Lyytinen & Hirschheim, 1987). For the newly designed system of 2001, Jack claimed that the system was a success and said: “It is a perfect model of student recruitment system. The development of EduRP can follow up the technical structure of IS design —common interface design and significant system revision”. DI is more convinced that “IT/IS as the secret scroll of Kung Fu” has a magic power -- the system’s success is the effects of “IT/IS as the secret scroll of Kung Fu”. However, DAA still seems to encounter expectation failure. For example, DI designs to separate the authorities of input and data collation respectively to ensure the data correctness. For operational convenience, all DAA personnel know the ID and password of the highest authority. Each DAA could simultaneously input and collate the data, which violates the original design intent and so increases the risk of data errors. Notwithstanding, DAA still believe “IT/IS as the secret scroll of Kung Fu”, they would raise a new system request to challenge DI in order to meet their own expectation. Therefore, DAA claims: “DI has higher ideals, which we cannot understand”. As DI director asks Jack: “Have you finished the development of EduRP?”, and Jack asks him in return: “Will system development end one day? The system will be continuously revised and renewed...”.

Hirschheim & Newman(1991) suggest to use symbols, i.e., myth, metaphor, and magic, in interpreting the social actions that are embodied within ISD. They facilitate a richer understanding of system development. CECC has the myth of IS and they believe that the technical structure of IS design could solve all problems. However, problems persist and unexpected negative consequences can not be avoided. In the process of problem solving, the consequence dissimilates. In other words, the original intent of organizational change has been altered to the advocacy of IS. Table 2 shows the elements of functionalist explanation of technical structure for IS design and an illustration of how they are applied in the CECC case.

Essential element	Illustration
Structure to be explained	DI adopt common system design, and significant system revision to construct the perfect student recruitment system, and totally solve all requirements and problems of DAA, that result in persistent, unintended negative consequences, such as more system requirements & problems
Function	“IT/IS as the Secret Scroll of Kung Fu” is the shared belief of DI and DAA
Destabilizing tensions	There are always new problems and requirements after system is on line. DI introduce “anti-cheating design” into the system still cannot avoid errors.
Causal feedback loop through the social group, through which the function maintains the structure	DI adopts the “common system design” and “system revision” to meet all the requirements of CECC. Thus, DI and DAA believe that “IT/IS as the Secret Scroll of Kung Fu”; since they continuously demonstrate that “IT/IS as the Secret Scroll of Kung Fu”, DI keeps the two technical structures to show the effect. Thus, IS is constantly developed likewise.
Warrant that the function is a consequence of the structure	Even though DI and DAA encounter more new requirements, errors, and conflict, DI insists on using “common interface design” and “significant system revision” to develop IS. It show the result that “IT/IS as the Secret Scroll of Kung Fu” – they want to hold IS.
Warrant that function is beneficial for the social group	It benefits two divisions, enhances work efficiency of DAA, and carries out the vision of a digital campus of DI.
Warrants that the function is unintended by the social group	During implementation and development of IS, DI and DAA personnel request each other to do something related to IS in return and so they always contend with each other. It is out of their original expectations and goal of IS. During the implementation and development of IS, DI and DAA request each other to do something related to IS in return and so they always contend with each other. The IS lastly deviated from the original goal.
Warrant that the function is not recognized by group members	DI is not willing to intervene in the daily works of DAA. DAA do not intend to continuously depend on DI. However, when new problems & demands occur, their close cooperation is still needed to solve the problems.

Table 2 Functionalist Explanation for the Negative Consequences of a Technical Structure of IS Design

7 CONCLUSIONS

This paper examines, from the functionalist explanation perspective, the persistence of this problem by focusing on a specific technical structure of IS design which intends to eradicate all problems. It does not aim to replace causal explanation or interpretative study. Instead, it provides another

alternative explanation to explore the contradiction phenomenon of the IS development and implementation.

According to the real case in this paper, they have the myth of IS(Hirschheim & Newman, 1991; Markus & Benjamin, 1997). We found that when a company adopts a specific technical structure to solve problems, unintended consequences come along, which enhance and maintain the existence of the technical structure. Therefore, the original problems persist due to the function's dissimulation, but the technical structure would not be discarded because it brings an unintended benefit.

We proposes two suggestions for future researches: Douglas(1986)suggests that a function refer to a belief. What else can a function be regarded as? For instance, A function could be a symbol. When companies adopt technical structures, such as IT governance mechanisms(Sambamurthy & Zmud, 1999) and IT standards-setting processes(Damsgaard & Lyytinen, 2001), a function would be generated and what symbol can this function be regarded as? Second, this paper does not probe into the interactions between IS and organizational structure. Future researches could address these issues to clearly realize the reason why organization adopts unreasonable technical structures.

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