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AN EXPLORATORY STUDY OF THE GAP BETWEEN CLIENT EXPECTATIONS AND CLIENT PERCEIVED PERFORMANCE OF THE DELIVERED INFORMATION SYSTEM

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Abstract

This exploratory study is designed to answer "what happens when the clients complain that the delivered Information Systems (IS) don't match their expectations?" This discrepancy between client expectations and the client perceived system performance at the time of system delivery can be described as a "gap". The "gap" phenomenon, the failing to match client expectations with the delivered system, will lead to client dissatisfaction, system rejection, and project failure. Since we know little about the "gap" phenomenon, and no literature has directly and systematically investigated this phenomenon before, an exploratory qualitative study was conducted to answer (1) what the gap is; and (2) how and why the gap is generated in the IS development process. Focus group interviews were conducted with project managers, developers and consultants from four leading IS developing organizations. This paper reports the findings of the first part of the exploratory study. In this study, two dimensions of the gap – the possible areas of the gap and the forms of the gap are identified and four types of the gaps are classified based on the two dimensions. We then adopt a process view to investigate how the gap is generated in the IS development process. To assist the discussion and investigation, we defined four sub-gaps – requirements definition gap, system design gap, construction gap, and system delivery gap. Propositions are proposed and a gap model is developed to explain the relationship between the four sub-gaps and the final gap.

Keywords: IS development projects, IS outsourcing, client expectations, the gap phenomenon, client satisfaction, project failure, system development life cycle.

1 INTRODUCTION

Clients: "The developers just don't listen; the developed system is not what we want." "The developers agreed on my requirements, but the system they delivered is just different."

Developers: "The clients normally have no idea what they want, but are absolutely sure when they want it and what it should cost (Coble, Karat et al. 1997)."

"They first said they want something, when we bring the result to them, they said they want something else. This kind of things happened again and again, and it seems there's no end"

Most outsourced Information System (IS) development projects involve a vendor – a developer organization contracted to deliver the Information System, and a client - an organization which commissions the project, provides funding, and expects to get business value from the IS. The above complaints from both parties highlight a very common and critical problem in the development of ISs – the failing to deliver a system matching the clients' expectations, and the conflict perspectives between clients and developers on the cause of such failure.

Success development of IS is often defined in terms of client satisfaction and system acceptance (DeLone and McLean 1992; Saarinen 1996; Li 1997; Gelderman 1998; Seddon, Staples et al. 1999; Delone and McLean 2003). Matching client expectations with IS performance or over delivery is the key to satisfy clients (Szajna and Scamell 1993; Bhattacherjee 2001; McKinney, Yoon et al. 2002). Most times even though the system is elegantly designed, well built, and exactly functions to specifications - a success by all objective measures – as long as its performance does not match client expectations, the client is still disappointed and consider it unsuccessful (Nevo and Wade 2007). Thus, knowing what the client wants and delivering a system exactly matching these expectations is crucial in satisfying the client and determining the success of the project.

We use the "gap" (the final gap) between client expectations and client perceived system performance to describe whether or not and to what degree the delivered system failed to match client expectations and satisfy the client. We defined the "gap" as the discrepancy between client expectations and client perceived system performance at the time of system delivery. The gap is positive when the performance is perceived to deviate from or fall short of client expectations, and the result will be client dissatisfaction with the system. The gap is zero when the system performed exactly as client expectations and negative when the system is perceived to outperform client expectations. And the result will be client satisfaction under both conditions. This is consistent with expectation-confirmation theory (ECT) (Oliver 1980; Churchill and Surprenant 1982) in client satisfaction literature in the marketing field.

The positive final gap reveals the failure to meet client expectations with the delivered system performance, and has caused client dissatisfaction, system rejection, and even project failure (Ginzberg 1981; Lyytinen 1988; Gelderman 1998; Nevo and Wade 2007). It is quite common in industry and has bothered IS designers and developers since the early days of IS development. Much effort has been put to reduce this gap. A comprehensive literature review was conducted in IS development and implementation, project management, IS outsourcing and requirements engineering field. However, no literature to date has been found to directly and systematically studying this "gap" phenomenon. And related literatures dealing with some aspects of this phenomenon are widely scattered across different fields and disciplines. Thus, there is a need for us to systematically investigate the "gap" phenomenon.

This paper takes an initial step toward understanding the "gap" phenomenon in the context of outsourced IS development projects. In this paper, we (1) give a definition of the gap, (2) explore the different dimensions of the gap, and (3) adopt a process view of IS development and develop a gap model to explain how the gap is generated in the IS development process. An exploratory qualitative study was undertaken to systematically investigate into these issues. The more that is understood about these issues, the better we as IS developers can improve our IS development process to reduce the gap.

2 BACKGROUND OF THIS STUDY

In this section, we briefly describe the context of this study – IS project management and outsourcing, and followed by the definition of the final gap.

2.1 IS Project Management and outsourcing

According to the Project Management Institute (PMI, 2008), a project is "a temporary endeavour undertaken to create a unique product, service, or result." An IS development project may develop a new system from the scratch, develop some components and purchased others, purchase components and assemble the application, or purchase the application and modify it. These types of IS development projects highlight the scope of IS development projects we discuss in this study. Compared to non-IS projects, IS projects have many unique features such as uniqueness, complexity and high uncertainty, which make it difficult to handle and more prone to risks and the "gap" phenomenon. In the last decade, IS project failures gained more and more attention. Today still many IS projects suffer total failure, cost overruns, schedule overruns, or deliver fewer functions and features to meet client expectations. The "gap" – the focus of this study – captures this last type of project failure – the failing to meet client expectations.

Furthermore, in this study we choose to investigate the "gap" phenomenon in the context of outsourced IS development projects and specifically under one client and one vendor outsourcing arrangement. Compared to in-house development and insourcing, the developers and clients under this outsourcing arrangement belong to two different organizations. The interaction and communication between the two parties as well as their conflicts can be studied more clearly under this arrangement. And as outsourcing especially offshore outsourcing becomes more and more popular, our research also contribute to the IS outsourcing literature.

2.2 Definition of the Final Gap

The focus of this study is the "gap" phenomenon. Here, we define the final "gap" as follows

The Final Gap: the discrepancy between client expectations and client perceived system performance at the time of system delivery.

It is consistent with expectation-confirmation theory (ECT) (Oliver 1980; Churchill and Surprenant 1982) in client satisfaction literature in the marketing field. The positive final gap is the cause of client dissatisfaction, system rejection, and even project failure.

Changing expectations

In this study, the definition of the gap is consistent with the goods quality and service quality definitions and the dominant expectation-confirmation paradigm in satisfaction research. However, in traditional goods and service sectors, client expectations are always well-established, stable and can be expressed explicitly by the clients. In the development of ISs, the clients are always criticized by the developers as do not know what they want, cannot express their needs clearly, and change their minds frequently. It is found in this study that even though the client don't have clear expectations at the start, the client expectations will form and change during the IS development process. So unlike client expectations in traditional goods and service sectors, client expectations in IS development projects are not so clear and may fluctuate during the IS development process.

Perceived gap vs. objective gap

In the definition, we use "perceived" to emphasize that the gap is the discrepancy between client expectations and system performance from the client's perspective. It is a perceived gap, not an objective one. It involves the client's subjective judgment about the gap and is a highly relativistic phenomenon that differs between judges. So it cannot be measured objectively in terms of some

software testing standards. Thus, survey or interview with the client is the best way to measure the gap.

The gap at the time of system delivery

The client may have some expectations in terms of individual productivity improvements or organizational benefits from using the system. By restricting the assessment of the gap to the time of system delivery, such individual impacts measures (such as job performance, decision-making performance, and etc (Delone and McLean 2003)) and organization impacts measures (such as organizational performance consisting of financial perspective, customer perspective, internal business process perspective, and the learning and growth perspective as suggested by Martinsons, Davison et al. (1999), Delone and McLean (2003)) are excluded in the assessment of the gap. Since the system has to be used for a period of time before these impacts can be measured. We put this time restriction into the definition so that we can focus on the gap in the system features caused by the failure in the system design and development process.

The relationship with project failure

In its landmark study of IS project failure, the Standish Group categories projects into three resolution types (Standish Group 1994):

- Successful: the project is completed on time and on budget, with all features and functions originally specified.
- Challenged: the project is completed and operational, but over-budget, over the time estimate, and/or with fewer features and functions than initially specified.
- Failed: the project is cancelled before completion or never implemented.

A project is challenged or fails when it is not delivered on time, within budget, and/or falls short on meeting the client expectations. Even when delivered on time and on budget, a project still can fail if it does not meet the client needs or expectations (Brooks 1995). So the "gap", the focus of this study, captures this last kind of project failure – failing to meet client needs or expectations. Schedule and budget overruns are not counted as indicators of the gap, but schedule and budget are big constrains on meeting client expectations and have great effects on the magnitude of the final gap.

3 RESEARCH METHODOLOGY

Since knowledge about the gap phenomenon is limited, this study is exploratory in nature and firmly grounded in the theory building stage of the research cycle. However, testing these theories is not included in this study. Qualitative research method is chosen for this study. Focus group interviews were used as the means to draw out the experience and opinions of the people who have the most insights about the "gap" phenomenon. Additionally, informal discussions, documentations, literature and anecdotes were used to supplement the focus group interview data.

Two pilot in-depth unstructured interviews were conducted with a system analyst and a project manager in order to get a whole picture of the research area, to frame research questions, identify related literatures, and to develop the interview guide. Then four semi-structured group interviews were conducted with 2-4 people included in each group to draw out the experience and opinions of those people about the gap phenomenon. Each group interview has two sessions and lasts from one hour to three hours. In session one, semi-structured interviews were conducted with one interviewee at a time about his/her experience about the gap phenomenon in IS development projects. In session two, the group members were encouraged to brainstorm the dimensions of the gap and how it is generated in the IS development process. Interview guides were developed to guide these two sessions with a list of questions or issues to be explored. The interviews were tape recorded with all interviewees' permissions.

Fourteen informants from four organizations were recruited for this study. The four organizations include two leading IS developing and consulting companies and two IS laboratories. They were chosen because they are most experienced with IS development and represent the best IS developing practices in Hong Kong and China. The informants selection criteria are that the informant should 1)

be working or have worked in at least one of the four IS organizations; 2) have at least two years experience with IS development; 2) have been involved in at least one outsourced IS development project; and 3) have insights about the "gap" phenomenon and be willing to share with us. The experience of the fourteen informants cover all the roles in IS development projects (project manager, system analyst, designer, programmer, and tester), both types of IS projects (develop from scratch, tailored development based on available application packages), and all client types (company, government, and state-owned enterprise). And we believe that system development consultants' extensive experiences in dealing with different kinds of clients in different types of projects make them qualified to represent their clients' view.

The coding approach from grounded theory methods are used to analyze the data. Our data analysis strictly follows the procedure developed by Auerbach (2003).

4 RESEARCH FINDINGS

4.1 The Dimensions of the Gaps

From the analysis of our interview data and some documentation, two dimensions of the gaps are discovered, which are the possible areas of the gaps and the forms of the gaps. The possible areas of the gaps describe "what", and the forms of the gaps describe "how". Put together, they describe what features or attributes do not match in what ways. We will discuss each dimension in detail in the following.

4.1.1 The Possible Areas of the Gaps

In this research, we use client expectations as the comparison standard to define the gaps. So the possible areas of the gaps are the areas of client expectations which are not achieved. So to understand the possible areas of the gaps, we first elicited what client expectations include from our focus group interviews. We believe that the system development consultants' extensive experiences in dealing with different kinds of clients in different industries make them qualified to represent the clients' view. To corroborate and complement the interview data, we examined some user requirements and software requirements documentations. We believe that user requirements are collected from the clients and ideally should reveal the clients' expectations. The software requirements reveal the developers' view of what the system should do. Besides these requirements documentations, we also reviewed software quality standards which are often used as evaluation criteria, and we believe can also reveal the possible areas of the gaps.

We summarized our interview data as well as documents analysis results about client expectations - the possible areas of the gaps in table 1. The client expectations mentioned by the focus group informants can be organized into two levels. The first level is business level expectations which are the business values the clients expect to gain from the adoption of the developed IS. The second level is the system level expectations which are the functional and non-functional attributes that can be operationalized in a system.

Categories	Themes	Concrete cues	Selected Quotes
Business benefit	Gain Competitive advantage/business sustainability	• Improve the quality and visibility of information • Enable better and faster decisions • Improve service quality • Support growth • Enable flexibility • Enable standardization	"The company expects the system to provide them long-term strategic benefits" "The system is supposed to simplify and automate the flow and sharing of information across the organization."
	Generate revenue	• Reduce cost • Increase sales • Increase profits	"Cost reduction is the main anticipated benefit of ERP system."

	Improve efficiency	• Automate and integrate business process • Improve productivity • Save time • Facilitate collaboration	One objective of the system is to "use the information system to harmonize and simplify research processes" "Our client thought the project is a failure because it doesn't automate the production line as they expected."
Functional attributes	Functions	• The process the system should support • The data the system should provide	
	Interface requirements	• Communication interfaces (e.g. networks and network protocols to be used) • Hardware interfaces • Software interfaces (e.g. other applications, compliers, operating systems, programming languages, and database management systems)	In a library system, "there should be a standard interface to all databases based on the Z39.50 standard."
	Compliance to standards and regulatory	• Export file formats • Legal requirements	In a library system, "because of copyright restrictions, some documents must be deleted immediately on arrival." "Personal customer information shall be used only in accordance with privacy laws."
Non-Functional attributes	User interface requirements	• Physical aspects of the user interface (e.g. layout, report content, command language style, menu system, and icons) • Look and feel • Personalization	"To end-users, user interface is nearly everything."
	Performance involves the speed, capacity, and accuracy attributes of the functions	• Speed • Capacity (e.g. the number of terminals to be supported; the number of simultaneous users to be supported; amount and type of information to be handled.) • Accuracy	"The system should have a satisfactory response time." "All Web pages must download within three seconds during an average load, and five seconds during a peak load." "95% of the transactions shall be processed in less than 1s."
	Reliability describes the capability of the system to maintain its service provision under defined conditions for defined periods of time	• Availability • Mean time between failures • Mean time to repair • Accuracy • Maximum acceptable bugs	"The clients may specify that the mean time to failure shall be at least four months."
	Usability describes the ease with which the system can be learned or used	• Understandability • Ease to learn • Operability (e.g. don't interrupt their work; don't need extra work)	"For government portals, it should be able to be used by members of the public who will receive no training before using it."
	Security concerned with the ability of the software to be protected against threats to its confidentiality, integrity, and	• Access control • Protection against hardware or software faults (e.g. computer breakdown, fires, power failure) • Protection against virus and other malicious interference	"The system should provide information to users according to their access right"

	availability		
	Efficiency concerned with the system resources used when providing the required functionality	• Processing power usage • Main memory usage • Disk space usage • Network usage	
	Portability describes the ability of software to be transferred from one environment to another	• The number of lines of code and/or the number of modules that have to be changed to port the software from one hardware base or operating system to another • The effort required to install the software • Plug and play aspect of software components	

Table 1. The possible areas of the gaps

4.1.2 The Forms of the Gaps

The possible areas of the gaps describes what features don't match. And this dimension – the forms of the gaps – describes how. We focus on the verbs and adverbs which describe the mismatch. From the focus group interviews and documents analysis, three types of mismatch emerged, which are missing, distorted, and not fully fulfilled. The definitions of each type are described in table 2.

Categories
Missing: the absence of client expected features or attributes in the intermediate artefacts or the delivered system. In this situation, the expected features or attributes can only be verified as either present or absent.
Distorted: the alteration of client expectations which leads to the expected features or attributes appears in the intermediate artefacts or the delivered system not exactly the same as expected.
Not fully fulfilled: The perceived attributes of the intermediate artefacts of the delivered system does not match the expectation level. In this situation, the expected attributes are present to some degree and can be scaled from low to high.

Table 2. The forms of the gaps

4.1.3 The Dimensions of the Gaps

We just discussed two dimensions of the gaps, which are two areas of possible gaps – functional and non-functional gaps, and the three forms of the gaps – missing, distorted, and not fully fulfilled. Combined together, we have four types of gaps as illustrated in table 3.

Forms of the gaps / Possible areas of the gaps	Functional expectations	Non-functional expectations
Missing	I	N/A
Distorted	II	III
Not fully fulfilled	N/A	IV

Table 3. The dimensions of the gaps

The two "N/A" in the table means that the corresponding types of the gap does not exist. Because the functional attributes in a software product can be verified as either existing or missing; it is a yes or no answer. So here we have the "functions are missing" gap, but no "functions are not fully fulfilled" gap. For non-functional attributes listed in table 1 (i.e. usability), they cannot be verified as a simple on or

off; they normally present to some degree. So "non-functional expectations are missing" does not make any sense here. In our focus group interview data, we also didn't identify these two types of gap.

Here are some examples of the Type I to Type IV gaps from our focus group interviews:

Type I gap – Functions are missing:

"In the portal system, users need to take half an hour to fill in a long form. But the saving function is missing. If something happens before the form is submitted, everything they've written will disappear. The users are really annoyed with it. " (system analyst)

"The client from mining industry cannot accept this ERP system. Because in this system, the real-time price feature doesn't exist. For mining industry, the prices of the minerals fluctuate over time, and then it will affect the transportation and accounting." (system analyst)

Type II gap – Functional expectations are distorted:

"It always happens that when we bring them a prototype or sometimes even the final system, the clients complain that the function is not what they expect." (project manager)

Type III gap – Non-functional expectations are distorted:

"User interface cannot be emphasized more. But how we as developers understand clear and attractive might be quite different with users. There are always misunderstandings about these." (developers)

"There's always a trade-off in every system. You cannot expect the system very efficient, highly performed, with very attractive animation interface and extremely stable. If the system can only use very limited memory resource, you cannot expect it to run very fast. And the gap always occurs when the developers mis-prioritize them. They assume what is important to the client but actually they are wrong." (consultant)

Type IV gap – Non-functional expectations are not fully fulfilled:

"When we developed the web portal, there are lots of problems and client complaints about the user interface. For example, the layout is not clear enough; the users need to click too many clicks before they can get what they want." (developer)

"Here is an example of the operationality gap. We have this very big system, to accomplish a task in one application, you have to install another application and do something in this another application first, and then you can finish the task in the former application. The client doesn't want to install and run another application." (developer)

It is also important to note that the presence or absence of these functions in a software product can be verified as either existing or not, in that it is a Boolean (either a yes or no answer). The other software characteristics listed (i.e. usability) are only present to some degree, i.e. not a simple on or off.

4.2 A Gap Model

4.2.1 The Definitions of the Four Sub-gap

We adopt a process view in investigating how the gap is generated. To assist our discussion and investigation, we defined four sub-gaps according to the stages in the IS development life cycle (figure 1). The definitions of the four sub-gaps are as follows:

Requirements Definition Gap: we combine the requirements elicitation gap and requirements analysis gap into requirements definition gap. It is the discrepancy between client expectations and requirements specification; the gap caused by the requirements elicitation and analysis process.

System Design Gap: the discrepancy between requirements and system design; the gap caused by system design process.

Construction Gap: the discrepancy between system design and the system software; the gap caused by coding and system integration.

System Delivery Gap: the discrepancy between system software and the delivered system perceived by the client; the gap caused by site deployment, testing, and training, also known as system delivery.

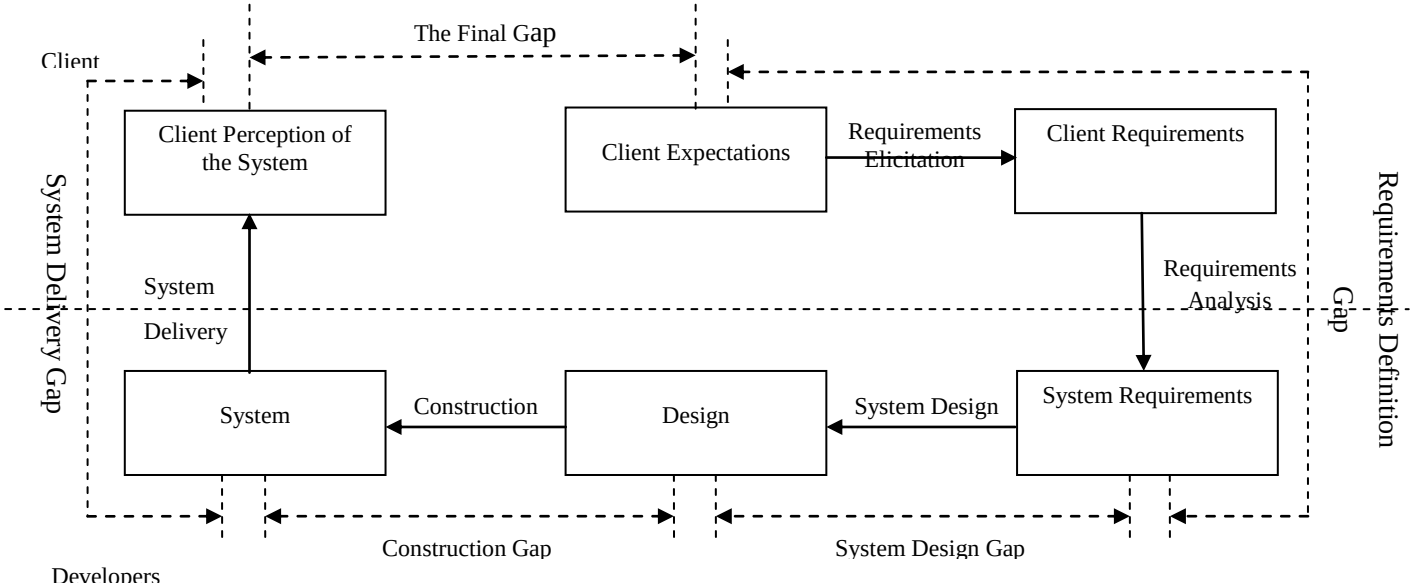

Figure 1. A process view of IS development – the four sub-gaps and the final gap

The definitions of these four sub-gaps are very clear in the water-fall life cycle. Because in the traditional water-fall process, requirements definition, design, implementation are all restrained in their own phases. But in the iterative and incremental life cycle, these activities are iterative and are revisited again and again throughout the lifecycle. However, even in the iterative and incremental life cycle, we can still divide the whole life cycle into several phases with each phase has its own objective and main focus. So we can still use the same definitions of the sub-gaps here in the iterative and incremental life cycle.

4.2.2 Insights from the Exploratory Investigation

The focus group interviews and document analysis reveal that the requirements definition gap, system design gap, construction gap and system delivery gap are prevalent in every IS development project.

Proposition 1: Requirements definition gap will have an impact on the final gap.

Proposition 2: System design gap will have an impact on the final gap.

Proposition 3: Construction gap will have an impact on the final gap.

Proposition 4: System delivery gap will have an impact on the final gap.

So from the process view of the IS development, we can conclude that the final gap between the client expectations and the client perceptions of the performance depends on the size and direction of the gaps associated with requirements definition, system design, construction, and system delivery. The final gap is a function of the requirements definition gap, system design gap, construction gap, and system delivery gap. But the next question is - what is the form of this function.

It is found in our study that the form of the function depends on the type of IS development life cycle the project follows, waterfall life cycle or the iterative and incremental life cycle. So the type of IS development life cycle is a moderating variable.

In traditional water-fall life cycle, requirements definition, system design, construction, and system delivery is a rigid single-pass sequence. For example, for IS development projects which follow the water-fall approach, most of the requirements are defined in the requirements definition phase. At the end of this phase, a software requirements specification document is developed, and the requirements are frozen in this document. Requirements evolution is avoided after the requirements freezing. And any requirements changing is managed through a strict requirements changing procedure. This means that after the requirements definition stage, the requirements are unlikely to change much. So the requirements definition gap between the client expectations and software requirements specification upon the completion of the requirements definition stage truly reveals the gap between client expectations and the requirements the software developed upon. But for projects which follow the iterative and incremental approach or agile approach, the requirements are not defined a priori, but are socially constructed through interactions among the participants in the IS development process. Developers are seeking to meet the clients' true expectations through the whole IS development life cycle. Requirements evolution is viewed as a natural and inevitable feature of the system development process. After the initial requirements definition stage, the requirements are still subject to lots of changes.

It is found in this study that we normally assume that most of the final gap comes from the requirements definition gap. If the requirements go in the wrong direction, the design and implementation will follow this wrong direction anyway, and the whole project is in jeopardy. In this kind of situation, the design gap and implementation gap is not that relevant anymore. The big requirements definition gap leads to the big final gap. It is the case in projects following the water-fall approach. However, in projects following the iterative and incremental approach, this is not the case anymore. Even though there is a big requirements definition gap at the beginning, there is still chance that the final gap is not that big.

Proposition 5: Requirements definition gap in the projects following the water-fall process has a greater impact on the final gap than in the projects following the iterative and incremental process.

It is found in this study that in traditional water-fall life cycle, the requirements definition gap will pass on to the design gap, the construction gap, and then the system delivery gap. Say if a software requirements seriously deviate from the client expectations, then the design and construction work are in vain. In this situation, the design and construction gap are not relevant any more, no matter how closely the design and construction stick to the requirements. It is the same for the design gap. If there is a big design gap, then the construction gap is not relevant any more. Even if the requirements only deviate a little, the design and construction following the deviant part are sure to be deviant. This means in traditional water-fall life cycle, the sub-gap in the preceding phase will pass on to the subsequent phases. If the gap occurs in the delivery phase, it stays in the delivery phase. But if it occurs in the requirements definition phase, it will pass all the way through design, construction, and delivery phases. However, in the iterative and incremental life cycle, due to the iteration and the feedback from the clients, even though there's a deviation in the preceding phase, we still have the chance to bring the project to the right direction in the subsequent phase. So in iterative and incremental life cycle, the sub-gaps can be favourable or unfavourable from the client expectations' perspective. For instance, system design gap will be favourable when system design reveals the client expectations better than the system requirements specifications. It happens when new and more accurate expectations emerged iteratively during the system design stage. So when it comes to the form of the function, we believe it will be different under different IS development life cycles:

Proposition 6: The type of IS development life cycle will affect the relationship between the four sub-gaps and the final gap.

For waterfall life cycle,

The final gap = f (Requirements Definition Gap, System Design Gap, Construction Gap, System Delivery Gap)

For iterative and incremental life cycle,

The final gap = g (Requirements Definition Gap, System Design Gap, Construction Gap, System Delivery Gap)

4.2.3 The Gap Model of IS Development

The proposed gap model of IS development is presumed to take the following form:

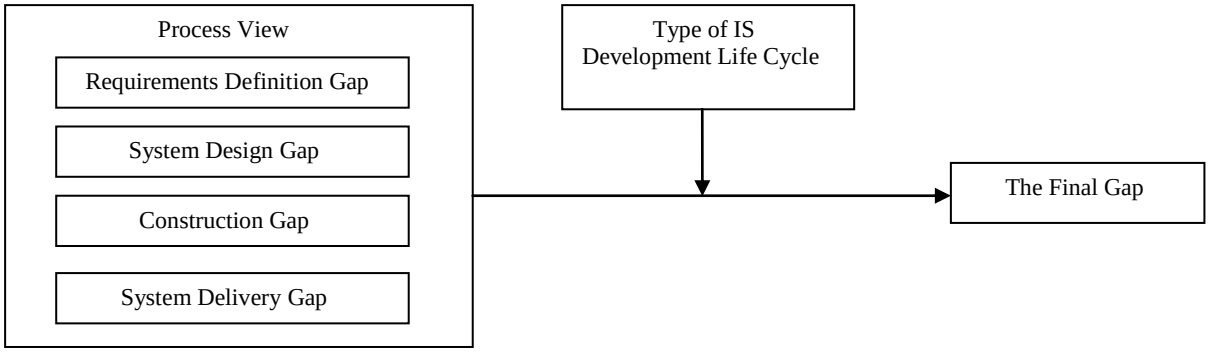

Figure 2. The proposed gap model of IS development

5 DISCUSSION

This study takes an initial step toward the understanding of the "gap" phenomenon. It has opened up new areas for further investigation. Specifically, the contributions of this study are: First, in this study, we identified the dimensions of the final gap that transcend different IS development projects. It is the first attempt to delineate the construct of the "gap". It lays the foundation for measuring the final gap and empirically testing its relationship with other constructs in this field. Second, the proposed gap model is the first attempt to understand the generation of the final gap from the process view. It can serve as a framework for further empirical research in this important area.

This paper reports the first part of the findings in the exploratory study. In the second part, we integrated the technical and social perspectives with the process view to explain how and why the gaps are generated. Specifically, the technical perspective deals with technical & technological constraints which can help us to answer how and why the gaps are generated when the artifacts are transformed from one form to another. And the social perspective deals with cognitive & communication barriers and conflicts of interest which can help us to answer how and why the gaps are generated when the artifacts are transferred from organization to organization and from people to people. Based on the findings, we can provide developers tookit for identifying the potential causes of the gaps. It also provides us with a new way to look at the success factors such as user involvement, executive management support, iterative and incremental process and etc and explain how these factors affect the success of the projects.

This exploratory study laid the foundation for further investigation of the "gap" phenomenon. The directions for future study include: first, there is a need and an opportunity to develop standard instruments to measure the final gap based on the dimensions of the gaps discovered in this study. Second, it is a challenge for researchers to devise methods to measure the four sub-gaps consistently so that they can be compared. Reliable and valid measures of these sub-gaps will be necessary for empirically testing the propositions implied by the proposed gap model. Third, research is needed to explore further the nature of the association between the four sub-gaps and the final gap. Specifically, are one or more of these sub-gaps more critical than the others in affecting the final gap and why? Do the previous sub-gaps have impacts on the subsequent sub-gaps? Can "favorable" sub-gap caused by over delivery in one stage offset "unfavorable" sub-gaps caused by under delivery in other stages? Based on the findings, we can find out the exact form of the functions in Proposition 5. Experiments

can help us answering these questions. We can design experiments to isolate one sub-gap and control other sub-gaps to find out the relationships among them. Forth, as we discussed in the "limitations of this study section", conducting interviews with the clients and conducting longitudinal studies observing the whole IS development process could provide us more valuable information and complement to the findings of this study. Fifth, as outsourcing becomes more and more popular, many new outsourcing arrangements emerged. It would also be worthwhile exploring the gap phenomenon under these different IS outsourcing arrangements.

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