

Pre-engagement Process Improvement in IBM PC Services

by

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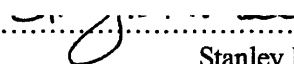
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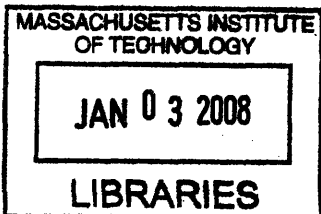
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In Manufacturing

ABSTRACT

The front end of the IBM PC factory integration & deployment process is a pre-engagement process. In this study, the pre-engagement process was analyzed. The organizational structure in the pre-engagement process and the pre-engagement process flow were examined. The information flow in both the global supply chain and the IBM customer solution center was identified. The current service-offering model in the IBM customer solution center was also described.

Two problems in the pre-engagement process were examined. A methodology to probe the problems and to figure out the root causes was proposed and applied. Five root causes were determined. Solutions were proposed to address those root causes and furthermore, their benefits and concerns were evaluated. In the end, a conclusion that Checklist A, Checklist B, and the continuous improvement process were the best and feasible solutions was drawn.

Thesis Supervisor: Stanley B. Gershwin

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CHAPTER ONE: General Introduction^{1 2}

The thesis project was completed at the Customer Solutions Centre (CSC) at IBM Singapore. This chapter provides the background information on IBM, IBM International Holdings in Singapore, and specifically the IBM CSC (Singapore).

- **IBM**

Overview

International Business Machines Corporation (IBM) is the world's largest information technology company headquartered in Armonk, New York, USA.

IBM was founded in 1889 as the Tabulating Machine Company. It was incorporated as the Computing-Tabulating-Recording Company (C-T-R) in the state of New York in 1911 and it formally changed its name to the International Business Machines Corporation in 1924.

IBM had revenue of US\$91.4 billion, net income of US\$9.5 billion, and over 355,000 employees in 2006. These are increases of 0.3%, 19.1%, and 8.0% compared to 2005 respectively. IBM has managed to increase its earnings per share for the last 16 quarters continuously.

IBM has employees in over 170 countries. The geographical distribution of revenue is listed in Table 1. IBM Singapore falls into Asia Pacific that makes up the third largest region in terms of generated revenue.

FOR THE YEAR ENDED DECEMBER 31:	2006	2005
Geographies:		
Americas	\$39,511	\$38,817
Europe/Middle East/Africa	30,491	30,428
Asia Pacific	17,566	18,518
OEM	3,856	3,271
Total	\$91,424	\$91,134

Table 1 Geographical Distribution of Revenue³

Business Segment

Organizationally, the company's operations comprise the following segments: the

¹ Chengguang Li, "Qualification of the IBM Singapore CSC Factory in Singapore: Resource Estimation and Allocation in Software and Hardware Services", Sep. 2007, MIT Mechanical Engineering Department Thesis

² Siyu Fan, "Field Deployment Process Transformation in IBM PC Services", Sep. 2007, MIT Mechanical Engineering Department Thesis

³ IBM Annual Report, 2006

Global Technology Services (GTS); the Global Business Services (GBS); the Systems and Technology Group; the Software; and the Global Financing.

The Global Technology Services (GTS) and the Global Business Services (GBS) are both part of the Global Services. The main objective of the Global Services is to provide solutions to the clients. This is usually done by using IBM software and hardware. The Global Technology Services mainly deals with the infrastructure services. It includes outsourcing, integrated technology, and maintenance services. The Global Business Services (GBS) mainly deals with the professional services. It includes consulting, systems integration, and application management services.

The Systems and Technology Group provides business solutions that require advanced computing power and storage capabilities. It includes server and storage sales, semiconductor technology and products, packaging solutions, and engineering technology services.

The Software consists primarily of middleware and operating systems software. Middleware is a standard software platform that allows clients to integrate systems, processes, and applications. Operating software is designed to run computers.

The mission of the Global Financing is to generate a return on equity and to facilitate clients' acquisition of mainly IBM hardware, software, and services.

Table 2 shows the revenue from continuing operations.

YEAR IN REVIEW
RESULTS OF CONTINUING OPERATIONS

Revenue

(Dollars in millions)

FOR THE YEAR ENDED DECEMBER 31:	2006	2005
Statement of Earnings Revenue Presentation:		
Global Services	\$48,247	\$47,407
Hardware	22,499	24,343
Software	18,204	16,830
Global Financing	2,379	2,407
Other	94	147
Total	\$91,424	\$91,134

(Dollars in millions)

Table 2 Revenue from Continuing Operations⁴

⁴ IBM Annual Report, 2006

Worldwide Organization⁵ ⁶

There are three companywide organizations at IBM: the Sales & Distribution, the Research, Development, and Intellectual Property and the Integrated Supply Chain.

Employees at the Sales & Distribution organization work in the integrated teams with IBM consultants and technology representatives to deliver high-value solutions that address the clients' critical needs.

The Research, Development, and Intellectual Property has the main objective to produce high impact hardware and software products as well as the service solutions for the company's clients. IBM spends approximately US\$6 billion annually for R&D. It managed to be awarded more U.S. patents than any other company was in 2006. This is the 14th year in a row. These innovations have been able to generate direct intellectual property income of around US\$1 billion.

The Integrated Supply Chain works to transform its clients' supply chains for greater efficiency and responsiveness to the global market conditions. It also continuously improves the IBM supply chain. Around US\$36 billion are spent through the IBM supply chain annually.

The IBM Singapore CSC is part of the Integrated Supply Chain organization.

- **IBM International Holdings, Singapore**

The IBM International Holdings (IIH) was formed to meet the overall manufacturing strategy for the IBM Integrated Supply Chain (ISC). In 1994, the ISC IIH Singapore began operations as a hard drive and network peripheral assembly site. In 2000, the unit added to its facilities to provide microelectronics testing. Overall, there were 4000 employees in the Manufacturing and Development (M&D) community in Singapore in 2002. As Asia Pacific becomes the center of growth for many sectors, IBM has been continuously expanding and adjusting its position in the region.

Today, the main missions of the IBM International Holdings include the Disk Storage System Manufacturing, the Tape Storage System Manufacturing, the Global Customer Solution Center, the Asia Pacific Integrated Supply Chain Configuration Centre of Competence, the Procurement Engineering, the Southeast Asia, Retail Store Solution (hardware & software) and the Software Development Lab.

⁵ IBM Annual Report, 2006

⁶ IBM website<<http://www.ibm.com>>

The CSC Singapore is the organization under the Global Customer Solution Center of the IBM International Holding (IIH), Singapore.

- **Customer Solution Centre(CSC) Singapore**

Overview

There are totally eight customer solution centers all around the world, such as the one in Rochester, US, the one in Markham, Canada, the one in Poughkeepsie, New York, US, the one in Fujisawa, Japan and so on. The CSC Singapore was built in 2005 and currently has around 25 employees. It is located at 1 Kaki Bukit Ave., Techview Building, Singapore.

In IBM, the CSC is the service provider that supports the IBM Brands/Services Team by providing IT solutions including PC and Server services, etc. To CSC, the IBM Brands/Services Team with its sub-groups such as the Server Technology Group, the Software Group, and the Strategic Outsourcing Group, is IBM internal or potential internal customers. The end customers are companies, educational facilities (local universities), and others in Singapore. The IBM Brands/Services Team has commercial contracts with the end customers, while the CSC has internal contracts, which are referred to as the Document of Understanding (DOU) with the internal customers (Figure 1).

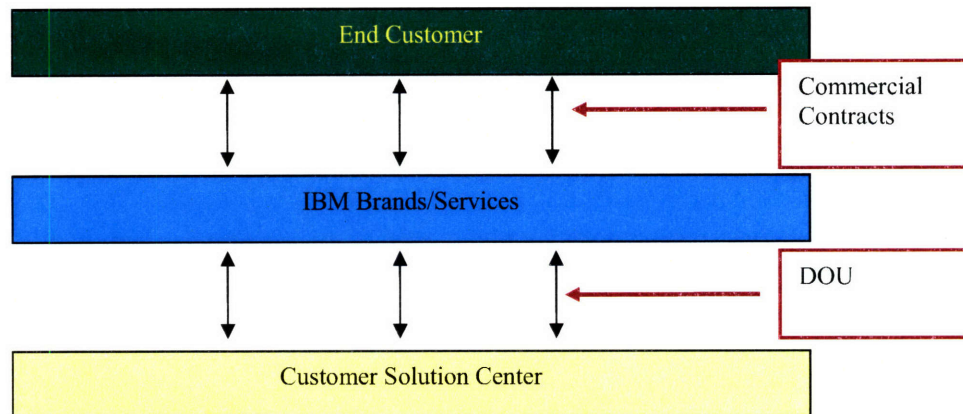


Figure 1 Commercial Contracts and DOU

Currently the revenue recognition method that CSC operates is called Cost Recovery. It means that CSC does not have any profits through each business but recovers the cost they incurred from the IBM Brands/Services Team.

CSC Services

CSC supports many integration needs, including integration and staging services at both IBM and partners' customer solution centers, lifecycle asset services to extend the life of the used assets or handle leased, worldwide CSC network supporting, logistics optimization to ensure the fulfillment efficiency and to provide the lowest cost possible, single point of engagement for fast proposal turnaround times, etc.

The CSC services can be divided into several categories: Pick, pack and ship worldwide; Integration of packaged solution; Pre-loaded software; Solution development, prototyping & integration; Mass deployment; System test; Product life cycle; Life cycle asset services and customized hardware. Each category has different detailed services.

PC Factory Integration & Deployment Services

One big portion of the services that the CSC provides to the internal customers is the PC factory integration & deployment services. It is where the thesis focuses.

The scope of the operation is 5000-6000 units annually at the moment. The CSC has a cost recovery of US\$800,000 a year.

These services could also be divided into several categories (Table 3).

Service Products	Service Components
Acquisition and Tracking	Order Management Asset Tagging
Integration and Customization	Warehousing and Stock Management Platform Build Logistics and Delivery Platform Backup Data and Personal Migration
Customer On-Site Support	Audit and Site Readiness Surveys Installation Move, Add and Change Hardware or Software Platform Removal and Return
Recovery and Disposal	Emergency Replacement Platform Refurbishment Asset Disposal
Project Management	Planning and Design Project Support 3rd Parties Management

Table 3 CSC PC Factory Integration & Deployment Services

Figure 2 below indicates that the CSC is providing the whole lifecycle management for IT equipment to the customers. The whole lifecycle starts with Pre-engagement Service and goes through Ordering Management, Pre-Deployment Service, Deployment, Maintenance, and ends with Retirement.

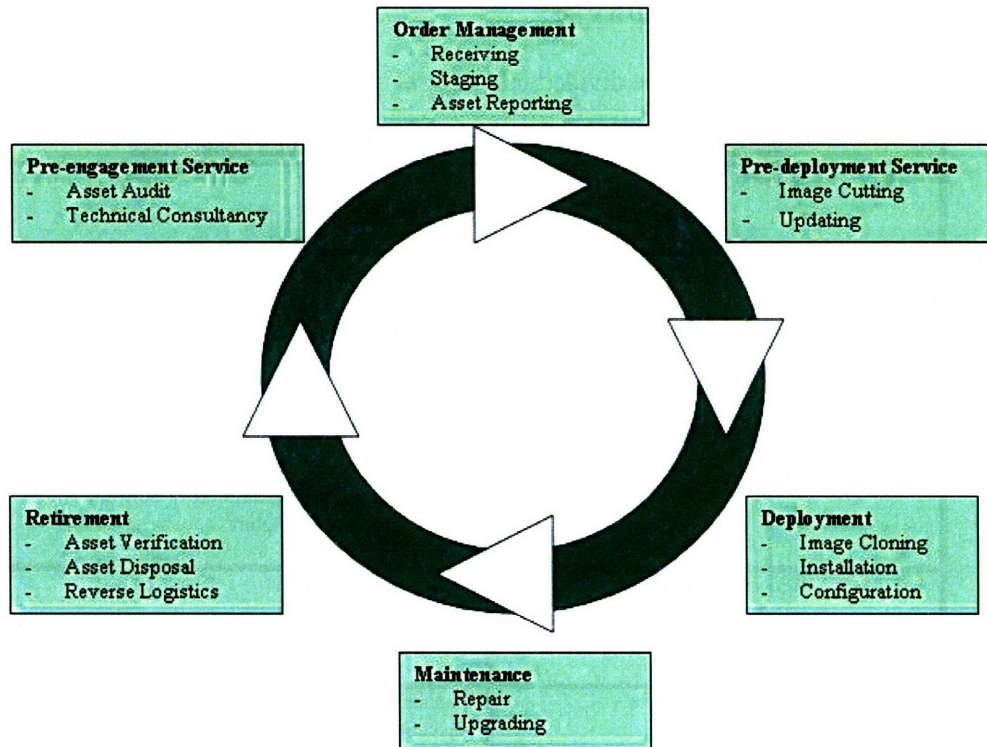


Figure 2 Whole Lifecycle Management for IT Equipment

CSC Teams

The CSC operations can be separated into three parts. The strategic part includes the Business Development Team, the Engagement Team and the Engagement & Project Management Team. They are teams that develop and maintain the relationships with the customers. The tactical part includes the Customer Fulfillment Representatives (or planners) who receive the customer orders, contact with the end customers in the daily delivery, receiving and shipment (or logistics), factory operations, and procurement. They are teams that are involved in the daily delivery. The Enablement, Process & Implementation (EPI) Team, as the third part of the CSC operations, is the link between the strategic part and the tactical part. They design the processes, develop solutions with the Engagement Team and implement the solutions with teams in the tactical part (Figure 3).

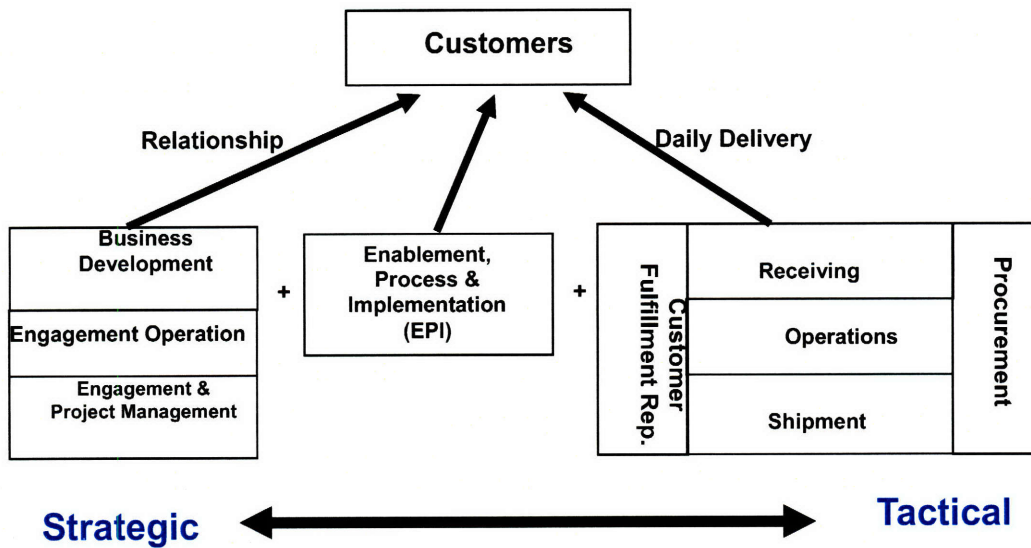


Figure 3 CSC Operations Structure

End-to-End Process

The CSC service delivery process is an end-to-end process. The end-to-end process can be divided into three stages: an engagement process, a CSC factory level Service, and an on-site service support (or field deployment).

The engagement process can be divided into the pre-engagement process and the post-engagement process. The pre-engagement process is to decide whether the CSC will provide services to the customers, including evaluating the ability of the CSC to provide the required services under certain cost constraints, the processes to provide services to the customers, the credibility of vendors, etc. The post-engagement process is to provide post-sales services including customer satisfaction, continuous cost improvement, and so on.

After the CSC decides to provide services to the customers, the services providing cycle starts with the factory level, which includes receiving PCs from Lenovo or the end customers, installing the desired software, delivering the units with software installed to the end customers.

After the factory level service, PCs are then deployed to the end customers. If the end customers have a request for some services to be done on site such as software/hardware installation, then the process comes into the on-site service support stage. The CSC outsources provide the on-site services support to vendors. Factory level services are preferred because it takes advantage of risk pooling/mass

production and is the core competency of the CSC; however, certain services such as data migration (moving data from one storage device to another) are better done on the customer's site. The current ratio of factory level/field deployment services is 4:1.

The thesis will only focus on the pre-engagement process in the IBM PC factory integration & deployment services.

- **Objective**

The objective of the thesis is to propose solutions to resolve problems in the pre-engagement process and to achieve the goal of the pre-engagement process improvement in the IBM CSC PC factory integration & deployment services.

- **Outline**

This thesis proceeds as follows:

Chapter Two, CSC Process Introduction details the CSC processes, the process inputs/outputs, the engagement process and the pre-engagement process.

Chapter Three, Problem Statement elaborates the “Cost Difference Problem” and the “Response Time Problem” in the CSC pre-engagement process.

Chapter Four, CSC Pre-engagement Process Analysis states all of the important facts related to the pre-engagement process including the organizational structure, the process flow, the information flow, issues related to the vendor on-site support and the CSC service-offering model.

Chapter Five, Problem Analysis uses a methodology proposed to determine the underlying root causes.

Chapter Six, Proposed Solutions describes all the solutions proposed to tackle the root causes and evaluates each solution including its benefits and related concerns.

Chapter Seven, Conclusion summarizes all of the facts and analyses, and arrives at a conclusion for the thesis.

CHAPTER TWO: CSC Process Introduction

2.1 CSC Processes

As mentioned before, the service delivery process is an end-to-end process that has three stages – an engagement process, a CSC factory level service and an on-site service support. Another way to look at it is that the CSC service delivery process has two main processes – an engagement process and an operation process. The engagement process is to engage businesses and to provide post-sale services. Activities in the engagement process include engaging new deals, proposing delivery solutions and processes, committing cost and service level agreements, measurement and business control, continuous cost improvement, customer satisfaction and so on. The function of the operation process is to execute delivery solutions. Activities in the operation process include factory level operations such as planning, order management, assembly & integration, site installation, and outsourced field deployment operations.

2.2 CSC Process Inputs/ Outputs

2.2.1 Assumptions

The CSC is represented in Figure 4 by a yellow box named A. Parties outside the CSC – the IBM Internal Customer and the End Customer – are represented by a light turquoise box named B. All activities, systems, and processes in Box B are transparent to the CSC (Figure 4).

2.2.2 Inputs/Outputs

Box A has two inputs that come from Box B. One is the customer requirements from the IBM Internal Customer. The other is feedback that indicates customer satisfaction, service level fulfillment from the End Customer in the operation process.

Outputs from Box A can be categorized into two types. One type is the delivery solutions that the CSC proposes to Box B in the engagement process. More specifically, solutions are officially proposed along with the activity of signing off the DOU by the IBM Internal Customer and the CSC. The other type is the solutions that the CSC actually delivers to the End Customer, which happens in the operation process (Figure 4).

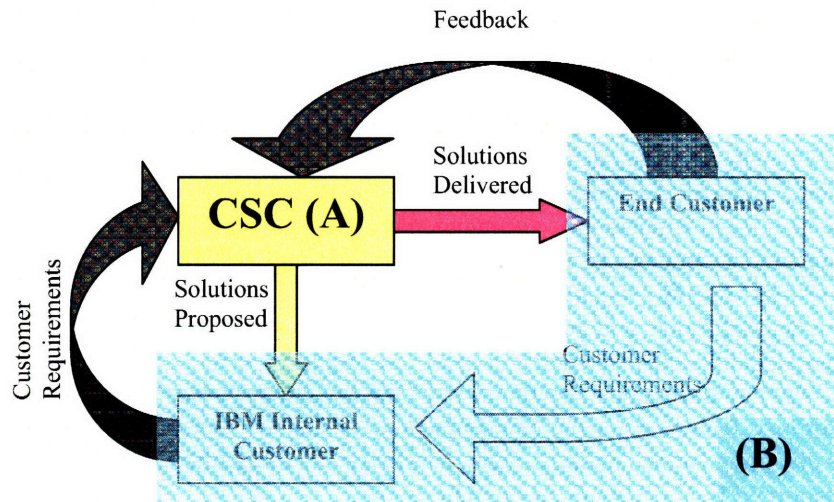


Figure 4 Inputs and Outputs of the CSC Process

2.3 Engagement Process

2.3.1 Two phases

The engagement process includes a pre-engagement process and a post-engagement process. The pre-engagement process is the front end of the engagement process. It happens before the operation process. It includes all activities that take place before a new deal between the CSC and the IBM Internal Customer is closed. These activities are communicating with the IBM Internal Customer to understand customer requirements, proposing delivery solutions including outsourcing vendor for on-site support if needed, designing the appropriate process, committing cost and service level agreement, etc.

The post-engagement process is the second phase of the engagement process. It happens after the pre-engagement process. It includes activities such as continuous cost improvement or customer satisfaction, project setting up, business transition and so on.

2.3.2 Pre-engagement Process

The Engagement Team is a client-facing team and performs as the key player in the pre-engagement process. Their mission in this process is to close the deal with committed cost and service level agreement.

CHAPTER THREE: Problem Statement

3.1 Two Problems

There are two problems in the CSC's pre-engagement process.

The first one is that the delivery cost that the CSC estimates in the pre-engagement process is different from the execution cost that the CSC actually incurs. It is referred to as the "Cost Difference Problem" in this thesis.

The second one is that the time for the CSC to propose solutions with the committed cost to the IBM Internal Customer may not always satisfy the time requirements. It is referred to as the "Response Time Problem" in this thesis.

3.2 Impact of the Problems

In the CSC's PC services, usually the actual execution cost is about 30% higher than the estimated cost. People work longer than expected. Sometimes people are "borrowed" from other departments to do the operations. They cannot always meet the service level agreement well under the estimated resource requirements. Vendors for field deployment charge the CSC higher than the quotation. There is much communication between the CSC and vendors to renegotiate the quotation and between the CSC and the IBM Internal Customer to renegotiate the cost.

In addition, in the pre-engagement process, the IBM Internal Customer sometimes only gives the CSC two or three days to propose solutions. The CSC cannot always meet the time requirements, and thus they have significant pressure to close the deal in order to win the business. The pressure sometimes makes the process in a mess. Moreover, the pressure sometimes plays a role in underestimating the operation cost in the pre-engagement process.

3.3 More Elaborations

- **"Cost Difference Problem"**

In the pre-engagement process, there are three major steps for the CSC to estimate the cost for a certain deal. Firstly, the CSC understands the customer requirements and designs appropriate delivery solutions. Secondly, they convert solutions into resource requirements. The mathematical model they use to convert solutions is referred to as the resource model. Thirdly, the resource requirements are put into the cost model (or cost case) for calculating cost.

The resource model is analyzed by one of my team members in this internship. The

cost model is IBM confidential. Therefore, this thesis does not study on those two models but only focuses on the information input of the resource model.

- **“Response Time Problem”**

The main cause of the problem is that usually the IBM Internal Customer requires the CSC to provide solutions including the cost quotation within a very short period, 2 days for example. Since time is a crucial factor to win business, it is not realistic for the CSC to request more time for the proposal. Therefore, it is better that the CSC reduces their response time to propose solutions to customers rather than requesting more time.

In this thesis, how to reduce CSC’s response time to the IBM Internal Customer is investigated.

Furthermore, these two problems are correlated to each other. Factors resulting in one problem may also be the factors resulting in the other. Therefore, the analysis is structured in the following way: state all of the important facts, analyze those facts to find out root causes of the two problems, and propose solutions.

CHAPTER FOUR: CSC Pre-engagement Process Analysis

4.1 CSC Organizational Structure

4.1.1 Organizational Chart

In this section, the CSC organizational structure is illustrated in Figure 5. It is a further investigation in Box A in Figure 4. Therefore, the assumptions in Figure 4 still apply here.

In Figure 5, there are three boxes on the left hand side, indicating the roles of the relative parts on the right hand side. On the left hand side, the same as Figure 4, Box A still represents the CSC and is marked in yellow. The part on the right hand side of Box A indicates organizational structure within the CSC. On the left hand side, Box B in light turquoise still represents the IBM Internal Customer and the End Customer. The part shaded by light turquoise on the right hand side of Box B stands for those two customers. Similar to Figure 4, processes, structure or systems within Box B are transparent to the CSC. On the left hand side, the Inputs/Outputs box indicates that the part on the right hand side beside that box shows the inputs and outputs of the CSC processes. Inputs are the customer requirements from the IBM Internal Customer and feedback from the End Customer in the operation process. Outputs are solutions proposed to the IBM Internal Customer and solutions actually delivered to the End Customer.

Parts within yellow borders show that the CSC process starts from getting customer requirements and ends at delivering solutions. It includes two processes, which are Pre-engagement Process and Operation Process.

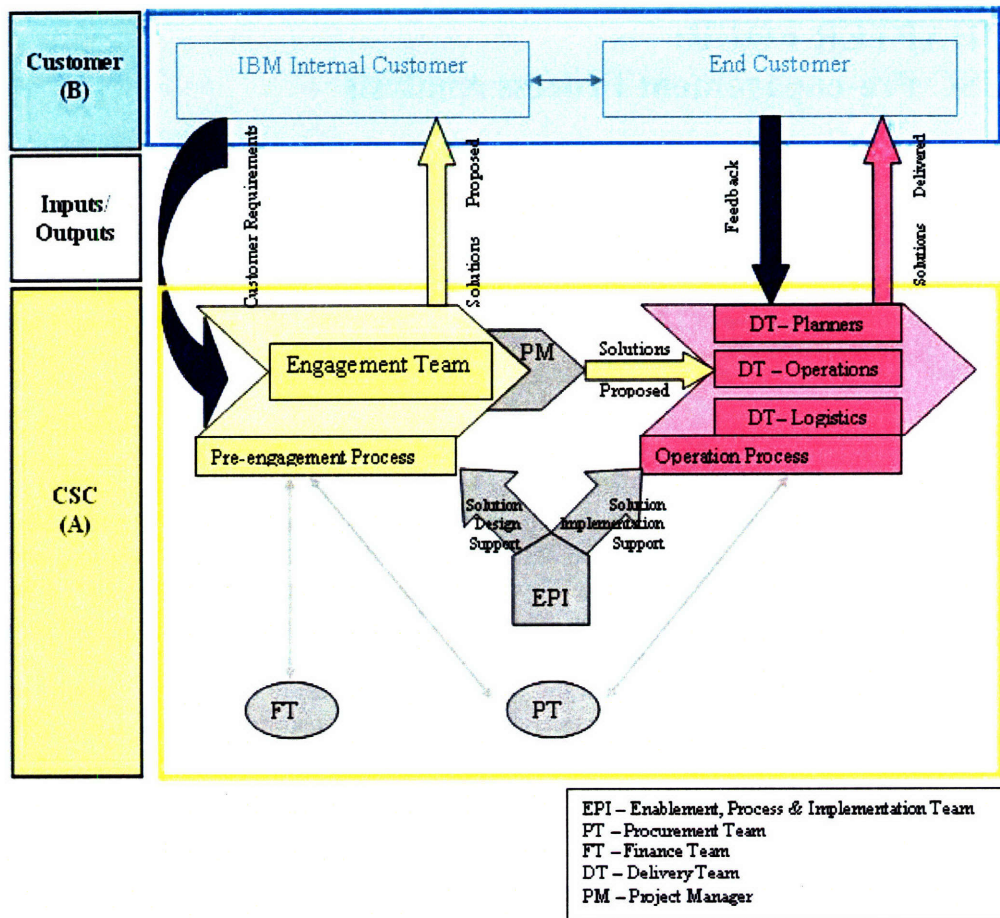


Figure 5 CSC Organizational Structure

4.1.2 More Elaborations on CSC Processes and Teams

More elaborations on Figure 5 are described below.

- **Pre-engagement Process**

In the pre-engagement process, the Engagement Team is the team to gather the customer requirements and to propose solutions with the committed cost to the IBM Internal Customer. Three teams support the Engagement Team in the pre-engagement process, which are the Enabling, Process & Implementation Team (EPI), the Procurement Team (PT), and the Finance Team (FT). The EPI Team helps the Engagement Team design, develop and document the delivery solutions including proper solution process flows. The Procurement Team helps

the Engagement Team design solutions which are related to procurement and outsourcing. The Finance Team helps the Engagement Team develop the cost model based on the resource model that the Engagement Team prepares and does the financial review. People in each team do not play cross-functional roles in different teams.

- **Operation Process**

In the operation process, the Delivery Team is the team that actually delivers services to the end customer. The Delivery Team includes three functional parts - operations, logistics, and planning. The operations part performs services within the CSC factory. The logistics part deals with logistic issues. The planning part makes plans for operations or field deployment. In addition, the EPI Team and the Procurement Team are also supporting the Delivery Team in the operation process. The EPI Team helps the Delivery Team implement the service solutions. The Procurement Team helps the Delivery Team deal with any issues related to procurement and outsourcing.

- **Links Between the Two Processes**

Project Manager

After the Engagement Team closes a deal with the IBM Internal Customer, the Engagement Team will assign a project manager (PM) to launch a project. Currently, Project Manager for a specific project is the same person in the Engagement Team that engages that project for the CSC. Therefore, the project manager is supposed to understand all of the issues related to the pre-engagement process and to the operation process about the project he launches.

EPI Team

In the pre-engagement process, the EPI Team develops solutions, provides the technical support and designs the process flow for operations in the factory. In the operation process, the EPI Team instructs the Delivery Team on how to deliver service solutions, including providing technical instructions and implementing the process flow they have designed in the pre-engagement process.

Hence, the project manager from the Engagement Team and the EPI Team are two links between the pre-engagement process and the operation process. Those two links are qualified in the IBM CSC and they make the transferring of information including customer requirements and solutions proposed between the two processes, more smooth and reliable.

4.2 CSC Pre-engagement Process Flow

The CSC has the Engagement Team as well as three other teams that are supporting this process, involving in the pre-engagement process. These four teams play very important roles. They have different responsibilities. Whether their roles and responsibilities are robust and whether they are functioning well will affect the performance of this process. For example, the proposal turnaround time, customer requirements transferring, resource requirements estimation, and so on.

4.2.1 Roles & Responsibilities

There are four teams involved or supporting the pre-engagement process. They are the Engagement Team, the Enablement, Process & Implementation Team (EPI), the Procurement Team, and the Finance Team (Figure 6). The process flow starts with the IBM Internal Customer.

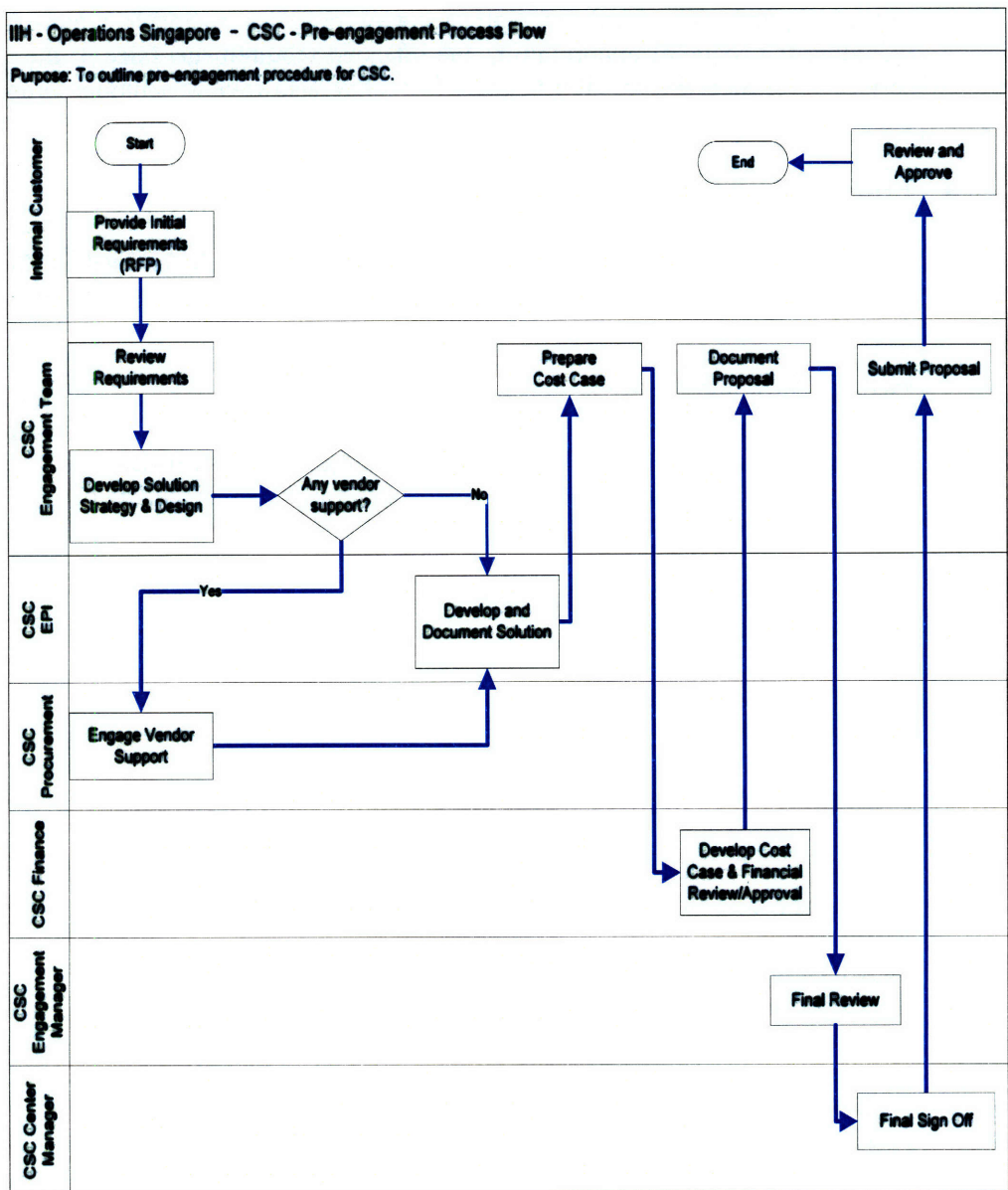


Figure 6 CSC Pre-engagement Process Flow

No iteration is shown in Figure 6.

- **IBM Internal Customer**

The IBM Internal Customer's clients are the IBM end customers such as universities, companies, banks and so on. The CSC is IBM Internal Customer's

service supplier. The IBM Internal Customer provides customer requirements including the scope of opportunities, the intended requirements (size of the deal, service level agreements, etc.) to the CSC. They also review solutions proposal from the CSC and accept or reject it.

- **Engagement Team**

The Engagement Team is the team that interfaces with the IBM Internal Customer. They negotiate with the IBM Internal Customer and engage new businesses as many as possible.

Their first responsibility is to obtain the customer requirements, review the requirements, and perform the overall solution design. Then, they discuss with the EPI Team about the solution. They also get the Procurement Team involved to gain relative information, such as the vendor selection recommendations and the quotation information.

They also prepare resources estimation for the cost case to enable the Finance Team to calculate the unit cost.

Their final responsibility is to document and propose the CSC solution with the committed cost to the IBM Internal Customer.

- **Enablement, Process & Implementation Team (EPI)**

The EPI Team develops solutions from a technical perspective. They design the operation process flow. Finally, they document the solutions.

They have several responsibilities:

- They evaluate the customer's requirements to see whether the CSC has the capability for some new requirements that the CSC has never provided before from a technical perspective. They will provide the technical support.
- They design the process flow for services required by the customer.
- They explore the technical opportunity to enrich their best knowledge.
- They will implement the process flow and services in the operation process.
- They deal with all technical issues.

- **Procurement Team**

The Procurement Team is supporting both the pre-engagement process and the operation process in all respects related to procurement and outsourcing. In the pre-engagement process, they help the Engagement Team get the quotations from vendors and deal with procuring issues as well.

- **Finance Team**

In the pre-engagement process, the Finance Team is helping the Engagement Team to quote properly with the IBM Internal Customer. The Finance Team plays a role of developing the cost case to estimate the cost, which will be incurred from executing a certain business based on the resources requirements from the resource model.

The responsibility for the Finance Team is to make sure: 1) the cost is quoted properly with all the information they have which is provided by the Engagement Team; 2) the cost case takes into consideration all of the key factors which will affect the cost. In other words, the cost case should include all the information that it needs to calculate the cost and include all the proper considerations on the uncertainty or risk as well.

In a word, the role of the Finance Team is to perform the costing of the opportunities based on the data provided by the Engagement Team at their best knowledge (best understanding of the resources requirements).

4.2.2 Process Flow

This section will describe each action box in the CSC Pre-engagement Process Flow chart (Figure 6).

The process flow starts with the Internal Customer.

Provide Initial Requirements (RFP)

The IBM Internal Customer provides initial service requirements to the CSC Engagement Team and request for a proposal (RFP) from the CSC. The proposal includes the service solutions with the cost quotations.

Review Requirements

The CSC Engagement Team reviews the customer's requirements. There is much iteration between the Engagement Team and the IBM Internal Customer to enable the CSC to understand customer requirements.

Develop Solution Strategy & Design

The Engagement Team develops the solution strategy based on the customer requirements. The solution strategy is the solution design from a high level. For example, if the customer requires an order management, then the Engagement Team might suggest that the CSC use some IT ordering tools to fulfill that requirement.

Engage Vendor Support

If there is a need for the vendor support, the Engagement Team will provide a scope of work based on customer requirements for the CSC Procurement Team to engage the vendor support.

The CSC Procurement Team will provide the scope of work to vendor candidates in hand and request the quotation.

Develop and Document Solution

If there is no need for the vendor support, the Engagement Team will provide the customer requirements and the solution strategy to the EPI Team. The CSC EPI Team will develop the solution and then document it.

The EPI Team mainly designs the process flow on how to implement the services and provides the solutions to meet the technical and systematic requirements. For example, if the customer requires that they will use an online system for the order entry and this kind of order entry is new to the CSC, the EPI Team will propose solutions on how to design this order entry and how this order entry interfaces with the CSC current inventory system.

After the EPI Team develops the solutions and gets the solutions from the Procurement Team (if there is the need for the vendor support), they will finally document the solutions.

Prepare Cost Case

Preparing the cost case means that the Engagement Team uses the resource model to prepare the resource requirements for the cost model (cost case). Those requirements include the headcounts, the space requirements, and quotations from vendors and so on.

The Engagement Team prepares the cost case based on the past cases and their experiences. If there are new technical requirements, the EPI Team will provide the Engagement Team with suggestions on the resource requirements related to the technical or systematic support.

Develop Cost Case & Financial Review/Approval

The CSC Finance Team will develop the cost case based on the resource requirements from the Engagement Team. The Finance Team will estimate the cost (\$/unit) and perform the financial review and make an approval.

Document Proposal

After the Finance Team estimates the unit cost and makes an approval, the Engagement Team documents the proposal including the solutions and the cost proposed and submits it to the CSC engagement manager for the final review.

Final Review

The CSC engagement manager will review the whole solutions they have designed and the cost they have estimated.

Final Sign Off

The CSC center manager is the decision point of whether the CSC should pursue the new business or not. He/she will consider the recommendations from the engagement manager and then make the decision on whether the CSC will pursue this business or not, which based on the business strategy and some other factors. Currently, the CSC center manager is the same person who is in charge of the operation process. That person is the operation manager as well as the center manager in the CSC.

Submit Proposal

After signing off by the CSC center manager, the Engagement Team will submit a proposal to the IBM Internal Customer.

Review and Approve

The IBM Internal Customer will review and approve the proposal if it matches their requirements including the service level, the cost, etc. If they do not approve, they will communicate and negotiate further with the Engagement Team and thus the CSC pre-engagement process flow may start over again.

To simplify Figure 6, iteration is not shown.

4.2.3 Time Consumption in the Process Flow

Regarding the “Response Time Problem”, it is not realistic for the CSC to request more time for proposing solutions with the committed cost. Therefore, a better way to resolve this problem is to reduce the time consumed in the pre-engagement process. Investigating where the time is consumed, what factors affect the time consumption in the process is very important.

It is hard to estimate the time consumption in this pre-engagement process flow. However, based on the experience of the Engagement Team, the time is consumed in the following three major aspects.

- **Time for the Engagement Team to Prepare the Cost Case**

The Engagement Team uses the resource model to convert customer requirements into the resource requirements. If the customer requirements are not detailed enough, the Engagement Team will communicate with the IBM Internal Customer many times to get detailed requirements, and thus the time may be long.

- **Time for the EPI Team to Develop Solutions**

The EPI Team spends the time in understanding customer requirements from the Engagement Team. There are many communication loops between the EPI Team and the Engagement Team.

In addition, when there are some services requirements, which the CSC has never provided before, the EPI needs the time to develop a new process flow for those requirements and the time to design feasible technical solutions if some new technology is required. Let us consider the example mentioned in the section 4.2.2 again. The customer requires using an on-line ordering system for the request entry, but currently the CSC only accepts phone calls or emails for service requests. In this case, the EPI Team needs to figure out which tools can be used to fulfill this service requirement, whether these tools can align with the CSC current system (the inventory system, or the request ordering system, etc.), how new processes will be added into the original process flow to meet this requirement, and so on. Therefore, the EPI Team's best knowledge on the new technology, the CSC current system capabilities, and current process flows, must be sufficient to develop the service solutions in a short time in order to meet the time requirement.

- **Time for the Procurement Team to Get the Vendor Quotations**

Whether the scope of work to vendors is detailed enough is a critical factor that affects the time for vendors to quote. Vendors understand the requirements on field deployment from the CSC. If the scope of work does not provide all the information they need, vendors will communicate with the Procurement Team to get more information. The Procurement Team may not be able to answer some of questions proposed by vendors and will escalate them to the Engagement Team for more information. Therefore, the time is partly consumed in the process of understanding the scope of work.

Furthermore, whether vendors are qualified enough is also a factor that affects the time for the quotation. Some vendors do not have a standardized process for quoting. Therefore, it may take a longer time for those vendors to quote.

Some other issues may make the quotation process long. For instance, vendors may outsource part of their process to another party. Vendors may have a long process to get quotations in the case when they have extra procedures to go through, which are required by the company business control. The CSC has no control on this part. Hence, these issues will not be discussed anymore in the thesis.

4.2.4 Cost Case Related

The process of the cost estimation is described in Figure 7.

As mentioned above, there are three steps for the cost estimation. Among those three steps, solutions as the initial inputs into the resource model have a big impact on the final cost estimation because the resource requirements are determined by the initial inputs of the whole cost estimation process.

Therefore, how the CSC gets the resource requirements from the solutions they have designed needs to investigate because it will affect the estimation of the cost in the pre-engagement process, and finally it may cause the “Cost Difference Problem”.

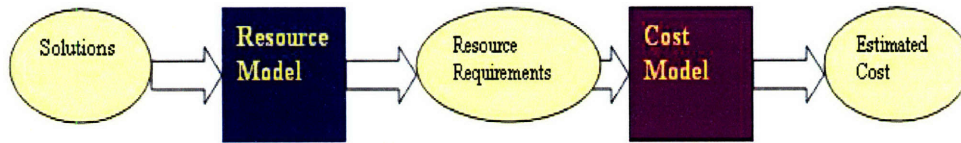


Figure 7 Cost Estimation Process

- **Source of Cost Components**

Cost components are those components from the solutions, which will have a cost impact in the execution. Capturing all of the cost components to get more precise resource requirements is significant in estimating the cost.

There are three sources of the cost components in delivery the solutions. The first one is the components from solutions executed in the CSC factory, the second one is from solutions executed on the customer’s site, and the third one is from requirements in the new technical support.

Currently, in the CSC, the Engagement Team gets the cost components from solutions which will be executed in the factory to estimate the resource requirements based on their experiences and the CSC past cases. The EPI Team that provides the technical support and designs the operation process flow estimates the resource requirements related to the new technical issues or the new process flow issues. The Procurement Team gets quotations from the vendors who provide the on-site support. The Engagement Team will finally consolidate all the information on the resource requirements and then prepare a cost case for the Finance Team to develop and to estimate the cost.

4.3 Information Flow

The information flow studied here is specific for the flow of the customer requirements. Customer requirements affect the solution design, the resource requirements, and finally the cost estimation. Furthermore, understanding the customer requirements is an important factor affecting the time consumption in the pre-engagement process. Hence, identifying issues related to the information flow is helpful to find out the root causes of the “Cost Difference Problem” and the “Response Time Problem”.

4.3.1 External View

From a global view, there are three echelons – the end customer, the IBM Internal Customer, and the CSC – in the supply chain. Those three echelons are three systems. We do not examine the processes or the systems within them, but only consider the inputs and the outputs from one system to another. In this supply chain, the customer requirements, which need to be fulfilled by the CSC, start transferring from the end customer. The inputs of the IBM Internal Customer are the customer requirements from the end customer. The inputs of the CSC are the customer requirements from the IBM Internal Customer.

As expected, the customer requirements from the end customer should be the same as those put into the CSC. However, the customer requirements are decreasing when we move up the supply chain from the end customer to the CSC. In other words, if for example there are ten customer requirements coming out of the end customer, the IBM Internal Customer may get eight of the ten requirements while the CSC only gets six. And the information decrease may result in less accurate resource requirements estimation or longer proposal turnaround time.

There are many reasons for this phenomenon. It may be because the IBM Internal Customer hides some information from the CSC to earn some benefits. For example, the IBM Internal Customer may provide a range of annual volume requirement to the CSC (e.g. 4000 – 6000 units/year). The inaccurate volume information will affect the cost estimation from the CSC. The CSC may get a range of the unit cost (e.g. 4 dollars/unit – 8 dollars/unit). In order to avoid any risk, the cost that the CSC should quote the Internal Customer is 8 dollars/unit. However, to win the business, the CSC may possibly commit 6 dollars/unit and thus take a risk that the actual cost is 8 dollars/unit. If the cost is 8 dollars/unit, then the Internal Customer earns 2 dollars/unit from the CSC, while the CSC has to absorb this 2 dollars/unit themselves.

In addition, this phenomenon may also result from the case that the Internal Customer forgets some requirements or the case that the Internal Customer does not know how to ask the right questions to get the customer requirements as detailed as possible.

Figure 8 shows this phenomenon. The shadow in color indigo is used to indicate the amount of the customer requirements, which need to be fulfilled by the CSC.

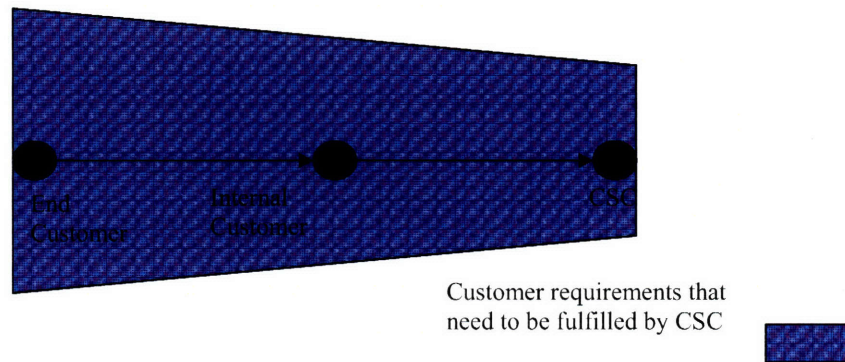


Figure 8 External Information Flow

4.3.2 Internal View

A study on the information flow within the CSC is conducted here. The information is still specifically referred to as the customer requirements that need to be fulfilled by the CSC.

- **Key Information Holder**

Identifying the key information holder is vital because that person or group has the responsibility to get the right and detailed information and to transfer the information to different parties within the CSC pre-engagement process. Whether the key information holder functions well will have direct effect on whether parties supporting the pre-engagement process can get the information they need.

In the CSC, the key information holder is the Engagement Team (Figure 9). The blue arrows in this figure indicate the flows of the customer requirements. Customer requirements enter the CSC from the IBM Internal Customer. The Engagement Team – the client-facing team – gets customer requirements and becomes the key information holder. The Engagement Team provides the relative information to different players supporting the pre-engagement process. The Engagement Team provides the customer requirements to the EPI Team for them to develop the solutions. They provide a scope of work extracted from the initial customer requirements to the Procurement Team to engage the vendor on-site support. They also describe the business nature based on the customer

requirements to the Finance Team.

The Engagement Team should have a standardized way to gather customer requirements from the IBM Internal Customer and to share the information among those three supporting teams, so that the information flow can be efficient and smooth. In the present CSC process, the Engagement Team communicates with the IBM Internal Customer by either emails or phone calls. Sometimes, the IBM Internal Customer prepares the documents describing the customer requirements. Sometimes, they do not prepare the documents for the CSC but only describe what they need the CSC to provide via emails or phone calls. The information sharing within the CSC is done by oral descriptions or meetings. Sometimes they have the documents to share. Sometimes they do not.

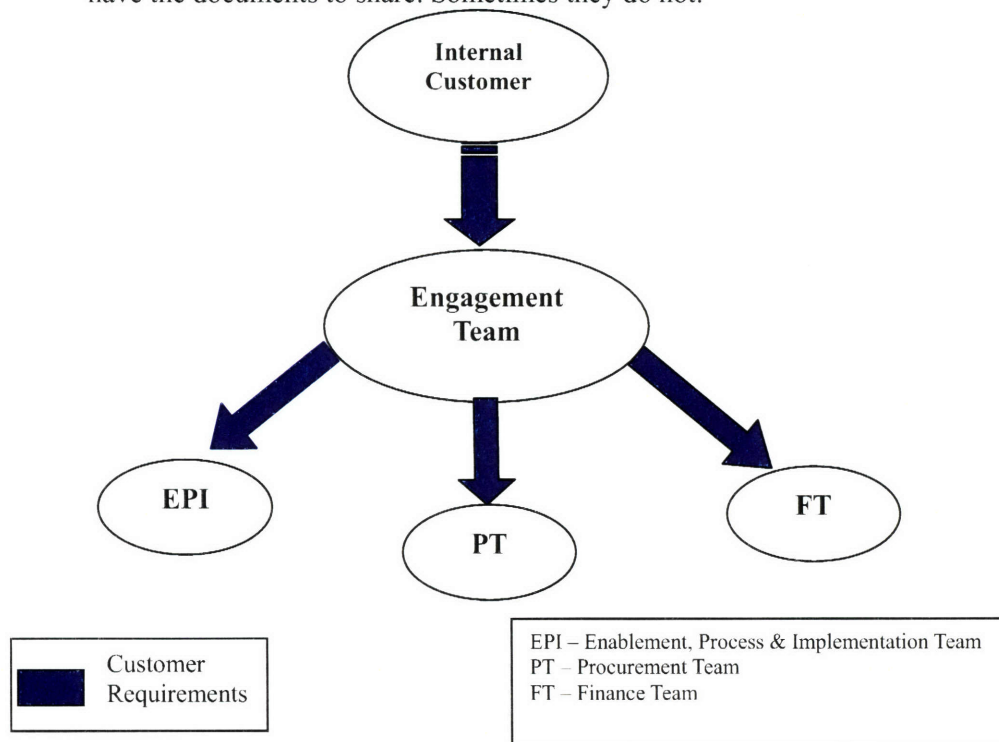


Figure 9 CSC Pre-engagement Process Information Flow

4.4 Vendors On-Site Support

Issues related to the vendor on-site services have been partially described in the previous sections. In this section, these issues will be summarized to provide an overall picture of how a third party plays a role in the CSC service delivery.

4.4.1 Scope of Work

The CSC outsources the field deployment to vendors. In the pre-engagement process, the Engagement Team compiles a scope of work related to the field deployment from the customer requirements they get from the Internal Customer and then they provide this information to the Procurement Team to engage vendors. The Procurement Team transfers the scope of work to at least three vendor candidates for quoting. There might be many communication loops among the Engagement Team, the Procurement Team and vendors to enable vendors to understand the customer requirements completely. Therefore, a detailed and clear scope of work is an important factor in reducing the communication loops between the CSC and vendors and thus in reducing the response time for the CSC to propose solutions to the IBM Internal Customer.

Furthermore, whether the scope of work is accurate and detailed also has an effect on the accuracy of the quotations. If the scope of work is vague, then vendors may make many assumptions in quoting. Those assumptions make vendor quotations less accurate and thus reduce the possibility for the CSC to quote properly to the IBM Internal Customer.

4.4.2 Other Issues

Whether vendors are highly qualified is also of significance for analyzing the two problems of the CSC.

If vendors are good candidates, for example, they have a good reputation and sufficient experiences in the IT delivery services, then they will probably have a more appropriate quotation and the time for them to estimate quotations might be less. However, if they are new in this industry, they may not be familiar with the pricing and may overestimate their capabilities in providing services. For instance, they may estimate that they can finish decommission on five PCs per day, however, in the actual deployment, they only finish three PCs per day. The difference will increase backlogs and finally vendors will try to charge the CSC more, which will result in the “Cost Difference Problem” that the cost in the execution is larger than the cost estimated. Furthermore, vendors who are not qualified, may take a longer time to estimate the cost because they may not have the standardized procedures to quote and they may need the longer time to do more market research.

The procedures within vendors are transparent to the CSC. However, vendors’ internal procedures may become considerable factors, which have an effect on the CSC pre-engagement process, but the CSC has little control. For instance, if vendors are the big firms which have long business procedures to go through before they can provide the quotations to the CSC, the response time for the CSC to propose solutions to the IBM Internal Customer will be long too. Nevertheless, the big firms will be more able to provide the more accurate quotations because of their

more standardized business processes, their more thorough market research and more experiences in dealing with the unexpected problems.

In addition, vendors may also outsource part of the services to another party. Outsourcing may increase the procedures for quoting and thus make the response time for vendors to quote the CSC longer. Outsourcing may also result in a less proper quotation.

4.5 CSC Service-offering Model

The CSC current service-offering model is as follows: the CSC does not provide a standardized and detailed document describing what the CSC can offer to the IBM Internal Customer. They only have general service descriptions (Table 3). For every new business, the Internal Customer describes their requirements to the CSC and the CSC usually commits as much as they can to win the deal. The CSC does not have a framework to follow for each business. They just try to compare the new deal with their past cases to design the solutions and quote the Internal Customer. Therefore, each business is more like a “90% - 95% customization” to the CSC, which means that each new deal is highly customized.

Customization means additional needs based on the standard products. Everything beyond a standard baseline is called the customization. Considering a more common example in daily life, we order food in the restaurants. Restaurants will provide the menus. We may have some additional needs beyond the menus. Those additional needs are “customizations”. Those needs will cost us extra money because the restaurants will spend more effort in providing these services. Moreover, the more customization is, the more cost will be incurred to satisfy the customer needs.

Since the CSC does not have a detailed “menu” for the IBM Internal Customer to choose what they need, the CSC is like running a “90% - 95% customization” service-offering model though they may still try to have a “5%-10% standardization” by leveraging over their experiences and knowledge on past cases.

CHAPTER FIVE: Problem Analysis

5.1 Root Cause Analysis

Those two problems – the “Cost Difference Problem” and the “Response Time Problem” – are actually the symptoms of some broader problems. In order to improve the CSC pre-engagement process, the first priority is to get to the underlying “root causes”. After stating all of the important facts in the previous chapters, the analysis now involves the work of determining the root causes of the two problems.

In this chapter, we develop a root-cause analysis procedure based on the well-known fishbone diagram method. We review the fishbone method in Section 5.1.1 and we describe the new method in Section 5.1.2. We apply it to the CSC pre-engagement process in Section 5.1.3.

5.1.1 Fishbone Diagram Review

- **Fishbone Diagram**⁷

Fishbone analysis is an effective tool to conduct a root cause analysis. It shows a chain of cause-effect relationships ultimately leading to the observed problems. It requires people to continuously ask “why does this happen” at least five times to probe obvious problems. It suggests possible things that might be causing the problems.

There are a few steps to build up a fishbone diagram.

Define the problem

Problems are obvious symptoms that need to be analyzed to determine the root causes. After defining the problems, the fishbone diagram can be started to be constructed.

First, use a square box to represent the problem. Then, use an arrow pointing from the left to the problem. The problem box is the fish head and the arrow is the backbone. At the end of the first step, the fishbone diagram looks like:

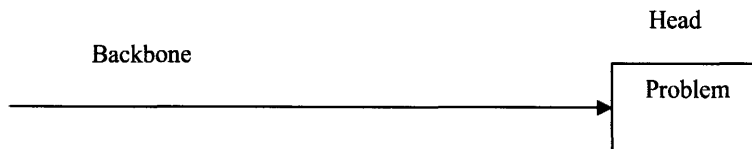


Figure 10 Fishbone Diagram 1

⁷ Dhanasekar Dhandapani, “Applying the Fishbone diagram and Pareto principle to Domino”, Jun. 21, 2004, <www.ibm.com/.../library/fishbone/index.html>

Brainstorm

Find out the facts that are logically related to the problem and then represent them in a fishbone diagram. There are several ways to find out those facts: 1) organizing facts, opinions, issues and ideas into a natural grouping, 2) gathering ideas from people who are experts in a process or potential contributors to the problem and 3) organizing the information in a process in a graphic manner and making it clear who is impacted at every stage.

Identify causes

The causes can be categorized into six areas.

Method – describes ways of doing things or the procedures followed to accomplish a task.

Man – refers to people who are responsible for the problem.

Management – refers to project management and management decisions.

Measurement – refers to the metrics that are derived from a project.

Material – refers to a physical thing in most of the cases.

Machine – refers to the equipment.

After the major causes are identified, they can be connected as fish bones in the fishbone diagram. They are represented as slanted lines with the arrow pointing towards the backbone of the fish. Each cause may have secondary causes as arrows pointing to them (Figure 11).

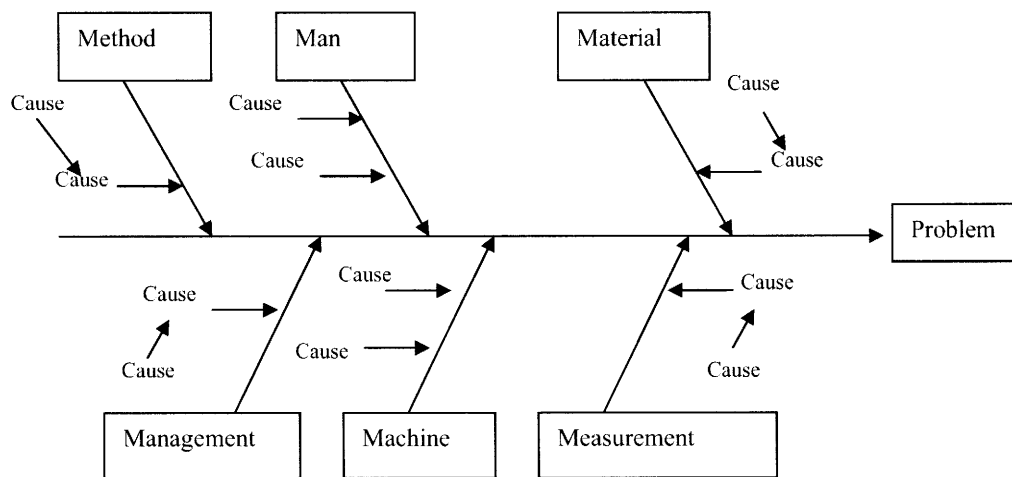


Figure 11 Fishbone Diagram 2

After building up the fishbone diagram, the evaluation is necessary and significant.

Each cause should be discussed and its relevance to the problem should be analyzed.

5.1.2 Methodology

The cause-effect analysis in this thesis takes advantages of some principles in the Fishbone Diagram method, including keeping asking “why does this happen”, ways to propose potential causes (such as organizing facts, opinions, gathering ideas from experts), and some of the analysis steps (e.g. starting from defining problems, then proposing potential causes, evaluating those causes, and finding out secondary causes). Nevertheless, in this methodology, causes are not categorized into the six areas as in the Fishbone Diagram method. Some flow chains are also used, but they are not depicted as a fish with bones.

There are a few steps to figure out root causes in this methodology (Figure 12).

Define problems

Find out obvious symptoms that need to be studied. It is better to analyze one problem at a time because these problems might be very complex. One at a time can make the analysis much easier. Problems might be correlated in such a way that some of the possible factors (e.g. factor X) in one problem (e.g. Problem A) may also be the possible factors in another problem (e.g. Problem B). If so, then correlations could be shown in the way that analysis chain from factor X in Problem B enters into the analysis chain in Problem A from factor X.

Propose potential factors that will cause the problems.

The analysis starts with the problems. Then, we can propose possible factors that may result in the problems. Similar to the fishbone diagram analysis, keeping asking “why does this happen” is a way to find out the possible causes. These possible factors are from relevant facts, understanding of the related processes, or opinions gathered from the experts in the processes. Each potential factor will start an analysis chain.

Evaluate each possible factor and decide whether it should be further investigated.

To evaluate each possible factor, the evidence supporting why some factor does not need to be considered or analyzed is cited. If there is no evidence showing that some factor does not need to be examined, then it means that the analysis from that factor continues. There is no quantitative way to evaluate each factor in this analysis because the CSC pre-engagement process does not have real quantitative data. If some factor has no need to be studied further, then the analysis of that factor stops and thus that chain of the analysis stops. (That factor has a red label saying “No”). If it needs to, then its possible causes are identified following the same method in the previous step. (The factor has a yellow label saying “Yes”).

Repeat the previous step until the analysis chains cannot go any further.

Repeating the previous step needs repeating asking “why does this happen” in the analysis. Many times of asking “why” will help the analysis to figure out root causes. In the end, all factors that need to be studied have “Yes” labels marked in yellow. All factors which do not need to analyze have “No” labels marked in red.

Evaluate factors at the end of all yellow “Yes” analysis chains, combine and determine the root causes.

When no analysis chain can go any further, it is the time to examine these factors. Some of them may be the root causes while some of them can be consolidated into one root cause. Root causes are listed in a column beside the “Potential Causes” column. Mark root causes with their relative factors at the end of the analysis chains in the same colors.

Find out other potential root causes that have not been determined through this analysis.

Some other root causes that have much impact on the processes may not be easily presented in those analysis chains. These causes can be found out based on the important facts that seem not to have close relations with any of the possible causes in the analysis chains at a first glance. In other words, these causes could be identified from relevant facts that have not been correlated closely to any of the potential causes in the analysis chains.

Summarize root causes.

Summarize root causes of the problem in a table. Solutions to tackle those causes could be listed on the right column beside the “root causes” column. Different problems may share the same root causes, so root causes for all of the problems could be summarized in one joint table.

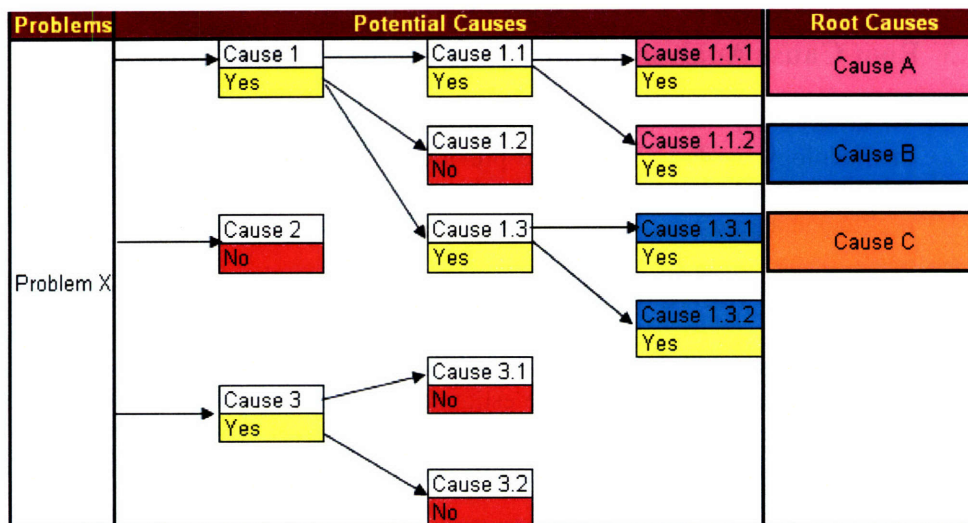


Figure 12 Analysis Methodology Demonstration

Figure 12 shows a demonstration of this methodology.

The analysis starts from Problem X. There are three potential causes leading to that problem. They are Cause 1, Cause 2 and Cause 3. After evaluating all the three causes, Cause 2 is considered as having no need to be further investigated for some certain reasons. It might because Cause 2 is assumed beyond the scope of the analysis, for example. Thus the analysis chain from Cause 2 stops. Cause 2 has a “No” label marked red. No evidence showing that the analysis on Cause 1 and Cause 3 should stop and thus they have “Yes” labels marked in yellow. Find out their potential causes and evaluate each of those potential causes. Continue analysis chain if those causes need to be further studied (Cause 1.1, and Cause 1.3). Analysis chain stops if those causes do not need to be analyzed (Cause 1.2, Cause 3.1, and Cause 3.2) for some reasons. Repeat proposing potential causes to Cause 1.1 and Cause 1.3, and then evaluate each potential cause. The analysis stops when it cannot go any further. Analyze the causes at the end of all the “yes” analysis chains. Cause 1.1.1 and Cause 1.1.2 have the same root cause and thus they are marked in the same color pink as Cause A in the “Root Causes” column. Cause 1.3.1 and Cause 1.3.2 have the same root cause – Cause B – and thus are all marked in turquoise.

Considering some facts that are not tightly related with those potential causes in the analysis chains but also have important effect on resulting in Problem X, those facts are summarized into another root cause – Cause C. Finally, root causes are found out and listed in the “Root Cause” column.

5.1.3 Root Cause Analysis in the CSC Pre-engagement Process

To analyze the two problems in the CSC pre-engagement process, the same methodology as described in the previous section is applied. The analysis also follows several steps. In addition, the analysis is conducted in a way of “one problem at a time”.

- **Analysis of the “Cost Difference Problem”**

The root cause analysis starts from the “Cost Difference Problem.” “Cost Difference” means that the estimated cost in the pre-engagement process is different from (usually smaller than) the actual execution cost in the operation process. In addition, all the analysis here is focusing on the pre-engagement process.

Figure 13 shows the analysis process.

Problems	Potential Causes				Root Causes		
1 Cost difference between estimated and actually executed	Cost Model						
	No						
	Solution within CSC	CSC Operation Capabilities					
		No					
		Information Transferring between two process					
		No					
		Customer requirements are not detailed enough	Information is decreasing when we move up the supply chain			Information is decreasing when we move up the supply chain	Information is decreasing when we move up the supply chain
			Yes				
	The way of information entry is not standardized				No Standardized way of getting requirements/sharing requirements	No Standardized way of getting requirements/sharing requirements	
	Yes						
Issues related to roles & responsibilities	Issues related to Key Info. Holder	Get requirements based on past case/experience	No Standardized way to share info. among supporting teams	No Standardized way of getting requirements/sharing requirements	No Standardized way of getting requirements/sharing requirements		
				Yes	Yes	No Standardized way of getting requirements/sharing requirements	No Standardized way of getting requirements/sharing requirements
				One role missing/displaced	Roles/responsibilities	Roles/responsibilities	Roles/responsibilities
				Yes	Yes	Yes	Yes
Solution done by vendors	Issues beyond pre-engagement process						
	No						
	Issues within pre-engagement process	Quotation is not accurate	Customer requirements not detailed	Vendors are not qualified	Go to the entry of "Customer requirements not detailed"	Go to the entry of "Customer requirements not detailed"	
Yes					Yes	Yes	Yes
Yes	Yes	Yes	Yes	Vendors are not qualified	Vendors are not qualified		

Figure 13 Root Cause Analysis of the "Cost Difference Problem"

There are six potential causes resulting into that problem and those six potential

causes start six analysis chains. Those six potential causes are:

- The cost model may not be effective enough to generate very accurate cost estimation.

If the cost model could not be effective enough, then the cost estimation got from that model is probably not accurate. However, since the thesis does not research on the two models. Therefore, this analysis chain stops and has a red label saying “No”.

- The CSC Operations capability could not meet customer requirements.

If the CSC Operations is not well qualified to meet the service requirements, CSC may commit to the lower cost than the cost incurred in the actual delivery. However, the CSC Operations capability is beyond the pre-engagement process, and hence, this analysis chain stops too.

- There might be information-transferring gap between the pre-engagement process and the operation process so that what the CSC executes is different from what the CSC commits.

Cost estimation takes place in the pre-engagement process. Cost is incurred in the operation process. People probably think that there might be an information-transferring problem between the two processes. In the CSC, as stated before, the project manager who is responsible for a specific project is the same person that engages that project to the CSC. He/She is one link between the two processes. Since they are the same person, there are hardly transferring mistakes or gaps as in other organizations where no person plays a role in the engagement process and at the same time in the operation process.

Moreover, the EPI Team is the second link between the pre-engagement process and the operation process. The EPI Team develops the solutions and designs the operation process flows that will be implemented in the operation process. The EPI Team also helps the Delivery Team to implement the solutions designed.

Therefore, the information transferring gaps between the pre-engagement process and the operation process in the CSC are too trivial to be considered. Therefore, this analysis chain stops.

- Customer requirements are not detailed enough, and thus the CSC delivers more than they commit.

If the customer requirements obtained in the pre-engagement process are not detailed, then the resource requirements estimated based on the information are

probably less than actually required, and thus the execution cost may be higher than the cost estimated. Many facts listed in the previous chapters show that it will affect the cost estimation that whether the customer requirements are detailed or not. Therefore, this factor needs to be investigated further. Hence, this factor has a yellow label saying “Yes”.

Possible causes, which lead to the fact that the customer requirements are not detailed enough, are figured out. The potential causes are the information is decreasing when we move up the supply chain; the way of the information entry to the CSC is not standardized; issues related to the roles and responsibilities, more specifically, issues related to the key information holder.

- Regarding the solutions delivered by vendors, the operation capability of the vendors could not fulfill the customer requirements.

If vendors could not fulfill the customer requirements because of their poor operation capability, the cost incurred for the field deployment may be higher than the quotations that vendors propose in the pre-engagement process. However, since the vendors’ operation capability is beyond the pre-engagement process, this analysis chain also stops.

- Some issues related with the vendors, which happen within the pre-engagement process.

Issues in the pre-engagement process should be investigated. The most relevant issue is that vendors’ quotation is not accurate.

After the above analysis, there are four analysis chains.

- The information is decreasing when we move up the supply chain.

From an external view, there are three echelons in the supply chain – the end customer, the IBM Internal Customer, and the CSC. The information is decreasing when moving up the supply chain from the end customer to the CSC (Figure 8). This phenomenon is normal, necessary and hard to be totally avoided. It could be one of the root causes and needs to be analyzed and resolved independently.

- The way of the information entry into the CSC is not standardized.

The Engagement Team obtains the customer requirements sometimes via emails, sometimes via phones, sometimes via documents, and sometimes without any documents. The way of the information entry is not standardized, and thus the

CSC may miss out some requirements, which are not converted into the resource requirements though have cost impact, in the pre-engagement process.

No other factors lead to this potential cause and thus its related analysis chain ends here.

- Issues related to the key information holder

There are three important issues related to the key information holder:

- The Engagement Team gets the customer's requirements based on their experiences or past cases.

Usually the Engagement Team asks many questions to the IBM Internal Customer to get as many requirements as possible. In the CSC, the Engagement Team has no framework or question checklists to follow to propose the right questions. Therefore, the Engagement Team may forget to obtain some key information that will affect the execution cost.

- There is no standardized way to share the information among the supporting teams – the EPI Team, the Procurement Team and the Finance Team.

Usually the Engagement Team shares with them the customer requirements by holding meetings. Sometimes they have the documents to share with those teams, sometimes they do not and thus they just describe what they understand from the IBM Internal Customer during the meetings. No standardized documents or ways of sharing the information may omit some cost components in the stage of proposing solutions.

- There is one role missing or displaced in the pre-engagement process.

As described before that there are three major sources of the cost components: solutions executed in the CSC factory; solutions executed on the customer's site and solutions required the new technical support. Capturing the cost components from those three sources is of significance to estimate the resource requirements and finally estimate the cost. In the CSC, the EPI Team estimates the resource requirements related to the new technical issues or the new process flow issues. This role is right because the EPI Team is a team to provide the technical support and design the process flows. The Procurement Team gets quotations from vendors to estimate the cost on the field deployment.

This role is also right because vendors will provide the on-site support. However, the role for the Engagement Team to get the cost components from solutions in the factory is displaced because the Engagement Team is not the team that actually executes solutions in the CSC factory. The Engagement Team is just a sales team in the CSC that faces with the customers, unlike the Delivery Team that is an expert in the daily delivery. In other words, in the pre-engagement process, the role to capture the cost components from solutions performed in the CSC factory is missing. Missing or displacing that role enlarges the gap between the cost estimated and executed.

No other factors lead to those three factors and thus they are at the end of the related analysis chains.

- Vendors' quotation is not accurate.

There are two resulting factors – the scope of work stating customer requirements are not detailed enough and vendors are not qualified. If the scope of work is vague, then vendors may make many assumptions in quoting. Those assumptions reduce the accuracy of the quotations. This analysis chain will be the same as one of the above analysis chains starting from the factor “customer requirements are not detailed enough”, and hence, detailed analysis is not listed here.

The impact from the fact that vendors are not qualified is explained in details in the “Vendors On-Site Support” section (Section 4.4). Thus, we do not repeat it here.

After all the analysis above, let's evaluate factors at the end of all “Yes” analysis chains and extract root causes from those factors.

- The factor that the information is decreasing when we move up the supply chain can become a root cause for it is a bit independent compared with the rest.
- Three factors can be consolidated into one root cause that there is no standardized way to get customer requirements or to share the information among the supporting teams. Those three factors are 1) the way of the information entry is not standardized; 2) the Engagement Team gets customer requirements based on the past cases or experiences, and 3) no standardized way to share the information among the supporting teams.
- The factor that one role is missing/displaced can be summarized as the root cause “Roles/Responsibilities”.

- The factor that the vendors are not qualified can be one root cause for it is a bit independent compared to the rest.

All root causes are marked in different colors. Factors at the end of all “Yes” analysis chains are all marked in the same colors as their related root causes.

- **Analysis of the “Response Time Problem”**

After analyzing the “Cost Difference Problem”, the same methodology is applied for analyzing the “Response Time Problem”. To resolve this problem, a better solution is to find out where the time is consumed and which factors affect the time consumption, compared to request more time from the IBM Internal Customer.

Figure 14 shows this analysis process.

Problems		Potential Causes		Root Causes	
2 Response Time Problem	Time constraints from Internal Customer				
	No				
	Time consumed	For ET to prepare for the cost case	Customer requirements not detailed	Yes	Go to the entry of " Customer requirements not detailed" in ISheet "analysis for problem 1"
			No framework, based on experiences/past case	Yes	No framework to estimate the resource requirements, based on experiences/past cases
		For EPI to develop solutions	Customer requirements not detailed	Yes	Go to the entry of " Customer requirements not detailed" in ISheet "analysis for problem 1"
			new technical support requirements	Yes	Roles/responsibilities
Customer requirements not detailed			Yes	Go to the entry of " Customer requirements not detailed" in ISheet "analysis for problem 1"	
For vendors to provide quotations	Vendors are not qualified	Yes	Vendors are not qualified		

Figure 14 Root Cause Analysis of the "Response Time Problem"

Two potential causes lead to that problem and they start two analysis chains.

- **Time constraints from the Internal Customer**

The Internal Customer usually requires the CSC to propose solutions in a very short time. If the CSC could request more time to propose solutions then the

Engagement Team may not have huge time pressure. However, longer time means more risk of losing the business. Therefore, this analysis chain is not considered. It is marked a red label saying “No”.

- **Time consumption**

- Factors affecting the time consumption for the Engagement Team to prepare for the cost case**

- It may take a long time for the Engagement Team to prepare the detailed customer requirements to estimate the resource requirements. So “customer requirements are not detailed” is one of its resulting reasons. Thus, the analysis chain for this reason could be the same as one of the analysis chains in the previous problem from the factor “customer requirements are not detailed”.

Another factor is that the Engagement Team does not have any framework to estimate the resource requirements. They only estimate them based on their experiences and past cases. For example, to estimate the resource requirement of packaging based on their experiences, the packaging needs 2 minutes. However, they do not consider whether there are any special requirements in the packaging. If the packaging requires special steps for the fragile equipment, then the cycle time for packaging can be longer, 8 minutes for example. The Engagement Team might be reminded by the Delivery Team and then they communicate with the Internal Customer more to understand those special requirements. If the Engagement Team has some framework stating all those possible scenarios related to each service requirement, then they may probably be able to obtain those special requirements even at the first time when they communicate with the Internal Customer rather than after they are reminded by the Delivery Team. With the framework, communication loops between the Engagement Team and the Internal Customer can be reduced and thus the time can be less.

- Factors affecting the time consumption for the EPI Team to develop solutions**

- There are two potential factors. One factor is that if the customer requirements are not detailed enough, the EPI Team may spend a long time to understand the customer needs and thus the time for developing the solutions is long. This analysis chain again is also the same as one of the analysis chains in the “Cost Difference Problem” starting from the factor “customer requirements are not detailed”.

The other is that if there are new technical requirements, which the CSC has not provided before, and then it takes extra time for the EPI Team to design the solutions.

- Factors affecting the time consumption for vendors to provide quotations**

Two issues are pertinent. One issue is whether the scope of work that the Procurement Team provides to vendors is detailed or not. Again, this analysis is the same as the one in the “Cost Difference Problem”. The other issue is whether vendors are qualified enough. If vendors are not qualified, they may not have efficient procedures to estimate the cost, which make the response time for the CSC to propose solutions longer.

All potential causes that need to be studied further have yellow “Yes” labels.

After the abovementioned analysis, we could extract the root causes from the potential causes at the end of the analysis chains.

- No framework to estimate the resource requirements, based on the experiences or past cases.
This could be one of the root causes resulting in the “Response Time Problem”
- When there is the need for the new technical support
This could be summarized as the root cause of “Roles/Responsibilities”
- Vendors are not qualified
This could be the root cause of “vendors are not qualified”.
- Root causes shared with the “Cost Difference Problem”
Since some analysis chains are the same as the analysis chain in the “Cost Difference Problem” from the potential cause “customer requirements are not detailed”, some root causes from that analysis chain in the previous problem analysis are also root causes in the “Response Time Problem”.

5.1.4 Five Root Causes

Among those root causes for the two problems, the root cause “No framework to estimate the resource requirements, based on experiences/past cases” in the “Response Time Problem” could be combined with the root cause “No standardized way to get the requirements and to share the information among the supporting teams” in the “Cost Difference Problem.” Therefore, the root cause now could be “No Standardized way of getting the requirements/sharing the requirements/estimating the resource requirements”

Besides those root causes found through the analysis chains, there is one fact that is also very important but could not fit into those analysis chains. The fact is the current CSC service-offering model. As mentioned before, the CSC is running a

“90%-95% customization” model because they do not provide a detailed “menu” describing the CSC service offerings for the Internal Customer to choose what they need. This model makes the cost estimated less accurate because the CSC does not have a standardized and detailed service offering as a baseline to compare with. This model also makes the CSC proposal turnaround time (the response time) longer for they do not have a template to more easily fill in the customer requirements, in other words, they do not have a standardized way to follow and then to design solutions. Therefore, the current service-offering model is another root cause to the two problems.

Now summarize all root causes in one table. There are five root causes leading to the two symptoms: the “Cost Difference Problem” and the “Response Time Problem”. The five root causes are:

- No standardized way of getting the customer requirements/sharing the customer requirements/ estimating the resource requirements
- Vendors are not qualified
- Issues related to Roles/Responsibilities
- Information is decreasing when we move up the supply chain
- Current service-offering model

Problems	Root Causes
Cost Difference Problem	1 No Standardized way of getting the requirements/sharing the requirements/estimating the resource requirements
	2 Vendors are not qualified
Response Time Problem	3 Roles/responsibilities
	4 Information is decreasing when we move up the supply chain
	5 Current service-offering model

Table 4 Summary of Root Causes

CHAPTER SIX: Proposed Solutions

After finding out the root causes, solutions or recommendations to each root cause are proposed. The detailed descriptions of each solution or each recommendation are stated too. Benefits and/or concerns and their feasibilities are also illustrated.

6.1 Checklist A

6.1.1 Description and Purpose

Checklist A is a list including all of the CSC service offerings and all the questions that are used to capture the cost components based on each item in the service offerings. It can be used for the Engagement Team to raise questions to the IBM Internal Customer in order to gather detailed customer requirements. It can be used to share with the EPI Team, the Procurement Team, and the Finance Team for the solution design or the cost estimation. It can also be used as a framework that the Engagement Team can follow to obtain more cost components in order to estimate the resource requirements more accurately.

In a word, Checklist A is a standardized way to describe the CSC service offerings, to obtain the customer requirements as many as possible, to share the information among all parties involved or supporting the pre-engagement process and to provide a framework for the Engagement Team to estimate the cost requirements.

6.1.2 Contents and Approach

Based on the purpose of the checklist, Checklist A should include several main parts.

- **CSC Service Offering**

The CSC service-offering document is to describe what services the CSC can provide to its customers. In this document, the CSC refers to the service categories as the “Service Products”. Each service product has different service types, which the CSC refers to as the “Service Components”. Each service component includes different steps or tasks that the CSC refers to as the “Service Features”.

The CSC can offer five service products. They are the Acquisition and Tracking; the Integration and Customization; the Customer On-Site Support; the Recovery and Disposal; and the Project Management & Support.

The format of Checklist A is an EXCEL workbook. Each of the five service products has one table in Checklist A. In each table, the first column is the “Service

Components” listing all service components under that certain service product. The second column is the “Service Features” describing all the service features under the relative service components.

- **Key questions or points which can capture cost components**

The three sources of the cost components described before are one from solutions in the CSC factory, one from solutions by the vendors, and one from the new technical support/process flow. To find out cost components based on the service offerings, questions or key points should come from experts in the factory level service, the field deployment service, the technical support and the process flow design. Therefore, the approach to gather questions and key points is to identify those experts and then to interview them.

Since the Delivery Team is responsible for the daily delivery especially for the CSC factory services, the Delivery Team is the expert to provide the information on the cost components in the factory services. Regarding the field deployment, though the CSC outsources the support to the vendors, the Delivery Team is still the expert in this aspect because they can be in charge of the whole CSC operations including the factory operations and the on-site services. It is just because of the current strategy that the CSC outsources the on-site support to third parties. The EPI Team is the team to provide the technical support and to design the solution process flow and thus they are experts in capturing cost components from the new technical requirements and the process flow requirements. Therefore, key persons from the Delivery Team, the EPI in the technical segment and the EPI in the process flow segment were interviewed to get all of the key questions and key points regarding the service offerings. All of them raised questions based on each service feature. Questions are combined together in the third column in each table in Checklist A. The fourth column is indicating where those questions come from, in other words, where the source is from. The rest columns are left for comments or answers from the Internal Customer.

Figure 15 shows one table of Checklist A.

Services		Key Points		
Service Components	Service Features	Questions	Source From	Comments
Warehousing and Stock Management	Receipt and warehousing of agreed components (e.g. hardware, software and consumables)	list of agreed parts HW: New or recycled? SW: License? IP issues, individual license or company license Who absorb inventory holding cost? How is inventory holding cost charged? First X parts free? Who receive? What is the volume? Do the parts need to be dismantled? This will add extra control point What System to be used or in place? Can the system meet customer request?	Operations (Eric) Operations (Eric) Operations (Eric) Operations (Eric) Operations (Eric) Operations (Eric) Operations (Eric) Operations (Eric) Operations (Eric) Process Flow (Christina) EPI (Paul) EPI (Paul)	
	Insurance while on IBM premises			
	Electronic stock level report(Excel format)	What is the frequency? Who provides the format? Can the current or future-system cater for this? What kinds of formats?	Operations (Eric) Operations (Eric) EPI (Paul) Others	
	Electronic asset tracking report including receiving and shipping details (Excel format)	Frequency? Who provides the formats? What kinds of formats? Are all the information available inside RIMS? Or manual extraction of info is required from other systems? Can the current or future-system cater for this?	Operations (Eric) Operations (Eric) Operations (Eric) Process Flow (Christina) Process Flow (Christina) EPI (Paul)	
	Update asset register/database	whose database? What is the frequency? When to update Who will be updating? Any special requirements in the format? Any information that is difficult to be obtained?	Operations (Eric) Operations (Eric) Operations (Eric) Process Flow (Christina) Process Flow (Christina) Process Flow (Christina)	

1. Acquisition and Tracking 2. Integration and Customization 3. Customer On-Site Support 4. Recovery and Disposal 5. Project Management

Figure 15 Checklist A Sample 1

- **Questions or concerns from all parties involved or supporting the pre-engagement process**

Since Checklist A can also be shared with the supporting teams – the EPI Team, the Finance Team, the Procurement Team – to improve the communication, Checklist A should also include some general questions from those teams for the Engagement Team to ask the right questions to the Internal Customer to gather the information that the supporting teams need and to reduce the communication loops within the CSC. Moreover, questions from the Engagement Team are also included in case the Engagement Team forgets to ask some questions when they communicate with the IBM Internal Customer.

The approach to gather questions is still first to identify the key players and then to interview them. The key persons in each supporting team were interviewed. Questions are consolidated into one table of Checklist A. In that table, the first column shows the key players, the second one are key points from each key player, the third one indicates where the questions are from (e.g. Who were interviewed?)

Which documents were referred?) , and the rest columns are left for comments and remarks (Figure 16).

Key Players	Key points	Source From	Comments	Remarks
Engagement Team	What is the volume What is the project timeline? Who is the contact person? What is the time requirement for proposal	Alex		
EPI Team	(From technical and system perspective) What is your requirement for system? Can we support? Or Outsource skillsets? What is the hardware specification? What is the requirements?(service support?) What is the hardware configuration? Hardware purpose-> requirement detailed provided? Or we propose the	Paul		
Procurement Team	What is scope of work for vendors? Questions related to select vendors are listed in vendor assessment checklist.	Conversations with Joanne RFQ,RFI,Scorecard		
Finance Team	number of head counts (eg. Technician, engineer, planners) What is the storage spaces (operation, warehouse) how many pallets? What is the volume, high level customer requirements? What is the transportation(1way/2way) Travelling (local or oversea?)			

Figure 16 Checklist A Sample 2

6.1.3 Benefits

Checklist A has several benefits.

Firstly, it can be used to gather customer requirements as many as possible, so that it can reduce the possibility of missing out some cost components. It can also help the vendors provide quotations that are more accurate. Therefore, it can finally reduce the gap between the cost estimated in the pre-engagement process and the cost incurred in the operation process.

Secondly, it can make the information entry into the CSC and the information sharing within the CSC more standardized. The Engagement Team can use this checklist to require the Internal Customer to choose the services they need. They can also provide this checklist with the request from the Internal Customer to the EPI Team and the Procurement Team.

Thirdly, it provides a framework for the Engagement Team to estimate the resource requirements. For each new business in the future, the Engagement Team can use this checklist to contact with the customer and to calculate the resource requirements based on each service feature in this checklist.

Fourthly, it can reduce the response time for the Engagement Team to propose the

solutions. It reduces the communication loops for the EPI Team, the Procurement Team to understand the customer requirements from the Engagement Team.

To sum up, it can tackle the root cause “No standardized way of getting the requirements/sharing the requirements/estimating the resource requirements” and make the pre-engagement process more organized and standardized.

6.1.4 Summary

Checklist A does not require any big investment and it is cheap since it is only an EXCEL workbook. It can be easily used. In the pre-engagement process in the future, the Engagement Team only needs to print out these sheets. Therefore, it can be regarded as a good and feasible solution to the CSC.

6.2 Checklist B

6.2.1 Description and Purpose

One of the root causes is that vendors are not qualified. Qualifying vendors is of much importance for the pre-engagement process and even in the future operation process. Checklist B is used to assess vendors for the field deployment. It includes all the criteria that can be used to evaluate the capabilities or the qualification of the vendors. It should be used before the pre-engagement process because in that process, under the time constraint, the CSC usually has no time to assess the vendors but only provides the scope of work to the vendor candidates in hand. In other words, Checklist B is used to prepare good vendor candidates for the pre-engagement process and the CSC field deployment services.

6.2.2 Contents and Approach

Contents of Checklist B are the criteria to assess vendors. The key issue to build up this checklist is to find out where those criteria come from. Three teams are involved in the vendor selection process. They are the Procurement Team that is an expert in outsourcing, the Engagement Team that is an expert in facing the client, analyzing the market situation and has good knowledge about the CSC past projects (People in the Engagement Team are also project managers), and the Delivery Team that is an expert in the Operations including the on-site services. Hence, the approach is to interview the key persons in those three teams to get valuable criteria.

Similar to Checklist A, Checklist B is also an EXCEL workbook. It includes six sheets. The first one is the guideline stating the purpose, the approach and some other information regarding Checklist B. The next three are the information got from those three teams. The fifth includes some general elaborations and suggestions for the vendor assessment. The sixth sheet is a reference table

including the reference information (Figure 17, 18). Some points have pink marks in front of them, which means that they are more important compared to the rest.

	Key Points	Comments	Remarks
	Service Capability What kinds of services do vendors provide? Can vendors provide services which CSC requires? 1 What is SLA of those services? What is their geographical coverage? Any maintenance and support infrastructure? What is their business operating time? Monday to Friday? Public Holiday? Weekends?		
	Resourcefulness Number of manpowers Manpower arrangement/workflow Any realtime system to monitor field engineers activities? Any planning system? Flowchart Backup System Key performance identifier on vendor workforce? Note: Not on individual worker but the whole workforce 2 Skillssets/Technical capabilities If vendors need to outsource, are they able to find capable parties? are they able to find reliable parties? are they able to reply within short leadtime? what is the price quotation of those parties? how do they control those parties? Notice period requirement. Eg. Question (if IILH requires xx team members to support for xx days of deployment, giving 10 working days of notice period, will you be able to deploy?)		
	Quotation from Procurement Team / from Engagement Team / from Delivery Team / Suggestions / Reference-Scorecard /		

Figure 17 Checklist B Sample 1

	Key Points	Comments	Remarks
	Two Key Problems What is vendors escalation path? any flow chart to prove? 1 What is the information flow from one single contact to the rest? CSC could test the rest to make sure vendors have a good/reliable information flow. Information could include service requirements, on-site procedure, training skillsets, and etc.		Resolving these two problems are the key to deal with vendor issue
	Next Steps after vendor assessment or selection Training CSC could train vendors on how to provide field deployment services. CSC may train leaders or all field engineers of vendors CSC may certify those engineers CSC will provide guidelines for field deployment 2 Audit CSC should audit the field deployment on spot. All details related to auditing (period, how to audit, what to audit) could be discussed further.		who to train depends on cost, etc
	"People" section from "from Engagement Team" tab in this checklist Be aware that 3 CSC actually does not have rights to control how vendors select their engineers		
	Issues related to engineers selection by CSC Risk If CSC finally decide which engineers from vendors to support field deployment, CSC may take the risk of being responsible for many on-site problems 4 Better way CSC could claim clearly R&R terms for unexpected problems in the contract with vendors CSC could develop a better strategy on outsourcing/vendor control		
	from Procurement Team / from Engagement Team / from Delivery Team / Suggestions / Reference-Scorecard /		

Figure 18 Checklist B Sample 2

6.2.3 Benefits

Checklist B can help the CSC to provide better vendor candidates for the pre-engagement process, more specifically, for providing the quotations. Better vendor candidates are probably more experienced, have more reputation, have more standardized business processes, better control on their facilities/labors, better understanding on the market situation and the information, etc. Thus more qualified vendor candidates may probably reduce the time for the CSC to propose solutions and to reduce the difference between the cost estimated and incurred as well. In a word, Checklist B can tackle the root cause “Vendors are not qualified”.

6.2.4 Summary

Similar to Checklist A, Checklist B does not require any big investment and it is cheap because it is only an EXCEL workbook. It can be easily used. So it is considered as a good and feasible solution to the CSC too.

6.3 Recommendations on Roles & Responsibilities (R/R) and the Process Flow

6.3.1 Description

This part of the solution is to tackle “one role missing/displaced” problem and, in addition, includes some recommendations to improve the pre-engagement process flow.

6.3.2 Recommendations on resolving “one role missing/displaced”

Currently, the Engagement Team is taking the role to capture the cost components from solutions operated in the CSC factory; however, since they are not experts in the factory operations, this role is displaced. The Delivery Team that is responsible for factory operations should take the role in the pre-engagement process. Nevertheless, the Delivery Team does not play the role and therefore, in other words, the role to capture those parts of cost components is missing.

There are a few recommendations to address this problem.

First, the EPI Team could take the role to capture the cost components from solutions in the factory operations. It is because the EPI is the link between the pre-engagement process and the operation process. They should understand issues in the CSC factory operations. Moreover, since they provide the technical support, they have the knowledge related to the technical issues. Most of the factory operations are also technical operations, such as image cloning. Therefore, the EPI Team has the capability to take that role.

Second, the key points from the Delivery Team in Checklist A can provide the Engagement Team with the Delivery Team's best knowledge on the factory operations. It has a big benefit that in the way that the Delivery Team does not need to be involved in the pre-engagement process, which avoids the possibly increased complexity in the process if the Delivery Team is involved.

Third, the Engagement Team can consult with the Delivery Team on estimating the resource requirements related to the factory operations. However, there is a big concern that if the Internal Customer requires the CSC to propose solutions in a very short time, then there may not be enough time for the Engagement Team to consult with the Delivery Team.

6.3.3 Recommendations on the Pre-engagement Process flow

There are some recommendations on the pre-engagement process flow (Figure 19).

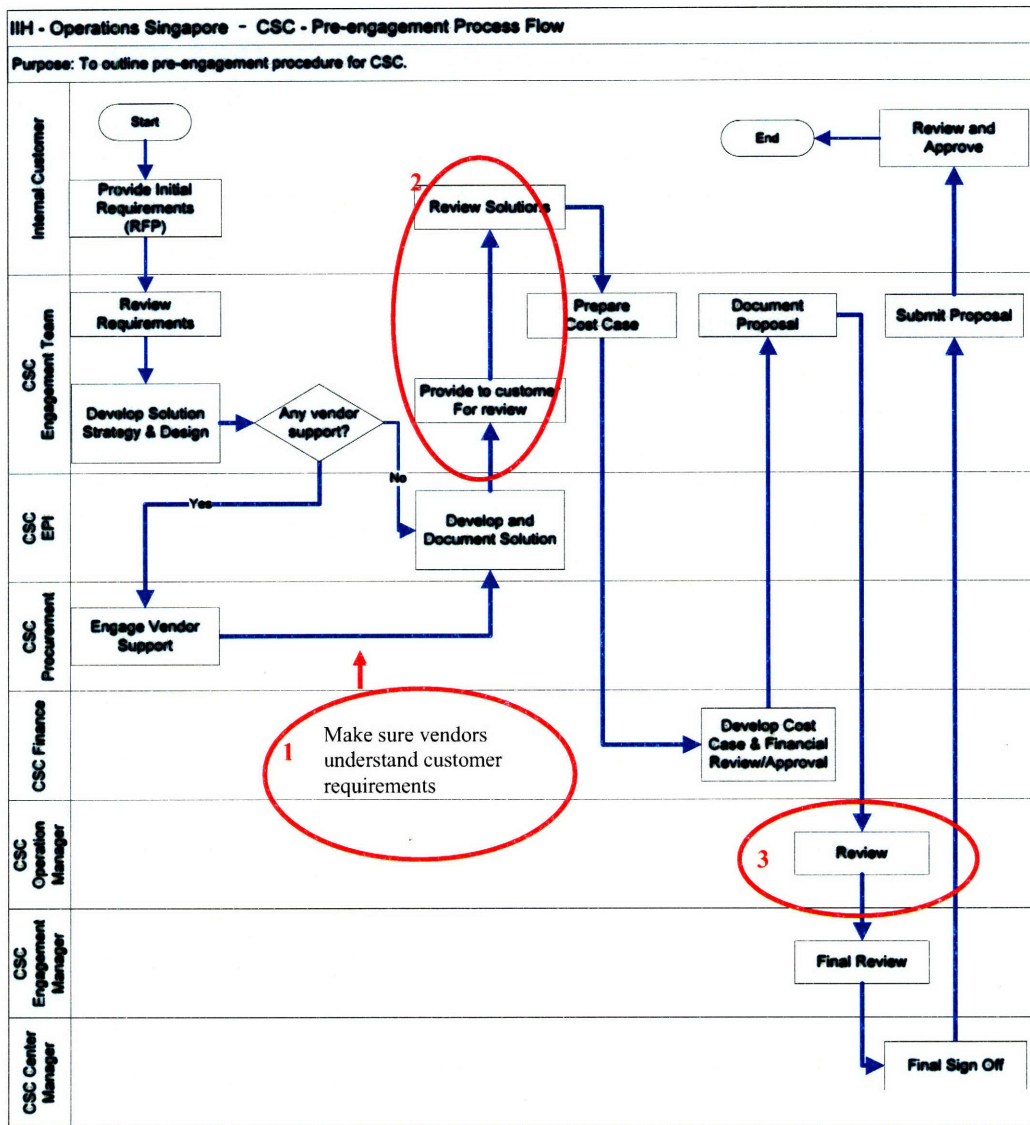


Figure 19 New Pre-engagement Process Flow

There are three steps added or changed in the pre-engagement process flow:

- Step 1: when the Procurement Team engages vendors, the Engagement Team can communicate with the vendors and make sure that vendors interpret the customer requirements properly.
 - Benefit: It can help vendors interpret the customer requirements more appropriately and thus improve the accuracy of the quotation.
 - Concerns: It increases communication loops because the Engagement

Team is required to communicate with vendors in the new design and thus it may increase the response time.

- A comprehensive Checklist A and preparing good vendor candidates using Checklist B could be the alternative ways. More detailed and clear customer requirements in Checklist A and good vendor capabilities can help vendors better understand their scope of work.
- Step 2: after the step “solution development and documentation” from the EPI Team, the Engagement Team can provide the solutions to the IBM Internal Customer for their initial review.
 - Benefit: It can make sure that the solutions the CSC designs will be able to meet the customer requirements in the early stage of the CSC pre-engagement process.
 - Concern: the CSC may not have the time for this step if the Internal Customer requests the solution proposal in two days, for instance.
- Step 3: it is already in the current process flow. Since in the CSC, the center manager (the decision point) and operation manager is the same person, the review of the operation manager and the review of the center manager are combined. However, in the new design, the review steps of the two managers are separated for the general use without considering whether people in the two positions are the same. The review step by the operation manager is very important because he/she is accountable for the solutions proposed can be executed under the resources requirements estimated.

Besides the above three steps, one more step may be changed too. (It is not marked in Figure 19). When there are new technical requirements from the Internal Customer, the EPI Team can be involved in the step “review requirements” with the Engagement Team because the EPI Team is an expert in the technical support. This flexibility will help the Engagement Team understand customer requirements better when there are some new technical support requirements.

6.3.4 Summary

Taking all the benefits and concerns into consideration, the best solutions to address the “one role missing/displaced” problem are Checklist A and at the same time, the EPI Team takes the missing role to capture the cost components from solutions in the factory operations, which is beneficial of avoiding the involvement of the Delivery Team in the pre-engagement process.

There may only be one concern related to the recommendations on the pre-engagement process flow that if the Internal Customer requires a short proposal turnaround time, then the CSC may not be able to take the actions in some steps

suggested above. In addition, in analyzing “add-on” step 1, Checklist A and Checklist B are alternative to that additional step. It also shows how powerful Checklist A and Checklist B are in improving the CSC pre-engagement process.

Therefore, generally speaking, this part of the solution is feasible but at the same time, the CSC should also consider the time constraints on proposing the solutions. Furthermore, Checklist A and Checklist B can replace some of the recommendations here.

6.4 Recommendations on the Information Decrease in the Global Supply Chain

6.4.1 Recommendations

One of the root causes is that the information is decreasing when we move up the supply chain from the end customer to the CSC. It may be because the Internal Customer hides some information on purpose to gain some benefits. The CSC may not be able to do much to avoid its happening.

It may also be because the Internal Customer forgets some requirements or does not know how to raise the right questions to get detailed customer requirements. To address this, there are three recommendations.

- The CSC can try to involve in the Internal Customer’s sales and engagement process. It will help the CSC to get more detailed and accurate customer requirements if the CSC can meet the end customer together with the IBM Internal Customer. It aligns with a concept “global collaboration” in the supply chain management.

However, this is not quite feasible because: 1) the Internal Customer may not allow the CSC to contact with the end customer directly. As mentioned already, the Internal Customer sometimes tries to hide some information (e.g. exact volume) from the CSC. If the CSC contacts with the end customer directly, then the Internal Customer will lose the advantage to control and hide certain information; and 2) from an external view, the Internal Customer and the CSC are both IBM. If both parties face with the end customer, the end customer may be confused that why so many “different IBM” contact with them. As a result, it may affect the public image of IBM.

- “Centralized Information System”
“Centralized Information System” is regarded as a concept of the information sharing. In the process of transferring the customer requirements from the end customer to the IBM Internal Customer, and then to the CSC, there should be the documents recording those information shared with the three parties. In solution proposing in the pre-engagement process, there should also be the

documents recording solutions shared with the three parties. The emphasis is “sharing documents”. The sharing documents are more reliable than people’s memories or conversations. The benefit is that the “sharing documents” make sure that the same information is shared among the three parties.

However, there are still some concerns that make this recommendation impractical. 1) There may not be the customer requirement documents. The end customer may not have the documents describing their needs. The IBM Internal Customer may not ask for the requirement documents because the Internal Customer still wants to win the deal even without the detailed requirements description. 2) The Internal Customer does not hope the CSC to contact with the end customer directly and thus the solution documents from the CSC can probably only be submitted to the IBM Internal Customer. In this case, the solution document from the CSC may not be the same as the one that the IBM Internal Customer shares with the end customer. Therefore, there may not be the real “sharing solution document” among the three parties.

- Checklist A can be used to stimulate the IBM Internal Customer to ask more questions to the end customer. Checklist A actually includes many questions that can capture the cost components for the CSC. When the Internal Customer forgets some requirements or forgets to get some information from the end customer, Checklist A can be a reminder in such a way that, the Engagement Team can use Checklist A to raise the questions to the Internal Customer to remind them to get sufficient and right information from the end customer. If the Internal Customer could not answer some of the questions in Checklist A, they could interact with the end customer for more information.

6.4.2 Summary

The first two recommendations are two important concepts – global collaboration and information sharing – in today’s supply chain management. The third recommendation – Checklist A – has been analyzed before.

To tackle the root cause “information is decreasing when we move up the supply chain”, Checklist A is the most feasible solution. The first two recommendations are not as feasible as Checklist A; however, the CSC could still make the effort to have a try because the collaboration and the information sharing can help improve the performance of the global supply chain to some degree.

6.5 New Service-offering Model

6.5.1 Description

One root cause stated before is that the CSC is running a “90% - 95%

customization” service-offering model. In the current model, they do not have a detailed service offering for the IBM Internal Customer to select services they need. This model results in a gap between the cost estimated and the cost incurred and increases the response time for proposing the solutions to the Internal Customer.

The core concept of the new service-offering model proposed here is “providing a baseline as a standard, and then capturing deviations from the baseline.” It includes:

- The CSC provides the standardized service offerings to the Internal Customer
- The customer chooses services they want from this offering document.
- Customer requirements beyond the service offerings are customized. (so-called “customization”).
- The CSC service offerings should be based on the Internal Customer service-offering document that is provided to the end customer by the IBM Brands/Services Team (the Internal Customer). The alignment will build up a common language between the CSC and the Internal Customer for describing services and thus to enhance mutual understanding.

6.5.2 Benefits and Concerns

There are several benefits.

Firstly, it can make the service providing process more standardized because it has the standard service offering as a baseline.

Secondly, since there is a standard service offering as the baseline, it is easier for the CSC to capture the deviations from this baseline and thus to minimize the gap between the cost estimated and executed.

Thirdly, it can also tackle the “response time problem” to a certain degree.

There are also two concerns related to this solution.

The first concern is that this solution may not work when the customer requirements deviate too much from the baseline (too many deviations mean “no baseline”). Since the core concept of the new model is to have a baseline to capture deviations from this baseline, and to minimize the gap between the cost estimated and executed, if there are too many deviations (“no baseline”), it does not make much difference between using the new model and using the current model. It can only provide the visibility of what will occur in the execution to help the managers to make the decision on whether the CSC should pursue the deal or not.

The second concern is that the implementation of new service-offering model may take some time and may not be easily to be operated because it needs a change on how people in the CSC perceive and understand the way that the CSC provides the services. Usually people in the CSC do not understand the concept of the service-offering model and they just do the routine jobs. Only the top or the senior management team has the knowledge on how the CSC runs its service delivery business. Therefore, it takes the time for those management teams to make its lower level management teams or even some people who are not in the management teams to understand what the current model is like, that there is a need for change, how the change is like and what they should do to implement the change. In a word, it probably takes a long time for the top or the senior management team to implement the new model in the whole CSC organizations.

6.5.3 Summary

The suggestion about the new service-offering model may be feasible because the standard service offerings and questions to capture the cost components have already been realized in Checklist A. However, considered the concerns regarding this new model, the business transformation from the current model to the new model may take a long time.

6.6 Continuous Improvement Process

Besides the solutions suggested above, the CSC can also have a routine process to examine the problems occurred in the pre-engagement process. The process should include recording the problems, discrepancies, then analyzing them, and finally proposing solutions to resolve the problems and to prevent them from happening again. Solutions and recommendations suggested before are part of the continuous improvement process.

Designing the continuous improvement process involves determining how the pre-engagement process is monitored, who will be responsible for recording the problems and discrepancies, who will be responsible for analyzing and then proposing solutions, how to implement the proposed solutions, how to evaluate the solutions proposed and their implementations, etc.

In the CSC, a cross functional team can be formed to be responsible for the continuous improvement process. The team should include members from the Delivery Team, the Engagement Team and/or the EPI Team. Team members should have the knowledge of understanding the CSC processes, and the CSC organizational structure.

The continuous improvement process is a very important solution because it is beneficial for the solution implementations, controlling the new processes and

monitoring the new changes in the CSC business in a long run. Furthermore, this solution can be researched more in the future.

6.7 Summary Table

To summarize all of the solutions proposed above, there are totally six solutions. Among them, Checklist A, Checklist B, and the continuous improvement process are feasible and powerful solutions. "R/R, process flow" is feasible but the CSC has to consider the time constraints sometimes and some of the recommendations can be replaced by Checklist A or Checklist B. The new service-offering model may be feasible but it may take a long time to implement. Among the "three recommendations" regarding the information decrease when moving up the supply chain, the first two are not quite feasible but the CSC still can try. The third one is still Checklist A (Table 5).

Problems	Root Causes	Solutions	Feasibility
Cost Difference Problem	1 No Standardized way of getting the requirements/sharing the requirements/estimating the resource requirements	Checklist A	Feasible
	2 Vendors are not qualified	Checklist B	Feasible
Response Time Problem	3 Roles/responsibilities	R/R, process flow	Feasible but have to consider time constraint
	4 Information is decreasing when we move up the supply chain	three recommendations	First two are not quite feasible but can try
	5 Current service-offering model	New service-offering model	May be feasible but transformation may take a long time
		Conitnuous Improvement Process	Feasible and important

Table 5 Root Causes - Solutions Summary Table

CHAPTER SEVEN: Conclusion

This thesis evaluates the current CSC pre-engagement process in the following aspects. It describes the background information including the description of the CSC processes, the process inputs and outputs and the engagement process; states the current two problems; and illustrates the CSC organizational structure. Furthermore, it explains the pre-engagement process flow including elaborations on the roles and responsibilities and the analysis of the time consumption in the processes. It also explains the cost case, the information flows from both the external view and the internal view and the vendor on-site support including the quotation and the response time analysis. Finally, it clarifies the CSC current service-offering model.

Then, the thesis analyzes the two problems – the “Cost Difference Problem” and the “Response Time Problem” – by leveraging over some principles from the Fishbone Diagram method and developing a methodology to figure out the root causes. After this analysis, five root causes are determined.

In the end, the thesis states the solutions proposed to resolve those root causes, analyzes the benefits and concerns, and evaluates the feasibility of each solution. And finally it comes to the conclusion that, among the six proposed solutions, Checklist A, Checklist B and the continuous improvement process are the most feasible and important solutions. Recommendations on the Roles and Responsibilities and the process flow are feasible but under the time constraint. The new CSC service-offering model may be feasible but it may take a long time to be implemented. Recommendations on the information decrease in the supply chain is not very feasible, however, the CSC still can try.

GLOSSARY

Brands/Services Team: A sales team that is considered as the IBM Internal Customer.

CSC: Customer Solution Center which provides hardware or software services to the customers.

DT: Delivery Team that delivers services to the customers.

DOU: Document of Understanding which is an internal contract between the CSC and the IBM Internal Customer.

EPI: Enablement, Process & Implementation Team that supports both the engagement process and the operation process.

ET: Engagement Team that is involved in the engagement process.

FT: Finance Team that estimates the unit cost in the pre-engagement process.

IIH: IBM International Holdings.

ISC: Integrated Supply Center.

PM: Project Manager.

PT: Procurement Team.

R/R: Roles and Responsibilities