A Megaproject that Defines the Nation: The Building of the Largest Airport Terminal in Asia

Teaching Case

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Abstract

This teaching case presents the journey undertaken by the Beijing Capital International Airport (BCIA) Company Limited in the building of the 3.5 billion dollars Terminal 3 for the 2008 Olympics games. The Beijing Terminal 3 is crowned as the largest airport terminal in Asia and can be rightfully classified as a megaproject. A comparison between the Beijing Terminal 3 and the London Heathrow's Terminal 5 megaprojects is made to offer students a good idea of the scale and the complexity of this megaproject. The teaching case focuses primarily to detail the journey of building the Terminal 3 from the perspective of the IT department in BCIA.

The IT department is given the following mandates by the Chinese Government: (1) to complete all the IT system projects in Terminal 3 within a time frame of around two years; and (2) to make sure ‘zero incidents, zero accidents and zero complaints’ objective during the period of 2008 Olympics and Special Olympics. By closing examination four critical systems in the Terminal 3 megaproject, this teaching case presents a rich description of how the IT department manages to meet these mandates despite facing many challenges during implementation. Recommendations to instructor on how to make use of this teaching case are also provided in the teaching notes section.

Keywords: Case study/studies, Megaproject, IS project management, Knowledge management, Change management, ISD agility
Introduction

On the 8th of August 2008, the world turned their eyes onto China. It was the year when China hosted its first Olympics games. As part of China’s massive construction projects to meet the requirements as the host of the games, the largest airport terminal in Asia was conceived (i.e. Beijing Terminal 3). This new airport terminal was designed to meet two objectives: (1) to cope with the demand of the rapid increase of air traffic to and from Beijing; (2) to serve as the country’s gateway to welcome all Olympics participants and visitors during the games.

“Beijing capital international airport is China’s first gate to the world. During the period of the Olympics, it takes on the responsibility and honor of being the first customer contact point for athletes and VIPs from all over the world ... the impression that the airport leaves on the visitors represents the hospitality and congeniality of the country ...” Mr. Hu Jintao, Chinese President (Translated from the book “The 52nd Gold Medal”)

The building cost of the Terminal 3 project is USD3.5 billion and it took 3 years and 9 months to complete (from design to build) (Jen 2008). In addition, thousands of people living in the areas were relocated during the construction process. The project was highly regarded by the Chinese government as a critical touch point that had left a lasting nation-level impression in the minds of all the people who had visited Beijing for the Olympics games. Because of all these reasons, the BCIA Terminal 3 project can be considered as a megaproject. A megaproject is defined as a project which costs more than USD$1 billion and receives a lot of public attention because of its substantial impact on communities, environment, and budgets (Davles et al. 2009).

The Terminal 3 megaproject was tendered for and awarded to a London-based Architecture Firm ‘Foster and Partners’ in Dec 2003 (Sam 2003). When construction was completed in 2008, it was deemed as one of “the world’s largest and most advanced airport building, not only technologically, but also in terms of passenger experience, operational efficiency, and sustainability” (FosterAndPartners 2011).

“The deadline (of completing the Terminal 3 megaproject) was paramount from the beginning” Mouzhan Majidi, Foester and Partner’s Chief Executive

To understand the scale and the complexity of the Terminal 3 megaproject, we made reference to a similar airport terminal extension megaproject: London Heathrow’s Terminal 5 construction. Table 1 shows the comparison between the Beijing Terminal 3 and London Heathrow’s Terminal 5 megaprojects.

| Table 1. Comparison between Beijing Terminal 3 and London Heathrow’s Terminal 5 megaprojects |
|-----------------------------------------------|-----------------------------------------------|
| Time period | Beijing Terminal 3                                                                 |
| Cost (in USD) | 3.5 billion                                                                 |
| Schedule (from construction to completion) | March 2004 till March 2008. Total time spent: around 4 years |
| Resource | At its peak of construction, 50,000 people buzzed onsite. Six large-scale testing of systems involving 60,000 participants |
| Total floor area | 986,000 square meters |
| Bad incidents during opening | None |
| Time period | London Heathrow’s Terminal 5                                                                 |
| Cost (in USD) | 4.3 billion                                                                 |
| Schedule (from construction to completion) | Sept 2002 till March 2008. Total time spent: around 5.5 years |
| Resource | At its peak of construction, 8,000 people buzzed onsite. Four large-scale testing of systems involving 15,000 participants |
| Total floor area | 353,020 square meters |
| Bad incidents during opening | First two weeks were disrupted by problems with the terminal’s IT systems, coupled with insufficient testing and staff training, which caused over 500 flights to be cancelled |
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| Outcomes                                      | Achieved its goal of ‘zero incidents, zero accidents and zero complaints’ during the entire period of 2008 Olympics Games | Failed to meet its intended goals and endured the longest public inquiry of its failure in British history |

The table provides an apple-to-apple comparison of similar airport terminal extension megaprojects. It especially highlights the greater degree of complexity and challenges of the Beijing Terminal 3 megaproject. For example, it is noted that the Beijing Terminal 3 megaproject needed management and coordination of an additional 42,000 people at its peak during construction, an additional 45,000 participants during each large scale system testing and an addition of 2 iterations (6 versus 4) of full large-scale system testing in contrast with the London Heathrow’s Terminal 5 megaproject. In addition, the Beijing Terminal 3 megaproject was given a mandate by the Chinese Government to ensure the fulfillment of the objective in achieving ‘zero incidents, zero accidents and zero complaints’ throughout the Olympics games. This means that unlike the London Heathrow’s Terminal 5 megaproject, the Beijing Terminal 3 megaproject had almost no room for any failure because the consequence of any failure would be disastrous not only to the Beijing Capital International Airport (BCIA) Company Limited but also to the reputation of the nation. Internally, the Terminal 3 megaproject also represented the most extensive, complex, and difficult project ever undertaken by the BCIA Company Limited. The entire Terminal 3 implementation, consisting of many mission-critical IT systems, had to be ready within an ambitious deadline of about 2 years once the physical constructions of the terminal was completed around 2006.

Envisioned to become the world’s most technologically advanced airport terminal, many of these IT implementations are state-of-the-art systems (e.g. the 240 million dollars luggage-transfer system and the mandatory highest level airport security system implementation in the whole of China) that are complicated, highly risky in nature, and require close coordination among multiple stakeholders in order to succeed. Yet against all these odds, the megaproject was completed on schedule and achieved its ‘zero incidents, zero accidents and zero complaints’ objective during the Olympics games. What has the Beijing Capital International Airport team done differently from the London Heathrow Terminal 5 team, which had allowed them to yield such dramatic differences in outcome?

This case study presents the story of the Terminal 3 implementation from the perspective of the Beijing Capital International Airport (BCIA) IT department. We detailed the way the BCIA’s IT department had prepared itself for this megaproject. In addition, we identified four critical IT projects and traced the way the IT department and its staff tackled each challenge faced in the IT project. In so doing, the case study provides a good way to help students understand and appreciate the role of IT in contributing to the success of a megaproject.

Organization Background

The Beijing Capital International Airport (BCIA) Company Limited is a state-owned enterprise that manages the main airport of Beijing, China. Under its charge, BCIA manages the Beijing Capital International Airport that consists of three airport terminals namely Terminal 1, 2 and 3. As the capital airport of the nation, BCIA is constantly under intense pressure to cope with the growth of air traffic to and from Beijing. This intense pressure has mandated the BCIA to constantly upgrade its Terminals’ facilities.

In 1990, Terminal 1 was built and it occupies a floor space of around 90,000 square meters. Within a period of less than 10 years, BCIA had built Terminal 2. Terminal 2 has a total floor space of 336,000 square meters (around 3.7 times larger than Terminal 1) and went live in operation in 2000. Terminal 2 was specially constructed to provide the much-needed ‘breathing’ space for Terminal 1’s facilities to be refurbished. The refurbishment of Terminal 1 took four years to complete. In 2004, when the refurbishment project for Terminal 1 was at the final stage of the handover from vendors, the Terminal 3 project was initiated. The colossal Terminal 3 was specially designed and constructed for the 2008 Olympics games and has a floor area of 986,000 square meters. Its floor space is more than twice the size of Terminal 1 and 2 combined. The scale and the complexity of IT system implementations for Terminal 3’s project were also unprecedented in BCIA’s history. A myriad of IT systems were implemented and put into operations within a short span of 2 years starting from around 2006. Many of these IT systems are state of the art systems that have never been implemented and/or maintained before in the history of the
company (e.g. Airport Security System). When the Terminal 3 construction was finally completed in 2008, the IT systems managed by the BCIA IT department had increased by 100%. As a result of this increase, the current IT infrastructure now includes 70,000+ information points, 5,000+ terminals, 2000+ network equipment and 100+ IT systems. Figure 1 shows the actual size comparison between Terminal 1, 2, and 3 captured in Google Maps.

The constant building and refurbishment exercises meant that the company was constantly undergoing radical organization changes especially in the area of airport operations. This was especially evident since the late 90s when IT was first introduced into the day-to-day management and operations of BCIA's terminals. Figure 2 shows the expansion history of Beijing Capital International Airport Terminals.

**BCIA’s IT Department**

Before 1998, the usage of IT in BCIA was mainly restricted to office automation projects. As time progressed, the role of IT had changed incrementally towards a more strategic one. In 1999, in recognition of its strategic role, an IT department was formed which reported directly to the General Manager (equivalent to a company CEO). The first strategic role that the newly formed IT department took on was the development and management of Terminal 2 IT systems. This brought about the informatization of the entire Terminal's operations in BCIA that helped to drive improved productivity and quality of work. The second strategic role was assigned in 2000 where the IT department was being tasked to make sure that the millennia bug would not affect the highly centralized BCIA’s terminal operations. The failure of the Terminal’s operations due to this bug might have resulted in the loss of lives and would be detrimental
to the company’s reputation. Despite the lack of experience, the IT department successfully overcame the millennia bug. Figure 3 shows the current organization structure of BCIA.

![Figure 3. Organization Structure of BCIA (Adopted from (BCIA 2011a))](image)

As a result of these increased responsibilities of the IT department, the department experienced rapid growth of its manpower resources. Many new staff members were recruited from university. The growth also compelled the management of the IT department to invest heavily on knowledge management processes.

“To the Airport, IT has evolved from the supporting role to become one of the most important business development drivers ... I cannot imagine what the airport businesses would be like today without IT. As businesses increasingly depend upon IT, the pressures of properly up-keeping our IT systems are intense. How to ensure the efficiency and security of the IT systems? How to ensure that there is zero business breakdowns? These (questions) have always been the driving forces behind our passion for continuous research and improvement” – Deputy Manager, IT Management Department

As a result of this relentless pursuit for operational excellence and rigorous knowledge management by the IT department, a series of important achievements were accomplished during the early 2000s. Some of these key achievements include:

- The development of a comprehensive Airport Terminal’s IT systems operational and maintenance manual in 2000;
- The development of an integrated system experimental lab that can simulate various forms of operation malfunction scenarios to train newly joined IT staff. The same lab was also used for large scale systems testing in 2003; and
- The completion of enterprise-wide network connectivity and the full-scale push for office automation across all departments through web technologies in 2003.

The constant interactions with business units to ensure smooth terminal operations in addition to the fulfillment of these achievements have helped the IT department develop strong trust relationships with the business departments. It has also helped to lay the foundations for the subsequent Terminal 3 IT systems implementation. Figure 4 shows the current role of the IT department.
BCIA’s IT Department Challenges

When the news of the construction of Terminal 3 was announced, there was a directive from the Chinese Government to the Beijing Capital International Airport (BCIA) Company Limited to assure the fulfillment of the ‘zero incidents, zero accidents and zero complaints’ objective during the entire period of the 2008 Olympics. Not surprisingly, the responsibility to achieve this tall order issued by the Chinese Government had fallen upon the IT department.

This was a huge challenge for the IT department to accomplish. In 2004, when the construction work of Terminal 3 was starting, Terminal 1’s refurbishment project had just been completed, and the IT department was busy taking over from various outsourced vendors in the new Terminal 1. In addition, the centralized IT systems that were running the day-to-day airport operations in Terminal 2 were due for technological refresh of their hardware. All these activities were over and above the existing role of ensuring the day-to-day management of terminal operations and IT personnel in Terminal 1 and 2. With only around 100+ IT staff in the department, the IT department was constrained by its resources to cope with this massive increase in its work scope.

“By 2007, when the Terminal 3 project is in its most intense development phase, our IT department needs to draw out a significantly large number of experts to participate in it and to ensure the smooth handover (of Terminal 3’s IT projects) from vendors. How to ensure the normal execution of the operations in Terminal 1 and 2 and the smooth handover of Terminal 3 projects are big problems to us. While we have increased our manpower (through aggressive hiring), the gap in resources is huge. In addition, newly hired staff need time to get familiar with our environment and technology.” – Deputy Manager, IT Management Department

Mitigating BCIA’s IT Department Challenges

To overcome these challenges, the IT department made two moves to prepare itself for the Terminal 3 megaproject. First, the IT department’s operational maintenance strategy was modified and second, the department was restructured.

“After carefully reviewing our situation, we revamped our operational maintenance strategy. We broke down the system maintenance work into two parts. The first was targeted at infrastructure endpoints, communication equipment, and network cable maintenance. This work doesn’t require high technological knowledge and hence we outsourced most of it ... The second is the maintenance of the main and web core systems. We adopted a centralized
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infill model (filled with fewer experienced IT staff) and supplemented it with consultants and service outsourcing (hired experts externally for consultancy). Together with the aggressive recruitment of staff, these measures allowed us to free up our valuable resources and successfully complete the Terminal 3 IT systems implementations ... and meet the requirement of the zero incidents objective.” – Deputy Manager, IT Management Department

In summary, the following outsourcing strategies were implemented: (1) A complete outsourcing of ‘low knowledge intensive’ system maintenance work which freed up valuable resources; and (2) An ‘expertise’ outsourcing strategy implemented to supplement the fewer experienced IT staff left behind to perform maintenance of main and web core systems. The careful and appropriate deployment of valuable resources within the IT department and the adoption of sound outsourcing strategies allowed the IT department to free up its IT elites to lead and manage the vendors (overseas and local) involved in the Terminal 3 megaproject. The seasoned IT elites, who had gone through many iterations of the radical and rapid organizational changes (from Terminal 1 to Terminal 2 construction and back to Terminal 1 refurbishment), played a pivotal role in the success of the megaproject.

To understand how these IT elites and the outsourced vendors (overseas and local) managed to contribute to the success of the megaproject, this case study dives into the details of four critical system implementations. These four systems were featured in this paper because of their sheer size of implementation, their complexity in dealing with large groups of internal and external stakeholders, their criticality towards the success of the megaproject, and their need to integrate with many systems (internal and external of BCIA). All four systems were implemented by a team consisting of the IT elites of BCIA and outsourced vendors (overseas and local). A brief overview of each of these systems is presented in Table 2.

<table>
<thead>
<tr>
<th>System Name</th>
<th>Brief System Background</th>
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| Airport Operation Database (AODB) | The ‘core hub’ that allows information captured within other systems (internal and external of the airport) to be seamlessly stored, analyzed, and shared to ensure the smooth running of all aspects of its operations (a.k.a the ‘heart’ of the airport operations).

The system requires close interaction with various internal and external stakeholders responsible for the various systems that AODB needs to integrate into. One of the most important external stakeholders is the Airport Transport Authority that holds all the critical flight and weather data needed for safe and smooth terminal operations. |
| Airport Departure | The system that manages the entire process of checking in and boarding the passengers and their luggage. This system must be integrated with all the airlines’ departure systems in Terminal 3 and therefore requires close interaction with various airlines’ staff to ensure it can integrate seamlessly to their systems. |
| Airport Security | The system that handles all forms of security-related processing within Terminal 3. The security system of the airport can be classified into five levels of security checks (see Airport-int 2009).

Due to the huge number of country leaders and foreign visitors involved during the Olympics Games in 2008 and the “zero incidents, zero accidents and zero complaints” mandated by the Chinese Government, the highest level of security 5 was advocated in Terminal 3. This is unprecedented in the history of BCIA. To achieve this level of security, close cooperation and collaboration among various stakeholders (such as custom officers, ground crew, airlines, and etc.) were critical during system implementation. |
| Airport Data Centre | The system that captures all the terminal operations information for the purpose of analysis to aid the process of decision making especially in the process of operational excellence. It is also intended for this system to |
subsume some existing functionalities in two existing systems in BCIA namely: (1) the Terminal Operation Database System; and (2) the Enterprise Resource Planning (ERP) System. The system also facilitates the billing for services rendered in Terminal 3 by the BCIA’s customers (e.g. airlines, airport shops, etc.).

As a result, this system needs to integrate with all the systems of BCIA’s customers to extract accurate and error free service utility data and to interact with various system owners of the Terminal Operation Database System and the ERP system.

Airport Operation Database (AODB) System

As the ‘heart’ of all airport terminal operations, the AODB system was critical to all airport operations in Beijing Capital International Airport’s Terminals 1, 2 and 3. It was the platform on which the entire airport terminals’ data was integrated into one and seamlessly exchanged across all mission critical systems within BCIA and its partners’ systems. The current AODB system had evolved significantly from its initial design since its inception in 1996. The first custom-built AODB system was installed in Terminal 2 in 1999. It was a joint development effort between BCIA’s IT department and Motorola. When Terminal 1 was refurbished, this custom-built AODB system was integrated into Terminal 1’s terminal operations allowing one AODB system to manage two terminal operations at the same time.

The AODB system draws significant amount of its critical operational data from the Airport Traffic Control (ATC) System that is managed by the Air Traffic Control Authority in Beijing. The ATC system is a critical system that feeds important flight and weather information to the AODB system that in turns makes this information available to other systems connected to it. It is obvious that information stored and shared within the AODB system has to be of its highest accuracy for safety and operational excellence reasons.

Given its complexity and integrative nature of the system, the IT department faced significant challenges in learning the right way to maintain and use it. Constant experimentation of the system is a way of life for all AODB administrators. Over an extended period of experimentations, the IT department developed its own set of standard operating procedures in 2002 that laid the foundation for the future administration and maintenance of AODB in all its airport terminals.

“What from 2000 to 2002, we came up with a maintenance standard operation procedure handbook. Till today, our maintenance strategy is dependent on this handbook.” –Deputy Manager, IT Management Department

System Implementation Challenges

The implementation of a new AODB system in Terminal 3 started in 2006 and was delivered by the outsourced vendor in early 2008. Several key challenges were presented during the project implementation and they were listed as follows: (1) The new AODB to be installed in Terminal 3 was an off-the-shelf system that differed significantly from the custom built AODB system for Terminal 1 and 2; and (2) The information systems in the Airport Transport Control (ATC), which AODB drew its information from, were also undergoing a major upgrade. This led to many uncertainties on how the two systems should interface to exchange data.

Mitigating the System Implementation Challenges

Because of the constant investment in instilling strong knowledge management practices in BCIA, valuable AODB operational knowledge was captured via standard operating and maintenance manuals. In addition, the IT department had always believed in nurturing a strong culture of learning and sharing that facilitated the exchange of knowledge across generations of AODB administrators (currently at its fourth generation). These knowledge management practices and culture of learning and sharing played a pivotal role in helping the IT department to mitigate the risk inherent in the Terminal 3’s AODB system implementation.
“... our IT department had a very strong learning culture ... In 2000, I took the lead with a few other colleagues to look into system backup and business continuity in-depth study (for the AODB) ... during that time, we didn’t leverage upon outside help and we did all the research on our own ... we invented many system maintenance strategies.” –Deputy Manager, IT Management Department

As a result of this strong learning and sharing environment, behaviors by employees, such as selfless sharing of valuable knowledge and proactive problem solving with ‘no-blame’ culture, were highly evident in the day-to-day work of the IT department. The selfless sharing of knowledge was best exemplified through the informal mentor-apprentice relationships in the IT department, whereby the past AODB administrators served as mentors to the new AODB administrators.

“We have an unofficial master-apprenticeship mechanism and a backup mechanism ... if the apprentice is good at work, the master will have the opportunity to do other things and can also be promoted. This serves as a big motivation for the master (to coach the apprentice).” –Chief Engineer (1st Generation AODB Administrator), IT Management Department

Leaders of the IT department had placed great trust in the hands of the highly experienced AODB administrators to drive the Terminal 3 project. The outsourced vendor for the Terminal 3 AODB system was also a trusted partner by the leaders of the IT department since they had worked closely during the AODB implementation for Terminal 1 and 2.

“Because of our in-depth knowledge of T2’s (Terminal 2) business operation, we can easily make a comparison between T2 and T3 (Terminal 3) and highlight the weaknesses and strengths of T2’s system (AODB system), then we can use this knowledge to inform the vendors to improve their system by absorbing T2’s strengths and eliminating its weaknesses. In this way, our T3 design (of AODB) can be more aligned with our most ideal maintenance process which was not possible in the past (in T2 AODB).” –Business Process Lead, AODB System Project

Because of this high level of trust between the Beijing Capital International Airport (BCIA)’s management, AODB administrators, and overseas and local vendors, the challenges posed by the Terminal 3’s AODB system implementation were systematically overcome. For example, the uncertainties brought forth by the system upgrade of the Airport Traffic Control (ATC) system were overcome because the IT department was able to accurately preempt all the possible changes that could be made to the ATC system. This could not be easily achieved if knowledge of AODB was not actively managed. In addition, by leveraging upon the trusted working relationships among the BCIA’s management, AODB Administrators, and overseas and local vendors, the IT department was able to come up with an innovative solution that could flexibly adapt to all the preempted changes to the ATC System. When the changes in the ATC System finally got implemented and the Terminal’s AODB had to be extensively modified, this anticipated roadblock was quickly mitigated by this solution. This kept the project on schedule.

Airport Departure System

The Airport Departure System was more of a platform than a system. Its main functionality was to allow all the airlines’ departure systems to link up to it, in order to support the process of checking in passengers and their luggage, and facilitating the passengers’ boarding process. The system requirements were not complex since the business process of checking in and boarding passengers had remained simple across the air transportation industry for many decades. However, because airlines were the main customers of the Beijing Capital International Airport (BCIA)’s terminals, managing the airlines’ expectations and making the process of linking BCIA’s systems with airlines’ departure systems as seamless as possible were important considerations for BCIA.

System Implementation Challenges

The development work of the airport departure system with a renowned overseas outsourced vendor started in 2006 and was completed in early 2008. Given the large number of airlines using Terminal 3, the IT department’s key challenge was how to keep these airlines satisfied. This was not easily achievable.
On one hand, due to the tight schedule, BCIA had wanted to keep the customization of the Airport Departure System to the minimum. On the other hand, it was inevitable that the airlines will request for various different customizations to meet their organization’s needs.

To make matters worse, the trust level between the IT department and the outsourced vendor was low. As a vendor that served many customers, BCIA was just another account to them. Even though the vendor had more than 50 years of implementing Airport Departure systems around the globe, their proprietary software was maintained overseas. As a result, the speed of implementation and the quality of the customization work could not be easily controlled. Furthermore, the final customized solution was going to be installed, configured, and tested by local members, who were less experienced. Given the large number of airline departure systems that the project was required to integrate, these factors posed significant risks of schedule slips.

“They (the vendor) guard their technical knowledge strictly … and because their technology is proprietary and not open-source … we honestly feel that this is not a healthy development into our future relationship” – Technical Lead, Departure System Project

**Mitigating the System Implementation Challenges**

To achieve the balance of keeping all airlines satisfied and to keep customization of the system at bay, the IT department appointed one of its subject domain experts in the Airport Departure System as the technical lead for this project. The expert had over 9 years of experience in the Airport Departure System and was involved heavily during the development and maintenance of Terminal 1 and 2’s departure systems. Working closely with the airlines’ management, the IT department also managed to convince them to send their subject domain experts in their respective airlines departure systems to form the project steering committee. Because the subject domain experts from the airlines and the IT department knew and respected each other, the alignment of shared goals to serve passengers between the airlines and IT staff was quickly established early in the project. Leveraging upon this shared goal, the IT department was able to keep the customization of the system under control. Customization of the system was only approved by the project steering committee if it was directed towards the common goal of enhancing the experience of passengers. As a result of these measures, the IT department was able to draft accurate and detailed business requirements and to keep these requirements relatively unchanged throughout the process of implementing the system.

“If you have a chance to read the requirements submitted (for the departure system) by each airline, you will be surprised to realize how deep into the future they have predicted for the airline industry to go into development and the needs of their passengers … Because our customers are airlines, the requirements gathered from them are all very accurate in predicting the eventual use” – Technical Lead, Departure System Project

To mitigate the lack of trust of the outsourced vendor and to ensure that the local members of the vendor could work efficiently and effectively, a series of training sessions were conducted by the IT department. These training sessions were designed to impart important information pertaining to Beijing Capital International Airport (BCIA)’s culture, practices, work attitudes and standards to the local vendor before implementation commenced. This was to ensure that the local members of the vendor got a clear interpretation of the tender’s expectation and was able to assimilate seamlessly into the BCIA’s culture and working norms.

“We provide training to their (the vendor’s) project management team to impart knowledge about our company’s management philosophy, procedure and specific things to take note of when it comes to system requirements. The objective is to ensure that they can reach up to the same standards as our internal IT staff and to align their way of thinking with ours.” – Technical Lead, Departure System Project

A rigorous and detailed ‘Backward Planning’ (interpreted as setting hard deadlines for the project and planning backward to set milestones) methodology was adopted to communicate expected deliverables and their deadlines to the vendor. A weekly meeting was held to track the development progress of the vendor. The technical lead of the project even went to the extent of detailing a daily schedule of work activities for the local members of the vendor. Some members of the IT department staff were specially
assigned to be stationed beside the local members of the vendor to ensure conformance of the daily schedule and to ensure the quality of the tasks completed.

Leveraging upon the developed shared goal of the project steering committee and the tight control over the works of its vendor, the IT department was able to accurately pin down all the system requirements very early in the project and ensure that these requirements were meticulously implemented by vendors. This kept the project on schedule.

Airport Security System

The tender for this system was awarded in October 2005 and the system went live in March 2008. As one of the most critical systems that was directly linked to the ‘zero incidents, zero accidents and zero complaints’ objective, the airport security system was of utmost importance to the entire Terminal 3 megaproject. The system was designed to handle all forms of security-related processing within Terminal 3. Because of the nature of the system, it had to integrate with many business processes and systems. For example, several of the systems that it had to integrate with were the 240 million dollars luggage-transfer system, the security camera monitoring system, and customs processing system. Given the large number of people anticipated to attend the Olympics, the entire security processing was required to be tight and yet highly automated. Table 3 shows the industry standard five level screening processes that were mandated for the airport security system project in Terminal 3.

<table>
<thead>
<tr>
<th>Level</th>
<th>Requirements</th>
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<tbody>
<tr>
<td>1</td>
<td>Automated evaluation of the x-ray image by the x-ray machine</td>
</tr>
<tr>
<td>2</td>
<td>Operator analysis of the level 1 image at workstation(s) by customs personnel, carried out whilst the bag continues in transit</td>
</tr>
<tr>
<td>3</td>
<td>A more in-depth analysis of the original level 1 image at separate workstation(s) or subjecting the bag to a separate x-ray process using a different x-ray technology. For example, Computer Tomography (CT Scanner)</td>
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<tr>
<td>4</td>
<td>Reuniting the passenger and bag and carrying out a manual search</td>
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<tr>
<td>5</td>
<td>In the event that the passenger cannot be found, then the bag is considered as a bomb threat and dealt with accordingly</td>
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System Implementation Challenges

The requirement to achieve maximum security at level 5 comprehensively, posed significant risk to the system implementation process mainly because of the complexity and the large number of resources needed to accomplish it. Many of the requirements mandated by security level 5 can only be effectively enforced through automation. For example, in order to achieve the industry standard of level 4 security, a large number of security cameras with face recognition capability had to be installed across the colossal floor space of Terminal 3 to automatically trace all passengers’ movement. Once a bag was detected to contain a suspicious item, the airport security system must be able to readily trigger an alarm to the security personnel which will in turn use the system to trace the location of the passenger in the terminal. The security ground crew can then be promptly activated through the system to unite the bag with its owner for further searching. This may sound simple in theory but it requires the incorporation of complex system logic and tight coordination with the airport security team and customs department of China to accomplish. At level 5, the bomb squad and emergency personnel will also have to be activated automatically and a comprehensive emergence evacuation procedure triggered and coordinated through the system. While security systems within Terminal 1 and 2 exist, none of them are as complex and as large scale as Terminal 3’s airport security system. The level of close cooperation and collaboration with the customs department of China and ground security personnel deployed in Terminal 3 was unprecedented. Under such circumstances, there was a huge gap of knowledge and experience in the IT department’s staff to ensure the success of this project.
Mitigating the System Implementation Challenges

To mitigate the lack of knowledge, the IT department spent a significant amount of their time before October 2005 visiting many vendors around the world to acquire their knowledge for the implementation of the security system.

“As far as security is concerned, this system is the first of its kind in China ... In April 2005 before the beginning of the tender, we did a number of visits and researched on a number of airports ... we involved the design unit in T2 (Terminal 2) to consolidate our findings into the tender specification for the security system in T3 (Terminal 3).” – Project Manager, Security System Project

A lack of experience mandated a more cautious and consecutive approach towards system implementation to be adopted. As a consequence, a low trust environment was highly evident during system implementation. For instance, an independent and separate audit team was formed to inspect all the project deliverables to ensure high quality of the deliverables. Without the quality approval of the audit team, the subsequent implementation of the system would not be able to proceed. In addition, payments to the vendors were done in a ‘milestone’ style, i.e. they only got paid when the audit team certified that they had met all the requirements of that milestone. Some key staff of the IT department and vendors were mandated to stay onsite during the entire system development period. The project was expected to run 24 x 7 where necessary. Frequent site inspection and weekly meetings by leaders across all levels (including country leaders) were conducted to instill the sense of urgency and importance to get things done right the first time.

When the project implementation commenced, the IT department developed several practices which promoted risk taking and self-learning to resolve unforeseeable situations that may occur during project implementation. For example, a scheme on ‘joint responsibility deposit’ was derived. In this scheme, vendors and staff were asked to make a proposal on how to resolve an unforeseen problem that occurred during project implementation. To ensure that nothing ‘foolish’, which may jeopardize the project, was proposed, vendors/staffs were asked to ‘put their money where their proposals are’ under a ‘joint-responsibility deposit’ scheme. If a vendor or staff made a proposal and was able to resolve the problem effectively and in a timely fashion, he or she will have this deposit returned to him or her with additional monetary rewards. However, if his or her proposal failed, he or she will risk losing some or all of his or her deposit.

“Our company adopts an outcome driven control, that is to say if you achieve your target, you will be given monetary reward, if you don’t, money is deducted... once we established the target, everyone will come up with the ‘responsibility’ deposit, if you don’t hit it (target) we deduct money from the deposit. You complete it, we give you the reward.” – Project Manager, Security System Project

To demonstrate the commitment and will to successfully complete this project on time, the leaders in the IT department led by example. Progress meetings were held on Saturdays and site inspections were often conducted at night. Often, leaders worked longer hours than their subordinates. Despite the immense hardship during system implementation, the involved vendors and staff were not discouraged. Many felt proud and privileged to be associated with the ‘novelty’ of the level 5 security system in the world. As the system slowly took shape, they relished in their national pride of having proven to achieve something seemingly impossible, at all costs no less, through the collective determination of multiple stakeholders.

“The success of this project relies on our common working attitude. This doesn’t just apply to us (IT Department) but the vendor as well. The wife of one of our vendor members was giving birth during that time, and he chose to stay onsite.” – Project Manager, Security System Project

To create a strong social unity among all those who were involved in this project, the IT department used encouragement slogans. Many were placed around the premises to motivate all the stakeholders to answer to the higher calling of their work. For example, one of the slogans in Chinese posted at the canteen is translated as: “If you are afraid of death, don't become a communist. If you are afraid of hard work, don't take up the system development work of T3!”
Through the overseas knowledge acquisition visits, the incorporation of strict and tight audit control mechanisms, and the indoctrination of higher calling within the vendors and staffs, the IT department was able to minimize the inherent high project risk and develop a sense of collectivism among its stakeholders. This heightened sense of collectivism propelled the vendors and staff to sacrifice their personal benefits for the greater good during system development. This kept the scope in check and schedule on track.

**Data Centre System**

The implementation of the data centre system started in late 2007 and was delivered within six months in March 2008. In essence, the Data Centre System was a business intelligence system. Its main functionality was to collate all terminal operations related data from the various systems so as to provide information to aid decision making towards operational excellence. In addition, it was also a system that was intended to provide a single authoritative source of bill calculation for all the internal customers of Beijing Capital International Airport (BCIA) Company Limited. This system directly supported the revenue generating activities of BCIA. Figure 5 shows the typical business intelligence system screen shots of the Data Centre System.

![Figure 5: Screen Shot of Data Centre System](image)

**System Implementation Challenges**

Because the system was concerned with generating the billing details, the system’s output must be accurate and error-free. Without the assurance of error-free accuracy, the bills generated from the system would not be trusted by the customers (namely, airlines, shop owners in Terminals and etc.) of Beijing Capital International Airport (BCIA). Besides the need to convince the customers to adopt the system as BCIA’s main billing mechanism, the project was plagued with a number of challenges. First, because of the ambitious deadline, the project manager leveraged upon his close working relationships with the local partners of the outsourced vendor to start the project even before the signing of the contract. This had serious consequences because the outsourced vendor, company CX (a large multinational company), had decided to exit the project (because the company had decided to pull out from the China market) before the project implementation commenced. Second, during the development of the project, three unforeseen requests for change were raised as mandatory for implementation. Unfortunately, doing so would mean a schedule slip and the system would not be ready for the Olympics. Finally, during the development and rollout of the system, significant resistance to change was anticipated because the system was designed to subsume some of the existing functionalities of the Terminal Operation Database system and ERP system. The consolidation of two systems into one would lead to disruption of existing established information flow and power structure.
To make matters worse, the trust level of its internal partners (such as airline and shop owners) was low because the IT department did not believe that these partners would serve in the best interest of Beijing Capital International Airport (BCIA) Company Limited. Yet, because of the requirement to ensure accurate billing to internal partners, the internal partners had to be involved actively.

“If you don’t have professionals to control the process of this project, the project risk would be high. If you let the users (partners) control the process, you will face the challenge of frequently changing requirements ... because they (the partners) represent their own interest.” – Project Manager, Data Centre System Project

**Mitigating the System Implementation Challenges**

To mitigate these challenges, one of its most well-respected IT staff within the airport was assigned as the project manager. Through close coordination and many intense negotiations with all the stakeholders, the BCIA project manager was able to keep the implementation effort moving. To achieve the close monitoring and tracking of changes requested by the stakeholders, a rigorous change management process was implemented. For instance, any stakeholder who needed to make changes to the system requirements was required to send a formal change request document to the project manager for approval.

Through the hard work of the project manager, each of the highlighted challenges above was overcome and the details on how the project manager managed to achieve it are as follows: (1) **Vendor CX pulled out at the last minute** - The project manager managed to convince BCIA’s management to award the contract to a local partner of the outsourced vendor, Company LP. Several key staff of company CX who were initially deployed to BCIA were laid off due to this sudden change. The project manager and company LP’s project manager managed to convince them to join company LP; (2) **Three unforeseen requests for change** - The project manager mitigated the situation by convincing the stakeholders to defer the changes to phase 2 (scheduled to be after the 2008 Olympics) after some intense negotiations; and (3) **Disruption of existing established information flow and power structure** - Leveraging upon his respectable status and given complete authority by the management, the project manager managed to navigate an extremely delicate change process which enabled the smooth transition from the Terminal Operation Database system and ERP system to this new system.

“During the system development process, we have been given a lot of authority to control many decisions concerning payment and operational data which include daily operation reports ... from our angle, this makes a lot of our work easier to implement” – Project Manager, Data Centre System Project

The reputation and the status of the project manager were not the only reasons why this project had stayed on course. Another contributing factor of the project’s success lay with the installation of practices advocated by the project manager. These practices include: (1) a comprehensive communication plan to educate all stakeholders of the accounting regulatory requirements that BCIA needed to conform to and the key advantages and improvements which the stakeholders can gain by adopting the new system; (2) weekly meetings that rigorously tracked project schedule and changes, and to assure the conformance of the deliverables’ quality; and (3) a payment mechanism that only allowed payment to the vendor when a milestone was completed and signed off by the project manager and all the internal stakeholders.

Due to the project manager’s willingness to engage the local vendor (LP) despite the withdrawal of the main potential contractor (CX), the vendor’s project manager was also willing to give something in return to the project manager’s trust. For example, he was very proactive in reporting the status of the project and was flexible to take up ad hoc work of a smaller scale not specified within the initial terms of contract. He did these jobs at no extra cost to BCIA.

“... The core team (vendor team) comprises of team members that possess in-depth business domain knowledge and strong technical skills and experiences in this area (development of Data Centre) ... you don’t need to explain things in detail to them (the vendor) ... if we have another vendor, the pressure on us would be really great and we will probably have to do overtime everyday” – Project Manager, Data Centre System Project
Through the experience and quick thinking of a well-respected project manager and the installation of good practices during project implementation, the IT department was able to convince the stakeholders to participate actively in the project to overcome the identified challenges. This kept the project on schedule.

The 52\textsuperscript{nd} gold medal in Olympics to Beijing Terminal 3

As the games of the 2008 Olympics came to an end, the athletes and VIPs headed home via the Beijing Capital International Airport (BCIA) Terminal 3. The years of hard work by the BCIA IT department had paid off. The myriad of IT systems were not only rapidly adopted by all the stakeholders, everyone also worked closely in unity to ensure that the operational work was seamless throughout the time of the Games. The Chinese government was so proud of Beijing Capital International Airport (BCIA)'s achievement that they dedicated a book titled 'The 52\textsuperscript{nd} Gold Medal' to all staff in BCIA. In the eyes of the Chinese government, they felt that the BCIA's achievement in the megaproject was equivalent to winning the 52\textsuperscript{nd} gold medal in the Olympics Games for China (China had won 51 gold medals during the 2008 Olympic Games).

"The service efficiency of the ground services (in Terminal 3) was very high, I am very pleased with it." – International Olympic Committee Chairman for 2008 Beijing Games (Translated from the book 'The 52\textsuperscript{nd} Gold Medal')

"This is the first time we arrived at Beijing Capital Airport Terminal 3. It feels really majestic and very beautiful. The services are very comprehensive and good. It is a very happy experience." – Brazil Beach Volleyball Gold Medalists of 2008 Beijing Games (Translated from the book 'The 52\textsuperscript{nd} Gold Medal')

"The work of the Beijing Capital Airport's team has brought about many surprises and happiness to everyone. It motivated the athletes (of the Special Olympics) to strive for excellence in their results. The airport's special arrangements and services for the Special Olympics have improved China's reputation (as a nation who cares)." – International Special Olympic Committee Chairman for 2008 Beijing Games (Translated from the book 'The 52\textsuperscript{nd} Gold Medal')

Lesson Learned

Similar to the London Heathrow's Terminal 5 megaproject, the Beijing Terminal 3 megaproject was implemented by a team comprising of the company's elites, internal and external stakeholders, and local and overseas vendors. However, one can't help but to wonder what the BCIA IT department had done differently which allowed them to pull off this Terminal 3 megaproject?

In our teaching cases, we have presented the various mechanisms, practices, and techniques undertaken by BCIA IT department to address the challenges faced during the implementation of four critical IT systems in the Terminal 3 megaproject. Given the eventual success of the four IT systems, we believe these mechanisms, practices, and techniques are useful to be applied to any IT implementation that faces similar challenges. To end the paper, we would like to ask if the case study had enabled you to extract the mechanisms, practices, and techniques implemented by the BCIA IT department after reading it?
References


Teaching Notes

Teaching Objectives

This case study can be used in a variety of ways especially in courses on IS development agility, IT project change management, knowledge transfer, and megaproject implementation. Depending on the particular course, one or more of the following teaching objectives should be emphasized.

1. To explore the challenges faced when implementing an IT megaproject especially under intense pressure and urgency to complete the IT megaproject on time and on schedule.

2. To understand the role of IS development agility in an IT megaproject implementation.

3. To understand the importance of the installation and enforcement of a change management system in mitigating project risk during an IT megaproject implementation.

4. To understand the role of knowledge transfer activities in mitigating project risk during an IT megaproject implementation.

Assignment Information

Students in preparation for the case discussion could be asked to address the following questions as an assignment:

1. Identify all the risks in each of the IT systems in Terminal 3 and the consequences of these risks should they occur.

2. What is IS development agility? What is the role of agile IS development practices in the Terminal 3 IT megaproject implementation?

3. What constitutes a change management system? Why are change management processes important in an IT megaproject implementation especially in an environment that is plagued with high uncertainties? How can an organization build an effective change management system during the IT megaproject implementation?

4. Identify at least three kinds of knowledge activities in the Terminal 3 IT implementations, and clarify the role of these activities in mitigating project risks and assuring the success of an IT megaproject implementation.

Teaching Plan

Case Introduction

The instructor should start the lesson by giving an overview of the Beijing Capital International Airport (BCIA)’s competitive environment. This can include the following discussion: The airport terminal’s main revenue streams can be broadly classified into aeronautical (from airlines) and non-aeronautical (from passengers) streams. In recent years, the industry has become highly competitive with every airport terminal company looking into ways to improve its services and terminal’s capacity. The aim of BCIA is to become the ‘travel’ hub for airlines and passengers in its region. References can be taken by looking at how Hong Kong International Airport, Singapore International Airport and etc. are competing in this industry. Due to the highly competitive environment and the mandate to complete all the Terminal 3 IT system implementations before the 2008 Olympics, instructors can tease out the urgency of project completion and the importance of implementing all these systems right the first time and as quickly as possible. The instructor may introduce each of the systems in the case study and highlight the highly complex nature of each system implementation. Together with the urgency to complete the project before the Olympics, a high perceived risk for all the projects can be emphasized. The IT department had to work very closely with the internal and external stakeholders, and also with the local and overseas outsourced...
vendors to assure its success. The instructor may also introduce the ideas of agile IS development practices, project change management systems, and knowledge transfer activities in the context of high project complexity and project completion urgency.

**Class Discussion**

**Question 1**

Identify all the risks in each of the IT systems in Terminal 3 and the consequences of these risks should they occur.

**Suggested Answer to Question 1**

To complete the system implementation within a short span of two years is a common risk present in our teaching case. In addition, the IT systems highlighted are highly complicated and complex in nature and require intense cooperation and collaboration across internal and external stakeholders to assure their successful implementation. Below are the suggested risks of each system and their corresponding consequences that instructors can discuss in class:

1. **AODB System** – Requirement to integrate with multiple systems that depend on the critical flight and weather information. This makes the system highly complicated. Failure to ensure proper integration with other systems will mean the failure of all systems. This system is a critical system to ensure the “zero incidents, zero accidents, and zero complaints” commitment. A good example to facilitate a fruitful discussion with students is the integration with the Airport Transport Authority (ATC) system. Given that the ATC system was also undergoing a major upgrade when the AODB system for Terminal 3 started, what are the consequences of failure of integrating with the ATC system during the AODB system implementation?

2. **Airport Departure System** – Requirement to integrate with all airline systems. Hence, requiring the IT department to actively engage the airline’s staff to negotiate customization works needed to fulfill the needs of the airlines. This system is directly linked to the passengers’ impression of the airport. A good example to facilitate a fruitful discussion with students is the challenge to control the customization work requests from airlines. Given that this system needs to integrate with all airlines’ departure systems and customization work is inevitable, what are the consequences of having too much customization work given the lack of trust with its outsourced vendor?

3. **Airport Security System** – Requirement to integrate with all security systems and the mandatory conformance to level 5 security make this system highly risky and complex. This system is a critical system to ensure the “zero incidents, zero accidents and zero complaints” commitment. A good example to facilitate a fruitful discussion with students is the challenge to fulfill level 5 security for this system. What are the consequences should a security slip at level 5 occurs during the Olympics and the system fails to function like it should be?

4. **Airport Data Centre** – Requirement to work with multiple stakeholders (especially airlines and shop owners in Airport Terminal 3) and to integrate with multiple systems to obtain critical data needed for decision making and bill calculation had made this system highly complicated. This system is of great importance to BCIA as it is directly linked to its revenue generating activities. A good example to facilitate a fruitful discussion with students is the subsuming of a few functionalities of the Terminal Operation Database System and ERP System into this system. Given that having information is power, the changes in information flow mandated by the system will lead to the risk of resistance to change. What kinds of resistance are anticipated and from who? And what are the consequences of these resistances?

**Question 2**

What is IS development agility? What is the role of agile IS development practices in the Terminal 3 IT megaproject implementation?

**Suggested Answer to Question 2**
IS development agility is defined as the continual readiness of an ISD practice “to rapidly or inherently create change, proactively or reactively embrace change, and learn from change while contributing to perceived customer value (economy, quality, and simplicity), through its collective components and relationships with its environment” Conboy (2009), pp. 340. To illustrate the role of agile IS development practices, a discussion of the various types of project uncertainty inherent in each IT system is necessary and they are elaborated in Table TN1:

<table>
<thead>
<tr>
<th>IT Project Name</th>
<th>Project Uncertainty Type (Adopted from Meyer et al. (2002))</th>
<th>Definitions of Project Uncertainty Type (Adopted from Meyer et al. (2002))</th>
<th>Justifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Airport Departure System</td>
<td>Variation</td>
<td>Many small influences that will cause the cost, time, and performance levels of a project to vary randomly, but in a predictable range.</td>
<td>Although the business process of passenger check-in has remained similar for decades, the main requirement of the system is to perform small customization changes tailored for airlines, which may vary in a small way from one airline to another.</td>
</tr>
<tr>
<td>Airport Operation Database System</td>
<td>Foreseen Uncertainty</td>
<td>A few known factors that will influence the project’s outcome significantly, but in unpredictable ways.</td>
<td>The integration between AODB systems in Terminal 1, 2 &amp; 3 and the integration between AODB systems and Airport Transport Control system are all identified as major factors that will influence the project. However, the team was unable to ascertain how they will influence it.</td>
</tr>
<tr>
<td>Airport Security System</td>
<td>Unforeseen Uncertainty</td>
<td>One or more major factors that will influence the project’s outcome significantly but are not known in advance.</td>
<td>The novelty in developing a system to fulfill level 5 security requirements for the airport terminal. Unprecedented in the company’s history in terms of scale of implementation as well as level of coordination among multiple stakeholders. This means more than one major influencing factors to the project can’t be accurately forecasted in advance.</td>
</tr>
<tr>
<td>Airport Data Centre System</td>
<td>Chaos</td>
<td>Unforeseen events that happen during project implementation that completely invalidate the project’s target, planning and approach</td>
<td>The sudden withdrawal of the main vendor, company CX in the initial phase of the project, and the last minute change requests submitted near the end of the project were all unforeseen events that can completely invalidate the project’s target, planning and approach.</td>
</tr>
</tbody>
</table>

We posit that the role of agile IS development practices is to help the BCIA IT department deal with each type of project uncertainty specified above and the urgency to complete the project. Without the project completion urgency, we assert the agile IS development practices may not be needed. In addition, we also assert that without these practices the BCIA IT department will most likely run into a high risk of schedule slips. This will have dire consequences to the reputation of the nation.

We further posit that these practices are formed by organization control mechanisms that are highly contingent upon the trust of the stakeholders involved in the execution of the practice. We advocate that the instructor provides a summary of organizational control first as shown in Table TN2 before going into the discussion of how agile IS development practices are developed in each system implementation. Organizational control is defined as ‘encompassing all attempts to ensure that individuals in an
organization act in a manner that is consistent with meeting the organization’s goals and objectives’ (Eisenhardt 1985; Kirsch 1997; Ouchi 1980)

<table>
<thead>
<tr>
<th>Table TN2: Types of Organization Control (Adapted from Kirsch (1997))</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inform Behavior Control</td>
</tr>
<tr>
<td>Inform Outcome Control</td>
</tr>
<tr>
<td>Informal Clan Control</td>
</tr>
<tr>
<td>Informal Self Control</td>
</tr>
</tbody>
</table>

The agile IS development practices evident in our case are presented in Table TN3, TN4, TN5, and TN6:

<table>
<thead>
<tr>
<th>Table TN3: Agile IS development practice in AODB System</th>
</tr>
</thead>
<tbody>
<tr>
<td>Informal Clan Control</td>
</tr>
<tr>
<td>Informal Self Control</td>
</tr>
<tr>
<td>Trust</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Table TN4: Agile IS development practice in Airport Departure System</th>
</tr>
</thead>
<tbody>
<tr>
<td>Formal Outcome Control</td>
</tr>
<tr>
<td>Formal Behavioral Control</td>
</tr>
<tr>
<td>Trust</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Table TN5: Agile IS development practice in Airport Security System</th>
</tr>
</thead>
<tbody>
<tr>
<td>Formal Control Behavior</td>
</tr>
<tr>
<td>Informal Clan Control</td>
</tr>
<tr>
<td>Trust</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Table TN6: Agile IS development practice in Airport Data Centre System</th>
</tr>
</thead>
<tbody>
<tr>
<td>Formal Outcome Control</td>
</tr>
</tbody>
</table>
| Informal Self Control | Complete freehand given to vendor on handling implementation details. Started the project with vendors even before the contract was signed. Vendor self-
imposed reporting routines to update status of project. Vendor took on extra duties without payment.

| Trust | Low trust for partners and high trust for vendors. |

**Question 3**

What constitutes a change management system? Why are change management processes important in an IT megaproject implementation especially in an environment that is plagued with high uncertainties? How can an organization build an effective change management system during IT megaproject implementation?

**Suggested Answer to Question 3**

A change management system is a comprehensive system founded on five principles: (1) promote a balanced change culture; (2) recognize change; (3) evaluate change; (4) implement change; and (5) continuously improve from lessons learned (Ibbs et al. 2001). A megaproject, given its high complexity, high public visibility, and large scale, is plagued with uncertainties (see Table TN1). Inevitably, this means that it is highly vulnerable to changes in project scope, schedule, and resources. In the case of the Beijing Terminal 3 implementation, it has an added risk of a tight deadline and constrained resources. The installation and enforcement of an effective change management system is absolutely critical to the success of the megaproject. In our case, we have presented many ways in which an appropriate change management system can be developed especially in the discussion of individual system implementations. For example, the training to instill Beijing Capital International Airport IT department's culture to vendors, the weekly progress meeting to keep track of changes, the use of an audit team to verify a completion of milestones, the use of joint responsibility deposits and many other examples. Instructors may ask students to run through the case data and identify the various principles of a good change management system salient in our case.

**Question 4**

Identify at least three kinds of knowledge activities in the Terminal 3 IT implementations, and clarify the role of these activities in mitigating project risks and assuring the success of an IT megaproject implementation.

**Suggested Answer to Question 4**

There are many knowledge transfer activities that are evident across the four IT implementations highlighted in our teaching case. We highlight three of such activities here and they are: (1) the informal mentor-apprentice relationships among the AODB administrators; (2) the various overseas visits to acquire knowledge from the implementation of security systems across the globe; and (3) the training conducted to acculturate the vendor into the Beijing Capital International Airport’s corporate culture. Given that the IT department needs to ‘squeeze’ its IT elites to embark on the Terminal 3’s megaproject, knowledge transfer activities play a pivotal role in ensuring the smooth day-to-day operations of existing systems in Terminal 1 and 2 and also in allowing the department to transfer the valuable knowledge residing in its IT elites to the Terminal 3 project. These are imperative activities that assure the meeting of the ambitious deadline set for the Terminal 3’s megaproject. Instructors may ask students to run through the case data and identify the various effective knowledge transfer activities salient in our case.

**Other Topics for Teaching Considerations**

While we have suggested a few ways of using this teaching case, it is by no means exhaustive. Unfortunately, our submission is limited by this conference’s page limits. Hence, we have chosen to focus on topics that we feel are highly critical to the Terminal 3 megaproject. We posit that the rich case description in our teaching case provides instructors with many other alternatives, which they can consider when using our material for teaching. For example, we believe that the discussion on stakeholder management to ensure alignment of IT projects towards a strategic goal may be a fruitful discussion to consider. Another suggestion would be the discussion on how to develop a strong corporate culture that assures rigor during IT project implementations. Last but not least, the discussion and identification of the important traits of good project managers can also be considered as a potential topic.
Suggested Background References


