

Teaching Case

Migrating Legacy Systems in the Global Merger & Acquisition Environment

Pairin Katerattanakul

Business Information Systems Department
Western Michigan University
Kalamazoo, MI 49008-5412, USA

Hwee-Joo Kam

Business Technology Department
North Central Michigan College
Petoskey, MI 49770, USA

James J. Lee

Management Department
Seattle University
Seattle, WA 98122, USA

Soongoo Hong

Management Information Systems Department
Dong-A University
Pusan, Korea

ABSTRACT

The MetaFrame system migration project at WorldPharma, while driven by merger and acquisition, had faced complexities caused by both technical challenges and organizational issues in the climate of uncertainties. However, WorldPharma still insisted on instigating this post-merger system migration project. This project served to (1) consolidate the separated legacy MetaFrame systems from the three pre-merger pharmaceutical organizations into one globally managed system and (2) develop a global support team for the newly consolidated global MetaFrame system. This system migration project was aligned with WorldPharma's IT strategy that aimed to streamline its IT resources and enhance system efficiency.

Keywords: Teaching Case, IT Project Management, Migration of Global IT Systems, IT Management

1. INTRODUCTION

After the merger and acquisition (M&A) that involved WorldPharma acquiring and merging with CB Medicine and PharmaTech (we disguise the names of the three pharmaceutical companies in this case to protect their identities), a new department – the Computer and Information Technology (CIT) department, was established to globally manage the IT resources of the post-M&A WorldPharma organization. The CIT department initially served the main task of delineating the migration and

integration plan for various IT systems, including the MetaFrame system, in this new organization.

The main goals of the global MetaFrame system migration project were to (1) consolidate every legacy MetaFrame system from the three previously separated pharmaceutical companies into one unified, globally managed system; and (2) develop a global team for supporting the new and centralized MetaFrame system. A new manager – Mr. John Collins, was hired to manage this MetaFrame system migration project. Since this project was entangled with technical complexity and organizational

issues, Mr. Collins would have many obstacles to overcome (we disguise the names of the people in this case to protect their identities).

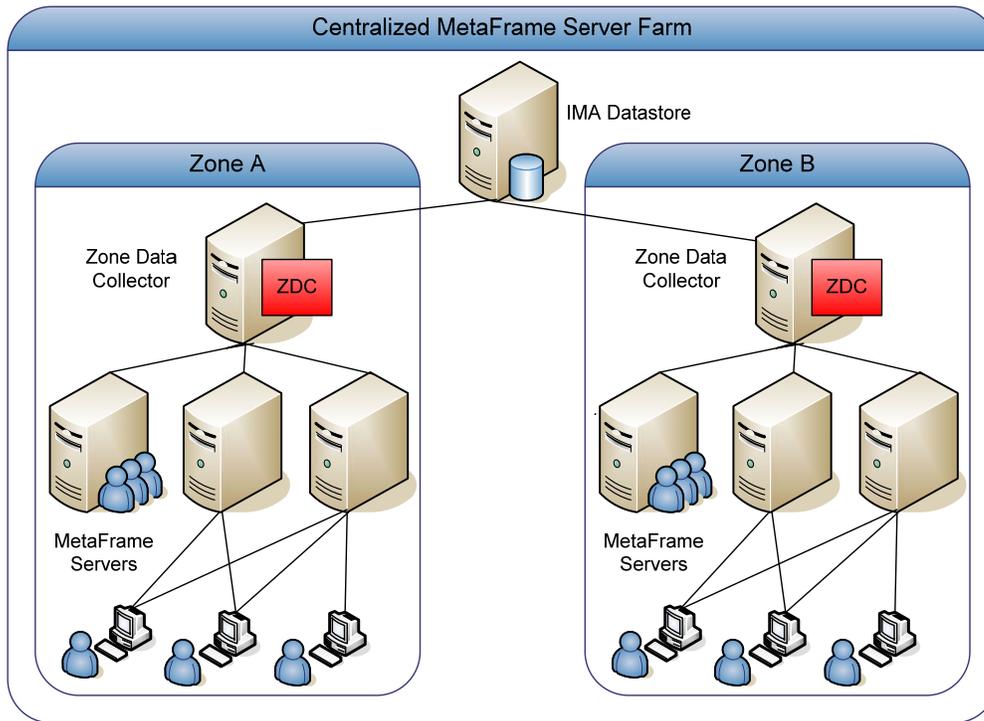
1.1 Definition of MetaFrame

Metaframe, a software product developed by Citrix Corporation, allows users to access the applications hosted on MetaFrame servers (running on UNIX or Windows operating systems). All applications are processed on these MetaFrame servers, enabling users with less powerful hardware to use resource intensive applications.

Figure 1 shows a centralized structure of a MetaFrame system that includes an Independent Management Architecture datastore (IMA datastore), a Zone Data

Collector (ZDC), and several MetaFrame servers. MetaFrame servers run the applications and allow users to access and use these applications. IMA datastore is a database (e.g., Microsoft Access, Microsoft SQL Server, Oracle, IBM DB2) that keeps the information about the configuration of the MetaFrame system.

A MetaFrame system could increase its performance by setting up zones that allow geographic sites to operate on their local computer networks and minimize network communication to the IMA datastore. The logical way of establishing zones is to set up one in every operation that has a high number of MetaFrame servers or has a low capacity network connection to the nearest IMA datastore. For each zone, ZDC maintains non-system configuration information

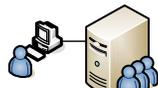



IMA Datastore

The IMA Datastore is the database (e.g., MS Access, MS SQL Server, Oracle, IBM DB2) that keeps the information about MetaFrame system configuration (not any business data) and tracks MetaFrame server farm information that does not change frequently (more static information).


Zone Data Collector

A Zone Data Collector (ZDC) is the in-memory database that maintains zone specific data. ZDC receives incremental data updates and queries from MetaFrame servers within the zone. ZDC stores the information such as server loads, active sessions and disconnected sessions (i.e., the information that is not about MetaFrame system configuration). ZDC sends messages between zones. Individual MetaFrame servers do not directly query MetaFrame servers in other zones. One MetaFrame server in each zone is assigned the task of being the data collector for that zone.


MetaFrame Servers

MetaFrame server allows multiple users to log on and run applications in separate protected sessions on the server without interference from other users. Clients connect to these servers via the Independent Computing Architecture (ICA) protocol. This thin-client protocol uses very little bandwidth as only mouse clicks and keyboard strokes are sent to the server and only screen shots are sent back to the client.

Figure 1. MetaFrame Environment (centralized structure)

such as server loads, active sessions, and disconnected sessions. ZDC also manages the communication within the zone as an individual MetaFrame server will not directly query any other MetaFrame servers.

It should be noted that Citrix Corporation had released several versions of its MetaFrame product, beginning with the first release titled “WinFrame” followed by “MetaFrame 1.8” and “MetaFrame XP.” During this migration project, Citrix Corporation released a new version entitled “Presentation Server™” and also announced that the MetaFrame XP version would be supported until June 30, 2007.

Because there was a great deal of expertise on MetaFrame XP and a substantial MetaFrame XP presence within WorldPharma, it was agreed that MetaFrame XP would be implemented during this migration project even though the newer version (i.e., Presentation Server™) had already been available. Thus, the MetaFrame mentioned in this teaching case would refer to the MetaFrame XP version.

Additionally, during the time when this teaching case was written (i.e., on February 11, 2008), Citrix Corporation changed the name of its “Presentation Server™” product line to “XenApp™.” More detailed information about the MetaFrame product can be found at www.citrix.com.)

1.2 Existing MetaFrame Systems: Pre-M&A

Immediately after the M&A, a consolidation plan for various existing MetaFrame systems of the three legacy companies started to unfold. The first issue was related to the difference in MetaFrame structures implemented in the three legacy companies. The legacy MetaFrame systems of PharmaTech and CB Medicine adopted a “centralized” MetaFrame structure (see Figure 1). In contrast, the WorldPharma’s legacy MetaFrame systems implemented a “siloeed” structure (see Figure 2).

In the centralized structure, all users would access one large MetaFrame system environment controlled (logically) by the same IMA Datastore. For instance, a scientist in Sweden, an engineer in Japan, a manufacturing supervisor in the U.S., etc., would see and use the same MetaFrame system environment (please note that the MetaFrame system environment could be explained as “a list of servers and the applications hosted on each server”).

On the other hand, in the siloeed structure, each business unit (e.g., a marketing unit in East Coast US, a manufacturing unit in Midwest US) would build and maintain its own MetaFrame system environment. Thus, WorldPharma found itself with a marketing MetaFrame system environment, a manufacturing MetaFrame system environment, etc.

In this regard, the CIT department and Mr. Collins would need to make a decision about which MetaFrame structure would match the main project goals and best support WorldPharma’s needs in competing in the pharmaceutical industry.

2. PHARMACEUTICAL INDUSTRY

2.1 New Drug Development

Before a pharmaceutical company can introduce a new drug in the United States, it must receive an approval of a New Drug Application (NDA) from the Food and Drug

Administration (FDA). As a document that may consist of over 100,000 pages, the NDA must provide enough information to permit the FDA to reach the following key decisions (www.fda.gov):

- Whether the drug is safe and effective in its proposed use(s), and whether the benefits of the drug outweigh the risks.
- Whether the drug's proposed labeling is appropriate, and what it should contain.
- Whether the methods used in manufacturing the drug and the controls used to maintain the drug's quality are adequate to preserve the drug's identity, strength, quality, and purity.

The process of bringing a new drug from the research stage to market takes many years and involves several phases (see Figure 3). After a chemical compound (i.e., a potential new drug) is synthesized, the compound proceeds to several years of preclinical testing, including animal testing and other testing (e.g., toxicology, pharmacokinetics) in the laboratories. The data generated in this preclinical testing provide the basis for the Investigational New Drug Application (IND), which the FDA must review and approve before clinical trials of the compound can begin.

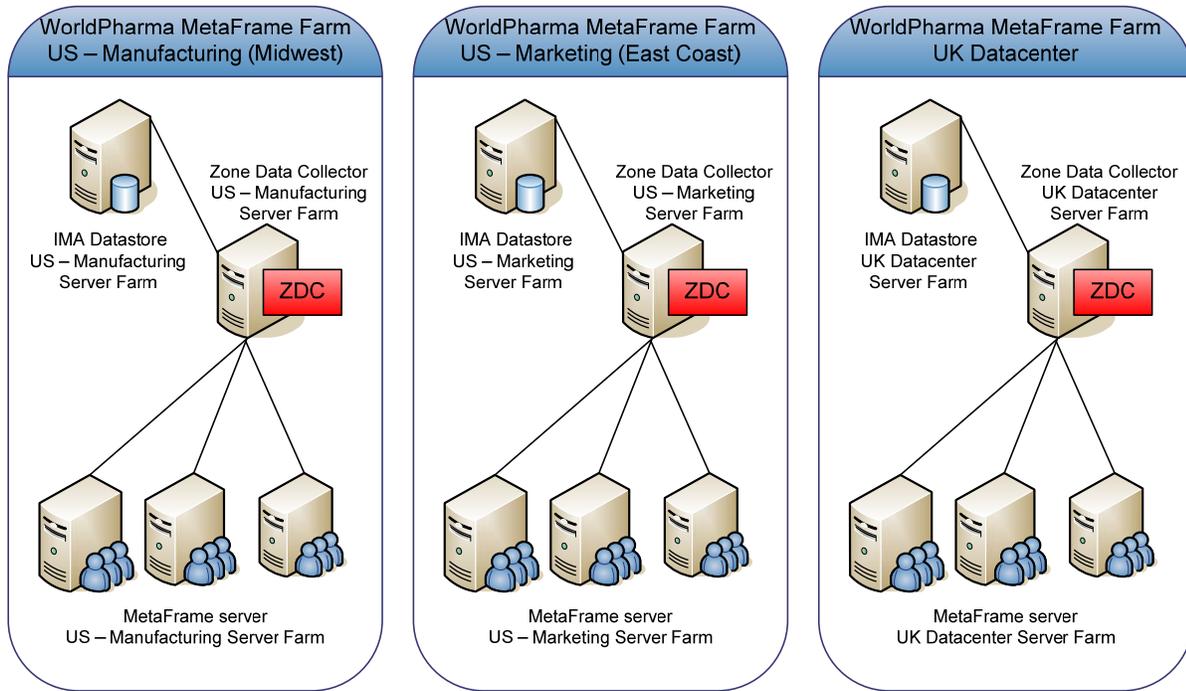
The three stages of clinical trials involve testing, in humans, for safety and for effectiveness in treating a target medical condition. Stage I involves less than 100 patients; Stage II involves a few hundred patients; and Stage III involves a few thousand patients. If the new chemical compound still appears to be promising after Stage III, the pharmaceutical company assembles the data generated during the clinical trials and other supporting materials into the NDA, which the FDA must approve before the new drug may appear in the market.

After approval of the NDA, the pharmaceutical company is still required to monitor and gather safety data on the new drug. Reporting of Adverse Drug Reaction (ADR) data must be prepared for the FDA. The pharmaceutical company must report any “untoward effect that occurs in the course of use of a drug in professional practice” that is not listed on the drug label and that meets the definition of a serious ADR. If it turns out later that the new drug is not as safe as it was previously thought, the FDA may put strict requirements and limitations on the use of the new drug, or even revoke the right to sell it in the United States.

Additionally, in pharmaceutical manufacturing, the pharmaceutical company must monitor the production process. This involves the process in which production operators must fill out forms to record data describing the conditions for the manufacture of a particular batch of the drug.

Furthermore, the NDA is not a static document. Even after the FDA has already approved it, the pharmaceutical company may submit additional information for further review when seeking approval for a broader range of therapeutic indications or in other circumstances.

Finally, most drugs are on the market in more than one country, and the regulatory agencies of other nations must approve new drugs before they enter overseas markets. Those agencies often have requirements for forms and contents that are considerably different from those the FDA specifies for documents submitted to it.



This figure shows the pre-M&A siloed MetaFrame structure at three WorldPharma’s datacenters (i.e., Midwest, East Coast, and UK). Other WorldPharma’s datacenters also employed the same siloed MetaFrame structure.

Figure 2. Existing WorldPharma’s Pre-M&A “siloed” MetaFrame Structure

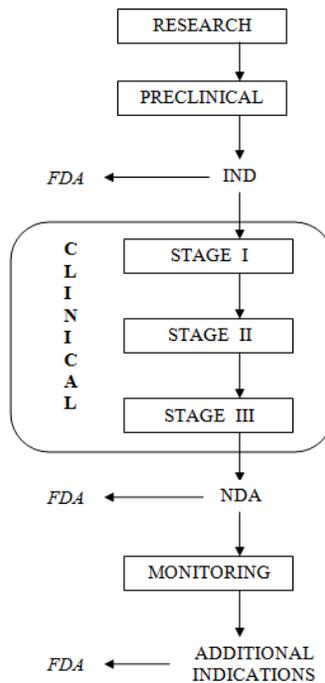


Figure 3. New Drug Development Process (Studebaker, 1993)

Pharmaceutical companies have prospered historically by discovering, developing, manufacturing, and then marketing their drugs. To maintain their growth rates, pharmaceutical companies are increasing the number of potential new drugs being tested. However, the cost of developing new drugs is rising. Despite a dramatic increase in investment in technology in drug research and development (R&D), the gross productivity of drug R&D does not increase proportionally (Wilhelm, 2001). The Pharmaceutical Research and Manufacturers of America (www.pharma.org) said that it takes an average of 12-15 years to discover and develop a new drug. Only 1 in 1000 potential new drugs makes it to clinical trials. And only 1 of 5 potential new drugs which make it to clinical trials actually makes it to market. This process makes the drug development cost be about \$500 million for a new drug.

2.2 IT in New Drug Development

Because of the competition from a growing number of “me-too” drugs, the pharmaceutical industry is highly competitive. There are several major pharmaceutical companies competing for the same market. The company that can design, test, and market a new drug first receives a tremendous competitive advantage, both in financial payback and brand recognition. As the patents are issued before a potential new drug goes into clinical trials, the faster a trial goes, the longer the pharmaceutical company enjoys a monopoly until generic versions can be sold (Marwaha, Patil, and Singh, 2007).

Additionally, industry statistics highlight some other problems. An estimated 200 drug patents, (representing nearly \$40 billion in annual revenue to the pharmaceutical industry) had expired by 2005. In 2003, the FDA approved only 17 potential new drugs, which was the lowest rate of approvals in 20 years (in 1996, the FDA approved 120 potential new drugs). To be successful, pharmaceutical companies must respond by accelerating and increasing drug development.

The clinical trial process is a key area that pharmaceutical companies are scrutinizing for efficiency and IT is critical to meeting this challenge. Pharmaceutical companies expect IT to improve data collection, speed up regulatory reporting, improve the targeting of physicians, and manage the progress of clinical trials. To boost the productivity of clinical trials, pharmaceutical companies have introduced Electronic Data Capture (EDC) systems, which allow patients, physicians, and researchers to prepare Case Report Forms (CRFs) and enter their trial information directly into the online systems. EDC systems have substantially reduced the time required to gather data on clinical trials – to 2 weeks, in some cases, from 20 weeks (Marwaha, Patil, and Singh, 2007).

Regarding the FDA compliance, achieving cost effective FDA compliance is one of the industry’s most significant challenges. The risks associated with non-compliance can be severe. A citation issued by the FDA for non-compliance can subject a company not only to large fines but also to a warning letter stating that if the infraction is not corrected within a given time period, product production will be curtailed by the order of the FDA. When a company has not properly documented changes to databases

that store clinical trial data, the FDA has the authority to shut an entire production line down and/or withdraw products from the marketplace.

An important aspect of FDA compliance is system validation, which means that all IT systems in the pharmaceutical company must be configured and documented (on an ongoing basis if changes are made) in accordance with regulatory guidelines. The FDA has also recognized the benefits of an electronic NDA system and has mandated that all NDAs be done electronically with some mechanisms in place to authenticate the person and the time of creation of electronic records. To comply with the Regulatory Compliance for Electronic Records and Electronic Signatures (i.e. Title 21 CFR Part 11) imposed by the FDA, technologies for generating and verifying the authenticity of operator control and observation have been developed. EDC systems include these technologies to develop and implement a procedure for verifying and documenting an individual’s identity before assigning an electronic signature (Mlodozeniec, 2004).

In addition to the issue related to FDA Compliance, another issue exists. Unfortunately, many pharmaceutical companies are not coordinating a number of clinical trials across their organizations. The lack of cross-trial transparency can create delays when different clinical trials compete for scarce resources. Many pharmaceutical companies haven’t yet embraced reusability by streamlining their approach to the design of clinical trials. Certain components of the forms that guide researchers in clinical trials could be shared and reused across a number of them (Marwaha, Patil, and Singh, 2007). Thus, in recent years, some leading pharmaceutical companies have begun to increase productivity by revisiting IT systems to transform clinical trial design from ad hoc planning to an integrated approach. In this integrated approach, IT platforms for enterprise project management would play a major role to allow pharmaceutical companies to manage a portfolio of clinical trials more efficiently across the whole organization (Marwaha, Patil, and Singh, 2007).

Finally, over the past decade, IT spending at most pharmaceutical companies has grown much faster than revenues, partly to meet the information needs of the business but mainly because the IT environment is diverse and highly decentralized (Marwaha and Van Kuiken, 2005). Most phases of drug development are divided into different business units or groups across countries with different cultures, languages, and regulations. The solutions to individual problems in drug development may be created or bought by individual groups. These have led to a highly fragmented and heterogeneous environment with several incompatible systems. In a typical pharmaceutical company, fiercely autonomous and well-financed divisions and functions make their own IT decisions. There might be dozens of different systems for Enterprise Resource Planning (ERP), finance, lab information management, and document management, etc. These layers and layers of fragmented systems make it very difficult for pharmaceutical companies to integrate and scale their IT resources to reach efficiency goals. This inefficiency is costly: more than 85% of the industry’s IT spending goes toward maintaining and supporting these disparate assets. In short, IT has become an

impediment to, rather than an enabler of, better business performance (Marwaha and Van Kuiken, 2005).

3. WORLDPHARMA METAFRAME SYSTEM MIGRATION PROJECT

3.1 Initiation and Planning

For the CIT department, its main responsibility was to streamline IT resource management and save a significant amount of IT expenses on both equipment and personnel. WorldPharma's IT resources would also include all existing MetaFrame systems from the three legacy organizations. After M&A, high expectations were poured onto the effort of consolidating all these existing MetaFrame systems into one globally managed system. Realizing the criticality and the benefits of the project, the executives at WorldPharma's Global Project Management Office (GPMO) promptly approved this project. The GPMO also made an official announcement apropos of this project to all of its employees worldwide. According to GPMO, the project scope was pertaining to "... *consolidate both local and regional MetaFrame systems into one globally managed system and to develop a global MetaFrame support team ...*".

After this official announcement, Mr. Collins, knowing that he would face an avalanche of challenges, wasted no time before refining the project scope, which encompassed the following project objectives:

- To consolidate all MetaFrame systems from the three previously separated companies into one globally managed system.
- To build fault tolerance for WorldPharma's global MetaFrame system.
- To retire those redundant MetaFrame servers and/or applications.
- To employ standards (e.g., hardware components, operating systems) for every MetaFrame server.
- To develop a global MetaFrame support team.
- December 31, 2005 would be the project deadline (approximately 18 months after the official announcement).

The project was planned for the existing MetaFrame systems at eight datacenters of the post-M&A WorldPharma organization (two centers in Michigan, one center in New Jersey, one center in New York, two centers in Connecticut, one center in Sweden, and one center in the U.K.).

In this project, there would be three major activities: information gathering; planning of the new MetaFrame system environment; and decommissioning and migrating MetaFrame servers at each datacenter. Mr. Collins would need to collect, as much as possible, the information about the existing MetaFrame systems at each datacenter. Based on the collected information, a plan of the new global MetaFrame system and its system environment would be developed.

Then, Mr. Collins, the existing IT and/or MetaFrame personnel, and the business units at each datacenter would discuss and develop a plan for the new MetaFrame system of the datacenter. This plan would include decisions regarding:

- The applications that needed to be maintained on each MetaFrame server located at the datacenter

- The applications that needed to be shut down, as users could be redirected to use the same or similar applications hosted on the servers located at other datacenters
- The number of MetaFrame servers needed at the datacenter
- The number of existing servers that did not meet the specified hardware and/or software standards, which would need to be decommissioned and then evaluated for potential re-build

On deciding which applications and/or servers to be decommissioned, the first task required would be organizing all existing CB Medicine and PharmaTech business units to fit into the current WorldPharma governance structure. For example, when the legacy R&D division in PharmaTech was assimilated with the global R&D team of WorldPharma, it became relatively easy to decide which applications and/or servers needed to be decommissioned while dissolving the business units in PharmaTech (e.g., the R&D division).

Another criterion was the redundant applications. For example, WorldPharma, CB Medicine, and PharmaTech all had a document management application running on their legacy MetaFrame servers; under this circumstance, the redundant applications of CB Medicine and PharmaTech were usually decommissioned. Finally, any business units that would like to retain any remaining applications had to develop a business case, to be presented to a steering committee, explaining why the applications should be retained.

After developing a plan of the new MetaFrame system for each datacenter, the existing IT and/or MetaFrame personnel at each datacenter would (1) define their responsibilities, (2) set up the project team, and (3) begin the migration process. In this process, new MetaFrame servers would be brought into the datacenter, retired servers and applications would be shut down, remaining applications would be migrated to other servers, and retired servers would be evaluated for potential re-build. A timeline was set up for the migration at each datacenter, including (a) the time frame when the new servers would be ready for application installation and testing, (b) the date when the old servers would be disconnected and the applications would be moved over to other servers, and (c) the anticipated date to decommission the old servers.

3.2 Potential Risks

It was such a relief for the CIT department and Mr. Collins to learn that this MetaFrame system migration project received unwavering support from the executives at WorldPharma. The policy distributed to every WorldPharma business unit worldwide stipulated that the unified, globally managed MetaFrame system was one of the major objectives of WorldPharma's IT strategy and that every business unit at each datacenter had to accomplish its MetaFrame system migration by December 31, 2005. Under this policy, potential risks related to project resistance and funding were mitigated.

However, with high expectation from top management, the pressure to perform fell on Mr. Collins' shoulders. "I must pull this off", Mr. Collins murmured to himself as he

realized that the main potential risks of this project were technical-related risks. Because the existing MetaFrame servers hosted critical applications for business units' daily operations (e.g., EDC, document management, financial management, supply chain management), thorough testing would be required to ensure compatibility and minimize any potential problems. Mr. Collins was also fully aware that a contingency plan would be needed in case of any migration failure.

Another problem that Mr. Collins anticipated was that the project could suffer from a lack of information regarding some applications hosted on existing MetaFrame servers. Because of the M&A, some employees from virtually every business unit had already left WorldPharma. Unfortunately, several of these former employees were the individuals who were responsible for some of the applications hosted on MetaFrame servers. In one incident, an employee who was about to leave the company had not yet finished documenting one of the applications. When approached and asked about the documentation by Mr. Collins' assistant, that employee just shrugged his shoulders expressing that he did not care. Amid the chaos, Mr. Collins tried to stay above the fray and thought about how to motivate those departing employees to finish their assignments before they left.

Mr. Collins was also seriously concerned with the possibility of not having enough IT and/or MetaFrame personnel to complete the task of MetaFrame system migration on time. As one of the expected benefits from this project was saving significant amount of IT expenses on equipment and personnel, the number of IT and/or MetaFrame personnel in the company would eventually be reduced. Thus, some IT and/or MetaFrame personnel had already left WorldPharma to pursue other opportunities elsewhere and many others were looking for their new employment opportunities as well. Unfortunately, some of these former IT and/or MetaFrame personnel had built and maintained the legacy systems in the three previously separated organizations. Mr. Collins must devise a plan to ensure that there would be sufficient IT and/or MetaFrame personnel to finish the project on time.

3.3 Global MetaFrame Support Team

At the beginning of this MetaFrame system migration project, all existing MetaFrame personnel continued to support the applications and servers that they had supported before the M&A. However, as the migration continued and some servers and applications were relocated, the support and responsibilities were delegated to MetaFrame personnel based on geographical location. For example, if a server in Michigan was relocated to Connecticut, the MetaFrame personnel in Connecticut would become the primary support for this server even though the majority of the server's users were still in Michigan and would move to Connecticut six months or a year later.

Interestingly, Mr. Collins noticed that cohesiveness among the existing MetaFrame personnel emerged as a result of this assignment. As the servers and responsibilities were relocated, the existing MetaFrame personnel had to start exchanging more information in order to keep up with the increasing demands being placed upon them. They got to know each other better and had a chance to learn about

various systems built around the world. "I am glad that they see eye to eye", Mr. Collins gladly told his assistant as he realized that this was the first step for the MetaFrame support team to become truly global.

Mr. Collins knew that member selection of the global MetaFrame support team would be based on several criteria including personality, documentation skills, technical and business knowledge, etc. However, there were still many decisions he had to make about this MetaFrame global support team. In global settings, users from different geographical locations and time zones could access the same applications at virtually the same time. Thus, for the support team to become truly global, Mr. Collins had to decide how many members of this global support team would be needed, where each team member should be located, and how this global support team should be managed etc., in order to effectively provide the 24/7 support for WorldPharma's MetaFrame system regardless of its users' geographical locations or time zones.

4. RESULTS AND THE NEXT STEP

In June 2006, approximately two years after its official announcement, WorldPharma's MetaFrame system migration project was completed. It was about six months later than its expected completion date (i.e., December 31, 2005). Additionally, total project cost was approximately 10% higher than its original budget of \$3.0M (including hardware and software, but excluding human resource compensation). Mr. Collins and his team had consolidated all existing MetaFrame systems (from the three previously separated companies) with multiple servers running the same or similar applications, into one globally managed MetaFrame system. The benefits of this MetaFrame system migration project were apparent. It was estimated that the costs of system hardware and software were reduced to approximately half of those previously spent by the three legacy companies combined. Additionally, the number of MetaFrame support personnel was also reduced from approximately 30 people to 13 people who are current members of the MetaFrame global support team.

During 2006-2007, WorldPharma maximized the value of its global MetaFrame system by expanding the number of enterprise applications that were delivered using this global MetaFrame system. Similarly, in an ongoing effort of streamlining costs within WorldPharma's IT organization and addressing the issues about infrastructure flexibility, the CIT department planned to deploy this global MetaFrame system for WorldPharma's operation in several other countries. For example, WorldPharma previously implemented multiple servers running client/server applications across China. In an attempt to reduce the cost of updating and maintaining hardware for WorldPharma's operation in China, the CIT department planned to consolidate the distributed servers in China into one MetaFrame system located in Beijing. The new MetaFrame system in Beijing would connect to, be an additional part of, employ the same copy of IMA datastore, and share the same system environment with the global MetaFrame system.

5. ASSIGNMENT QUESTIONS

1. What are the advantages and the disadvantages of implementing the MetaFrame software system in WorldPharma?
2. What are the advantages and the disadvantages of the “centralized” MetaFrame structure vs. the “siloesd” MetaFrame structure in WorldPharma’s IT environment? Which one of these two structures should be implemented in this project?
3. As the major stakeholders of this project, what were the main concerns of the business units, the existing MetaFrame support staff and other IT support personnel, and the CIT department (especially Mr. Collins)?
4. Identify potential risks related to human resources in this project and provide your suggestion about what WorldPharma may do to manage these human resource risks.
5. As MetaFrame servers hosted critical applications for business units, to shut down any old MetaFrame servers and put them into decommission process, it was necessary to have a consistent and comprehensive controlling procedure. Additionally, a contingency plan was required in case of any migration failure. Provide your suggestion regarding the procedure to shut down any old servers and the necessary contingency plan.
6. Do you consider this MetaFrame system migration project a successful project? Provide reasons to justify your evaluation of the success or the failure of this project.

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AUTHOR BIOGRAPHIES

Pairin Katerattanakul is an Associate Professor at the Department of Business Information Systems, Western Michigan University. He has published his research in several journals such as the European Journal of Information Systems, Journal of the American Society for Information Science and Technology, Communications of the ACM, Communications of the AIS, International Journal of Information Technology & Decision Making, Journal of Information Technology Theory and Application. He also has more than 10 years of industry experience as a system engineer and product manager at several companies.



Hwee-Joo Kam is a lead Computer Information Systems instructor and a program coordinator in the Computer Information Systems Department in North Central Michigan College (NCMC). She has eight years of IT experience in the industry and higher education. Her areas of expertise include web development, database management, and object-oriented programming. Currently, she is designing the Computer Information Systems curriculum to accommodate the market demands. During her tenure in NCMC, she has developed courses such as Database Design and Management, Oracle Database Administration, Web Development, and Programming Logic.



James Lee is a Genevieve Albers Professor at the Albers School of Business and Economics. Prior to that he had served as an assistant professor at the State University of New York at Binghamton. He teaches primarily in the areas of e-Commerce & Information Systems, e-Business and Web Applications. His research is in the areas of Enterprise Integration in Social Context, Information Technology Conceptualization, and Communication Structure. His publications have appeared in such journals as Communications of the ACM, Journal of Information Technology, Industrial Management & Data Systems, and many more.



Soongoo Hong is an associate professor at the Department of Management Information Systems in Dong-A University, Korea. He received his Ph.D. in Management Information Systems in 2000 and Master of Arts in Management in 1995 from the University of Nebraska – Lincoln. He has published his research in several journals such as Communications of the ACM, Communications of the AIS, International Journal of Information and Decision Making. His research interests include web accessibility, data warehousing, and IT impacts on organizations.





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