

**NED UNIVERSITY OF ENGINEERING AND TECHNOLOGY, KARACHI**  
**MASTER OF COMPUTER SCIENCE & INFORMATION TECHNOLOGY**  
**FALL SEMESTER EXAMINATION -2008**

Time: 3 Hours

Dated: 06-12-2008

Max Marks: 70

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**SOFTWARE QUALITY ASSURANCE**  
**(CT-534)**

**Instructions:**

- This paper consists of two sections : Section A and Section B
- Section A consists of a Case Study
- All 7 questions should be attempted.
- Read the case study thoroughly before answering.

**SECTION A: CASE STUDY**

1. What is Capability Maturity Model? How many levels are there in CMM? Explain all the levels briefly. [10]
2. What was the reason for which CERTEGY was trying to achieve CMM level 2 certification? How was it able to achieve this success? *report* [10]
3. What do you understand by Software Configuration Management? Why is it helpful for the organization to implement SCM? [10]
4. What are Change Management Procedures and why is it necessary for any organization to implement sound Change Management Procedures? [10]

**SECTION B**

5. Give and explain any five practices of Extreme Programming. Also state when they are to be used. [10]
6. Explain briefly the four primary modeling elements of Rational Unified Process? [10]
7. What are the different techniques in White Box Testing? Explain some of them with examples. [10]

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# CMM Case Study

## Company Profile

Certegy Inc. provides credit, debit and merchant card processing, e-banking, check risk management and check cashing services to over 6,000 financial institutions, 117,000 retailers and 100 million consumers worldwide. Headquartered in Alpharetta, Georgia, Certegy maintains a strong global presence with operations in the United States, the United Kingdom, Ireland, France, Chile, Brazil, Australia and New Zealand. A leading global payment services provider, Certegy offers a comprehensive range of transaction processing services, check risk management solutions and integrated customer support programs which facilitate the exchange of business and consumer payments. Certegy's two main business units - Card Services and Check Services - are organized to enable targeted services and systems that address diverse customer needs. Certegy generated over \$1.0 billion in revenue in 2003.

Certegy Check Services is a division of Certegy Inc. (NYSE:CEY) located in St. Petersburg, Florida, with over 4,000 employees worldwide.

## Operational Highlights

- In 2003, Certegy serviced over 46 million cards, and authorized over \$35 billion worth of check transactions worldwide.
- Leading provider of comprehensive third-party card processing services to credit unions and community banks in the United States.
- Leading global provider of check risk management services.

## Check Authorization

Point-of-purchase (POP) check authorization has entered a new age of efficiency and effectiveness. With Certegy<sup>sm</sup>, today's businesses have access to online, real time check approvals within seconds - 24 hours a day - by verification against its database of 100 million+ good check writers.

With the most comprehensive check authorization system in the industry, Certegy utilizes artificial intelligence modeling, neural networks and other state-of-the-art technology to deliver unprecedented accuracy, convenience and simplicity. The results are powerful - lower check acceptance costs, improved sales and profits, improved POP efficiency, controlled check losses, reduced risk of fraud, enhanced customer service and improved cash flow.

## IT Environment

Most of Certegy Check Services' approximately 150 software developers work in St. Petersburg, FL, where the Check Services division's IT department is located, but some are in England, France and Australia. Mainframe applications still play a part in the delivery of some of the company's services, but their in-house development is built around the Sun Solaris, Compaq Tru64, and IBM AIX environments. Developers build applications for Windows and

several UNIX platforms primarily in C, Oracle, and Visual Basic. Certegy recently moved into Web applications that allow merchants to sign up for services and access applications online; for these

Java applications they use IBM WebSphere Studio.

## Competitive Market Environment

Today, the desire to achieve CMM Level 2 certification, or higher, is prevalent among companies that develop software for internal applications, resale, and embedded technology. The reasons for this include: qualification for government contracted development work; improvement of software quality through improved processes as a company's IT resources grow; compliance with regulatory standards; finding new efficiencies that lower costs and deliver ROI; achieving an industry accepted standard for development, or improving a company's competitive positioning in the marketplace. Certegy's goal to achieve SEI CMM Level 2 was driven by a number of business issues:

- IT resources doubled over the last 5 years making its management more complex and requiring a sound development process to maintain the levels of quality and accuracy its Check Authorization System required.
- The need to improve productivity through the creation of a well-defined, repeatable process.
- Reduction of errors and rework by the use of improved requirements management and peer reviews.

Key to any process improvement effort is a strong, process-centric SCM solution. Certegy's development group was using a project-level configuration management tool for basic version

control, but recognized that they required a more robust solution consisting of software configuration and change management to support their CMM Level 2 certification effort. Only with this type of a solution could they achieve the level of process automation and discipline set out by CMM Level 2. With a recommendation from Gartner, the team evaluated the MKS Integrity Solution®, consisting of MKS Source Integrity® Enterprise Edition for software configuration management, and MKS Integrity Manager® for process and change management, including workflow.

Certegy's use of other tools did not provide them with change management capabilities; specifically the ability to fully document all software changes in an audit trail and to document and trace change management in the system. As a result, the Software Configuration Management (SCM) Key Process Area (KPA) was identified as a significant weakness during their first CMM review. In December 2002, however, just six months after implementing the MKS Integrity Solution, Certegy Check Services passed a CMM level 2 assessment conducted by Dr. Bill Curtis, co author of the Capability Maturity Model (CMM), a former Director of the Software Process Program at the Software Engineering Institute (SEI), and co-founder and Chief Scientist with TeraQuest, a process consulting firm specializing in CMM. The MKS Integrity Solution was a key element, along with training, planning, and disciplined

use of configuration management principles, to fully satisfying the SCM KPA for having source and related documents under archived version control.

"Our developers can easily follow the process we've established using the MKS Integrity Solution and, in actuality, barely notice a process at all. The MKS Integrity Solution does the work for them. It's a very nice thing."

### Results

Certegy's development team submits a Metrics and Measurement report monthly to senior management. It tracks and forecasts trends for projects, including software defects, and estimated time to complete vs. actual completion time. Since implementing MKS's enterprise SCM solution in 2002, defect rates have dropped, productivity has increased, and the delivery cycle has shortened. They have also realized improvements in other areas of their software development practices, such as:

- Over the last 2.5 years, Check Technology has increased its accuracy of estimating target dates by 45% and increased its accuracy of estimating labor hours by 7.8%. With a 38.2% increase in headcount during this same period, Check Technology was able to complete 90.6% more projects that were 26.8% larger.
- Over the last 18 months, Check Technology tracked the percentage of Incident Reports (IRs) that

necessitated code changes. Even though Check Technology completed more projects of larger sizes and introduced more applications into production, the percentage of IRs needing code changes dropped by 20%.

- Through the efforts of continual process improvement, Check Technology's way of doing business has been enhanced with new features. For example, they audit project compliance with their defined and documented process. They're currently performing at a 94% compliance rate.
- They started asking their internal customers how they're doing by way of Project Champion Survey. Those customer surveys throughout 2003 reflect a 91% approval rate. They also started giving surveys to the students who attend their training classes. Training satisfaction averaged 87% for 2003.

"Certegy is continuing to utilize and expand on the power of MKS Integrity Manager and MKS Source Integrity, to make continuous improvements with our CMM Level II repeatable process. With the ability to now manage and track all change requests, our project teams are able to better schedule and meet implementation target dates. With plans to upgrade to the latest release, we will have the ability to integrate with our help desk and project management tools, allowing for a more complete and streamlined process throughout our SDLC. We are very pleased with the stability of the MKS Integrity solution, and its ability to adapt to our changing environments and process needs."