A Risk Assessment Tool Using a CMMI Quantitative Approach

Morakot Choetkiertikul and Thanwadee Sunetnanta

***Abstract*—A notable purpose of offshoring is to gain competitive advantages in software development business. While offshoring offers great opportunities, it also creates a new trend of threats in software development due to differences in culture, languages, time zones, and development processes deployed. Maximizing the profits of the offshoring relies on strong remote project management skills including remote risk analysis. It is important that potential risks should be detected promptly and there should be quantitative indicators that can help to precisely monitor risks in a remote manner. In that view, we present an offshoring risk assessment tool which uses our formally defined CMMI quantitative approach. This tool is implemented on IBM JAZZ platform to enable quantitative risk monitoring and assessment for application life cycle support.**

***Index Terms*—Offshoring development, software risk monitoring and assessment, quantitative CMMI.**

I. Introduction

Nowadays, software development business is highly competitive. To gain a competitive advantage, many organizations decided to distribute some business process aboard. Offshore sourcing or offshoring is a remote software development approach that aims to gain an advantage from competitor in reducing cost of investment, accessing the local excellent resources, improving quality of production, or round-the-clock development to improve time-to-market by using time zone differences. The work in [1], [2], [3], and [4] explained how dramatically offshoring has increased.

While offshoring offers great benefits, it also tends to lead to some risks in its development process. Some problems are raised due to differences in culture and languages, differences in development process of enterprises and providers or differences in communication procedures [5]. So risk assessment must be done to improve the proportion of offshoring revenue since ignoring risks may lead project failure [6].

Risk assessment can be done in either qualitative or quantitative manner. The work of Islam et al. in [7] and that of Gupta and Sadig in [8] proposed a quantitative model for risk control while the Alves et al. in [9] proposed a qualitative risk analysis model focus on offshoring. We followed the idea of quantitative risk assessment but instead of creating our own rules in assessing the risks, we used Capability Maturity Model Integration (CMMI) as a guideline and attempted to apply it to offshoring risks.

In our study, we focused on three problems of risk assessment for offshoring 1) Existing risk assessment models do not provide a guideline to prevent risks, 2) Risk assessment for offshoring site can be costly since it requires extra activity and budget to perform assessment process on the site, and 3) Qualitative risk assessment relies on the opinions, not formal in the mathematical sense, and very subjective. In our view, there should be quantitative indicators that can help to precisely monitor risks in a remote manner. This research consisted of three main objectives in order to solve the above problems 1) To design a risk assessment model using our formally developed Quantitative CMMI approach, 2) To build an automate tool to collect evidences, assess and monitor offshoring risks based on the proposed risk assessment model remotely, and 3) To apply this tool to a real application lifecycle management environment as a proof of concept.

This paper presents our risk assessment tool which was development further from our prior work in Quantitative CMMI in [10]. In section 2, we give a conceptual view of our risk assessment model extending from the work. Section 3 then discusses our implemented tool and its results. Last section concludes our contribution and ongoing work.

II. Our Proposed Risk Assessment Model for Offshoring Using CMMI Quantitative Approach

From our proposed risk assessment model in [10] we develop our risk assessment model based on four assumptions. First, risk is an invert to quality of project management. So the way to prevent risk is to maintain and try to improve project quality. Second, extra activities in risk assessment can be reduced when the assessment is embedded in offshoring development process, without requiring any activities such as interview or even gathering evidences. Third, the degree of impacts to risk assessment depends on the time that we assess the project. So, risk factors should be monitored in a timely manner according to its impacts at a different phase of software development. Forth, risk assessment should still maintain the nature of offshoring in a distributed manner and provides guidance to improve quality of remote project management.

As discussed earlier, it is important that potential risks should be detected promptly and there should be quantitative indicators that can help to precisely monitor risks in a remote manner. Towards that view, the deployment of CMMI can help offshoring gain better project management and higher quality.

To link offshoring risk analysis to CMMI, we studied CMMI and the Software Engineering Institute (SEI) Taxonomy-Based Risk Identification. While CMMI provides a measurement of software development process, it is also

Manuscript received May 28, 2012; revised June 30, 2012.

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composed of best practices which provide guidance for improving development process [11]. From this point, we first mapped risk factors to CMMI practices. Then we grouped risks factors together based on SEI risk taxonomy in [12]. To quantitatively assess and monitor offshoring risks, we proposed a risk analysis model to calculate the Quality of Project (QoP). The QoP describes a quality level of project from related CMMI practices. The more QoP a project has, the less project risk would be. Fig. 1 shows the fundamental idea of the development of our risk assessment model as discussed.

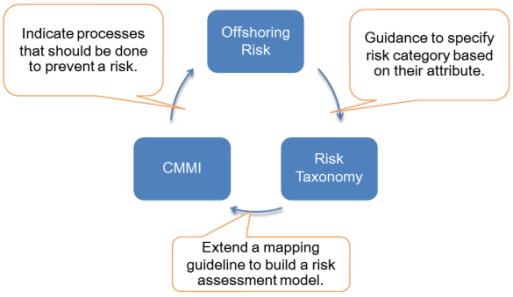

Fig. 1. Risk analysis approach.

III. A Risk Assessment Tool Implementation

Fig. 2 shows the architecture of our risk assessment tool based on our proposed model above.

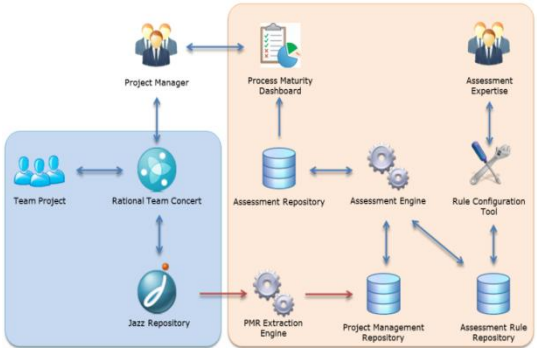

Fig. 2. An architecture of a risk assessment tool.

We developed this tool on the JAZZ platform which is an open source application introduced by IBM to support software development life cycle. From figure 2, our tool uses the project management data and evidences in *project management repository* (PMR) from the Rational Team Concert (RTC) on Jazz. When an assessment is initiated, the *PMR Extraction Engine* of the tool will collect required project management evidences from the JAZZ repository. After that, the *Assessment Engine* of the tool will quantify evidences objects to calculate the degree of risks according to our risk assessment model in [10], then calculate the QoP of the assessed project. Last, the tool will compare the QoP to related CMMI practices of each risk factor and display the risk results on the tool's dashboard.

Fig. 3 exemplifies the results generated by our tool. It shows two graphs. The top one can be used to check the chronological monitoring results of risks remotely. The bottom one shows the identification of potential risks and critical risks found based on our quantitative CMMI indicators. Users can also drill down to see the degree of each risk and associated CMMI practice that should be done. These results can be read and analysed in order to detect and protect any further damage the risks might have caused.

IV. Conclusion

We have presented a risk assessment tool based on our risk assessment model for offshoring using CMMI quantitative approach to facilitate remote offshoring risk assessment and monitoring. This tool was implemented on the real application life cycle management. The results from the tool indicated the invert of project management quality as potential of risks in a quantitative manner and provided a guidance to improve the quality of the projectfrom the risks with CMMI practices.

To increase the accuracy of assessment we still need to investigate and validate the CMMI quantitative rules to prove their accuracy and usability for various projects.

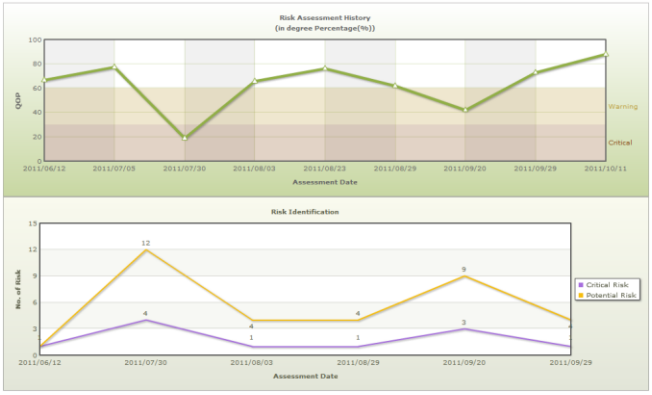

Fig. 3. Example of a risk assessment result.

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