UNIVERSITI PUTRA MALAYSIA

SYSTEM DYNAMICS SIMULATION MODEL TO ASSESS IMPACTS OF PERSONNEL FACTORS ON DELAYED SOFTWARE PROJECTS

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SYSTEM DYNAMICS SIMULATION MODEL TO ASSESS IMPACTS OF PERSONNEL FACTORS ON DELAYED SOFTWARE PROJECTS

By

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Thesis Submitted to the School of Graduate Studies,
Universiti Putra Malaysia, in Fulfilment of the Requirements
For the Degree of Master of Science
July 2011

In The Name of God, the Most Gracious and the Most Merciful

DEDICATION

To my mother, my father and all my family members.

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Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfilment of the requirement for the degree of Master of Science

SYSTEM DYNAMICS SIMULATION MODEL TO ASSESS IMPACTS OF PERSONNEL FACTORS ON DELAYED SOFTWARE PROJECTS

By

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July 2011

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According to the latest survey's reports, the software project's failure is considerably high despite the advancement in the field of software project management. Many projects were being announced to be completed beyond their planned schedule. Delivery of a software project beyond its schedule cannot be tolerated. The delay may result in the loss of a market opportunity and can be a cause of failure to a dependent project . Schedule slippage could even incur a much higher cost than the cost of the project itself. Therefore, software project managers may take any possible arrangement to ensure that the project completed on time, such as adding new manpower to the project. Adding new manpower to an ongoing delayed software project may cause negative impacts to the team productivity due to assimilation time, training overhead and communication overhead. Consequently, project managers have difficulties to make the decision whether to add new members to his team or not. Therefore, this research attempts to investigate how software project managers can minimize the negative influence of adding new manpower to delayed software projects.

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More specifically, this research aims to examine whether a significant schedule improvement can be achieved with proper consideration of the new manpower capabilities, skills and experience. A system dynamics approach has been employed for in-depth investigation of the issue. Accordingly, a System Dynamics Simulation Model is proposed to simulate the dynamic behaviour of the project progress when new members are added to the project. Some principal attributes of the model such as assimilation time, communication overhead and training overhead have been adopted from the previously developed system dynamics models. The COCOMO II personnel factors productivity multipliers are also employed to represent various personnel factors in the proposed model.

The proposed model was verified and validated by experiments with two cases: a literature case and an industry case. The results of the experiments indicate that significant schedule improvement of a late project can be achieved if people with certain levels of capabilities and experience are added to the project. Furthermore, the findings of this research demonstrates that software project managers can take the advantages of employing system dynamics approach for detailed trade-off analysis of adding new manpower to a project.

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Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia
sebagai memenuhi keperluan untuk ijazah Master Sains

MODEL SIMULASI SISTEM DINAMIK UNTUK MENILAI IMPAK
FAKTOR PERSONEL KE ATAS PROJEK PERISIAN YANG TERTUNDA

Oleh
MOSTAFA FARSHCHI
Julai 2011

Pengerusi: Yusmadi Yah Jusoh, PhD

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Menurut laporan terkini, kegagalan projek persian adalah cukup tinggi walaupun wujud kemajuan dalam bidang pengurusan projek perisian. Banyak projek yang telah diumumkan lewat disiapkan berbanding jadual yang telah dirancang. Projek perisian yang lewat disiapkan tidak boleh dibiarkan dalam banyak situasi. Kelewatan jadual boleh menyebabkan hilangnya peluang pasaran dan boleh menjadi penyebab kepada kegagalan projek lain yang berkaitan. Kelewatan jadual juga boleh meningkatkan kos yang jauh lebih tinggi daripada kos projek itu sendiri. Oleh itu, pengurus projek perisian mungkin akan mengambil apa-apa tindakan untuk memastikan projek disiapkan mengikut jadual, seperti menambah tenaga kerja baru untuk projek perisian yang sedang dilaksanakan. Menambahkan tenaga kerja baru kepada projek yang sedang dilaksanakan mungkin akan menimbulkan kesan negatif terhadap produktiviti pasukan disebabkan oleh masa asimilasi, overhead latihan dan overhead komunikasi. Akibatnya, pengurus projek mengalami kesulitan untuk membuat keputusan sama ada menambah ahli baru untuk pasukannya atau tidak. Oleh itu, kajian ini cuba untuk mengenalpasti bagaimana pengurus projek perisian boleh meminimumkan kesan negatif penambahan tenaga kerja baru untuk projek perisian yang tertunda.

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Secara lebih spesifik, kajian ini bertujuan untuk meguji sama ada penambahbaikan jadual berlaku melalui pertimbangan yang bersesuaian terhadap keupayaan, kemahiran dan pengalaman tenaga kerja baru. Pendekatan sistem dinamik telah digunakan untuk mengkaji secara lebih mendalam tentang isu ini. Oleh itu, Model Simulasi Sistem Dinamik dicadangkan untuk mensimulasikan perlakuan dinamik kemajuan projek apabila ahli baru ditambah kepada projek. Beberapa atribut asas model seperti masa asimilasi, overhead komunikasi dan overhead latihan telah diguna pakai dari model sistem dinamik yang telah dibangunkan sebelum ini. Penganda faktor produktiviti personel daripada COCOMO II juga telah digunakan untuk mewakili pelbagai faktor personel dalam model yang dicadangkan. Model yang dicadangkan telah diuji dan disahkan melalui eksperimen ke atas dua kes: kes daripada literasi dan kes industri. Hasil eksperimen menunjukkan bahawa pengurangan signifikan terhadap kelewatan jadual projek boleh dicapai apabila personel dengan tahap kemampuan dan pengalaman yang tertentu ditambah kepada projek. Tambahan lagi, penemuan kajian ini menunjukkan bahawa pengurus projek perisian boleh memanfaatkannya dengan menggunakan pendekatan sistem dinamik untuk analisa trade-off yang terperinci apabila menambah tenaga kerja baru untuk sesuatu projek.

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I certify that a Thesis Examination Committee has met on 14 July 2011 to conduct the final examination of Mostafa Farshchi on his thesis entitled —System Dynamics Simulation Model to Assess Impacts of Personnel Factors on Delayed Software Projects in accordance with Universities and University College Act 1971 and the Constitution of the Universiti Putra Malaysia [P.U.(A) 106] 15 March 1998. The committee recommends that the student be awarded the Master of Science. Members of the Thesis Examination Committee were as follows:

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DECLARATION

I declare that this thesis is my original work except for quotations and citations which have been duly acknowledged. I also declare that it has not been previously, and it not concurrently, submitted for any other degree at Universiti Putra Malaysia or at any other institution.

_____

MOSTAFA FARSHCHI

Date: 14 July 2011

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