



UNIVERSITI PUTRA MALAYSIA

***KNOWLEDGE TRANSFER MODEL OF TEAM CAPABILITY IN
NONCOLLOCATED SOFTWARE ARCHITECTURE DEVELOPMENT***

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By

SALFARINA ABDULLAH

**Thesis Submitted to the School of Graduate Studies, Universiti Putra Malaysia, in
Fulfilment of the Requirements for the Degree of Doctor of Philosophy**

August 2012

DEDICATION

I want to dedicate this thesis to my dearest family, especially to my soulmate, Mr. Sazly Anuar, my dearest sons, Mr. Iman Raziq and Mr. Iman Muhammad Riffqy, and also to my lovely daughter, Ms. Iman Nuryasmin for their care, patience and love throughout my studies.

Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfilment of the requirement for the degree of Doctor of Philosophy

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Chairman: Marzanah A. Jabar, PhD

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Software architecture is all about making design decisions based on the requirements specified by the users. Knowledge transfer (KT) is crucially essential as for making these design decisions, many factors and inputs need to be carefully considered and accounted. However, not much is known about KT in software architecture development, a setting that is very much knowledge intensive. Unclear flow of KT and insufficient explanation on how KT may influence teams' capabilities are identified as the problems seeking for immediate delineation. As awareness of the importance of KT in software development has increased, together with a growing interest in related capabilities, this research proposes to investigate how the KT unfolds between analyst and software architect teams in non-located software architecture development. Our interest also lies into the KT factors that might positively influence teams' capability in terms of team and task familiarity. 150 participants consisting of analysts, software architects and a few project managers have been interviewed in two distinct phases of semi-structured interview sessions for

data collection purpose. We describe and characterize KT through five key factors or constructs into a model: 1) the areas of knowledge used and exchanged, 2) the interdependency between teams, 3) the utilization of knowledge used and exchanged, 4) the mediums used for KT, and finally 5) the external conditions surrounding KT. The findings reveal confirmatory with our model. We used linear regression analysis for hypotheses testing, to check whether these five factors influence teams' capability in terms of team and task familiarity, as well as their influence direction. The results have proven the interdependencies between teams, the utilization of the knowledge exchanged, and the external conditions surrounding KT will positively influence teams' capability in terms of team and task familiarity. Although the mediums used for KT influence teams' capability, the influence was found in negative direction. Areas of knowledge used and exchanged however have shown no influence on teams' capability. The primary theoretical contribution of this research lies in the model that illustrates the interrelationships between analyst and software architect teams during non-located software architecture development, along with the influencing factors of KT over those teams' capabilities. Taking team and task familiarity in viewing teams' capability signifies a distinct approach that potentially inspires for greater contributions particularly in teams' capability area of interest. In short, it provides better prospects for KT to occur between different functional teams that are non-located and rest a good understanding of how KT may influence their capability.

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia
sebagai memenuhi keperluan untuk ijazah Doktor Falsafah

**MODEL PEMINDAHAN PENGETAHUAN KEBOLEHUPAYAAN PASUKAN DI
DALAM PEMBANGUNAN SENI BINA PERISIAN SECARA TIDAK BERKELOMPOK**

Oleh

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Seni bina perisian adalah semuanya mengenai membuat keputusan reka bentuk berdasarkan keperluan yang ditetapkan oleh pengguna. Pemindahan pengetahuan adalah sangat penting untuk membuat keputusan reka bentuk ini, yang mana banyak faktor dan input perlu diberikan pertimbangan dan diambil kira. Walau bagaimanapun, tidak banyak yang diketahui tentang pemindahan pengetahuan dalam pembangunan seni bina perisian, suatu persekitaran pengetahuan yang sangat intensif. Aliran pemindahan pengetahuan yang tidak jelas serta gambaran yang tidak mencukupi tentang bagaimana pemindahan pengetahuan ini boleh mempengaruhi kebolehpayaan pasukan atau pasukan dikenal pasti sebagai masalah yang memerlukan penyelesaian segera. Dengan peningkatan kesedaran ke atas pentingnya pemindahan pengetahuan dalam projek pembangunan perisian, seiring dengan minat yang semakin berkembang terhadap kebolehpayaan yang berkaitan dengannya, kajian ini mencadangkan untuk menyiasat bagaimana pemindahan pengetahuan berlaku di antara pasukan juru analisa dan pereka seni bina di dalam pembangunan seni bina perisian yang tidak

berkelompok. Minat kami juga adalah terhadap faktor-faktor yang berkemungkinan mempengaruhi secara positif ke atas kebolehpayaan pasukan-pasukan ini dari segi kebiasaan terhadap ahli pasukan dan tugas. Seramai 150 orang yang terdiri daripada juru analisa, pereka seni bina beserta beberapa orang pengurus projek telah ditemuduga dalam dua fasa sesi temuduga yang berlainan untuk tujuan pengumpulan data. Kami mencadangkan dan menggambarkan pemindahan pengetahuan melalui lima faktor utama atau konstruk ke dalam suatu model: 1) bidang pengetahuan yang digunakan dan dikongsi, 2) saling kebergantungan antara pasukan, 3) penggunaan pengetahuan yang digunakan dan dikongsi, 4) medium yang digunakan untuk pemindahan pengetahuan, dan akhir sekali 5) keadaan-keadaan luaran di sekitar pemindahan pengetahuan. Penemuan kami menunjukkan kesahihan dengan model yang kami cadangkan. Kami menggunakan analisis regresi linear untuk ujian hipotesis, bagi memeriksa sama ada faktor-faktor tersebut mempengaruhi kebolehpayaan pasukan dari segi kebiasaan terhadap ahli kumpulan dan tugas, juga untuk mengetahui arah pengaruh yang wujud. Keputusan kajian telah mendapati saling kebergantungan antara pasukan, penggunaan pengetahuan yang digunakan dan dikongsi, dan keadaan-keadaan luaran di sekitar pemindahan pengetahuan akan mempengaruhi secara positif kebolehpayaan pasukan dari segi kebiasaan terhadap ahli pasukan dan tugas. Walau pun medium yang digunakan untuk pemindahan pengetahuan mempengaruhi kebolehpayaan pasukan, pengaruh yang wujud itu adalah dari arah negatif. Bidang pengetahuan yang digunakan dan dikongsi bagaimanapun tidak menunjukkan adanya sebarang pengaruh ke atas kebolehpayaan pasukan. Sumbangan teori yang utama daripada kajian ini adalah model yang menggambarkan hubungan di antara pasukan juru analisa dan pereka seni bina di dalam pembangunan seni bina perisian yang tidak berkelompok, seiring dengan faktor-faktor pemindahan pengetahuan yang mempengaruhi kebolehpayaan kumpulan.

Mengambil kebiasaan terhadap ahli pasukan dan tugas dalam melihat kebolehpayaan pasukan adalah pendekatan berbeza yang mampu memberi inspirasi untuk sumbangan yang lebih besar terutamanya dalam bidang kebolehpayaan pasukan. Pendek kata, ia menyediakan prospek yang lebih baik untuk pemindahan pengetahuan berlaku antara pasukan yang berbeza fungsi yang tidak berkelompok serta memberikan pemahaman yang baik mengenai bagaimana pemindahan pengetahuan boleh mempengaruhi keupayaan mereka.



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I certify that a Thesis Examination Committee has met on 10 August 2012 to conduct the final examination of Salfarina Abdullah on her thesis entitled “Knowledge Transfer Model of Team Capability in Non-Collocated Software Architecture Development” in accordance with the Universities and University Colleges 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 Doctor of Philosophy.

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DECLARATION

I declare that the 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 is not concurrently, submitted for any other degree at Universiti Putra Malaysia or at any other institution.



SALFARINA ABDULLAH

Date: 10 August 2012

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