UNIVERSITI PUTRA MALAYSIA

NEW FUNCTIONAL SIZE CONVERTIBILITY MODELS IN FPA AND COSMIC MEASUREMENT METHODS

ABEDALLAH ZAID AHMAD ABUALKISHIK

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NEW FUNCTIONAL SIZE CONVERTIBILITY MODELS IN FPA AND COSMIC MEASUREMENT METHODS

BY

ABEDALLAH ZAID AHMAD ABUALKISHIK

Thesis submitted to the School of Graduate Studies, Universiti Putra Malaysia, in Fulfilment of the Requirement for the degree of Doctor of Philosophy

September 2012

DEDICATION

To my parents
for their love.

Abstract of thesis to the Senate of Universiti Putra Malaysia, in fulfillment of the requirement for the degree of Doctor of Philosophy

NEW FUNCTIONAL SIZE CONVERTIBILITY MODELS IN FPA AND COSMIC MEASUREMENT METHODS

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ABEDALLAH ZAID AHMAD ABUALKISHIK

September 2012

Chairman: Assoc Prof Mohd. Hasan Selamat

Faculty*:* Computer Science and Information Technology

Software functional size measurement is highly demanded and has gained wide adoption and acceptance in software organizations due to its benefits and wide applications in software project management. Function point analysis is the first method proposed by Albrecht, and has been maintained by the international function point user group. Function point analysis method is the most used measurement method globally. COSMIC method has been known as a second generation functional size measurement due to it is novel design. The method was designed to size a wider scope of functional domains, in particular, to measure real time systems and to alleviate the existing limitations of previous proposed methods.

The need for conversion is driven by a method's unsuitability for the task at hand, or its limitations, or it might be necessary because of the need to use the benchmark set of a particular domain. This is mainly, because function point analysis cannot size as many software functional domains as COSMIC, and because of some limitations surrounding function point analysis. The main problem with this change is to

maintain the software organization's ability to accurately convert their historical data measured by function point analysis to the corresponding value in COSMIC method.

This thesis proposes a new theoretical model that converts the functional size measured by function point analysis to its corresponding COSMIC measures, at the level of base functional components of both methods, using the principles of probability based on in depth analysis of the type of transaction functions and its primary intent, processing logic forms and COSMIC method rules. The model was found to adequately convert all the tested applications precisely, in which it converts 97.7% of the whole dataset elementary processes into the estimated interval accurately.

Most convertibility studies between the two methods undertook to convert the unadjusted function point to COSMIC size statistically. Two studies used the transaction functions size to obtain the corresponding COSMIC size, and found it more accurate than the type that uses the unadjusted size to obtain COSMIC measures. Accordingly, this thesis examines the accuracy of the two common statistical conversion types as well as the effect of function point analysis weighting tables and structural problems on its accuracy. Moreover, it proposes a new statistical conversion type that uses the number of files referenced by the whole elementary processes in a single application as a unit for prediction to estimate the corresponding COSMIC measures.

Basically, two regression models have been used to compare the accuracy of the two statistical conversion types with the proposed type, based on the accuracy of fitting

measures that uses the leave one out cross validation technique applied on one dataset. Also, four datasets from previous studies were used to further emphasize the obtained results. The two conversion types most often used were found to generate non-linear, inaccurate and violate the principle of measurement theory as scales transformation. The proposed statistical conversion type avoids the problems inherent in the other two types but not the non-linearity problem, and produced valid and highly accurate results over the tested datasets.

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

MODEL BAHARU FUNGSI PENUKARAN SAIZ ANTARA FPA DAN KAEDAH PENGUKURAN COSMIC

Oleh

ABEDALLAH ZAID AHMAD ABUALKISHIK

September 2012

Pengerusi: Profesor Madya Mohd. Hasan Selamat

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Pengiraan saiz bagi fungsi perisian menerima permintaan yang sangat tinggi di mana ianya telah diterima dan digunapakai secara meluas di kalangan organisasi perisian. Ini disebabkan oleh kelebihan dan penggunaannya di dalam perisian bagi pengurusan projek. FAP merupakan kaedah pertama yang dicadangkan oleh Albrecht dan diselenggarakan oleh kumpulan pengguna takat fungsi antarabangsa. Kaedah FAP ini merupakan kaedah pengiraan yang banyak digunakan secara global. Kaedah COSMIC pula dikenali sebagai generasi kedua bagi pengiraan fungsi saiz disebabkan oleh pendekatan baharu di dalam rekabentuk. Kaedah ini direkabentuk bagi memenuhi skop domain fungsi yang lebih besar bagi mengukur sistem masa nyata dan juga mengenepikan had-had yang terdapat di dalam kaedah sebelumnya.

Keperluan pengubahan ini didorong oleh ketidaksesuaian kaedah ini semasa pelaksanaan, had-had penggunaan, atau berkemungkinan disebabkan oleh

keperluannya di dalam domain tertentu sebagai set penanda aras. Ini disebabkan oleh FAP tidak mampu mengukur sebagaimana domain fungsi perisian seperti COSMIC dan juga beberapa had yang terdapat di dalam analisis ini. Walau bagaimanapun, masalah utama pengubahan ini adalah untuk mengekalkan keupayaan dan ketepatan organisasi perisian di dalam mengubah data-data lama yang menggunakan kaedah FAP kepada kaedah COSMIC.

Tesis ini mencadangkan satu model teoritikal yang baharu bagi mengubah saiz fungsi yang menggunakan FAP kepada COSMIC di peringkat asas bagi kedua-dua kaedah. Proses ini dilakukan dengan menggunakan prinsip kebarangkalian berdasarkan kepada analisis secara terperinci bagi jenis fungsi transaksi dan isi kandungannya, bentuk logik pemprosesan, dan peraturan kaedah COSMIC. Model ini telah diuji ke atas aplikasi-aplikasi dan terbukti mampu mengubah secara menyeluruh di mana 97.7% berjaya ditukar dari kesemua proses asas set data kepada selang anggaran dengan tepat.

Kebanyakan kajian yang dijalankan di antara kedua-dua kaedah adalah menukar takat fungsi yang tidak dilaraskan kepada saiz COSMIC secara statistik. Antaranya, dua kajian telah menggunakan saiz fungsi transaksi bagi mendapatkan saiz COSMIC yang sepadan dan mendapati ianya adalah tepat berbanding kajian yang menggunakan saiz yang tidak dilaraskan bagi ukuran saiz COSMIC. Sewajarnya, kajian ini mencadangkan jenis pengubahan yang baharu secara statistik di mana penggunaan nombor rujukan fail bagi keseluruhan proses asas di dalam aplikasi tunggal sebagai satu unit ramalan. Ini adalah untuk menganggarkan ukuran COSMIC yang sepadan.

Secara dasarnya, dua model regresi telah digunakan untuk membandingkan ketepatan dua jenis pengubahan secara statistik seperti yang dicadangkan. Ianya adalah berdasarkan kepada ketepatan ukuran yang sepatutnya iaitu dengan menggunakan teknik meninggalkan satu validasi lintang ke atas satu set data. Selanjutnya, empat set data dari kajian terdahulu digunakan bagi membuktikan keputusan yang diperolehi. Didapati dua jenis pengubahan yang selalu digunakan menghasilkan keputusan tidak linear, tidak tepat dan melanggar prinsip teori pengukuran sebagai skala transformasi. Oleh itu, jenis pengubahan statistik yang dicadangkan dapat menghalang masalah-masalah yang wujud dalam dua jenis yang lain tetapi bukan dari segi masalah tidak linear. Sebaliknya dapat menghasilkan keputusan yang sahih dan tepat ke atas set-set data yang diuji.

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APPROVAL

I certify that a Thesis Examination Committee has met on 27 December 2012 to conduct the final examination of Abedallah Zaid Ahmad Abualkishik on his thesis entitled "New Functional Size Convertibility Models in FPA and Cosmic Measurement Methods" in accordance with the 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 Doctor of Philosophy.

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Date: 19 December 2012

This thesis was submitted to the Senate of Universiti Putra Malaysia and has been accepted as fulfillment of the requirement for the degree of Doctor of Philosophy. The members of the Supervisory Committee were as follows:

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DECLARATION

I here by 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 other institution.

ABEDALLAH ZAID AHMAD ABUALKISHIK
Date: 27 September 2012

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