



UNIVERSITI PUTRA MALAYSIA

***KNOWLEDGE MANAGEMENT SYSTEM FRAMEWORK FOR
COLLABORATIVE SOFTWARE MAINTENANCE ENVIRONMENT***

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**KNOWLEDGE MANAGEMENT SYSTEM FRAMEWORK FOR
COLLABORATIVE SOFTWARE MAINTENANCE ENVIRONMENT**

BY
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**Thesis Submitted to the School of Graduate Studies, Universiti Putra Malaysia, in
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Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfillment of the requirements for the degree of Doctor of Philosophy

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Faculty: Computer Science and Information Technology

Software Maintenance (SM) environment is highly collaborative, complex, knowledge-driven and important. Organizations depend on how quickly, reliably and cost-effective the software could be changed to meet business demands. In a collaborative environment within SM Community of Practice (CoP), users and software maintainers interact on regular basis to share knowledge to resolve software bugs and to extend new enhancements. However, issue such as problem in identifying and sharing knowledge is still regarded as a major challenge.

In this study, a Knowledge Management System (KMS) framework for collaborative Software Maintenance (SM) is formulated based on existing components in general frameworks in Knowledge Management (KM), KMS and SM areas. A survey was carried-out to determine important KMS components to the SM CoP and the components are further examined by experts. As a result, a KMS framework consisting

of SM Community of Practice, Knowledge Required, SM Process/Activities, Knowledge Management Activities, SM Tools, Automation/Knowledge Discovery Tools, KMS Infrastructure, Collaborative and Soft Influences components was proposed.

The KMS framework was then validated vis-a-vis a prototype to verify selected components are indeed useful for SM CoP. The prototype, called Software Maintenance Collaborative Agent Team (SCAT), uses the Multi-Agent System (MAS) technology to automate knowledge storing and sharing during SM processes. A combined ontology has also been developed to link and extend the business domain to SM processes knowledge.

To evaluate the KMS framework components, SCAT is implemented, in an in-house SM department and evaluated against another KMS framework represented by an agent-based KMS tool developed by Rodriguez et al. A survey (based on Wu and Wang KMS Success Model) was conducted to gauge the benefits of both KMS tools, which covers knowledge or information quality and perceived KMS benefits. Based on t-test comparison on overall Rasch estimated measures, it was concluded that SCAT KMS is significantly better than Rodriguez KMS in the above areas. In addition, based on Common Person Equating plot and Measure Differences plots, SCAT is significantly better in important aspects such as complete knowledge portal, sharing specific knowledge and improves quality. In future, SCAT could be enhanced to improve the weak areas.

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

**RANGKA KERJA SISTEM PENGURUSAN PENGETAHUAN UNTUK
PENYELENGGARAAN PERISIAN DI DALAM PERSEKITARAN
BERKOLABORATIF**

Oleh

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Persekitaran untuk Pengurusan Perisian (PP) adalah sangat berkolaboratif, kompleks, penting dan memerlukan ilmu pengetahuan di dalam bidang yang berkaitan. Organisasi bergantung kepada berapa cepat, berkualiti dan kos efektif sesebuah aplikasi dapat diperbaiki untuk memenuhi keperluan perniagaan atau operasi. Sehingga kini, masalah mengenali dan mendapatkan sumber pengetahuan adalah isu yang besar di dalam PP. Bagi memanfaatkan Pengurusan Pengetahuan (KM) di dalam satu system aplikasi, sebuah sistem maklumat KM (KMS) diperlukan,

Di dalam kajian ini, satu rangka kerja KMS untuk persekitaran berkolaboratif bagi PP dirumus. Pada peringkat awal, rangka kerja umum dari bidang berkaitan dengan KM, KMS dan PP disintesis dan dirumus. Komponen asas seperti keperluan pengetahuan,

konteks organisasi, process dan aktiviti KM, teknologi dan peralatan kemudiannya dirumus sebagai rangka kerja awal KMS. Seterusnya, kajian soal-selidik dijalankan untuk menentukan komponen yang penting bagi PP.

Rangka kerja KMS yang telah disahkan di atas kemudiannya diolah menjadi satu sistem prototaip bagi menentusahkan bahawa komponen-komponen tersebut berguna untuk CoP di dalam PP. Prototaip ini, yang dipanggil *Software maintenance Collaborative Agent Team* (SCAT) mengguna-pakai Sistem Multi-Ejen (*Multi-Agent System* - MAS) untuk sistem automasi SCAT. Bagi memudahkan proses penstrukturan data dan informasi, ontologi pengetahuan bidang diadun dengan pengetahuan proses PP.

Untuk menilai keberkesanan Rangka Kerja KMS, SCAT dinilai dengan membanding dengan sebuah sistem multi-ejen lain yang dibangunkan oleh Rodriguez menggunakan model soal-selidik keberkesanan KMS oleh Wu & Wang yang meliputi aspek kualiti informasi dan pengetahuan dan faedah KMS. Ujian-t (*t-test*) digunakan bagi perbandingan antara sistem KMS SCAT dan Rodriguez. Kesimpulannya, secara keseluruhan, SCAT didapati lebih baik daripada Rodriguez KMS. Tambah lagi, hasil dari plot persamaan individu umum (*Common Person Equating plot*) menunjukkan SCAT lebih signifikan di dalam komponen penting KMS iaitu portal pengetahuan yang baik, perkongsian pengetahuan spesifik dan penambahbaik kualiti. Pada masa hadapan, SCAT masih boleh dipertingkatkan bagi memperbaiki komponen-komponen yang lemah.

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اللَّهُمَّ إِنِّي أَسْأَلُكَ عِلْمًا نَافِعًا وَرِزْقًا طَيِّبًا وَعَمَلًا مُتَقَبَّلًا

Meaning: “O Allah I ask you for beneficial knowledge, a good provision and deeds/actions that are accepted” (narrated from Abu Hurairah by At-Tirmidzi and Ibnu Majah)

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APPROVAL

Replace with approval sheet



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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.



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