

**SEQUENTIAL STRATEGY FOR SOFTWARE PROCESS MEASUREMENT  
USING STATISTICAL PROCESS CONTROL**

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I declare that this dissertation entitled "*Sequential Strategy for Software Process Measurement using Statistical Process Control*" is the result of my own research except as cited in the references. The dissertation has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.

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I strongly dedicated this dissertation to my beloved parents for their prayers and to  
my governor Dr. Rabi'u Musa Kwankwaso for sponsoring my study.

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## ABSTRACT

Software development process (SDP) and Software products are like two sides of a coin. We cannot achieve one without another. Today, in our software industries, monitoring software process is very challenging. Many problems of software process monitoring are hampering the quality of our software products. Several researchers in this area contributed their quota on addressing process monitoring issues using quantitative techniques. In this study, we address the problem of detecting software process deviations as a result of variations, investigating the causes of variations in software process, and the problem of process measurement. In addition, the study focus on code peer review process (CPRP). The first two problems can be addressed using one of the powerful quantitative techniques known as statistical process control (SPC). Also, control charts would be used in this study as it has been proved to be one of the suitable tools of SPC in monitoring process issues. As we know, the more defects we found during SDP, the less quality of the software product. Therefore, this study considers defect density as the metric to be use due to its significance in determining product quality. In order to have good analysis, this study conduct a case study on both Capability Maturity Model (CMM), lower and higher maturity levels software industries. On the other hand, to handle the problem of process measurement, a Sequential Strategy for Process Measure (SSPM) is proposed. This strategy is evaluated by Instrument for Evaluating Software Measurement Repository (IESMR) and Normative Information Model-based System Analysis and Design (NIMSAD) framework. Based on its evaluation, the strategy is similar to IESMR but differ in selecting measures, therefore it can be use for process measurement.

## ABSTRAK

Proses pembangunan perisian (SDP) dan produk perisian adalah seperti dua belah duit syiling. Kita tidak boleh mencapai satu tanpa yang lain. Kini, dalam industri perisian, pemantauan proses perisian adalah sangat mencabar. Banyak masalah pemantauan perisian proses yang menghalang kualiti produk perisian. Beberapa penyelidik dalam bidang ini menyumbang kuota mereka untuk menangani isu-isu pemantauan proses dengan menggunakan teknik kuantitatif. Dalam kajian ini, kami menangani masalah ketidakstabilan proses akibat daripada variasi, menyiasat punca variasi pada proses, dan masalah pengukuran proses. Di samping itu, tumpuan kajian adalah tertumpu kepada proses kajian kod rakan sebaya (CPRP). Dua masalah pertama boleh diatasi dengan menggunakan salah satu teknik kuantitatif yang berkuasa dikenali sebagai kawalan proses statistik (SPC). Juga, carta kawalan akan digunakan dalam kajian ini kerana ia telah terbukti menjadi salah satu alat SPC yang sesuai dalam memantau isu-isu proses. Seperti yang kita tahu, lebih banyak kecacatan didapati dalam SDP, kualiti produk perisian menjadi berkurangan. Oleh itu, kajian ini menganggap ketumpatan kecacatan sebagai metrik yang digunakan kerana kepentingannya dalam menentukan kualiti produk. Dalam usaha untuk mempunyai analisis yang baik, kajian ini menjalankan satu kajian kes di kedua-dua Model Kematangan Keupayaan (CMM), yang lebih rendah dan lebih tinggi tahap kematangan industri perisian. Sebaliknya, untuk mengendalikan masalah pengukuran proses, Strategi Jujukan Proses Langkah (SSPM) dicadangkan. Strategi ini dinilai dengan Instrumen untuk Menilai Repositori Pengukuran Perisian (IESMR) dan rangka kerja Analisis dan Reka bentuk sistem berdasarkan Model Maklumat Normatif (NIMSAD). Berdasarkan penilaianya, strategi ini adalah sama dengan IESMR tetapi berbeza dalam memilih langkah-langkah, oleh itu ia boleh digunakan untuk pengukuran proses.

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