RABAN - A SOFTWARE IMPLEMENTATION PROCESS FOR ROBOTIC PROCESS AUTOMATION (RPA) PROJECTS

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Degree of Doctor of Philosophy

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The thesis was submitted in partial fulfilment of the requirement for the Degree of Doctor of Philosophy in the Department of Computer Science and Engineering.

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DECLARATION

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ABSTRACT

Robotic Process Automation (RPA), the next level of business process automation, provides adaptive and transformative solutions to replace time-consuming, non-value-adding, and repetitive human tasks in a Business Process (BP). RPA based BP transformation projects differ from typical software development projects because RPA bots are developed on stable code. It is counterproductive to use existing software processes in RPA projects. A process template (i.e., software implementation process and metrics to track the project) is yet to be derived for RPA projects. The estimated initial RPA project failure rates are 30-50%, and the lack of a fitting implementation process is attributed as one of the key contributors to failure. We addressed this gap and derived a novel process for RPA projects named Raban and metrics to track RPA projects.

Scrum was used to formulate the Raban. Focus group discussions were conducted with scrum teams and identified 80 challenges. Those analyzed in Straussian grounded theory are grouped into six categories (i.e., *lack of agile mindset*, *inconsistency in story estimation*, *client management issues*, *lack of adherence to agile practices*, *scope change in requirement freeze*, and *lack of quantitative measurement*). Prioritized 15 burning challenges were classified based on significance, and taxonomy was developed. Derived steps to estimate RPA use-cases and a framework to achieve customer satisfaction adopting design thinking practices in agile projects. Moreover, 17 software metrics and three artifacts were derived and validated in five scrum projects. Raban was derived based on the solutions identified and further fine-tuned based on the feedback from follow-up interviews with the stakeholders and two workshops conducted with the other RPA project teams. After that, 14 metrics and two artifacts were derived for Raban and validated in a RPA project. Moreover, to select the right candidate BP for RPA transformation, predictive machine learning model was developed, where the decision made as yes/no on RPA suitability. We used 16 factors and a two-class decision forest classification model to develop the model.

Keywords: agile framework, agile metrics, design thinking, decision support tool, robotic process automation

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LIST OF ABBREVIATIONS

ASD	Agile Software Development
BPC	Business Process Complexity
CBPS	Candidate Business Process Status
CCM	Cyclomatic Complexity Metric
CF	Cognitive Features
CMMI	Capability Maturity Model Integration
CSM	Certified Scrum Masters
DD	Data-Driven
DMI	Delivery Maturity Index
DST	Decision Support Tool
EOL	End Of Life
HCM	Halstead Complexity Metric
HE	Human Error
IC	Integrated Circuit
IOF	Impact Of Failure
IT	Information Technology
IEC	International Electrotechnical Commission
ISO	International Organization for Standardization
KLOC	Thousands of Lines Of Code
LOC	Lines of Codes
MMI	Multi-Model Input
NOSA	No of Systems to Access
OC	Operational Cost
OTD	Ontime Delivery
PO	Product Owner
PQ	Product Quality
PP	Project Predictability

PT	Process Templates
PVT	Production Verification Testing
QA	Quality Assurance
ROC	Rate of Change
RBBP	Rule-Based Business Process
RC	Regulatory Compliance
RPA	Robotic Process Automation
SIT	System Integration Testing
SLA	Service Level Agreement
SLOC	Source Line Of Code
SME	Subject Matter Expert
SOE	Stability Of Environment
SPSS	Statistical Package for the Social Sciences
TDD	Test Driven Development
VOT	Volume of Transaction
SQuaRE	Software PQ Requirements and Evaluation
TP	Team Productivity
TVI+	Target Value Increase
UAT	User Accepting Testing
VOT	Volume of transaction
WIP	Working In Progress
WLV	WorkLoad Variance
WV	Workload Variance
XP, XP2	Extreme Programming

LIST OF APPENDICES