INTRODUCTION

Quantitative evaluation is a key factor of business process (BP) performance analysis to evaluate and improve the organisations processes. Performance analysis focus on quantitative evaluation of BP such as service levels, throughput times, and resource utilisation. Performance analytical modelling techniques, such as Stochastic Petri Nets (SPN) have been broadly used for performance analysis of BP. These techniques provide a powerful modelling and analysis tools to determine the effects of various parameters on performance indicators of BP. However, despite the importance of quantitative analysis of BP, hardly any studies are found in the literature that show the use of models for analysis of the quantitative behaviour and optimisation of BP.

GENERIC FRAMEWORK

The proposed framework consists of three modules:

- Modelling and mapping module: A module used to define BP in a formal language and mapped it to stochastic model.
- Analytical module: Used to analysis stochastic model by standard analytic tool support used as a solver.
- Algorithmic module: A mathematical module used to solve the desirable algorithms of BP improvement and optimisation (i.e. availability, Scheduling).

METHODOLOGY

- Insert BP model in a formal modelling language.
- Mapping BP into a Stochastic Petri Nets (SPN) model according to following relation: Task → Transition, Resources → Place and Relation → Arc. The expected execution time of task $e_{et} = \lambda^{-1}$, where $\lambda$ equal the firing delay of transition
- Compute the performance metrics of SPN model using stochastic Petri net analysis tools, (i.e. Stochastic Petri Net Package (SPNP)).
- Solve the mathematical algorithms of BP improvement and optimisation using the following algorithms for availability and scheduling:

Algorithm 1: Used to assess business process availability using the following equations:

1. The availability of single component calculated as $\text{MTTF}/(\text{MTTF} + \text{MTTR})$, where MTTF specifies the mean time to failures and MTTR specifies the mean time to repair after each failure.
2. The availability of workflows computed according to the formula: $P(W_t) = \prod_{j=1}^{m} (P_{R_{ij}}^t)$

Where $P_{ij}$ the availability of resource $j$ and $R_{ij}$ is the value of throughput of transition $t$ references to resource $r_{ij}$.

Algorithm 2: Used for BP scheduling which aimed to minimise overall BP workflow cost by minimise the overall workflow failure in meeting the specific workflow QoS requirements using the following equation:

1. $\text{Cost} = \min[C]$ 
2. $C = \sum_{j=1}^{m} \sum_{j=1}^{n} C_{ij}X_{ij}$, where $C_{ij}$ denotes the expected cost variable associated with $j^{th}$resource, $X_{ij}$ is the selected resource.

CONCLUSION

- This work introduces a generic framework for quantitative evaluation of business process that can be used for improve and optimise any BP.
- The framework consists of three modules; modelling and mapping module, analytical module and algorithmic module.
- A software support tools build in Java using the Eclipse platform used for design and execute framework modules. The execution of framework is presented in an automated way.