The gaps between proposed framework with previous frameworks are our model exist a 'signal' which is we called it proactive signal and map software development phases to risks. The signal actually have alert message that will avoided system proceed to next level if previous task incomplete. So, the signal present unique characteristic compare than previous work and present simple way to manage project in small scale of software project.

4. Research Methodology

This research is both exploratory and constructivist in nature. Based on the research objectives and the identified research questions, the System Development Research Methodology (SDRM) as suggested by Nunamaker and Chen (1990) has been utilized as research methodology [16]. According by Limbu, 2008 SDRM methodology has been used extensively in software engineering and information systems development research domain and it can accommodate dynamic evolution of the research in order to create innovations, define new ideas, and develop new technical capabilities [15]. SDRM has five stages which is shows in figure 7.

Based on the research objectives and the selection of the SDRM research methodology, the design of the research is as follows. Stage 1 comprises of extensive literature review of the problem domain. Stages 2, 3 and 4 comprises of creation of simulation model to address the research objectives. Stage 5 comprises of observation and evaluation of the model using individual early warning signs (EWS) testing and controlled experimental study.

There are four common risk management issues based on previous studies which are about people commitment, skills, communication and users demand. Based on these issues we proposed three metrics as shown in Table 1 while proposed attributes are shown in Table 2.

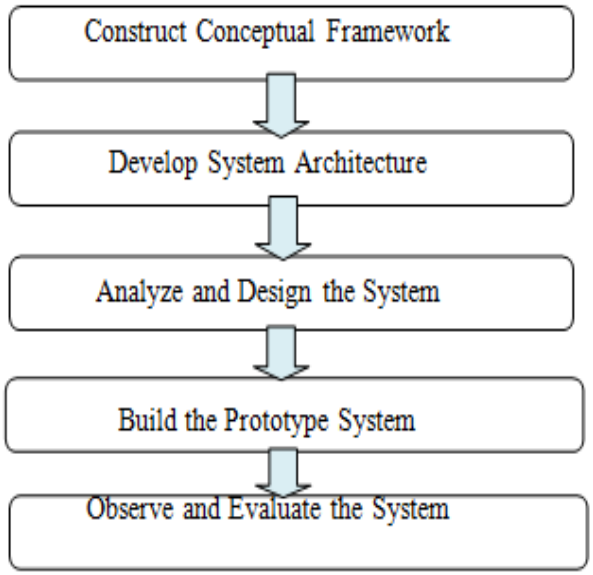

Figure 7: The research process proposed by Nunamaker and Chen (1990).

Table 1: The Proposed Metrics

Metrics	Unit	Description
Effeciency	**Defect Removal Efficiency (DRE)** = E(E+D) -E is the number of errors found before delivery -D is the number errors found after delivery	Effectiency to detect risks in every phases via signal.
Effectiveness	**Phase Containment Effectiveness for Phase i (PCEi)**= Number of phase i errors/(Num. of phase i errors+Num. of phase i defects). **Fault-slip-through(FST)**=Number of defect not found when it was most cost-effective	Effective in decrease project failure and increase project success.
Reliability	**Failure Rate (FR)**=Number of failures/execution time	Reliable to manage project well than before

Table 2: The Proposed Attributes

Attribute	Description
Number of risks	Number of risk in software project
Phases	Number of phases include in software process
Percentage of project success	Percentage of software project success to fulfill user requirement

Table 3 shown the experiment result analysis used to validate the metric 1, metric 2 and metric 3. The number of risks has shown the efficiency of proposed model and tool to detected risks. The phases and every stage that must be through by users push them to complete all task and then it shown the tool effectively will increase project success automatically. The percentage of project success shown that the reliability of the tool to help project team to manage the project and at the same time they can manage risks also. Besides that, the data in table 3 show that number of resource influence the duration of project completing and type of risks.

Table 3: Experiment Result Used To Validate Metrics and Attribute of Table 1 and Table 2.

Project	Num. of Resources	Duration	Num. of Risks Detected	List of Risk Existed in Project Development	Num. of Task Uncompleted	Percentage of Project Success
1	5	9 (months) 29(days)	3	Lack of top management. Weak required skills of team members. Project resources have been assigned to the higher priority project.	3	84.21%
2	10	6 (months)	6	Lack of top management. Weak required skills of team members. Communication breakdown among stakeholders. No stakeholder involvement. Subject matter is overscheduled. Weak Commitment of project members.	6	68.43%
3	7	8 (months)	4	Ineffective and not efficiency schedule planning of the project. Weak required skills of team members.	4	78.95%

4.1 Pilot Study

One pilot study was proceeded with choose one company that had long experience in software engineering and project management background to got experts opinion about our model and tool proposed. Data collection was achieved through the use of structured questionnaires followed TAM's format [17] which asked respondents question, aims at achieving the above objectives. Besides that, we also invited a few respondents from IT background and master students to answers questionnaires about model functionality (question 1-5) five questions and model usefulness (question 6-10) about our model also five questions. Some data was collected and presented into table 4 below.

Table 4: Result Analysis of Model Validity Test by 10 Respondents

Management Experience	Number Respondents	Functionality Agree (Ratio)	Usefulness Agree (Ratio)	Totally Agree	Agree Percentage %
0-3	3	0.6	0.8	1.4	70 %
3-5	4	0.4	0.6	1.0	50%
5-10	2	0.4	0.4	0.8	40%
10 or above	1	0.4	0.4	0.8	40%

Calculation for 'agree' percentage:-

Number of (Perceive ease of use) or functionality questions: n^f
Number of (Perceive usefulness) questions: n^u
Total of questions: t
Total of all questions: T

Formulae: $n^f /t + n^u /t = (n^f + n^u)/T$

So, total average for this tool 'agree' is 200/400%=50%

5. Conclusion

The proposed model is adopted from previous early warning sign model and risk factors framework. The model will detect the symptoms/risk factors during software development process in earliest stages before it's become costlier. The model automatically makes project manager know what actually symptoms cause and effect of project failure and project success. The contribution of this study is project failure will be decrease earliest and the cost to manage system will be reducing also. Besides, the model is quick simple and easy to use by any project. Early Prediction Model may be will be use in others platform such as social media, corporate, commercial and etc. and evaluate whether to get satisfactory result as is software project management.

5.1 Limitations

In this paper, we presented the Early Prediction Model for software project management to managing risks factors and ensure project success will be increase and project failure will be decrease before to become costlier. We proposed the 'Software Project Early Prediction System' and TAM questionnaire format to validating and verifying the model.
However, our research has the following limitations:

1. The tool, "Software Project Early Prediction System" just detect the most influential risk factors only and give the signal as project alert message, but the users need to make decision-making and risk control action manually.
2. The model may only works in certain situation, hence, if extreme result occurs, the experts must make adjustment before the implementation of the risk management plan.

References

[1] Roy Schmidt, Kalle Lyytinen, Mark Keil, and Paul Cule, "Identifying Software Project Risks: An International Delphi Study." Journal of Management Information System/ spring 2001, Vol. 17, No. 4, pp. 5-36.

[2] Leon A. Kappelman; Robert McKeeman; Lixuan Zhang, "Early Warning Sign of IT Project Failure: The Dominant Dozen." Information System Management Fall 2006; 23.4; ABI/INFORM Global Pg-31.
[3] Tom Philip; Erik Wende; Gerhad Schwabe, "Identifying Early Warning Signs of Failure in Offshore Software Development Projects-A Delphi Study." Proceedings of the sixteenth Americas Conference on Information System, Lima, Peru, August 12-15, 2010.
[4] Wen-Ming Han, Sun-Jen Huang, "An empirical analysis of risk components and performance on software projects." The journal of system and software 80 (2007) 42-50.
[5] Paul L. Bannerman (2008), "Risk and risk management in software projects: A reassessment." The journal of system and software 81 (2008) 2118-2133.
[6] Ingrid Spjelkavik; Bjorn Andersen; Lars E. Onsoyen, Tom Fagerhaug, Helge Marheim, "Project Performance Management System: A Conceptual Framework for early warnings in projects." No-7465, Mei 5.
[7] Mihir Kothari, "Early Warning Sign in Software Projects." A thesis for the degree of Master of Computer and Information Science (MCIS) 2010.
[8] Nikander, Iilmari O. (2002) "Early Warnings: A Phenomenon in Project Management." Dissertation for Doctor of Science in Technology, Helsinki University of technology, Espoo, Finland
[9] Xiaoqing (Frank) Liu, Gautam Kane, Monu Bambroo, "An intelligent early warning systems for software quality improvement and project management." The journal of systems and software 79 (2006) 1552-1564.
[10] Haneen Hijazi, Shihadeh Alqrainy, Hasan Muaidi, Thair Khdour, "Risk Factors in Software Development Phases." European Scientific Journal January 2014 edition vol.10, No.3 ISSN: 1857 – 7881 (Print) e - ISSN 1857- 743.
[11] L. Wallace, M. Keil, A. Rai, "How software project risk affects project performance: An investigation of the dimensions of risk and an exploratory model". Decision Sciences 35 (2) (2004) 289–321.
[12] Yong Hu, Jianfeng Du, Xiangzhou Zhang, Xiaoling Hao, E.W.T. Ngai, Ming Fan, Mei Liu, "An integrative framework for intelligent software project risk planning". Decision Support Systems 55 (2013) 927–937.
[13] Mohamed Saad, Sherif Mazen, Ehab Ezzat, Hegazy Zaher,"Towards a Conceptual Framework for Early Warning Information Systems (EWIS) for Crisis Preparedness". Á. Rocha et al. (Eds.): Advances in Information Systems and Technologies, AISC 206, pp. 523–534. DOI: 10.1007/978-3-642-36981-0_48.
[14] Limbu, D. K., "Contextual Information Retrieval from the WWW". Unpublished Doctoral dissertation, Auckland University of Technology, Auckland, New Zealand (2008).
[15] Nunamaker, J. F., & Chen, M., "Systems development in information Systems research". Paper presented at the Twenty-Third Annual Hawaii International Conference on System Sciences, Kailua-Kona, HI, USA (1990).
[16] Viswanath Venkatesh, Fred D. Davis, "A Theoretical Extension of the Model Technology Acceptance: Four Longitudinal Field Studies" Management Science vol. 46, No.2, February 2000 pp.186-204.

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