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Risk Associated with Management of Engineering Projects Using Intelligent Based Control System

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ABSTRACT

Some abandoned Engineering projects observed in some parts of the country this present era has arisen as a result of these factors Scope Creep, Schedule Delays, Budget Overruns, Safety Hazards, Technical Challenges and Additional Risk Factors. This is surmounted by introducing reducing risk associated with management of engineering projects using intelligent based control system. To achieve this, it was done in this manner, characterizing and establishing the causes of the risk associated with management of engineering projects, designing a conventional SIMULINK model for the risk associated with management of engineering projects, designing management rule base that will reduce the percentage of the risk associated with management of engineering projects, training ANN in the management rule base to enhance the efficacy of reducing the percentage of the risk associated with management of engineering projects, developing an algorithm that will implement the process, designing a SIMULINK model for reducing risk associated with management of engineering projects using intelligent based control system and validating and justifying the percentage improvement in the reduction of risk associated with management of engineering projects with and without intelligent based control system. The results obtained are the conventional Scope Creep that caused risk associated with management of engineering project was12%. On the other hand, when an intelligent based control system was introduced in the system, the percentage of risk observed in management of engineering project was reduced to10.4%, the conventional Safety Hazards that caused high risk associated with management of engineering projects was7%. However, when an intelligent based control system was integrated in the system the risk associated with management of engineering projects reduced to6.07% and the conventional Additional Risk Factors that caused risk associated with management of engineering projects was32% while when an intelligent based control system was imbibed in the system, it wittingly reduced to27.75%. Finally, with these results obtained, it shows that the percentage improvement in the reduction of risk associated with management of engineering projects when an intelligent based control system was integrated in the system over the conventional competitor was 4.25%.

Keyword: Reducing, risk, associated, management, engineering, project, intelligent, based, control, system

INTRODUCTION

Engineering projects are inherently complex, often involving intricate designs, tight deadlines, and significant financial investments. Throughout the project lifecycle, various uncertainties and challenges can arise, leading to significant risks that can impact project success. These risks can manifest as schedule delays, budget overruns, safety hazards, and ultimately, project failure. This paper explores the potential of intelligent control systems to mitigate these risks and enhance the overall management of engineering projects. By leveraging artificial intelligence (AI) and machine learning (ML) techniques, intelligent control systems can offer a data-driven approach to project management, enabling proactive risk identification, mitigation strategies, and improved

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decision-making. We will delve into the specific functionalities of intelligent control systems and how they can be applied to various aspects of engineering project management. We will explore how these systems can:

METHODOLOGY

To characterize and established the causes of the risk associated with management of engineering projects

Tabe1 characterize and established the causes of the risk associated with management of engineering projects

S/N	Causes of risk associated with management of engineering projects	Causes of risk associated with management of engineering projects (%)
1	Scope Creep	12
2	Schedule Delays:	8
3	Budget Overruns:	13
4	Safety Hazards:	7
5	Technical Challenges:	28
6	Additional Risk Factors	32

To design a conventional SIMULINK model for the risk associated with management of engineering projects

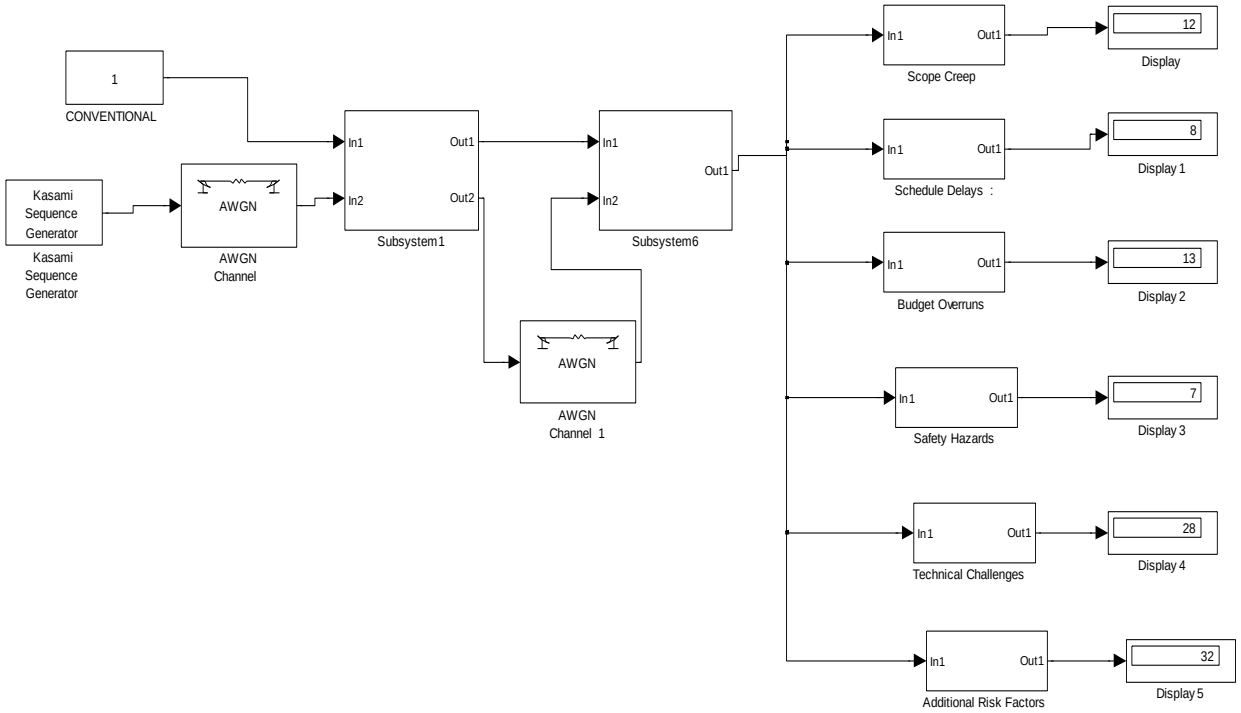

Fig 1 conventional SIMULINK model for the risk associated with management of engineering projects

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The results obtained are as shown in figures9 through14.

To design management rule base that will reduce the percentage of the risk associated with management of engineering projects

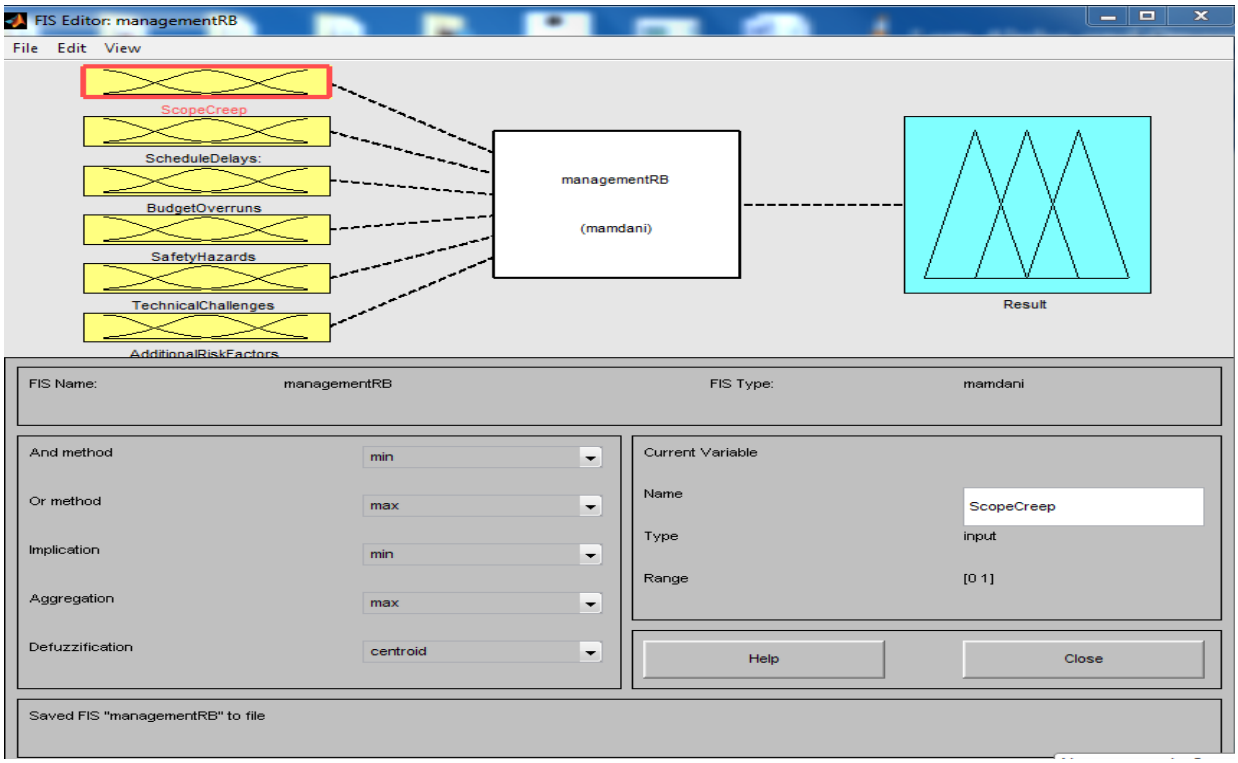

Fig 2 designed management fuzzy inference system that will reduce the percentage of the risk associated with management of engineering projects

Fig 2 has six inputs of the core causes of risk associated with management of engineering projects. These inputs ate Scope Creep, Schedule Delays, Budget Overruns, Safety Hazards, Technical Challenges and Additional Risk Factors. It also has an output result. This was done in Fuzzy tool box in MATLAB environment

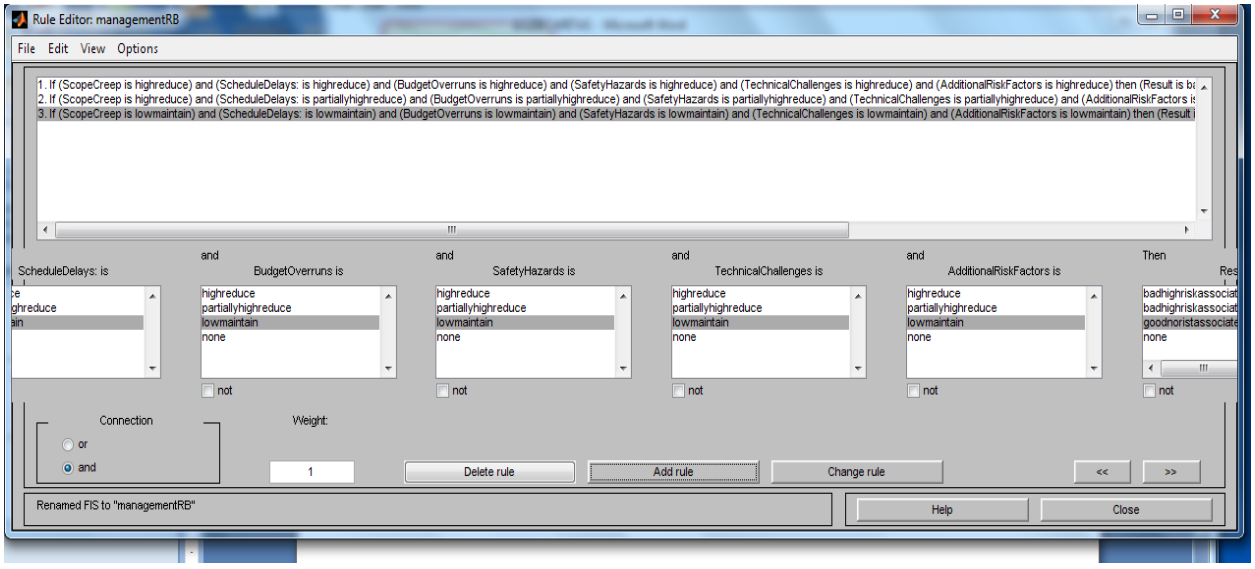

Fig 3 designed management rule base that will reduce the percentage of the risk associated with management of engineering projects

These rules are comprehensively written in table 2

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Table 2 comprehensive management rule base that will reduce the percentage of the risk associated with management of engineering projects

1	if Scope Creep is high reduce	And Schedule Delays is high reduce	And Budget Overruns is high reduce	And Safety Hazards is high reduce	And Technical Challenges is high reduce	And Additional Risk Factors is high reduce	Then result is bad high risk associated with Engineering management project
2	if Scope Creep is partially high reduce	And Schedule Delays is partially high reduce	And Budget Overruns is partially high reduce	And Safety Hazards is partially high reduce	And Technical Challenges is partially high reduce	And Additional Risk Factors partially is high reduce	Then result is bad high risk associated with Engineering management project
3	if Scope Creep is low maintain	And Schedule Delays is low maintain	And Budget Overruns is low maintain	And Safety Hazards is low maintain	And Technical Challenges is low maintain	And Additional Risk Factors is low maintain	Then result is good no risk associated with Engineering management project

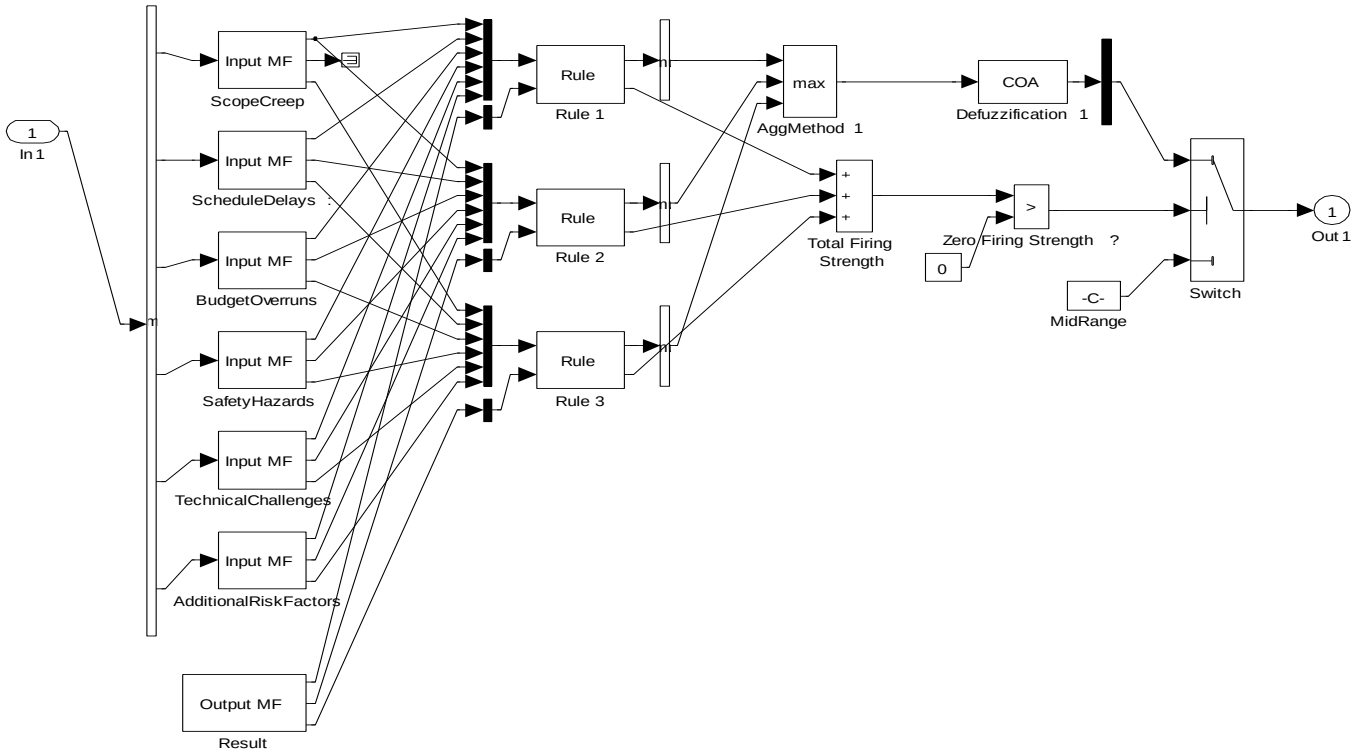

Fig 4 management rule base in operation to reduce the percentage of the risk associated with management of engineering projects

To train ANN in the management rule base to enhance the efficacy of reducing the percentage of the risk associated with management of engineering projects

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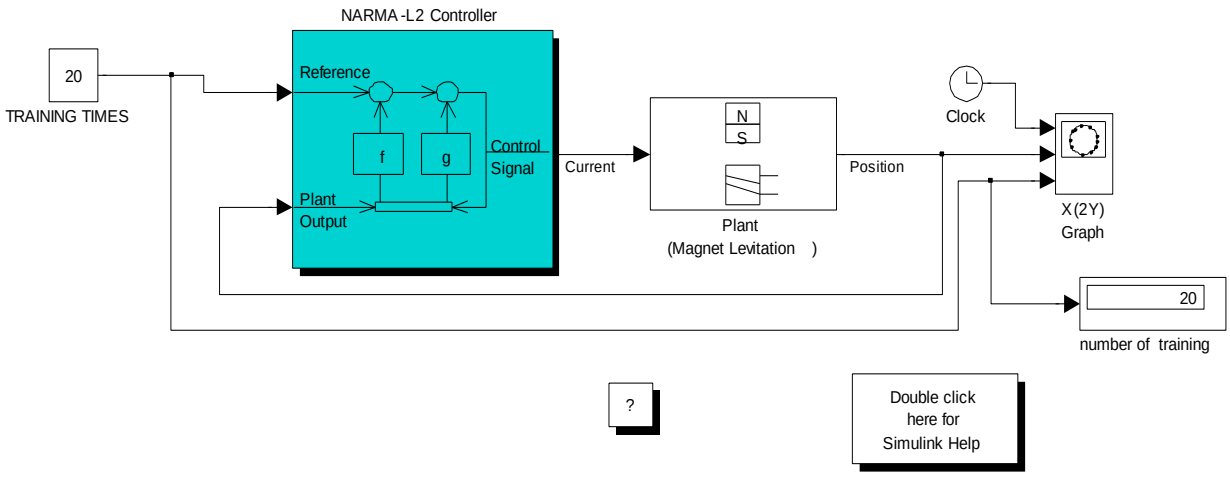

Fig 5 trained ANN in the management rule base to enhance the efficacy of reducing the percentage of the risk associated with management of engineering projects

In fig 5, it shows that ANN was trained twenty times in the three management rules

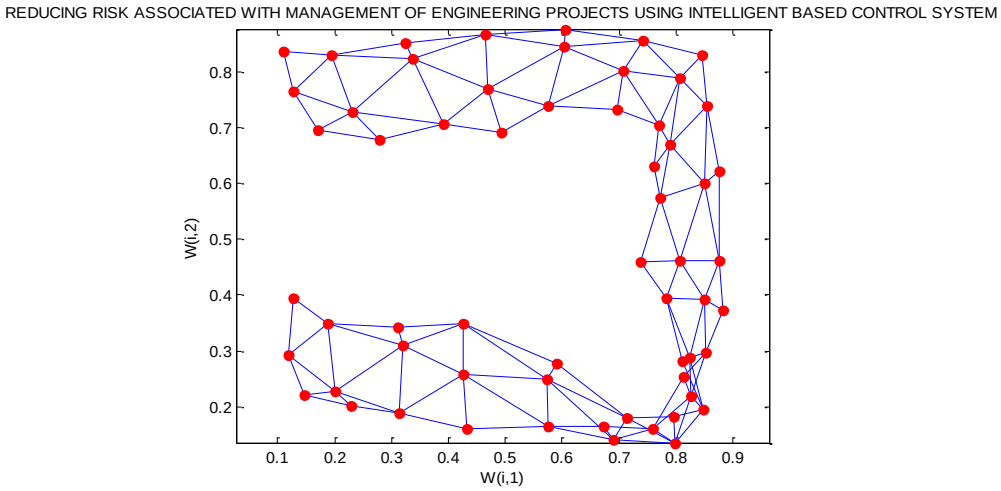

Fig 6 trained ANN in the management rule base to enhance the efficacy of reducing the percentage of the risk associated with management of engineering projects This was done in MATLAB environment

In fig 6 ANN was trained twenty times in the three management rules 20 x 3 =60 to give sixty neurons that look exactly like human brain that performs effectively what it is instructed to do.

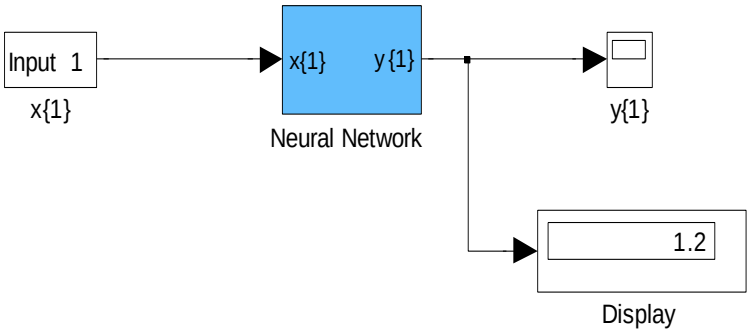

Fig 7 result obtained at the course of the training.

To develop an algorithm that will implement the process.

1. Characterize the causes of the risk associated with management of engineering projects

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2. Establish the causes of the risk associated with management of engineering projects
3. Identify high percentage of Scope Creep.
4. Identify high percentage of Schedule Delays.
5. Identify high percentage of Budget Overruns.
6. Identify high percentage of Safety Hazards
7. Identify high percentage of Technical Challenges
8. Identify high percentage of Additional Risk Factors
9. Design a conventional SIMULINK model for the risk associated with management of engineering projects and integrate 3 through 8
10. Design management rule base that will reduce the percentage of the risk associated with management of engineering projects
11. train ANN in the management rule base to enhance the efficacy of reducing the percentage of the risk associated with management of engineering projects
12. Integrate 10 and 11.
13. Integrate 12 in 9.
14. Do the high percentage of the established causes of the risk associated with management of engineering projects reduce?.
15. If NO go to 13
16. If YES go to 17
17. Reduced risk associated with management of engineering projects
18. Stop.
19. End

To design a SIMULINK model for reducing risk associated with management of engineering projects using intelligent based control system

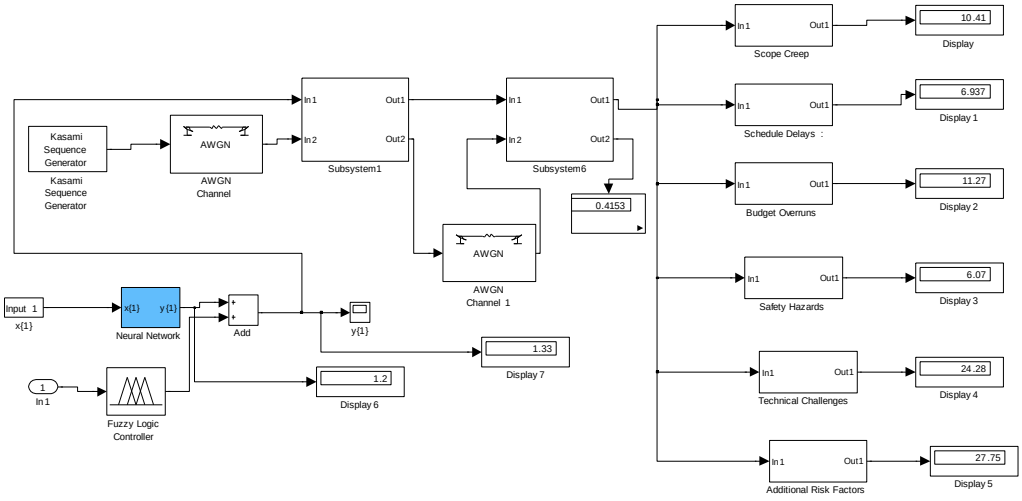

Fig 8 designed SIMULINK model for reducing risk associated with management of engineering projects using intelligent based control system

The results obtained after the simulation of fig 8 are as shown in figures 9 through 14

To validate and justify the percentage improvement in the reduction of risk associated with management of engineering projects with and without intelligent based control system.

To find percentage reduction of Scope Creep causes of risk associated with management of engineering projects with intelligent based control system

Conventional Scope Creep causes of risk associated MEP =12%

Intelligent based control system Scope Creep causes of risk associated MEP =10.41%

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% reduction of Scope Creep causes of risk associated with management of engineering projects with intelligent based control system =

Conventional Scope Creep causes of risk associated MEP - Intelligent based control system Scope Creep causes of risk associated MEP

% reduction of Scope Creep causes of risk associated with management of engineering projects with intelligent based control system = 12 %– 10.4%

% reduction of Scope Creep causes of risk associated with management of engineering projects with intelligent based control system = 1.6%

RESULT AND DISCUSSION

Table 3 comparisons of conventional and intelligent based control system Scope Creep causes of risk associated with management of engineering project

Time(s)	Conventional Scope Creep causes of risk associated with management of engineering projects (%)	Intelligent based control system Scope Creep causes of risk associated with management of engineering projects (%)
1	12	10.4
2	12	10.4
3	12	10.4
4	12	10.4
10	12	10.4

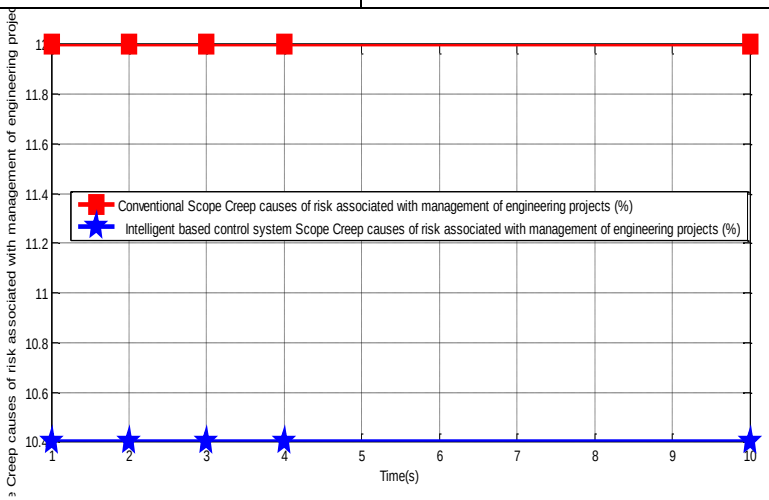

Fig 9 comparisons of conventional and intelligent based control system Scope Creep causes of risk associated with management of engineering project

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In fig 9 the conventional Scope Creep that caused risk associated with management of engineering project was12%. On the other hand, when an intelligent based control system was introduced in the system, the percentage of risk observed in management of engineering project was reduced to10.4%.

Table 4 comparisons of conventional andintelligent based control system Schedule Delays causes of risk associated with management of engineering project

Time(s)	ConventionalSchedule Delays causes of risk associated with management of engineering projects (%)	Intelligent based control system Schedule Delays causes of risk associated with management of engineering projects (%)
1	8	6.94
2	8	6.94
3	8	6.94
4	8	6.94
10	8	6.94

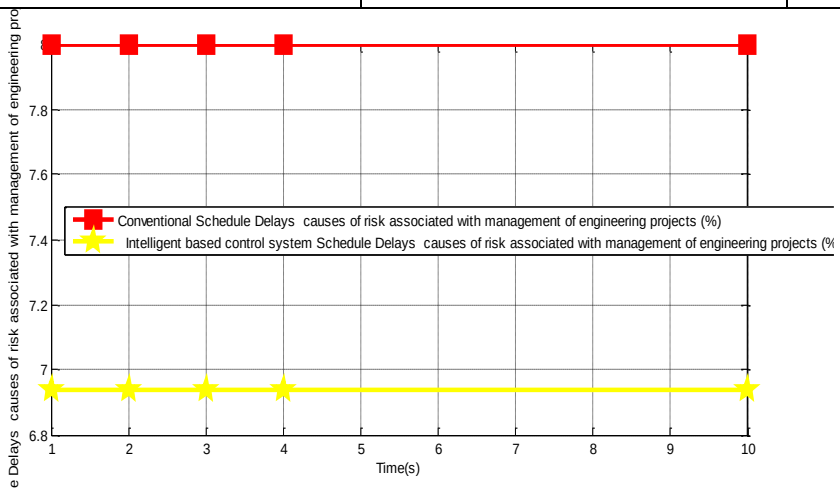

Fig 10 comparisons of conventional andintelligent based control system Schedule Delays causes of risk associated with management of engineering project

The conventional Schedule Delays that caused risk associated with management of engineering projects was 8%.Meanwhile, when an intelligent based control system was introduced in the system the Schedule Delays that caused a lot of risk in management of engineering projects drastically reduced to 6.94%.

CONCLUSION

management of engineering projects, designing a conventional SIMULINK model for the risk associated with management of engineering projects, designing management rule base that will reduce the percentage of the risk associated with management of engineering projects, training ANN in the management rule base to enhance the efficacy of reducing the percentage of the risk associated with management of engineering projects, developing

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an algorithm that will implement the process, designing a SIMULINK model for reducing risk associated with management of engineering projects using intelligent based control system and validating and justifying the percentage improvement in the reduction of risk associated with management of engineering projects with and without intelligent based control system.The results obtained are the conventional Scope Creep that caused risk associated with management of engineering project was12%. On the other hand, when an intelligent based control system was introduced in the system, the percentage of risk observed in management of engineering project was reduced to10.4%, the conventional Safety Hazards that caused high risk associated with management of engineering projects was7%. However, when an intelligent based control system was integrated in the system the risk associated with management of engineering projects reduced to6.07% and the conventional Additional Risk Factors that caused risk associated with management of engineering projects was32% while when an intelligent based control system was imbibed in the system, it wittingly reduced to27.75%. Finally, with these results obtained, it shows that the percentage improvement in the reduction of risk associated with management of engineering projects when an intelligent based control system was integrated in the system over the conventional competitor was 4.25%.

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