

Supply Chain Management for Total Quality of Sound System Using Intelligent Amplifier

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ABSTRACT

The consistent poor quality of sound which has crippled business activities that anchored on quality sound are caused by **inconsistent Manufacturing**, Material Defects, **Lack of Quality Control** to mention a few is overcome by introducing supply chain management for total quality of sound system using intelligent amplifier. To achieve this, it is done in this manner, characterizing and establishing the causes of poor quality of sound in supply chain management for total quality of sound system, designing a conventional SIMULINK model for sound in supply chain management for total quality of sound system, developing an intelligent amplifier rule base that will reduce the causes of poor quality of sound in supply chain management for total quality of sound system, training ANN in an intelligent amplifier rule to boost the efficacy of reducing the causes of poor quality of sound in supply chain management for total quality of sound system, designing a SIMULINK model for an amplifier, developing an algorithm that will implement the process, designing a SIMULINK model for supply chain management for total quality of sound system using intelligent amplifier

And validating and justifying the percentage improvement in the quality of sound in supply chain management for total quality of sound system with and without intelligent amplifier. The results obtained are the conventional **inconsistent Manufacturing** cause of poor quality of sound in supply chain management was 7%. On the other hand, when an Intelligent amplifier was integrated into it, it drastically reduced it to 6.03%. The percentage improvement in the reduction of **inconsistent Manufacturing** cause of poor quality of sound in supply chain management was 0.97%, the **conventional defects** cause of poor quality of sound in supply chain management was 3%. Meanwhile, when an intelligent amplifier was imbibed in the system, it automatically reduced Material Defects cause of poor quality of sound in supply chain management to 2.584%. With these results obtained, it shows that the percentage improvement in the reduction of Material Defects cause of poor quality of sound in supply chain management was 0.42%, the conventional **Lack of Quality Control** cause of poor quality of sound in supply chain management was 12%. However, when intelligent amplifier was input in the system, it reduced it to 10.34%. The percentage improvement in the reduction of **Lack of Quality Control** cause of poor quality of sound in supply chain management was 1.66% and the conventional quality of sound in supply chain management was 9%. On the other hand, when an intelligent amplifier was integrated in the system, it improved the quality of sound in supply chain management to 12.13%. Finally, the percentage improvement in the quality of sound in supply chain management over the conventional counterpart became 3.13%

Keyword: supply, chain, management, total, Quality, sound, system intelligent, amplifier

1.0 INTRODUCTION

In the contemporary audio equipment market, the pursuit of exceptional sound quality is paramount. High-fidelity sound systems rely on advanced components, among which intelligent amplifiers play a critical role. These amplifiers, equipped with sophisticated algorithms and adaptive features, ensure optimal audio performance by dynamically adjusting to various sound environments and user preferences [1]. However, achieving total quality in sound systems extends beyond the technical excellence of individual components; it requires a meticulously managed supply chain.

Supply chain management (SCM) encompasses the planning and execution of all processes involved in the

production and distribution of goods. For sound systems, this includes sourcing high-quality materials, coordinating with component manufacturers, ensuring efficient assembly processes, and managing logistics to deliver the final product to consumers. Effective SCM is crucial for maintaining the integrity and performance of intelligent amplifiers, as even minor disruptions can impact the overall sound quality [2].

The integration of intelligent amplifiers into sound systems necessitates a holistic approach to SCM. This approach must account for the technological complexities and quality requirements specific to these components. By leveraging SCM principles, manufacturers can enhance the reliability, performance, and user satisfaction of sound systems. This paper explores the intersection of SCM and

intelligent amplifier technology, highlighting strategies to achieve total quality in the production and distribution of advanced sound systems.

2.0 Methodology

To characterize and establish the causes of poor quality of sound in supply chain management for total quality of sound system

Table 1 characterized and established causes of poor quality of sound in supply chain management for total quality of sound system

<i>Establish causes of poor quality of sound in supply chain management for total quality of sound system</i>	<i>Components of the establish causes of poor quality of sound in supply chain management for total quality of sound system</i>	<i>Components of the establish causes of poor quality of sound in supply chain management for total quality of sound system (%)</i>
Component Quality Variations	Inconsistent Manufacturing	7
	Material Defects	3
	Component Aging	4
Supply Chain Disruptions	Delayed Deliveries	7.5
	Inventory Shortages	12.5
Poor Supplier Management	Lack of Quality Control	12
	Damage During Transit	13.5
Ineffective Quality Control Processes	Insufficient Inspections	10
	Lack of Testing	9
	Non-Adherence to Standards	2.5
Environmental Factors	Temperature and Humidity	1.5
	Electromagnetic Interference (EMI)	8.5
QUALITY OF SOUND SYSTEM		9

Causes of Poor Sound Quality in Supply Chain Management for Total Quality of Sound Systems

Poor sound quality in a sound system can significantly impact the overall user experience.

A well-functioning sound system requires not only high-quality components but also effective supply chain management to ensure that all components arrive on time, in good condition, and meet the necessary quality standards. Here are some common causes of poor sound quality related to supply chain management:

1) Component Quality Variations:

- **Inconsistent Manufacturing:** Variations in manufacturing processes can lead to components that do not meet the specified tolerances or standards.
- **Material Defects:** Faulty materials, such as low-quality cables or connectors, can introduce noise or distortion.
- **Component Aging:** Over time, components can degrade, leading to reduced performance and increased noise.

2) Supply Chain Disruptions:

- **Delayed Deliveries:** Late deliveries of components can disrupt production schedules and lead to rushed assembly, potentially compromising quality.
- **Inventory Shortages:** Insufficient inventory can force the use of suboptimal components or lead to production delays.
- **Damage During Transit:** Components damaged during transportation can introduce defects or malfunctions.

3) Poor Supplier Management:

- **Lack of Quality Control:** Suppliers that do not have adequate quality control measures may deliver defective components.
- **Unreliable Suppliers:** Suppliers with inconsistent performance or frequent disruptions can negatively impact the supply chain.
- **Lack of Communication:** Poor communication between suppliers and manufacturers can lead to misunderstandings and errors.

4) Ineffective Quality Control Processes:

- **Insufficient Inspections:** Inadequate inspection procedures may fail to identify defective components before they are used in the final product.
- **Lack of Testing:** Insufficient testing of assembled systems can reveal quality issues too late in the process.
- **Non-Adherence to Standards:** Failure to adhere to industry standards or internal quality standards can result in subpar products.

5) Environmental Factors:

- **Temperature and Humidity:** Extreme temperature fluctuations or high humidity can affect the performance of electronic components.
- **Electromagnetic Interference (EMI):** EMI from other devices or sources can introduce noise or distortion.

To address these issues, effective supply chain management practices must be implemented, including:

- **Supplier Qualification:** Careful selection and evaluation of suppliers to ensure they meet quality standards.
- **Quality Control at Source:** Implementing quality control measures at suppliers to reduce the risk of defective components.
- **Robust Inventory Management:** Maintaining adequate inventory levels to avoid disruptions and ensure timely delivery of components.
- **Effective Communication:** Maintaining open and transparent communication with suppliers and internal teams.
- **Continuous Improvement:** Implementing a culture of continuous improvement to identify and address quality issues.
- **Environmental Considerations:** Taking into account environmental factors that can affect component performance.

To design a conventional SIMULINK model for sound in supply chain management for total quality of sound system

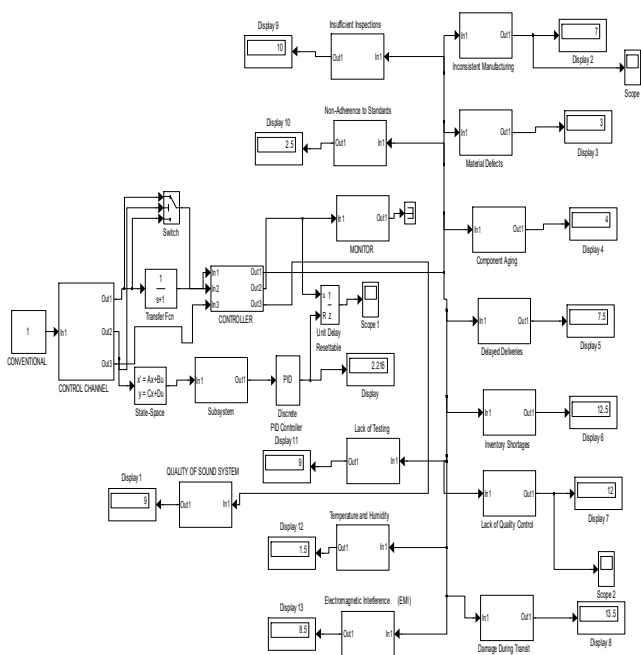


Fig 1 conventional SIMULINK model for sound in supply chain management for total quality of sound system

The conventional SIMULINK model for sound in supply chain management for total quality of sound system are comprehensively detailed in figures 9 through 12. To develop an intelligent amplifier rule base that will reduce the causes of poor quality of sound in supply chain management for total quality of sound system

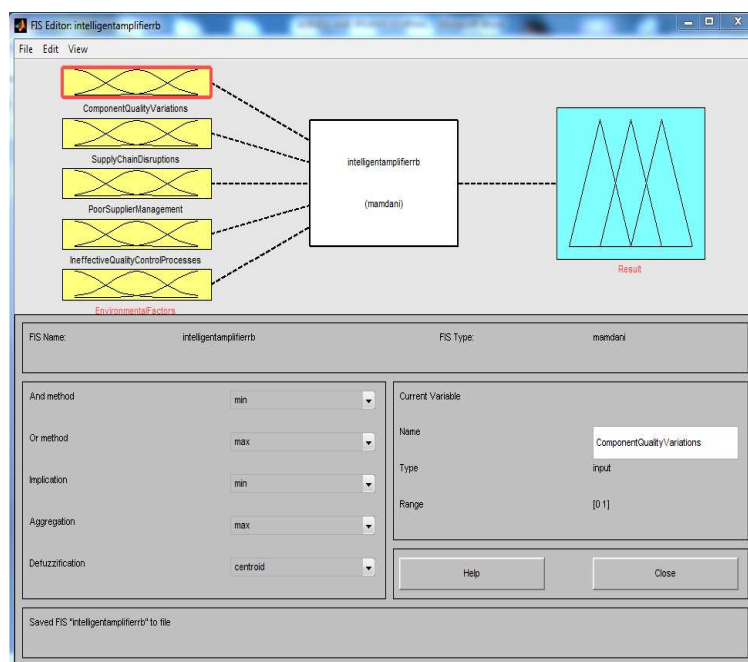


Fig 2 Developed intelligent amplifier fuzzy inference system that will reduce the causes of poor quality of sound in supply chain management for total quality of sound system. This has five inputs of Component Quality Variation, Supply Chain Disruptions, Poor Supplier Management, Ineffective Quality Control Processes, Environmental Factors and Environmental Factors. It also has an output of result.

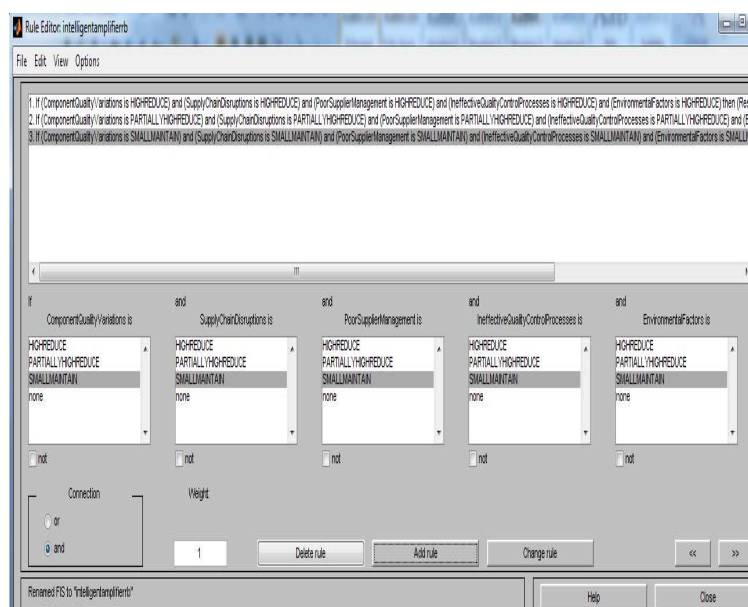


Fig 3 developed intelligent amplifier rule base that reduce the causes of poor quality of sound in supply chain management for total quality of sound system

The comprehensive details of the rules are as shown in table 3.

Table 2 comprehensive details of the rules in developed intelligent amplifier rule base that reduce the causes of poor quality of sound in supply chain management for total quality of sound system

1	IF Component Quality Variations IS HIGH REDUCE	AND Supply Chain Disruptions IS HIGH REDUCE	AND Poor Supplier Management IS HIGH REDUCE	AND Ineffective Quality Control Processes IS HIGH REDUCE	AND Environmental Factors IS HIGH REDUCE	THEN RESULT IS BADQUALITY SOUND
2	IF Component Quality Variations IS PARTIALLY HIGH REDUCE	AND Supply Chain Disruptions IS PARTIALLY HIGH REDUCE	AND Poor Supplier Management IS PARTIALLY HIGH REDUCE	AND Ineffective Quality Control Processes IS PARTIALLY HIGH REDUCE	AND Environmental Factors IS PARTIALLY HIGH REDUCE	THEN RESULT IS BADQUALITY SOUND
3	IF Component Quality Variations IS SMALL MAINTAIN	AND Supply Chain Disruptions IS SMALL MAINTAIN	AND Poor Supplier Management IS SMALL MAINTAIN	AND Ineffective Quality Control Processes IS SMALL MAINTAIN	AND Environmental Factors IS SMALL MAINTAIN	THEN RESULT IS GOOD QUALITY SOUND

To train ANN in an intelligent amplifier rule to boost the efficacy of reducing the causes of poor quality of sound in supply chain management for total quality of sound system

SUPPLY CHAIN MANAGEMENT FOR TOTAL QUALITY OF SOUND SYSTEM USING INTELLIGENT AMPLIFIER

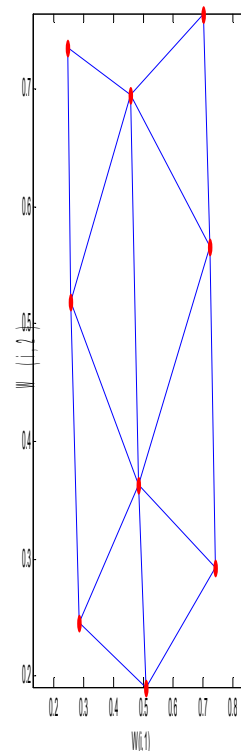


Fig 4 trained ANN in an intelligent amplifier rule to boost the efficacy of reducing the causes of poor quality of sound in supply chain management for total quality of sound system

In figure 4 ANN was trained three times in the three rules to have nine neurons that looks exactly like a human brain. This perfectly does what it was directed to do.

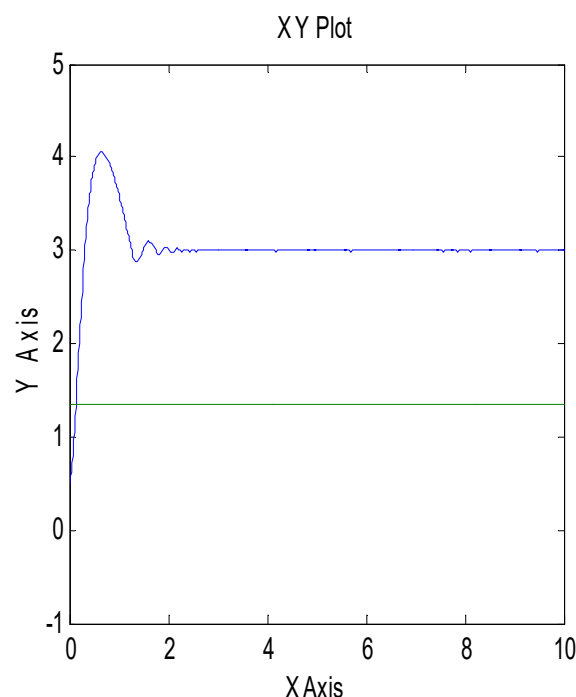


Fig 5 number of times ANN was trained in the rules to boost the efficacy of reducing the causes of poor quality of sound in supply chain management for total quality of sound system

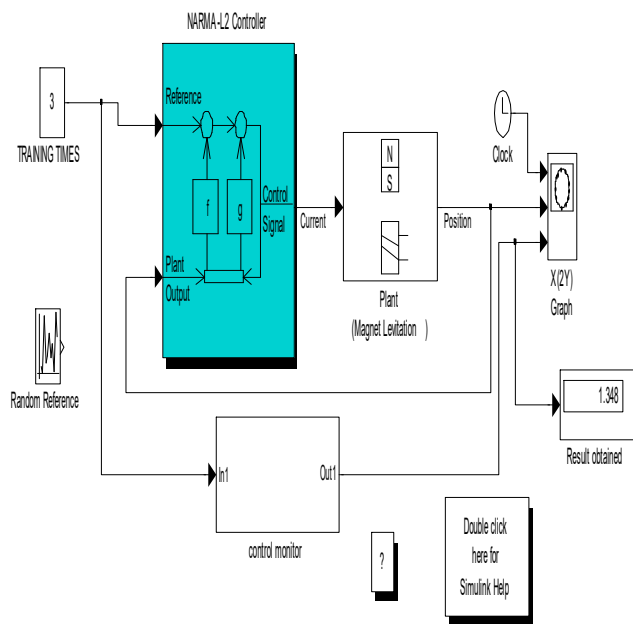


Fig 6 the result obtained at the course of training.

To design a SIMULINK model for an amplifier

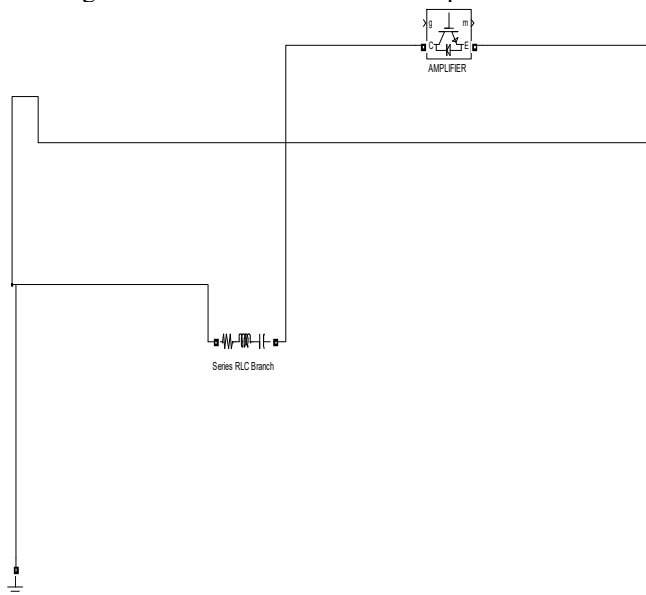


Fig 7 designed SIMULINK model for an amplifier
This will be integrated in the result obtained during the training.

To develop an algorithm that will implement the process.

1. characterize and establish the causes of poor quality of sound in supply chain management for total quality of sound system
2. Identify high **Inconsistent Manufacturing**

3. **Identify high** Material Defects
4. Identify high **Component Aging**
5. **Identify high** Delayed Deliveries
6. **Identify high** Inventory Shortages
7. **Identify high** Lack of Quality Control
8. **Identify high** Damage During Transit
9. **Identify high** Insufficient Inspections
10. **Identify high** Lack of Testing
11. **Identify high** Non-Adherence to Standards
12. **Identify high** Temperature and Humidity
13. **Identify high** Electromagnetic Interference (EMI)
14. design a conventional SIMULINK model for sound in supply chain management for total quality of sound system and integrate 2 through 13
15. develop an intelligent amplifier rule base that will reduce the causes of poor quality of sound in supply chain management for total quality of sound system
16. train ANN in an intelligent amplifier rule to boost the efficacy of reducing the causes of poor quality of sound in supply chain management for total quality of sound system
17. design a SIMULINK model for an amplifier
18. Integrate 15, 16 and 17
19. Integrate 18 in 14
20. Do the causes of poor quality of sound reduce?
21. If No go to 19
22. If YES go to 23
23. Improved quality of sound in supply chain management
24. Stop
25. End

To design a SIMULINK model for supply chain management for total quality of sound system using intelligent amplifier

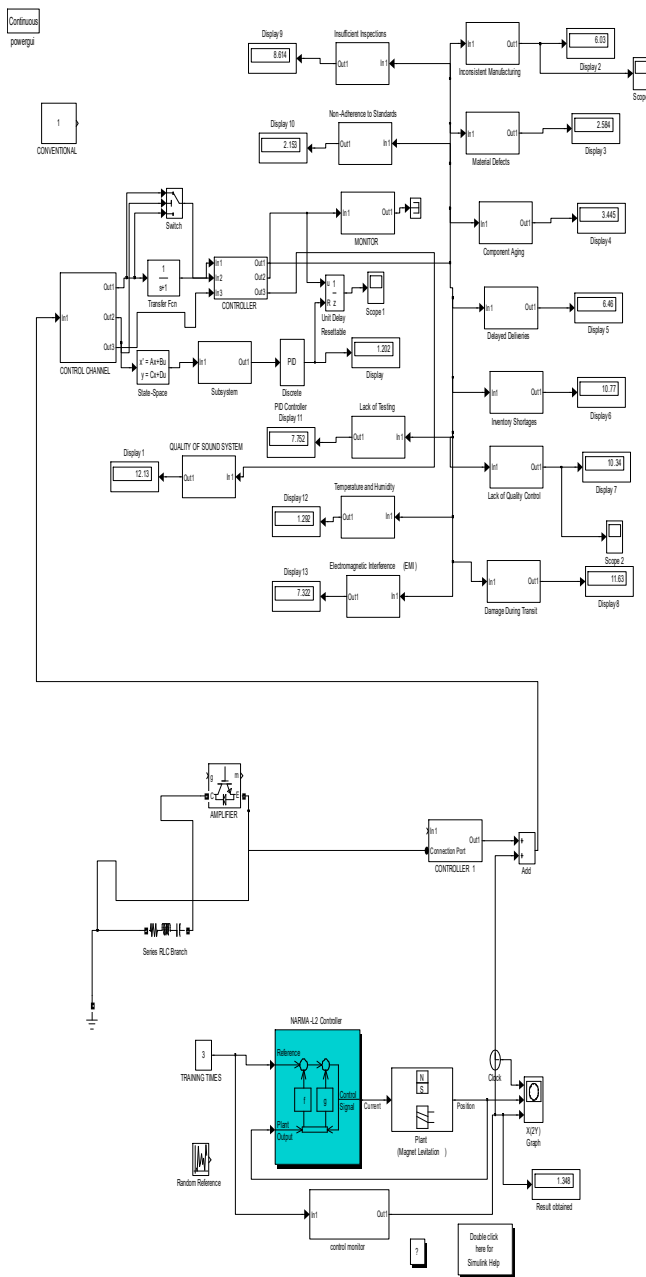


Fig 8 designed **SIMULINK** model for supply chain management for total quality of sound system using intelligent amplifier

To validate and justify the percentage improvement in the quality of sound in supply chain management for total quality of sound system with and without intelligent amplifier

To find percentage improvement in the reduction of high **Inconsistent Manufacturing** cause of poor quality of

sound in supply chain management with intelligent amplifier

Conventional **Inconsistent Manufacturing** cause of poor quality of sound=7%

Intelligent amplifier **Inconsistent Manufacturing** cause of poor quality of sound=6.03%

% improvement in the reduction of high **Inconsistent Manufacturing** cause of poor quality of sound in supply chain management with intelligent amplifier=

Conventional **Inconsistent Manufacturing** cause of poor quality of sound - Intelligent Amplifier **Inconsistent Manufacturing** cause of poor quality of sound

% improvement in the reduction of high **Inconsistent Manufacturing** cause of poor quality of sound in supply chain management with intelligent amplifier=7% - 6.03%

% improvement in the reduction of high **Inconsistent Manufacturing** cause of poor quality of sound in supply chain management with intelligent amplifier=0.97

To find percentage improvement in the reduction of high Material Defects cause of poor quality of sound in supply chain management with intelligent amplifier

Conventional Material Defects cause of poor quality of sound=3%

Intelligent amplifier Material Defects cause of poor quality of sound=2.584%

% improvement in the reduction of high Material Defects cause of poor quality of sound in supply chain management with intelligent amplifier=

Conventional Material Defects cause of poor quality of sound - Intelligent Amplifier Material Defects cause of poor quality of sound

% improvement in the reduction of high Material Defects cause of poor quality of sound in supply chain management with intelligent amplifier=3% - 2.584%

% improvement in the reduction of high Material Defects cause of poor quality of sound in supply chain management with intelligent amplifier=0.42

To find percentage improvement in the reduction of high **Lack of Quality Control** cause of poor quality of sound in supply chain management with intelligent amplifier

Conventional **Lack of Quality Control** cause of poor quality of sound=12%

Intelligent amplifier **Lack of Quality Control** cause of poor quality of sound=10.34%

% improvement in the reduction of high **Lack of Quality Control** cause of poor quality of sound in supply chain management with intelligent amplifier=

Conventional **Lack of Quality Control** cause of poor quality of sound - Intelligent Amplifier Material Defects cause of poor quality of sound

% improvement in the reduction of high **Lack of Quality Control** cause of poor quality of sound in supply chain management with intelligent amplifier=12% - 10.34%

% improvement in the reduction of high **Lack of Quality Control** cause of poor quality of sound in supply chain management with intelligent amplifier=1.66%

To find percentage improvement in the quality of sound in supply chain management with intelligent amplifier

Conventional quality of sound in supply chain management =9%

Intelligent amplifier quality of sound in supply chain management=12.13%

%improvement in the quality of sound in supply chain management with intelligent amplifier =

Intelligent amplifier quality of sound in supply chain management - Conventional quality of sound in supply chain management

%improvement in the quality of sound in supply chain management with intelligent amplifier =

12.13% - 9%

%improvement in the quality of sound in supply chain management with intelligent amplifier =3.13%

3.0 Results and Discussion

Table 2 comparison of conventional and Intelligent amplifier inconsistent Manufacturing cause of poor quality of sound in supply chain management

Time (s)	Conventional inconsistent Manufacturing cause of poor quality of sound in supply chain management (%)	Intelligent amplifier inconsistent Manufacturing cause of poor quality of sound in supply chain management (%)
1	7	6.03
2	7	6.03
3	7	6.03
4	7	6.03
10	7	6.03

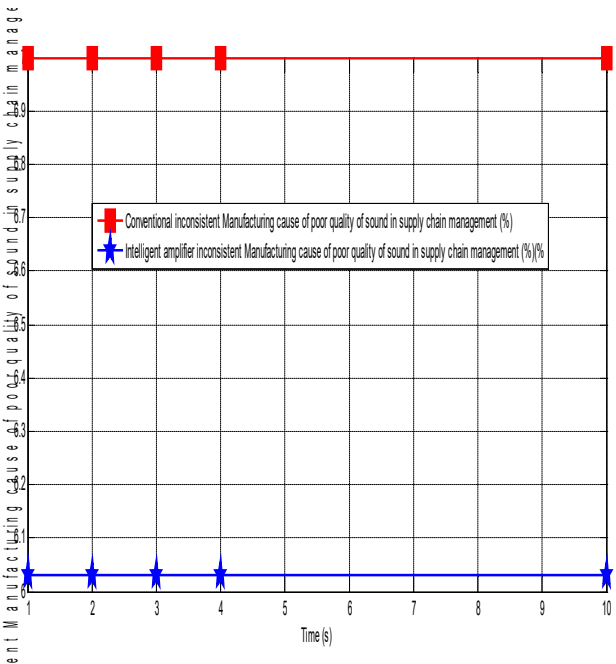


Fig 9 comparison of conventional and Intelligent amplifier inconsistent Manufacturing cause of poor quality of sound in supply chain management

The conventional **inconsistent Manufacturing** cause of poor quality of sound in supply chain management was 7%. On the other hand, when an Intelligent amplifier was integrated into it, it drastically reduced it to 6.03%. The

percentage improvement in the reduction of **inconsistent Manufacturing** cause of poor quality of sound in supply chain management was 0.97%.

Table 3 comparison of conventional and Intelligent Amplifier Material Defects cause of poor quality of sound in supply chain management

Time (s)	Conventional Material Defects cause of poor quality of sound in supply chain management (%)	Intelligent amplifier Material Defects cause of poor quality of sound in supply chain management (%)
1	3	2.584
2	3	2.584
3	3	2.584
4	3	2.584
10	3	2.584

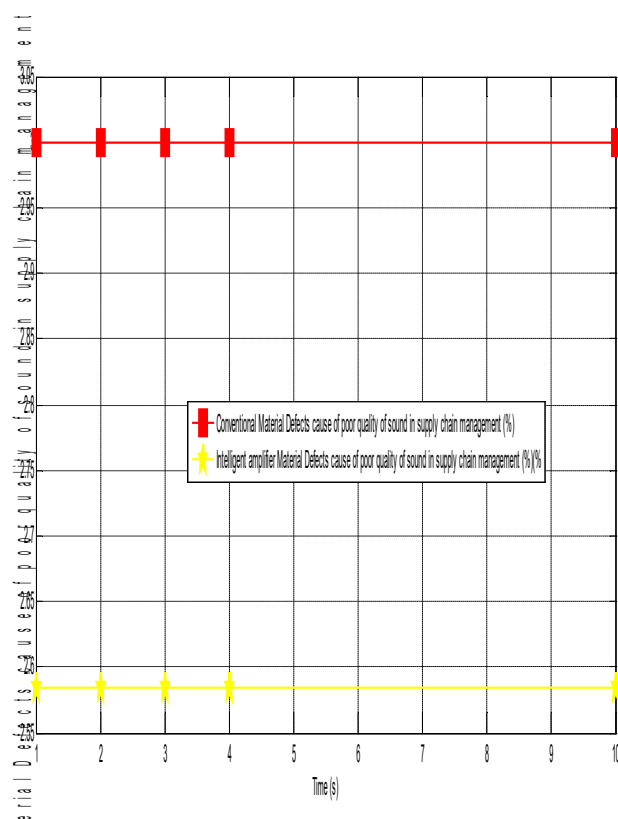


Fig 10 comparison of conventional and intelligent amplifier Material Defects cause of poor quality of sound in supply chain management

The **conventional defects** cause of poor quality of sound in supply chain management was 3%. Meanwhile, when an intelligent amplifier was imbibed in the system, it

automatically reduced Material Defects cause of poor quality of sound in supply chain management to 2.584%. With these results obtained, it shows that the percentage improvement in the reduction of Material Defects cause of poor quality of sound in supply chain management was 0.42%.

Table 4 comparison of conventional and Intelligent Amplifier Lack of Quality Control cause of poor quality of sound in supply chain management

Time (s)	Conventional Lack of Quality Control cause of poor quality of sound in supply chain management (%)	Intelligent amplifier Lack of Quality Control cause of poor quality of sound in supply chain management (%)
1	12	10.34
2	12	10.34
3	12	10.34
4	12	10.34
10	12	10.34

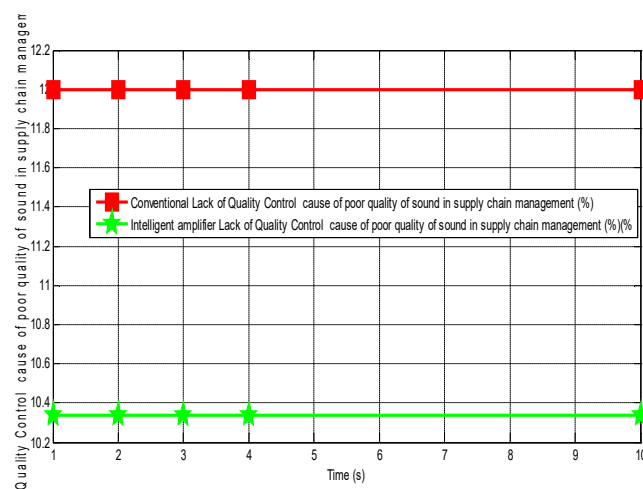


Fig 11. comparison of conventional and intelligent amplifier Lack of Quality Control cause of poor quality of sound in supply chain management

The **conventional Lack of Quality Control** cause of poor quality of sound in supply chain management was 12%. However, when intelligent amplifier was input in the system, it reduced it to 10.34%. The percentage improvement in the reduction of **Lack of Quality Control** cause of poor quality of sound in supply chain management was 1.66%.

Table 5 comparison of conventional and Intelligent amplifier improvement in the quality of sound in supply chain management

Time (s)	Conventional improvement in the quality of sound in supply chain management (%)	Intelligent amplifier improvement in the quality of sound in supply chain management (%)
1	9	12.13
2	9	12.13
3	9	12.13
4	9	12.13
10	9	12.13

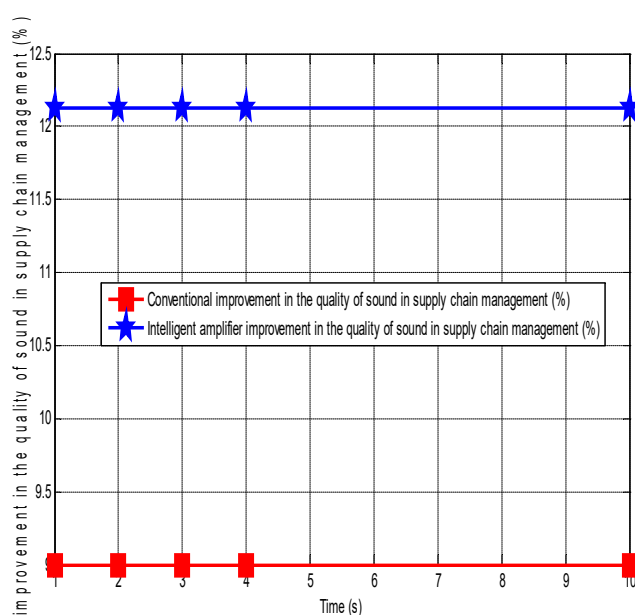


Fig 12 comparison of conventional and intelligent amplifier improvement in the quality of sound in supply chain management

The conventional quality of sound in supply chain management was 9%. On the other hand, when an intelligent amplifier was integrated in the system, it improved the quality of sound in supply chain management to 12.13%. Finally, the percentage improvement in the quality of sound in supply chain management over the conventional counterpart became 3.13%

4.0 Conclusion

The poor quality of sound that has paralysed business activities of establishments that solely depend on sound to run their daily activities that are caused by **inconsistent Manufacturing**, Material Defects, **Lack of Quality Control** to mention a few is overcome by introducing

supply chain management for total quality of sound system using intelligent amplifier. To achieve this, it is done in this manner, characterizing and establishing the causes of poor quality of sound in supply chain management for total quality of sound system, designing a conventional SIMULINK model for sound in supply chain management for total quality of sound system, developing an intelligent amplifier rule base that will reduce the causes of poor quality of sound in supply chain management for total quality of sound system, training ANN in an intelligent amplifier rule to boost the efficacy of reducing the causes of poor quality of sound in supply chain management for total quality of sound system, designing a SIMULINK model for an amplifier, developing an algorithm that will implement the process, designing a SIMULINK model for supply chain management for total quality of sound system using intelligent amplifier And validating and justifying the percentage improvement in the quality of sound in supply chain management for total quality of sound system with and without intelligent amplifier. The results obtained are the conventional **inconsistent Manufacturing** cause of poor quality of sound in supply chain management was 7%. On the other hand, when an Intelligent amplifier was integrated into it, it drastically reduced it to 6.03%. The percentage improvement in the reduction of **inconsistent Manufacturing** cause of poor quality of sound in supply chain management was 0.97%, the conventional defects cause of poor quality of sound in supply chain management was 3%. Meanwhile, when an intelligent amplifier was imbibed in the system, it automatically reduced Material Defects cause of poor quality of sound in supply chain management to 2.584%. with these results obtained, it shows that the percentage improvement in the reduction of Material Defects cause of poor quality of sound in supply chain management was 0.42%, the conventional **Lack of Quality Control** cause of poor quality of sound in supply chain management was 12%. However, when intelligent amplifier was input in the system, it reduced it to 10.34%. The percentage improvement in the reduction of **Lack of Quality Control** cause of poor quality of sound in supply chain management was 1.66% and the conventional quality of sound in supply chain management was 9%. On the other hand, when an intelligent amplifier was integrated in the system, it improved the quality of sound in supply chain management to 12.13%. Finally, the percentage improvement in the quality of sound in supply chain management over the conventional counterpart became 3.13%

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