

# Issues in Managing and Maintenance of an Expert System

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**Abstract:- An expert system or knowledge based software is regarded as the basement of an artificial intelligence. The integrity of every software is attached to its developmental life-cycle. Ageing has no negative effect on every software, but poor elicitation, developmental processes as well as the maintenance does. Experts system is one of the most sensitive system in the world, its failure can lead to a catastrophic situation. Managing and maintaining an expert systems is one of the difficult task to handle. This research underwent a systematic literature review to identify and iterate the best amongst the various ways used in maintaining and managing an expert system, with the aim of comparing, and providing a combination of best practices as a framework.**

## I. INTRODUCTION

For the purpose of proper understanding of this research topic, there is the need of elaborating the topic from the various point of views. First the term Managing Expert System simply refers to the techniques or methods used while handling the problems encountered during the development and maintenance of the expert system in some particular organization. Looking into the relationship between the Artificial Intelligence and the Expert System is also of paramount importance.

Artificial Intelligence (AI) is simply the system by which a machine (Computer) is trained to imitated natural intelligence through various means. Emotionality and consciousness are part of the agents to be imitated by the machine in which the machine may have the ability of perceiving their environments, and take decisions that expand the chances of achieving the target goals. Human cognitive functions which involved logical thinking, problem solving, learning and decision making are what is expected of an artificial intelligence machines.

Expert System is simply refereed to the domain that stimulate actions, behavior, judgments and the likes of the experts of the particular field, organizations, or institution for the Artificial intelligence. It is also called a knowledge base. The expert system as a software that tries to gain knowledge in various fields such as coding, medical diagnosis, computing, accounting, gaming, neural and many more. The knowledge stored in the expert system is used for decision making. It is an instance which change the perception of computer from the usual definition of garbage in garbage out (GIGO). The system (Computer) do possess the intelligence of the expert to which it was extracted. For example, the computer or the experts system may have the ability to diagnose the sick person and provide him with the

correct prescription, likewise in various instances the artificial intelligent computers defeated many experts in their field such as gaming.

Expert system does various amazing activities in mimicking human intelligence some of which includes providing assistance to human in decision making, lashing solutions, offering advices, medical diagnostics, inferring input with the means of providing output, ability to justifying conclusions, providing alternatives to solutions, results predictions, and many more. The expert system which is the most valuable field of Artificial Intelligence is divided into five components; Knowledge Base: an area where the knowledge tapped are stored including some rules for problem solving, Inference Engine: selecting and interpreting data to come-up with solution for the user, Learning Module: means the power of the expert system to gather more data from various sources, Interface: the phase that allow the communication between the expert system and the user , and explanation mode: an environment that provides user with clear explanation of the happening.

Looking at the explanation above, expert system requires a lot of activities to be accomplished, which involved the development and maintenance. This research proposal would want itemize and address the problems encountered while developing and maintaining expert system. The research proposed if actualized would provide the impact and the guidelines for expert system maintenance.

## II. PROBLEM STATEMENT

One of the most crucial issue of expert system is quality assurance. Poor quality of the expert system may result in so many unwanted errors, it may lead to damages that involved human suffering, loss of life, financial implications. Some other issues need to be considered while dealing or managing the expert system has to do with the main reason why the expert system was choosing to provide solution to the problem, to identify and handle the most common problem domain and the characteristic they addressed, the practical problems encountered while designing the expert system, the kind of issues developed by the expert system after designing it, the actual role of the expert system from the user's perspectives.

The problem with regard to the issues aroused as a result of structuring validation, generating the criteria of judging the system, problems of maintaining the objectivity of the system, the problems resulted in dealing with concepts of reliability and so on. This research proposal is designed to come-up with the best practices and techniques

to checkmate the aforementioned problems accordingly for the purpose of managing the expert systems.

#### A. Aims and Objectives of the Research

This research proposal is aimed at managing an expert systems to achieve the desired objectives of using the programming technologies in acquiring huge knowledge through inferential ways perfectly. And also the ability to build, develop and maintain the methodologies that permit the use of technology to problem solving. The objective of this research proposal includes

- The ability of the expert system to provide the easiest way of acquiring the knowledge from the experts by just expressing.
- Ability to judge, predicts, demonstrate and makes decision based via new information generated from the stored knowledge.
- The ability utilized the gathered knowledge by chaining and combining it in a proper manner for decision making.
- To be able to handle the manipulation exercises with ease, such as adding knowledge, modifying it and or removing it without any hesitation.
- To possess the power of reducing the risk by integrating huge amount of information generated from various sources.
- Taking strong potential actions through creativity.
- Having the power of increasing or storing knowledge through learning and dynamic tasks.

Any expert system that has the ability to achieve the above listed target through the stated objective would have the power to reason effectively and efficiently. Maintaining the expert system requires the involvement of many attributes

#### B. Significance of the Research

Managing expert system is of paramount importance to the entire field of artificial intelligence. This proposed research topic highlighted a number of significance to be achieved if carried out successfully. Some of the significance of this research includes

- Systematizing and improving decision making: - if an expert system is managed carefully, it is bound to make the automation of the system easier and straight forward. Though computing general has automatization as one of its characteristics, but when processes or activities are main for managing the system, various recommendation, advices, and opinions would pop-up aiming at providing the best practice in managing the expert system. Hence provide a better solution to the unforeseen circumstances.
- Diffusion expertise components: - Managing the expert system research would provide the expert with the idea of disseminating some components of the expert system, which would provide a clear view of the performance of each and every components so as to itemize the happening between them. It can also provide a means by which users that are not expert in handling the expert system find it easy to handle.
- Training Users: - A well-managed expert system may provide the best and easier ways of teaching and training the users on how to operate it. Documentation remains one

of the most important aspect of maintenance. While maintaining the expert system the document provided would enhance the performance of the novice users as well.

- Potential marketable: - an expert system generator marketing is making the expert system just another thing. Large companies generate interest in providing their own policies of expert system development, which in turn lead to a proper budgeting for the maintenance of the expert system.
- Improving staff performance: - an expert system managed properly can increase the performance of the firms' staff with a minimal error, consistency and completeness.
- Lead to Capacity growth and productivity: - every commercial organization is looking forward toward capacity growth and productivity and with less cost of production. A well-managed expert system help in achieving that target.

The significance of managing expert system cannot be over emphasized, this reached if carried out successfully can bring about various benefits to different stakeholders in the field of expert system and artificial intelligence.

### III. LITERATURE REVIEW (FOR 20 ARTICLES)

In this section of the research proposal, a number of not less than twenty articles would be reviewed to provide the audience with the knowledge of how important it is to manage an expert system.

Frey et al. (2019) argue that guaranteeing the quality of an expert system is very difficult. They further stated that poorly managed expert system can lead to catastrophe. Wagner (2017) corroborated the statement by saying that less qualitative expert system can cause a costly errors, which can lead to financial mislaid and human anguish. According to Bakeer and Abu-Naser (2017) an expert system that is having managerial issues may end up not performing to the expectation and this can make the expert system to make decisions that are inappropriate and wrong. Some commercial firms raised concern over medical diagnostic expert system and an income tax expert system over the possible liabilities to be faced by the failure of the system (Abu-Ghali et al. 2017).

Sartori and Melen (2017) indicated that for the proper managing of the expert system, validation, verification and quality of the system must to be achieved first. Yemelyanov, Nedelkin and Olenov (2019) in their findings indicated that professionals responsible for expert system development are more concern with the validation and verification termed 'V&V' but hardly if any of them is concern with the system quality assurance. Moreno et al. (2020) stated that various expert system developers ignores one of the most important aspect of the system which determined credibility, that is the aspect which answered the question of how credible is the system to the user? Credence can a user be able to put to the system if the quality assurance is not in place? (Milad et al. 2021).

Milad, Basri, Abdelsalam, and Rahmat (2017) highlighted various issues that are supposed to be of major concern to the expert system developers apart from the Quality, Validity and Verification. The issues includes Efficiency, Adequacy, Security, state of implementation, documentation, and the fitness between the system and the user (Milad, Basri, Abdelsalam, and Rahmat 2017). Mohammed, Ambak, Mosa, and Syamsunur (2019) listed five items to consider while developing and expert system with the consent of management and maintenance. The items are a) Evaluation b) Assessment c) Credibility d) Validation and e) Verification. Based on their research, the hierarchy of the aforementioned item is mutually affected by one another. That is if the validity of the expert system could not be determined, then the evaluation could not be worthwhile. Sivaram et al. (2019) stated that the possible errors found in software are related to the technologies used in their development and also the effort of the technologies used in their implementation. This is indicating that for an expert system to be efficient in achieving its own target, the technology involved must to be manage properly (Sanches et al 2016).

Rybina and Blokhin (2019) express their idea about the complicity involved in validating some software compared to some. A simple scenario of determining the validity of the compiler was presented as straightforward compared to the expert system of statistics or a model for operational research. Yazdi, Hafezi and Abbassi (2019) says that, in an expert system the knowledge based system which is the part of the system that handle the method of uncertainty must be seriously verified. Considering the characteristics of the expert system, which makes it a software and a model at the same time, it is validation and verification is very difficult according to Kim, Roh, and Ha (2015). Purnomo, Hartono and Munawaroh (2018) makes some certain acieration regarding how to maintain an expert system, the view of the expert system as a software or a model is of concern. They further stated that seen the experts system as model comes-up with a number of issues when it comes to validation. Because understanding the domain is required, which is critical. Almarashdeh et al (2018) argue that, while maintaining an expert system, the knowledge base and reasoning part of the domain are always different between different expert system, hence single techniques cannot be applied to achieve the same objectives. Based on the finding of Rahman et al (2018) expert system seems to be one of the most difficult system to maintain due to the fact that symbolic and numeric data are both part of the accepted modes in expert system contrary to some system that just adopted single mode. An estimation of accuracy is vary tedious when a system has the ability of recognizing various systems of information (Symbolic & Numeric) according to (Budiyanto et al 2018). Bohlouli et al (2017) expressed the idea about the use of “middle-out” method while designing an expert system contrary to the top-down, water system, or bottom-up approaches, which is starting with the prototype and then later evolved. This makes it naughty in the processes of validation. A lot have been discussed in this section regarding what the expert has said about the managing of the expert system.

#### IV. SUMMARY OF THE TWENTY ARTICLES

Abu Ghali, M. J., Mukhaimer, M. N., Abu Yousef, M. K., & Abu-Naser, S. S. (2017). Expert System for Problems of Teeth and Gums.

- **Introduction**

The research article uses expert system to discuss on gingiva for the purpose of securing safety in gums.

- **Procedure**

A knowledge based system was used in providing a ways by which the system can diagnose users with teeth issues.

- **Findings**

- =The use of SL5 shows higher efficiency in the performance of the expert system in tat filed

- **Personal comments**

Whenever any technology is used in determining the efficiency of the expert system in a particular domain it is indicated that, that technology provided the means of expert system management.

Almarashdeh, I., Alsmadi, M., Hanafy, T., Albahussain, A., Altuwaijri, N., Almaimoni, H., ... & Jaradat, G. (2018). Real-time elderly healthcare monitoring expert system using wireless sensor network. *International Journal of Applied Engineering Research ISSN, 0973-4562.*

- **Introduction**

The research search for the major chronic diseases which causes the death of elderly people

- **Procedure**

The research applied communication technology to develop and expert system called Elderly Health Care (ECH) using multidisciplinary approach.

- **Findings**

The architecture of the ECH has proven that elderly people can easily learn from the disease they are suffering from online without physically meeting the doctor

- **Personal comments**

The approach applied is of paramount important to the means of finding the way of managing the expert system.

Bakeer, H. M. S., & Abu-Naser, S. S. (2017). Photo Copier Maintenance Expert System V. 01 Using SL5 Object Language

- **Introduction**

This research introduces the design of an expert system that has the ability to diagnose the problems encountered by the photocopying machine.

- **Procedure**

The Object languages called SL5 was used in implementing the system

- **Findings**

Test cases called classical was used during the evaluation of the system and the result was accurate.

- **Personal comments**

Having the ability of finding various means of developing and expert system ease the maintenance and management of the system.

Bohlouli, M., Mittas, N., Kakarontzas, G., Theodosiou, T., Angelis, L., & Fathi, M. (2017). Competence assessment as an expert system for human resource management: A mathematical approach. *Expert Systems with Applications*, 70, 83-102.

#### • Introduction

The paper introduces the best way of assessing the efficient human resources management as well as representation of the required components

#### • Procedure

Software technologies with the combination of mathematical as well as statistical methods were employed to achieve the way the assessment was designed

#### • Findings

A data set called real human resources was used in ComProFITS as an European project and that was successful.

#### • Personal comments

The aim of this article was assessment for the expert system and if the system is bound to be access, that indicates that the maintenance can be achieved as well.

Budiyanto, G., Ipnuwati, S., Al Gifari, S. A., Huda, M., Jalal, B., Maselena, A., & Hananto, A. L. (2018). Web based expert system for diagnosing disease pest on banana plant. *International Journal of Engineering & Technology*, 7(4), 4715-4721.

#### • Introduction

This research was designed to deal with a web base expert system for diagnosing the disease found in banana plant for the expert and laymen in the farming of Banana.

#### • Procedure

PHP was used in designing the expert system. This techniques indicates that an expert system is produces using various programming languages and the maintenance need to be handle in that regards

#### • Findings

The system helps the Banana farmers in overcoming the disease that causes a lot of damages to their annual income, hence the system is successful.

#### • Personal comments

The nature in which the system was developed provided a clue on the requirement for the maintenance of the expert system at large.

Frey, M., Tanni, S., Perrodin, C., O'Leary, A., Nau, M., Kelly, J. ... & Barry, C. (2019). Deepinsight: a general framework for interpreting wide-band neural activity. *bioRxiv*, 871848.

#### • Introduction

In this research, neuroscience was used in developing and expert system to provide the means of sensory behaviors

#### • Procedure

The research applied the approaches of making the neural data to simulate the state of behavioral objectives.

#### • Findings

Using the so called backpropagation has proven the research valid and useful.

#### • Personal comments

The amount of technologies used indicated that a lot has to be made to achieve maintaining and managing the expert system

Kim, K. S., Roh, M. I., & Ha, S. (2015). Expert system based on the arrangement evaluation model for the arrangement design of a submarine. *Expert Systems with Applications*, 42(22), 8731-8744.

#### • Introduction

In this article, pass design was used in designing of the submarine expert system to achieve a certain target.

#### • Procedure

A space called pressure hall was filled with various component of the expert system, which lead to the designing of the prototype.

#### • Findings

The outcome indicated that an expert system designed with the above procedure has the ability evaluate a certain submarine expert system.

#### • Personal comments

While the proposed research topic deals with the management of the expert system, the finding of different approaches in designing and the development of the expert system widen the expectation for the management of the system.

Milad, A., Basri, N. E. A., Abdelsalam, H. M., & Rahmat, R. A. A. O. K. (2017). Prototype web-based expert system for flexible pavement maintenance. *Journal of Engineering Science and Technology (JESTEC)*, 12(11), 2909-2921.

#### • Introduction

A web base expert system was design using a prototype for the purpose of maintaining a flexible pavement.

#### • Procedure

The procedure applied in the process was the application of the IF-THEN rule using HTML, PHP, CSS, and J-Query.

#### • Findings

The building engineers who uses the expert system find it motivational and it increases their knowledge of handling related issues entirely.

#### • Personal comments

The reading of this article widen the knowledge of how to go about managing of an expert system to the greatest level.

Milad, A., Yusoff, N. I. M., Majeed, S. A., Ali, Z. H., Solla, M., Al-Ansari, N. ... & Yaseen, Z. M. (2021). An Educational Web-Based Expert System for Novice Highway Technology in Flexible Pavement Maintenance. *Complexity*, 2021.

- **Introduction**

An education expert system was developed to cater for the recent COVIC 19 pandemic

- **Procedure**

The procedure applied in the process was the application of the IF-THEN rule using HTML, PHP, CSS, and J-Query.

- **Findings**

The educationist who uses the expert system find it motivational and it increases their knowledge of handling related issues entirely. It brings opportunities for the student to learn from the best remotely

- **Personal comments**

The reading of this article widen the knowledge of how to go about managing of an expert system to the greatest level.

Mohammed, A. A., Ambak, K. A. M. A. R. U. D. I. N., Mosa, A. M., & Syamsunur, D. (2019). Expert system in engineering transportation: A review. *Journal of Engineering Science and Technology*, 14(1), 229-252.

- **Introduction**

This article applied a systematic review on Engineering expert system which aimed at providing stability, consistency, accessibility and likes.

- **Procedure**

Some combination of various approaches have been used in handling this research such includes Neural System, Rule-based, fuzzyESS, and Knowledge based

- **Findings**

The investigation indicated that the performance of the users (engineers) who uses the expert system improved drastically.

- **Personal comments**

This research uses the methodology usually called evolving methodologies combination advanced. It is one of the perfect method in expert system.

Moreno, E. F., Pacheco, E. E., Andaluz, V. H., & Mullo, Á. S. (2020, March). Multi-user Expert System for Operation and Maintenance in Energized Lines. In *Future of Information and Communication Conference* (pp. 454-472). Springer, Cham.

- **Introduction**

In this article, pass design was used in designing of the submarine expert system to achieve a certain target.

- **Procedure**

A space called pressure hall was filled with various component of the expert system, which lead to the designing of the prototype.

- **Findings**

The outcome indicated that an expert system designed with the above procedure has the ability evaluate a certain submarine expert system.

- **Personal comments**

While the proposed research topic deals with the management of the expert system, the finding of different approaches in designing and the development of the expert system widen the expectation for the management of the system.

Purnomo, A., Hartono, R., & Munawaroh, H. (2018, March). Naïve Bayes Approach for Expert System Design of Children Skin Identification Based on Android. In *IOP Conference Series: Materials Science and Engineering* (Vol. 333, No. 1, p. 012105). IOP Publishing

- **Introduction**

This expert system was developed with the intention identifying skin disease for the child related

- **Procedure**

An algorism called naïve was used in developing the expert system, this is indicating that while dealing with the management of the expert system, knowledge about this algorism is requires.

- **Findings**

The expert system was able to use android operating system to detect child related skin diseases

- **Personal comments**

Naïve algorism was used in developing the expert system, this is indicating that while dealing with the management of the expert system, knowledge about this algorism is requires.

Rahman, A., Slamet, C., Darmalaksana, W., Gerhana, Y. A., & Ramdhani, M. A. (2018). Expert System for Deciding a Solution of Mechanical Failure in a Car using Case-based Reasoning. In *IOP Conference Series: Materials Science and Engineering* (Vol. 288, No. 1, p. 012011). IOP Publishing.

- **Introduction**

This expert system was main for analyzing the skills of a player and be able to determine the position it's supposed to assigned to in the football filed.

- **Procedure**

Tsukamoto fuzzy inference system was used during the development of this expert system.

- **Findings**

The finding fit the best selection procedure while training and placing a player in the football field.

- **Personal comments**

For the purpose of managing the expert system the manager need to understand various king of expert system and the technologist used.

Rybina, G. V., & Blokhin, Y. M. (2019). Methods and Software Implementation of Intelligent Planning for Integrated Expert System Design. *Scientific and Technical Information Processing*, 46(6), 434-445.

- **Introduction**

This research focuses on designing a software that provide a better ground for the integrating the software

- **Procedure**

A method called automated planning was used while developing the expert system.

- **Findings**

The technology services the expected purposes right

- **Personal comments**

The research made a wonderful performance in terms of applying the expert system for the integration of software

Sánchez, L. E., Santos-Olmo, A., Álvarez, E., Huerta, M., Camacho, S., & Fernández-Medina, E. (2016). Development of an Expert System for the Evaluation of Students' Curricula on the Basis of Competencies. *Future Internet*, 8(2), 22.

• **Introduction**

This article deals with various skills gained by the graduate of a computer engineering classes that does not have much impact on some software industries.

• **Procedure**

An expert system was designed to enable the companies that choose between the skills required for the graduate to serve their companies.

• **Findings**

The system ease the suffering of the companies while searching for the personnel (Manpower).

• **Personal comments**

The technology used is perfect

Sartori, F., & Melen, R. (2017). Wearable expert system development: definitions, models and challenges for the future. *Program*.

• **Introduction**

This is system designed to obtain and input from the output of the wearable systems.

• **Procedure**

A number of two different frameworks were used while developing this expert system, thus, Knowledge Artifact framework (KAFKA) and Knowledge Acquisition framework

• **Findings**

The system has the capability of overtime, it also support various technologist for the decision making support.

• **Personal comments**

The combination of various frameworks indicate that the knowledge of managing the framework is required to deal with management of the expert system

Sivaram, M., Ahamed, B. B., Yuvaraj, D., Manikandan, V., Karlus, N. G., Sitanggang, A. S., ... & Maselena, A. (2019, February). Expert System in Determining the Quality of Superior Gourami Seed Using Forward Chaining-Based Websites. In *International Conference on Emerging Technologies in Computer Engineering* (pp. 310-321). Springer, Singapore

• **Introduction**

This research focuses on designing a software that provide a better ground for the integrating the software

• **Procedure**

A method called automated planning was used while developing the expert system.

• **Findings**

The technology services the expected purposes right

• **Personal comments**

The research made a wonderful performance in terms of applying the expert system for the integration of software

Wagner, W. P. (2017). Trends in expert system development: A longitudinal content analysis of over thirty years of expert system case studies. *Expert systems with applications*, 76, 85-96.

• **Introduction**

This research is about the trends of expert system developments

• **Procedure**

An analysis was made based on longitudinal concepts of the expert system

• **Findings**

The expert system has the power to collect data and analyzed based on the concept of longitudinal analysis

• **Personal comments**

Provide this research proposal with another domination of dealing with expert system management

Yazdi, M., Hafezi, P., & Abbassi, R. (2019). A methodology for enhancing the reliability of expert system applications in probabilistic risk assessment. *Journal of Loss Prevention in the Process Industries*, 58, 51-59.

• **Introduction**

This research meant for developing a new strategy of an expert system for the purpose of enhancing strategy.

• **Procedure**

Various sensitive analysis techniques were employed during the research or at the time of developing the expert system

• **Findings**

The system eliminated lack of certainty as well as quality assurance associated to the system that was developed for that purpose.

• **Personal comments**

This research further argument the effort of this research proposal which deals with the management of the expert system because it tackle quality assurances

Yemelyanov, V. A., Nedelkin, A. A., & Olenev, L. A. (2019, October). An object-oriented design of expert system software for evaluating the maintenance of lined equipment. In *2019 International Multi-Conference on Industrial Engineering and Modern Technologies (FarEastCon)* (pp. 1-4). IEEE.

• **Introduction**

This is a research for the designing of the exert system for the purpose of evaluating and maintaining line equipment

• **Procedure**

Object oriented paradigm was employed during the development of that expert system

• **Findings**

The system work perfectly at the end of the research

• **Personal comments**

The most interesting things about the research is the application of Object Oriented paradigm during the design, which provide more on the management of the expert system. +

## V. COMPARISONS FOR THE TWENTY ARTICLES USED

<b>Title</b>	<b>Authors</b>	<b>Method</b>	<b>Technology</b>
Expert System for Problems of Teeth and Gums	Abu Ghali, M. J., Mukhaimer, M. N., Abu Yousef, M. K., & Abu-Naser, S. S. (2017)	knowledge based system	Expert System
Real-time elderly healthcare monitoring expert system using wireless sensor network	Almarashdeh, I., Alsmadi, M., Hanafy, T., Albahussain, A., Altuwaijri, N., Almaimoni, H., ... & Jaradat, G. (2018)	multidisciplinary approach	Expert System
Photo Copier Maintenance Expert System V. 01 Using SL5 Object Language	Bakeer, H. M. S., & Abu-Naser, S. S. (2017).	The Object languages called SL5 was used in implementing the system	Expert System
Competence assessment as an expert system for human resource management: A mathematical approach	Bohlouli, M., Mittas, N., Kakarontzas, G., Theodosiou, T., Angelis, L., & Fathi, M. (2017).	mathematical as well as statistical methods	Expert System
Web based expert system for diagnosing disease pest on banana plant	Budiyanto, G., Ipinuwati, S., Al Gifari, S. A., Huda, M., Jalal, B., Maselena, A., & Hananto, A. L. (2018)	PHP was used in designing the expert system	Expert System
Deepinsight: a general framework for interpreting wide-band neural activity	Frey, M., Tanni, S., Perrodin, C., O'Leary, A., Nau, M., Kelly, J. ... & Barry, C. (2019).	neural data to simulate	Expert System
Expert system based on the arrangement evaluation model for the arrangement design of a submarine	Kim, K. S., Roh, M. I., & Ha, S. (2015).	submarine expert system	Expert System
Prototype web-based expert system for flexible pavement maintenance	Milad, A., Basri, N. E. A., Abdelsalam, H. M., & Rahmat, R. A. A. O. K. (2017).	web base expert system	Expert System
An Educational Web-Based Expert System for Novice Highway Technology in Flexible Pavement Maintenance	Milad, A., Yusoff, N. I. M., Majeed, S. A., Ali, Z. H., Solla, M., Al-Ansari, N. ... & Yaseen, Z. M. (2021).	IF-THEN rule using HTML, PHP, CSS, and J-Query	Expert System
Expert system in engineering transportation	Mohammed, A. A., Ambak, K. A. M. A. R. U. D. I. N., Mosa, A. M., & Syamsunur, D. (2019).	Neural System, Rule-based, fuzzyESS, and Knowledge based	Expert System
Multi-user Expert System for Operation and Maintenance in Energized Lines.	Moreno, E. F., Pacheco, E. E., Andaluz, V. H., & Mullo, Á. S. (2020, March).	pressure hall	Expert System
Naïve Bayes Approach for Expert System Design of Children Skin Identification Based on Android	Purnomo, A., Hartono, R., & Munawaroh, H. (2018, March).	Naïve Algorithms	Expert System
Expert System for Deciding a Solution of Mechanical Failure in a Car using Case-based	Rahman, A., Slamet, C., Darmalaksana, W., Gerhana, Y. A., & Ramdhani, M. A. (2018).	Tsukamoto fuzzy inference system	Expert System
Methods and Software Implementation of Intelligent Planning for Integrated Expert System Design	Rybina, G. V., & Blokhin, Y. M. (2019).	integrating the software	Expert System
Development of an Expert System for the Evaluation of Students' Curricula on the Basis of Competencies	Sánchez, L. E., Santos-Olmo, A., Álvarez, E., Huerta, M., Camacho, S., & Fernández-Medina, E. (2016).	Various skills for expert system	Expert System
Wearable expert system development: definitions, models and challenges for the future	Sartori, F., & Melen, R. (2017).	Knowledge Artifact framework (KAFKA) and Knowledge Acquisition framework	Expert System
Expert System in Determining the Quality of Superior Gourami Seed Using Forward Chaining-Based	Sivaram, M., Ahamed, B. B., Yuvaraj, D., Manikandan, V., Karlus, N. G., Sitanggang, A. S., ... & Maselena, A.	automated planning	Expert System

Websites	(2019,		
A methodology for enhancing the reliability of expert system applications in probabilistic risk assessment	Yazdi, M., Hafezi, P., & Abbassi, R. (2019).	Various sensitive analysis techniques	Expert System
An object-oriented design of expert system software for evaluating the maintenance of lined equipment	Yemelyanov, V. A., Nedelkin, A. A., & Olenev, L. A. (2019, October).	purpose of evaluating and maintaining	Expert System
A longitudinal content analysis of over thirty years of expert system case studies	Wagner, W. P. (2017). Trends in expert system development:	longitudinal concepts of the expert system	Expert System

Table 1

## VI. EXPECTED RESULTS

The success or failure of an expert system depends on various aspect, this research proposal is aimed at managing the expert system to be successful. This research topic if handle carefully would provide some guidelines that would provide the stakeholders with the most appropriate techniques of managing the expert system. Some if the expected practices or result at the end of this research includes

- Organizational support: - which involve the management, technical people, and the users.
- Library Support and
- Vendors Support

This research would provide a framework to support the aforementioned details for the sake of managing the expert system.

## VII. CONCLUSION

Various studied indicated that building an expert system is much easier than Managing or maintaining it, this is because of its dynamic nature of changing with time, which makes it indeed a complex issue. Various managing factors exists which are all supposed to be considered at the development time of the expert system. This research proposal highlighted some of the most significant and if the research is carried out successfully it would generate a framework for the successes of Managing the expert system.

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