A Feasibility Study on the Expert System for Diagnosing on Common Illnesses in Pediatrics

Group Assignment 2 of Requirement Engineering IUP

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1. Executive Summary

The article discusses the feasibility of creating an expert system for diagnosing common pediatric illnesses, exploring the potential benefits, challenges, risks, and problems that may arise from developing and using the system. Through analyzing the technological, economic, legal, operational, and financial feasibility, this study has determined that the creation of such a system could have a significant positive impact on the field of pediatrics, as well as potentially other medical fields. The system could improve the accuracy and efficiency of diagnoses, reduce healthcare costs, improve resource allocation, and improve access to healthcare, particularly in rural or underserved areas. However, legal and regulatory requirements must be carefully considered and addressed to ensure the privacy and security of patient data, as well as the need for an additional design for a standalone or offline version of the system for rural health systems. Overall, the development of such a system could be a crucial stepping stone toward the future of medical diagnosis and treatment.

2. Introduction

Pediatrics is a branch of medicine that takes vital health care of infants, adolescents, children, and adults typically at an age of about 18 years and under. In the field of healthcare professionals including pediatrics, diagnosing illnesses is one of the most prevalent parts of curing an illness of any patient to give what services and medicines of what the patients need. But there are times when misdiagnosis or misidentification of an illness could occur, which can have major consequences for patients because of the wrong treatment that can leave long-term effects which in pediatrics may lead to children having life-changing effects as well. Thus, by creating an expert system for diagnosing illnesses in children alike, there is the possibility to reduce misdiagnosis while also increasing accuracy and efficiency by reducing the workload on the medical staff for the health system of the current day.

This study explores the feasibility of developing such an expert system for diagnosing common pediatric illnesses. Specifically, this study will assess any potential benefits, challenges, risks, and problems that may arise from developing and the resulting outcome of the discussed system. By analyzing these factors, this study aims to provide valuable insights, evaluation of problems, and a potential solution that may help in the endeavors of creating such systems whenever development starts and the product may be released.

We hope that the creation of this expert system, which will further progress the field of pediatrics and also potentially other medical fields, as well would create a better and faster treatment for sick children. As such this study is one of the many crucial stepping stones and the laying foundation of the future development and use of the expert system.

3. Feasibility studies

A. Technological Feasibility

It is essential to carefully evaluate the technological feasibility of creating an expert diagnostic system for common pediatric diseases, since without the right hardware and software for the team to develop, it might be hard or outright impossible to develop the expert system as a whole. With our current and possible future procured resources, we have identified a couple points that should prove that this expert system is feasible to be developed and used. Below are some points for the system's feasibility:

Hardware and software:

We have expected that the interface software (for which the users of the system interact with the system) to be lightweight enough to be used on any modern computers of the current day and age. The major part of the system should be practically implemented in cloud servers services and storages which have been more available than ever before in today's age for the expert systems to do its diagnosis and storing its database. In addition developing the software can be done on most or all of all of the developing team's laptop with freely available tools and software for developing the system. As such Hardware and Software should have no negative impact on the system's feasibility.

Managing its Database:

Since any expert system requires a collection or database of knowledge from the experts of the field, a problem with managing the possibly vast amount of data for the system to store and for it to process to create a diagnosis may arise. But we have concluded that this shouldn't be a problem with the added data management system embedded in the expert system itself to manage its data which should make it efficient so it solves the problem.

From the points mentioned above we have determined that the discussed system should be technologically feasible with our current resources and current technologies. As such the system should be able to be developed and used by any modern computers, though with that being said we have identified this system may not be suitable for areas in which networking infrastructures may be lacking such as rural or outreached locations. A such a stand-alone or "offline" version of the system might need a sturdier hardware to store and process the system's need in one device.

B. Economic Analysis

An economic analysis on the system's release potential is another crucial aspect to determine whether the expert system could give more incentives and relieve some of the financial loads during development and sale of the system. As such below are some the points on the economical feasibility of the system use if it's ever released:

Cost-cutting measures:
The expert system result can quickly and accurately provide accurate diagnoses, which reduces the need for unnecessary costly diagnostic tests and lowering the cost of patient care.

Increased Efficiency:
By providing accurate and timely diagnosis, an expert system for diagnosing common illnesses in pediatrics can improve healthcare outcomes. Early detection and treatment can improve health outcomes, reduce the need for hospitalization and intensive care, and lower healthcare costs which is efficient in time and outgoing cost for both the medical practitioner and the patient.

Improved Resource Allocation:
The system can recommend the treatments option or compulsory lab tests from the diagnosed result, ensuring that resources are used efficiently. Furthermore, the system can provide patient outcome data, allowing healthcare organizations to prioritize resources for high-risk patients.

Societal Impact:
By providing accurate diagnoses remotely, the system can improve access to healthcare, particularly in rural or underserved areas. Furthermore, by providing consistent and reliable diagnoses regardless of a patient's location or socioeconomic status, the system can help reduce healthcare disparities.

Return on Investment (ROI):

The ROI of an expert system is calculated by comparing the system's costs and benefits. ROI is determined by the amount invested, the time period over which the ROI is calculated, and the accuracy of cost and benefit estimates.

Overall from the point discussed above we are certain that the economical impact of the expert system used for a low-cost, more efficient, resource allocation, societal impact, and ROI would substantiate the development and creation of such an expert system for it to be used in the medical fields.

C. Legal Feasibility

Legal feasibility refers to an expert system's ability to comply with legal and regulatory requirements when diagnosing common pediatric illnesses. Here are some key elements of the legal feasibility for the use of pediatric expert system for diagnosing common illnesses:

Privacy and security:
To protect patient data, the expert system must adhere to privacy and security regulations such as UU PDP in Indonesia. To protect patient data from unauthorized access or disclosure, the system must be designed with appropriate safeguards such as encryption and access controls.

Liability:
The expert system will be designed in such a way that the developers' and users' liability is limited. This may include disclaimers or liability limitations in the user agreement, as well as ensuring the system's accuracy and dependability.

Medical Licensing:
The system will abide by medical licensing regulations, which may differ depending on the country or state in which it is used. The system is designed for use by licensed healthcare professionals, and the developers must ensure that the system does not infringe on the licensed medical professionals' scope of practice.

Intellectual Property:
To ensure that the system and its components are protected, the expert system must comply with intellectual property laws, including copyright and patent laws. Obtaining patents or copyrights for the system or its components, as well as licensing technology or data from third parties, may be required.

Informed Consent:
Informed consent regulations may require patients or their legal guardians to provide informed consent before their data is used in the system, so the expert system must comply with these regulations. The system must also ensure that patients or their legal guardians are aware of the system's risks and benefits and that they have the option to opt out of using it.

In short, the legal feasibility of this system is determined by the system's ability to meet legal and regulatory requirements for privacy and security, liability, medical licensing, intellectual property, and informed consent. By addressing these legal concerns, the developers can ensure that the expert system is legally viable and sustainable, as well as

that it can be used to improve pediatric healthcare without violating legal or ethical standards.

D. Operational Feasibility

Operational feasibility is the ability to successfully build, implement, and maintain an expert system for pediatric disease diagnosis. The following are some aspects of the feasibility of an expert system for pediatric disease diagnosis:

Data Collection:
To build an expert system for identifying common illnesses in pediatrics, data on symptoms, diagnosis, and treatments for Different illnesses must be collected. This information can be gathered from various sources, such as medical journals and opinions from experts.

Knowledge Representation:
After the information has been gathered, it must be appropriately organized and documented so that the expert system can use it. A knowledge representation model that captures the connections between symptoms, diagnosis, and treatments for various illnesses must be created to accomplish this.

Rule-based System:
A rule-based system that uses a set of rules to match a patient's symptoms with the proper treatment and diagnosis must be developed as the expert system for diagnosing common illnesses in pediatrics. The rules must be based on the knowledge representation model and the data collected.

User Interface:
The expert system needs an intuitive interface that enables clinicians to enter symptoms and receive a diagnosis and treatment plan. Additionally, the interface must allow professionals to modify the diagnosis and treatment plan if necessary and present the reasoning supporting the diagnosis and recommended course of action.

Maintenance:
Regular maintenance is essential for keeping the expert system current with the most recent research in medicine and treatment recommendations. This could entail changing existing rules, introducing new rules, or updating the knowledge representation model.

Performance:

The expert system must perform accurately and quickly, offering precise diagnoses and treatment suggestions on time.

The availability of data, the capacity to create a knowledge representation model and rule-based system, the user interface, maintenance requirements, and performance all play a role in how technically feasible an expert system for diagnosing common pediatric illnesses is. By carefully considering these factors, it is possible to create and use an expert system to improve the accuracy and effectiveness of pediatric diagnoses and treatment.

E. Schedule Feasibility

Feasibility of the scheme refers to the ability to develop and implement an expert system for diagnosing common pediatric diseases within a given time frame Here are some key elements to creating an expert system diagram for diagnosing common childhood illnesses

Development time:
The development time of an expert system depends on the complexity of the system, the amount of data required and the level of knowledge required to develop the system The development team should have a clear plan and schedule for system development, including guidelines and deadlines

Installation time:
The installation time of an expert system depends on the number of users, the complexity of the system and the level of support required The implementation team should have a clear plan and schedule for implementing the system, including training and support for clinicians

Testing time:
The testing time of an expert system depends on the level of testing required to ensure that the system is accurate and reliable The testing team must have a clear plan and schedule for system testing, including unit tests, integration tests, and user acceptance tests.

Unexpected Weather:
Schedule should allow for unexpected times to account for unforeseen delays or problems that may arise during system design and installation. In general, the validity of an expert system for diagnosing common childhood diseases depends on the ability of the development team to develop and implement the system within a given time frame With a clear plan and schedule, including contingencies, the development team can ensure that the system is built and deployed on schedule and within budget

F. Financial Feasibility

Financial analysis of child diagnosis expertise often includes an assessment of the costs which is get from sponsors around Rp10,000,000 and benefits associated with the system. Key elements of the financial analysis for pediatric diagnostic specialists include:

Development costs:
Costs for development specialists include data collection, software development, and user interface design. Construction costs vary depending on the complexity of the system, the amount of data required, and the skills required to build the system. Fees: Business usage fees include hardware, software, and professional training. Utilization rates vary depending on the number of users, system complexity, and level of support required. To cover all that, it required 70% of the total fund which has Rp7,000,000.

Operating Costs:
The expertise system includes costs such as maintenance, updates, and regular user support. Operating costs vary depending on the complexity of the system, the number of users, and the level of support required. To support that, it required 30% of the total found which has Rp3,000,000.

Benefits:
Expertise benefits include assisting doctors in diagnosing patients, increasing efficiency for both medical practitioners and patients, improving resource allocation, and having a social impact. These benefits depend on performance, the number of patients treated, and the level of acceptance by physicians.

Financial feasibility can be used to determine if the benefits of the expertise justify the costs. This analysis compares the cost of the system to the additional benefits the system may produce, such as reduced health care costs and improved patient outcomes. Expert system financial feasibility for patient identification often involves analyzing costs and benefits, calculating return on investment, and performing a cost-benefit analysis. The financial analysis helps to determine if the work of the expert is effective and efficient and if the benefits of the system are worth the cost.

4. Conclusion

In conclusion, developing an expert diagnostic system for common pediatric diseases is a feasible and potentially beneficial undertaking. Through analyzing the technological, economic, legal, operational and financial feasibility, this study has determined that the creation of such a system could have a significant positive impact on the field of pediatrics, as well as potentially other medical fields. The system could improve the accuracy and efficiency of diagnoses, reduce healthcare costs, improve resource allocation, and improve access to healthcare, particularly in rural or underserved areas. However, legal and regulatory requirements must be carefully considered and addressed to ensure the privacy and security of patient data, as well as the need

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