Systematic Review of Web-Based Decision Support Systems for Clinical Applications: Enhancing Ontology with Unified Modeling Language and Ontology Web Language

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Abstract **– This article demonstrates an ontology-based technique that aids in envisioning the problem domain before software development, presenting an approach to assist decision-making for reliable and optimal healthcare administration. The proposed approach is designed for utilization by a Web-Based Decision Support System (WebDSS). The purpose of the study is to aid readers in comprehending how ontologies in healthcare management platforms can be modeled using UML and OWL. For the conceptualization and the design, service modelling and the semantics of the web language are crucial. We demonstrate the use of the Unified Modeling Language (UML) and the Ontology Web Language (OWL) in the administration of healthcare operations and key elements of the model-base of healthcare administration systems. Highly educated systems with automated assistance will allow decision-makers to more effectively incorporate aspects of sustainability into their decisions.**

In order to generate semantic ontologies for medical management, the present study proposes an ontology creation technique and a Semantic Web framework called Protégé. Web-based technologies, decision trees, data mining, and computational algorithms are implemented by WebDSS to assess medical resources administration information in real-time. These methods are employed to develop a decision making framework for this study. Time series graphs, email reports, and webpages are used to display the test findings. When healthcare thresholds are surpassed, the system uses text messages as email reports to automatically deliver warnings. Our study's primary contribution is the creation of a useful tool that makes it easier for academics studying medical concerns to locate online sites with information.

Keywords **– Clinical decision support systems, modeling languages, web-based systems, ontology web language, unified modeling language, medical management.**

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1. Introduction

Finding patterns buried within healthcare datasets through data mining offers a lot of potential for the medical business. An approach for tracking healthcare management, identify other options for medical issues, understand the qualities and create a framework for medically is one of the crucial processes employed in the healthcare industry. The WEB-DSS was developed to assist doctors who frequently rely on static information that may be out of current. Doctors and medical facilities would benefit from a WEB-DSS that can learn about the relationships between knowledge of the patient's history, diseases in the population, symptoms, laboratory findings of a disease, family history, and test results [1]. The combination of data mining can encourage the created presentation of WEB-DSS and enable the treatment of new types of difficulties that were not previously attended to.

They also assert that by enabling the fusion of knowledge from experts and knowledge extracted from knowledge, data mining and decision support could jointly expand existing methodology and create new approaches to cope with innovative thinking [2]. Web-DSS is anticipated to advance clinical decision-making with targeted clinical information, contaminated data, and other relevant data. It entails programming meant to serve as a quick reference for medical decisions, in which the characteristics of each patient are integrated with a computerized medical data base before patient-explicit evaluations or propositions are presented to the physician for a decision [3]. Although gathering and translating medical data used was previously the domain of healthcare professionals, the widespread availability of clinical knowledge in astonishing quantities has completely and irrevocably altered the landscape of current contemporary care [4]. The use of WEB-DSSs was recently proposed as a potential remedy for increasing the general competence and quality of healthcare providers. They are said to encourage improved adherence to evidence-based guidelines, promote the use of preventative therapies, identify potential risks associated with the use of various medications, increase access to more accurate clinical records, and improve ongoing doctor communication [5]. A DSS that can comprehend the connections between the medical histories of patients, community illnesses, evidence, illness physique, family history, and medical investigations would be helpful to doctors and hospitals. The concept of Decision Support System (DSS) is extremely broad due to the numerous diverse methods and areas in which choices are made. DSSs encompass, computer-based data systems, and this category includes systems founded on expertise. A DSS is typically a computerized tool that supports decision-making. It is possible to create WEB-DSS applications using the subsystems that are available. However, creating such a system is a challenging task that has not yet been taken on. Numerous factors have been identified, but a significant challenge has been identified as ignorance. The challenge of creating dependable and efficient (MDSS) medical decision support systems to assist the ever-complicated diagnostic choice procedure has become more challenging in an effort to reduce detection time and boost assessment accuracy. Soft computing methods like decision tree classification have shown to be useful in the creation of MDSS for renal disease, liver disease, and prolonged pancreatitis because medical evaluation is a difficult and confusing process of thinking by design.

Authorities from all over the world have expressed enthusiasm for the field of medical administration. This necessitates the development, installation, and deployment of web-based systems that expose healthcare organizational frameworks and services online and offer channels for communication between patients and health care facility administrators online through a single web platform, and allow online involvement by citizens in the decision-making procedures of policy authors [6]. It is crucial to comprehend the relationships between the tasks, procedures, and sectors that handle the health care administration elements, as well as how the data flow. There are numerous methods for modeling healthcare administration processes that may be used with both OWL and UML.

Both the OWL and UML offer the same components, classes, characteristics, and relationships (OWL refers to these as properties whereas UML uses the term relationships) [7]. In order to explain system structure, express equations and representations, connect to outside databases and control model bases, and combine simulations with different reports, ontology-based approaches can be used. The ontology-based reasoner has the ability to compare, arrange, find, and create models and model components autonomously. Web-based graphical design instruments must be included in simulations built using the conceptual system of management in order to build an illustration of medical administration that makes use of the methodology [8]. In later efforts, such as the dissemination of connected data pertaining to sensing livestock and medical qualities, ontology is applied [9]. Readers can better grasp how UML can be utilized for expressing ontologies in design diagnosis systems by comparing UML to the web ontology language (OWL) using a case study taken from the French project medical knowledge management [10]. The goal is to create a comprehensive semantic web framework for managing health problems. To facilitate the classification of health issues based on the medical framework directive, a web-based ontology for healthcare administration has been established [11]. Ontology study has gained popularity recently and is seen as knowledge that can help with problem identification, decision-making, and knowledge administration. It is outlining a method for creating organizing domains ontologies in the context of creating a medical administration plan. We discover that the replicating and changing concepts are adequately captured by ontologies. Show how ontologies can be used to plan healthcare administration. Over the past few decades, ontology has been employed for a variety of objectives, one of which is aimed at enabling compatibility across disparate information systems.

It shows how the employment of several ontologies will help the coming generations of information systems by using them to overcome interoperability problems. Professionals in a field of interest can share expertise by defining a set of information and its arrangement using ontology, an official description of domain knowledge. An innovative and effective way for managing information, integrating many data reports, and making it easier to take into account the intricate relationships between categories and slots while making decisions presents the ontology-based methodology [12].

A webDSS can be implemented practically using the agent technique. In particular, the integration of agents into webDSS enables the decision maker to automate a greater number of operations, providing simpler administration and necessitating less direct handling of the DSS.

Agents were utilized specially to gather data and produce options that would let the authority on medical concerns concentrate on the remedies that were determined to be important. We draw the conclusion that more research based on coordinating techniques between agents is required given this and the fact that interaction capacities are crucial for web DSS to operate in its (anytime, anywhere) deployment mode. To enhance the assistance for decision-making and organizing operations, the contextual data domain provided in the software tool will be expanded especially [13].

Agent-based healthcare DSS framework is currently being developed. In theory, an agent-based clinical DSS is designed to assist a medical authority in resolving resources failure issues in the healthcare industry via an online, Internet-based web service. We are going to utilize a web agent besides to the web service in our attempt to complete numerous tasks. The Human Health Center (HHC) will calculate the numerical value of the disease diagnostic variables to determine the patient's condition and will make interactions with agents according to that information [14].

In order to create an ideal decision support system for healthcare administration, this paper aims to investigate/develop circumstance evaluation, performance evaluation, and risk estimation models for various purposes. It also presents a method that combines an ontology developing technique with Protégé, a semantic web structure, to create an ideal WEB-DSS.

The remaining sections of the paper are organized as follows. In Section 2, we reviewed the most-related work. Section 3 discussed the decision modeling. Section 4 illustrated the building concepts for planning domain ontology.

Section 5 discussed the designing and developing web-based DSS and the methodology that used to create the ontology along with background theory on ontologies to orient the reader concept of ontology. Section 6 discusses the designing (UML&OWL) and presents the proposed ontology, which we have named the Medical Management (MM) ontology, and provides examples of how the proposed ontology can be applied to support modeling activities and web-based decision support system. Finally, conclusions and future research avenues are drawn in Section 7.

2. Related Work

A web decision support facility has been created because the prevalence of medical problems is so significant in the world. It offers the ability to access simulation findings on movement medical-disease circumstances and advanced scenario evaluation tools for studies and healthcare sector organizing through a user-friendly interface with well-known substitutes. International health changes and the escalating degree of humanity's actions are frequently the causes for healthcare emergencies throughout humanity [15].

The WEB-DSS is used in many aspects of medical administration, including the administration of healthcare assets and therapeutic planning. A decision support system in the healthcare administration course's representation, design, and deployment are all highly helpful in preventing medical emergencies. Healthcare resource allocation and administration are becoming more and more dependent on decision support tools like modeling and analysis with multiple criteria [16].

They have combined the four elements associated with successfully implementing WEB-DSS from several studies. One was automating alerts and updates, two was making recommendations at a suitable time and place, three was making important recommendations, and four was automating the complete action. These factors have an impact on the care and handling of crisis situations. To demonstrate how quickly the DSS communicated the crisis, a contextual evaluation was employed. Data exchange is a crucial component for the clinical decision support system to function properly [17].

The findings demonstrate that physicians who follow the advice of medical decision-support systems tolerate losing authority over their profession, losing specific skills, and gaining knowledge in a situation where any non-expert can gain access to the clinical material that is chosen for the physician. So when doctors choose to use a clinical decision-making system, skilled independence plays a big role.

This study also enhances two other areas: 1-the structure that encourages the chief to assign a field to doctors so they can create natural systems for clinical decision-making and have successful data sharing; and 2-the nature of the assistance provided to individuals by using appropriate medical information technology (IT) structures in hospitals [18]. Author of the study [19] has investigated the most significant WEB-DSS-related issues. The entire CDSS must be computerized, medical work processes must be integrated, the structure must be extensible and viable, ideal advice must be provided, costs and impacts must be evaluated, and constructions must be in place before the system's clinical decision-support authorities and components can be shared and reused.

They gathered the four elements linked to effective WEB-DSS implementation from multiple research studies. The components were as follows: automation upgrades and warnings, offering recommendations at a predetermined time and setting, offering significant recommendations, and automation the entire process. These factors have an effect on the crisis therapy and care procedure. Contextual evaluation was utilized to show how soon the DSS presented the problem. A system for clinical decision-making support must be correctly implemented, and data sharing is essential [20].

Given that various diseases are caused by contamination of water, health for humans is a significant concern that is tied to this, and the system as a whole is complex. As a result, the data acquires every requirement for modeling with the agent WEB-DSS technique. These traits include independence, flexibility, movement, responsiveness, interaction with other agents, and knowledge. The WEB-DSS agent strategy appears to be the sole method that can assist in reducing the complicated nature of the system by developing separate parts that resolve individual subdivision that collectively make up the main objective. Every agent uses the method that is most useful for resolving the specific subtask and avoids using the general strategy, which is suitable for the system as a whole but not suitable for a specific subtask [21].

For healthcare administration and studies, the authors have recommended using an assortment of artificially intelligent agents working within an agent-based intelligent system that supports decisions [22]. The IDSS's planned application concentrates on urgent instances and has as its intended goal to enhance of decision-making quality. The problem of administrator service, which is part of the method of decision-making framework, uses online services to present and monitor its performance as well as the additional layers to evaluate data from the knowledge integrative layer and develop alternatives.

It appears essential to develop an agent-based decision support system (ADSS) for discovering information and assessment about the impact of environmental tension on individuals through in-depth analysis of naturally occurring and externally generated disease cases because all of these works have shown novel and promising practical and theoretical outcomes.

A collection of facts and its organization have been defined using ontology, an official definition of domain expertise, to allow specialists to contribute their expertise in a particular field of interest. An innovative and effective way for managing information, integrating many different sources of data, and facilitating the examination of the intricate relationships between conceptions and slots when making choices presents the ontology-based technique. Constructing the ontology is a difficult task that requires the assistance of a domain specialist who can help you declare all relevant domain terms and the connections between them. The World Wide Web consortium's ontology languages standard is called Ontology Web Language (OWL). People, attributes, and categories make up OWL ontology [23].

The syntax and semantics of UML, which is an object-oriented visual language, are well-defined and clear. By means of underlying semantic frameworks (meta-model), language of description, and limitations, the syntax and meanings are semi-formally stated. Category graph, item graph, use case graph, situation chart graph, sequencing graph, cooperation diagram, activities graph, element graph, and delivery diagram are the nine designs that make up the UML, and each one represents a different part in developing a target system. Because the UML is adaptable, new constructs can be added to it to meet evolving problems in the creation of software without altering the programming language's initial semantics or syntax [24].

The object, implementation, and descriptions levels of a three level architecture for autonomous decision support are used in an ontology-based information management system for healthcare modeling. Information regarding models as well as knowledge sources is kept at the object level. Through the program straight, which is frequently a Graphical User Interface (GUI), users communicate at the component level. The subject matter ontology, containing important concepts and characteristics related to water quality algorithms and their result flow, and the material ontology, which involves general concepts and characteristics related to knowledge resources and data maintained at the component level, are both identified at the explanation level.

Healthcare prototypes are described by the following characteristics and circumstances in the field's ontology: (i) characteristics presenting the mathematical model (such as separation technique, category of impact, time stepping technique, initial circumstances and boundary circumstances, etc.); and (ii) circumstances for the simulation's variables. Each circumstance and characteristic has one or more potential values, and every value has been assigned with a different identifier. Consequently, an amalgam of one or more indexes can be used to characterize a computerized model [25].

3. Decision Modelling

Decomposing the issue of choice into easier and more easily comprehended elements is one technique to increase the standard of decisions. An official, technically valid method can then be used to investigate an intricate structure made up of such parts. Modeling is a term used to describe the process of breaking a problem down and establishing it. Finding a mental model of a real-world system that leaves out extraneous detail while simplifying and making as many assumptions about the structure of the system as feasible is what modeling essentially refers to. Developing an illustration of a decision issue enables the application of scientific information that is transferable between situations and frequently across disciplines, as compared to arguing about an issue holistically. It allows for analyzing, explaining, and arguing about a decision problem [26].

3.1. Components of Decision Models

Figure 1 illustrates how a framework and its elements constitute the three subsequent making decisions elements. A model is made up of parameters and an explanation of how they interact with one another.

a. Measure of preferences over decision objectives

Most people agree that the most crucial idea for making decisions is desire. A decision maker must carefully consider the outcome of a choice process in perspective of their attractiveness because not all outcomes are excellent.

b. An available decision options

The possibilities are frequently calculable (e.g., a list of potential providers), but they can also take the form of the constant numbers for defined policy parameters. An essential part of model architecture is a list of choices that are available for making decisions.

c. Measure of uncertainty

One of information's fundamental and pervasive characteristics is unpredictability, which results from inadequate information, imprecision, and modeling assumptions created for the purpose of simplification. It would not be an exaggeration to say that everyday choices without any element of ambiguity either do not exist or fall into a very narrow category [27].

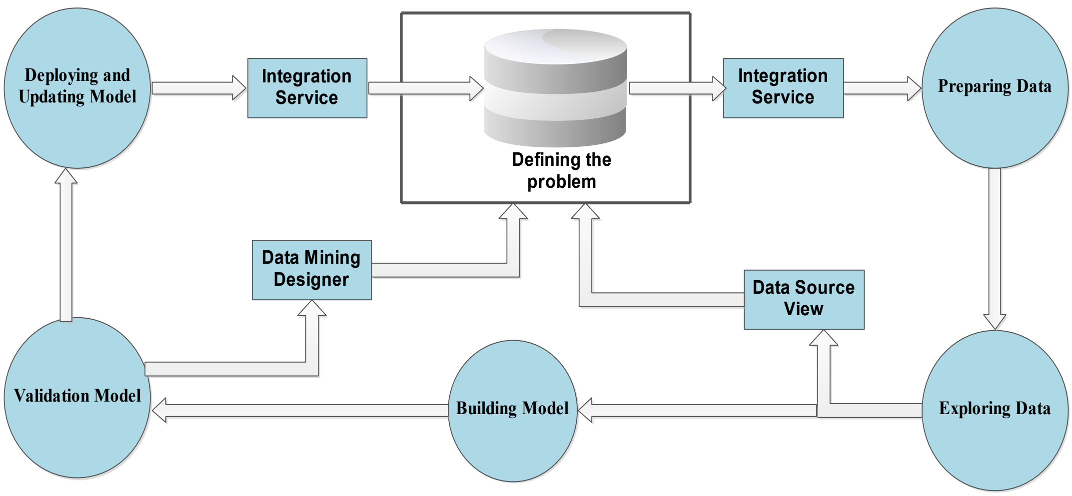

Figure 1. The components of DSS

3.2. Decision-Analytic Decision Support Systems

A few basic axioms of logical decision-making form the foundation of decision theory, an obvious framework for decision-making. The analysis of decisions depends on the experimentally validated hypothesis that while individuals are capable of reliably storing and retrieving their individual beliefs about ambiguity and preferences for various outcomes, they are considerably less capable of putting these disparate pieces together to form a whole inference. To shed light on the choice is the aim of decision assessment.

This realization, which includes an examination of all pertinent variables' levels of ambiguity and the fragility of some presumptions, is even more crucial than the pK2roposal itself. Successful applications of decision analytic DSSs to real-world commercial and medical systems have been made [28].

3.3. The Prposed Model Components

The method of developing models (or model selection) and outcome investigation is represented by the user interface.

The model that the system's reasoning is built on should be clear to the user through a suitable user interface. Modeling is rarely a one-time activity, and effective models are typically improved as their users gain first-hand knowledge of the system's suggestions. An illustration showing how all of its elements interact, such as a representation of the data structure the framework depends on, can significantly improve the model's user interface. The knowledge flow from the factors that are independent to the relevant variables that are dependent is shown in this graph using quantitative and structural explanations [29].

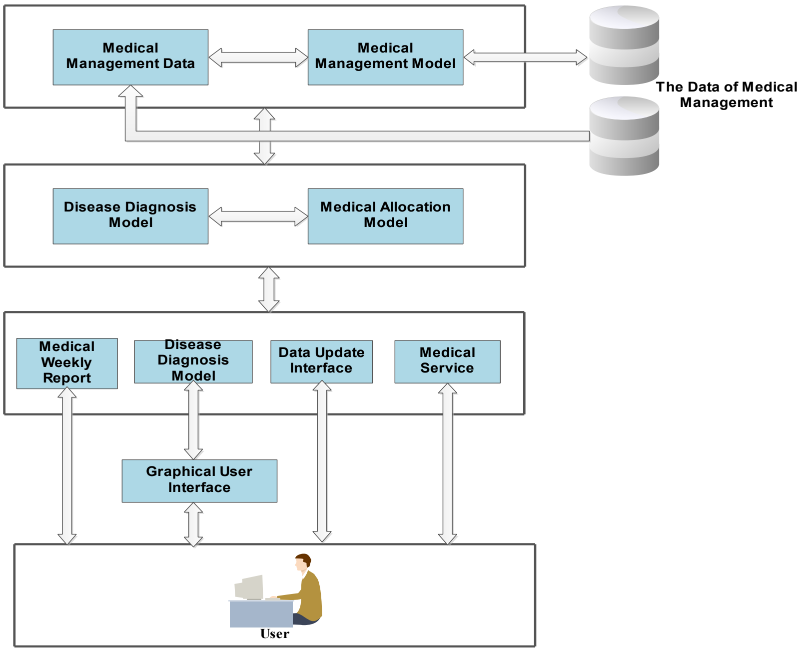

Figure 2. Overview components of medical management model

The goal of the study is to create a web-based DSS for health care administration that is supported by four components (Fig. 2): a database, a healthcare administration model connected to mathematical models for infection diagnosis, a logical collaboration unit in charge of communicating with disease diagnosis regulate simulations, and a user interface that enables the creation of variables for the simulation process and the display of produces through editable tables and maps. Various situations are covered by healthcare approaches to management or single activities, assisting decision-makers in determining the underlying causes and the best methods to treat the patient, healthcare services, sending alerts regarding patient states, and providing a report on the appropriateness of medical care.

4. Building Concepts for Planning Domain Ontology

The graphics language UML is object-oriented and has a well-defined grammar and concepts. Through constraints, descriptive language, and underlying semantic models (meta-model), the syntax and interpretations are semi-formally stated. The nine diagrams that make up the UML are the class, object, use case, state chart, order, cooperation, activity, element, and deployment charts. Each illustration presents a different aspect of developing a target system. Because the UML is an expandable language, new constructs can be added to solve evolving and developing software challenges without affecting the syntax or semantics of the language that was originally used.

4.1. Ontology Languages for the Semantic Web

A development of the present Web, the Semantic Web gives meaning to web materials enabling intelligent processing by programs. To simplify the incorporation and availability over the Web, the significance of Web resources is formalized in logic-based structures and expressed with ontologies.

The semantic web's ontology languages like XML, XML Structured Data (XMLS), RDF, RDF structure (RDFS), and OWL are used to describe ontologies logically. The main semantic web ontology languages used in the current study's analysis are RDF(S) and OWL [30].

a. RDF(S)

The initial established Web-based languages are RDF and RDFS. RDFS is an upgraded version of RDF that offers tools for the development of fundamental ontology elements including categories and hierarchical of categories, attributes, and the variety of characteristics. RDF is an information framework used to represent assets on the Web. RDF represents ontology using assertions with the format S, P, and O. A RDF statement means that the topic S possesses the asset P with the amount O. S and P are unified domain identification (URIs) in an RDF declaration, and O might be either a URI or a literal quantity [31].

b. OWL

To combat RDF(S)'s limited expressiveness, OWL was created. OWL provides methods for specifying relationships between categories, specifying attributes' features, and establishing relationship and value limitations on properties, which improve the expressiveness of RDF(S). Various programs exist for the automated generation of RDF(S) and OWL codes, therefore semantic web designers are not required to write RDF(S) and/or OWL programs by hand regularly [32].

4.2. Software Platforms for Semantic Web Ontology Development

Various software platforms as well as application interface (APIs) have been developed to enable the automatic production and use of RDF(S) and OWL ontologies in order to serve the goal of the semantic web, which is to make material accessible via the Web readable by machines. There are recent comparisons of a few of the RDF(S) and OWL authoring systems available in study [33]. A more complete list of these systems, including Protégé, Web ODE, Onto Edit, KAON, and others, may be obtained in [34]. In addition to the software systems utilized for RDF(S) and OWL ontology edition. The creation of the web [35]; in addition, there is a Protégé that is freely available and might make this study more repeatable. A system called Protégé was created at Stanford Medical Computing. It offers an interface for displaying and modification of the model that underlies it as well as an internal framework called a framework for ontologies representation.

The Protégé framework is utilized for representing ontology components as classes, features, or slots, as well as attribute attributes like facets and limitations, as well as examples that help developers when building WEB- DSS. Generate categories and situations, as well as configure class properties and limitations on attribute facets, using the Protégé interface with graphics. Protégé also provides a library of different tabs for accessing, displaying graphically, and querying ontologies. XML, RDF, UML, and OWL are just a few of the ontologies that may currently be fully loaded edited, and saved using Protégé [36].

4.3. Ontology Domain Application

The construction of an instance study for healthcare field ontology is presented in the following paragraphs. In connection with the use of various health problems and illness diagnosis administration as specified by the DMD technique, the MM technique constructs the evaluation of the numerous diseases problems like security of products, quality of the product, and study center setting [37].

a. UML Design of the WEB-DSS Domain for Medical Management

To create subject-matter ontology for the medical service field, a structure taken from the ontology development approach is used. The domain-specific ontology is subsequently built using RDF, OWL, Protégé, and the (UML) language to allow for efficient webDSS and semantic interpretation by algorithms. An official description of domain expertise is the ontology. In order to allow professionals to exchange knowledge in a particular field of interest, it has been utilized to describe a set of data as well as its organization. A novel and promising way of managing information, combining many various sources of data, and allowing for the examination of the intricate relationships between ideas and slots when making choices presents the ontology-based technique [38]. The health care research program is currently developing the system this study models. Several parties are involved in the framework [39]. For the system model, we selected UML characteristics that match theoretical services. They are illustrated in the UML diagram from Fig.3 as following.

- **Medical Management**: assessing the disease diagnosis systems and determining whether it is required to send a medical controller warning.
- **Medical Treatment**: gathering data from those in charge of the medical lab, diagnosing the infection, and deciding on the best course of action for the patient.

- **Disease Diagnosis**: Read the most recent reports on the occasions and actions taken within our organization. The users can receive information quickly and effectively and read about the paperwork needed to complete the contract, depending on the type of condition.
- **Medical Report**: Choose the address that is the most convenient to read the healthcare evaluation results from the list of addresses or the map.
- **Clinical Advices**: Learn important details regarding the agreement for services offered by online clinical termination circumstances / contracts' modification, necessary paperwork, forms, informational materials, and a comprehensive list of frequently requested inquiries regarding our healthcare products and services.
- **Healthcare**: The users are able to view the data contained on the medical service invoicing as the first benefit of opening an account on the internet.
- **Healthcare Center**: Medical administration of resources, medical care, and customer service are the organization's major areas of operation. This menu lists the products and services offered to its present and potential clients.

The medical investigation is currently developing the modeled system. For our computer system framework, we determined the UML capabilities that match the notional service. They are shown as follows in the UML representation in Figure 3.

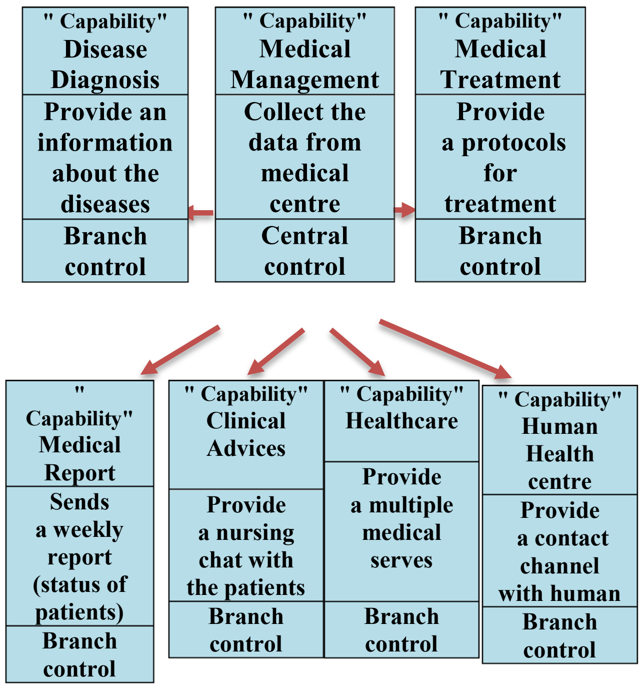

Figure 3. Capability diagram of the Medical Web-DSS domain

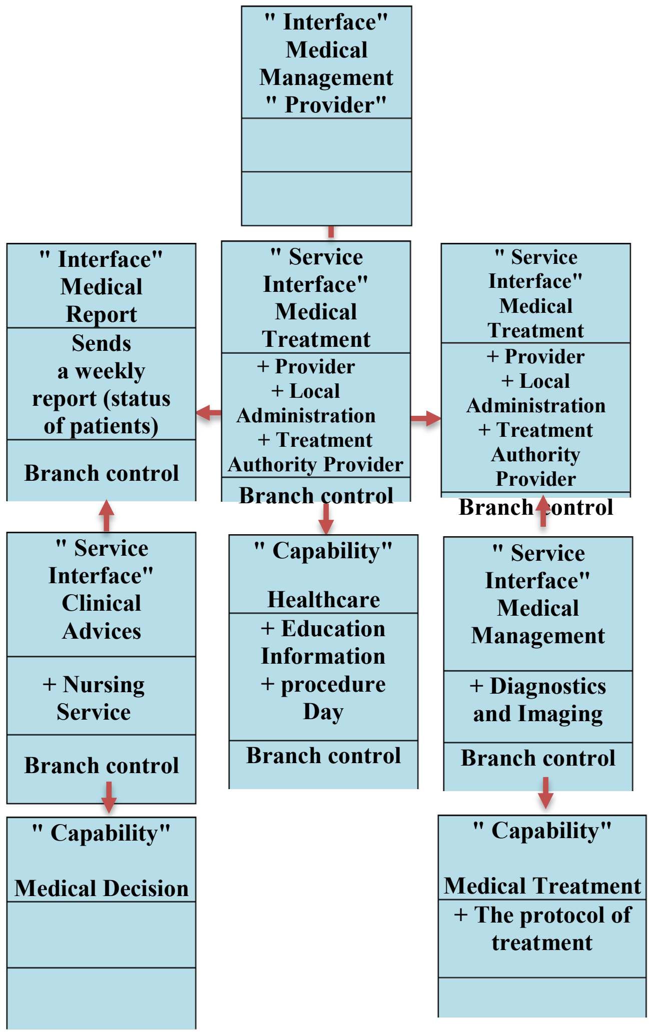

Figure 4. The service diagram interface of the Medical Web-DSS domain

The capabilities offered by the proper service interface, such as a human health center, are shown in Figure 4. It uses disease therapy interfaces, employing the facilities provided by healthcare management, and it provides the healthcare facility admission interface, offering assistance to administrator's software.

b. OWL Design of the DSS Domain for Medical Management

The semi-formal illustration of the health care administration framework (Figure 3) was used to construct the OWL implementation of the framework with Protégé (Figure 5). The class hierarchies (classes, cases, and inheritance architecture), slots, and the domain's definition and range of slots were all created using Protégé's interface-friendly visual user interface. Based on the UML structure of the medical administration framework (Figure 3), the following characteristics were developed. The Protégé file that resulted was exported as an OWL file.

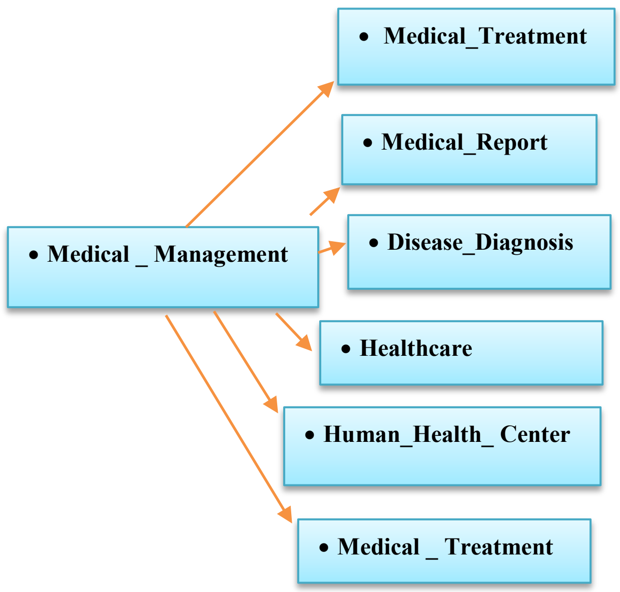

Figure 5. Part of OWL version of the medical management domain ontology

Parts of the healthcare management algorithm's subclass-of connections (inheritance), fields, and slot ranges are shown in Figure 5, along with a portion of the clinical ontology field that is shown in Figure 6. It is important to note that the Protégé ideas of group, property/slot, field and range, and individual/instance are the same concepts used in the UML representation of the medical model (Figure 3). This shows that the framework used in Figure 4 is suitable for corresponding to an informal ontology to be executed with Protégé. The goal of the study is to offer instructions for using Protégé to create OWL ontologies based on informal UML representations of domain ontologies like the healthcare administration paradigm.

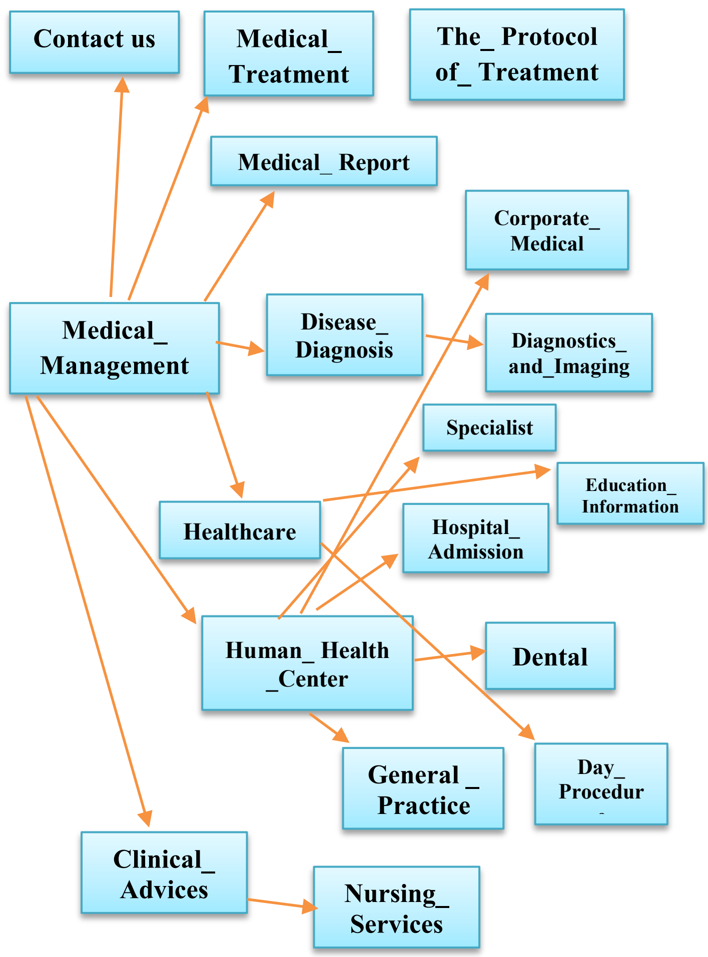

Figure 6. The ontology of the entire main components for medical Web-DSS framework

The semiformal formulation of the clinical resource administration framework was used to construct the OWL version with Protégé (Figure 7). The class hierarchies (classes, scenarios, and inherited architecture), slots, and the realm and range of slots were all created using Protégé's user-friendly visual user interface. Utilizing the medical management algorithm's UML description (Figure 4), these characteristics were developed. The Protégé file that resulted was saved as an OWL file.

Although this study has not yet entered the application development stage, we can nonetheless present a theoretical framework for creating an ontology-based knowledge administration system that uses Web-DSS by combining a number of currently available techniques and technologies. The conceptual procedure is shown in Fig. 8. Ontology programmers will use graph editor software because it offers a visual and user-friendly interface.

The nodes and connections in graphs indicate the retrieved categories (nouns) and connections (verbs) correspondingly. The diagrams will be converted to UML, which is still often used to build domain ontologies. The module-based method used by UML allows for the description of reality's abstractions and the visualization of knowledge architecture [40].

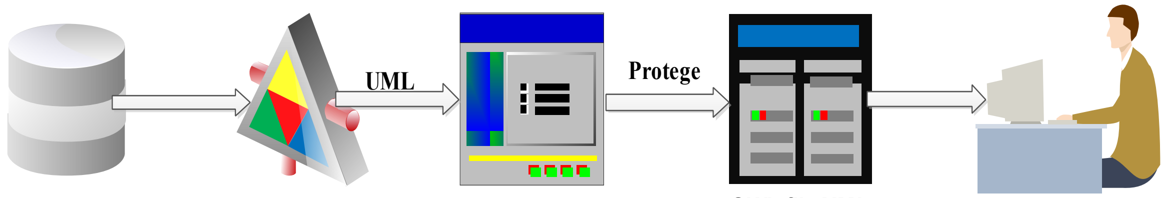

Figure 7. Conceptual process of ontology-based knowledge management system

It will be extremely practical to develop the knowledge repository with Protégé 4.3 by designing the model using UML. With a conversion capability from Protégé structure to OWL language, that constitutes the foundation of the semantic Web according to W3C typical, Protégé 4.3 is typically used in ontology construction. The majority of ontology instances will be represented by the ontology descriptive languages that have been created, including XML, RDF, and OWL. It will be easy for the end individuals to use web-based DSS if the ontology is implemented in a web-based form [41].

4.4. Medical WEB-DSS Functional Design

In order to construct a thorough and cogent analysis of decisions platform for medical decisions (medical administration), Healthcare WEB-DSS is an agent-based web-based program platform that houses a set of connected decisions evaluation tools.

This system mimics the features of a system built with private methods, including Java script and MySQL, while using open source software. The resulting system is across browsers and cross-platform compatible, freely available, needs browser plug-ins, and can be readily downloaded and used on any personal computer or servers (the Internet connections is not necessary to use the system).

a. Module Interfaces

Interfaces will be constructed after the foundational components have been created to enable communication between the components. AJAX requests will be used by the graphical user interface to interact with the model/controller; direct MySQL questions and access to Java script stored processes will be used by the model/controller to interact with the relational database; and code written in JavaScript will be used by the database to interact with the technical assessment module. When the particular tools are built, these user interfaces will be substituted with specific tasks and methods of communication.

b. Server Scripting

The hypertext processing system (PHP): A plug-in module for the Apache Web Server, PHP is a freely available server-side programming language. Clients will be able to communicate immediately with fields in the MySQL database thanks to the PHP module's implementation of the framework and controlled elements of a model/view/controller (MVC) framework (the view is carried out in the user interface). Presenting table data as well as adding, removing, and changing table rows are supported functions. The PHP component will enable direct calls to databases procedures that are stored from the web user as well. The Java Script code for these stored functions will be used.

5. Designing and Developing Web – Based Dss

For Web-based DSS, a decision-oriented assessment strategy is crucial. It is frequently ineffective to just make the current DSS available to management, clients, or other interested parties via a web browser. It ought to be viewed as a "quick fix" as opposed to a long-term method of delivering a decision support capability to create a web-enabled DSS instead than a web-based DSS. The real architecture used is typically straightforward. The majority of web-based DSS are constructed utilizing a three- or four-tier architectural.

The hypertext transfers protocol (HTTP) is used by a user of a web browser to submit an inquiry to a web server. The request is handled by the web server utilizing an application or script. The script could handle a database demand, construct or link to a model, or produce a document. The user's Internet browser receives the findings for display. Any registered user who has a computer with a web browser and an account on the Internet can engage with web apps. The user experience is often displayed in the client's web browser, but the program's code typically sits on a distant server [42]. When we create a system, there are a number of elements that must be taken into account, including interface, performance, and databases. WSS's framework can be compared to a (thin) client/server model. Client on the top layer are users, include decision-makers as well as knowledge seekers. Through the web and Internet, they use browsers to access the system. Web browsers will display the client-side version of the user experience that was created on the server. The lowest levels and parts enclosed by the oval-dotted line resemble traditional automated assistance systems very well. In other words, one could think of a Web-based support system as a support system that uses the web and Internet as its user interface. These act as both the connection layer's and the data layer's middleware for the three-tier client/server framework. On this layer, deduction, conclusion, and agent capabilities are crucial. A secure and uniform system is produced by separating individual user profiles from managing data. These operations are dispersed throughout the Internet to create an online server in order to benefit from Web technology (Figure 8) [43].

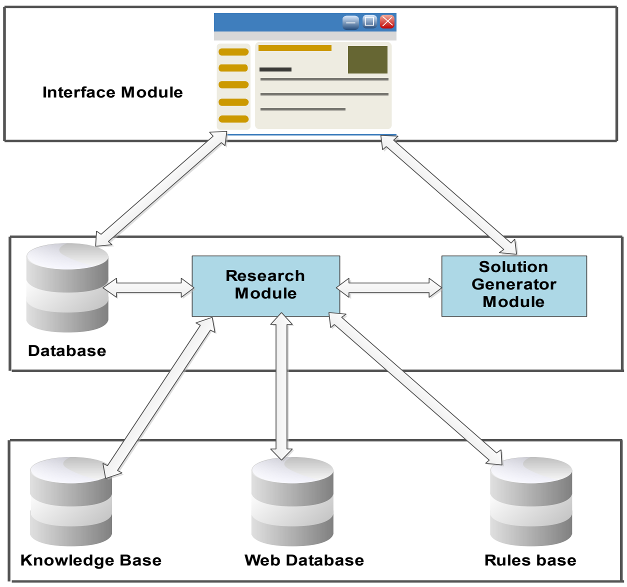

Figure 8. The architecture of web-based support systems

There are three levels that the web support system (WSS) can be categorized into.

Support for one's own interests is the first level. Personalized funding for research is one instance of this kind of assistance. Individual research tasks including searching, finding, reading, and producing content are encouraged. The second degree of support is administrative, such as institutional backing for research. Network level is the highest level. This level includes inter organizational cooperation and collective decision-making, such as those seen in group systems that support decision-making. The group-decision support area could be an online virtual space [44].

6. Discussion

The accuracy of a framework expressed in OWL can be verified with the aid of reasons, for example, to see if a relation is employed with appropriate classes (verifying its scope and limits) or if an object's description is accurate (verifying that the property contains owl: some values from and owl: all values from). The OWL standards can also be used for achieving the inference function. The ideas explained in OWL make it easier to search for and retrieve certain items for usage in web-DSS. As a result, in OWL, clients can also express rules for inference. The model is implemented differently in UML and OWL. Implementing UML class diagrams for multiple applications may result in changes. However, logicians will be used to draw this conclusion. The kind of characteristics and connections that must be permanent in the data model heavily influences the decisions. In this regard, by establishing suitable qualities that differentiate between the three duties of management of processes and decision as shown in Figure 3, they may be arranged as instances of the process. It is possible to think of the main class process (medical administration) as a participant mapping in a framework. Ontology application development systems and semantic web ontology languages have been covered in the study. The UML framework was used to create an ontology construction technique as an informal model for the field's ontology. Additionally, the machine-process able versions of the medical domain ontology in OWL and RDF were created using Protégé, a semantic web platform for ontology building. It is important to note that Protégé offers a few capabilities that are helpful for ontology implementation. That is used with several database administration systems, like as MySQL and Oracle, for RDF storage and query. In addition, the UML API offers tools that could be used to read OWL ontologies created with Protégé and produce an RDF graph, which could make it easier to create practical semantic website applications for creating web-based DSS where Protégé is employed for ontology editing and UML connections are utilized for handling questions.

7. Conclusions

The suggested ontology includes professional consensus-accepted knowledge. Communication across medical management technology platforms is facilitated and improved by using these ideas to suggest an established data interchange format. An intriguing viewpoint will be to convert the UML-based ontology into an official ontology (RDF, OWL) for the purpose to open up novel opportunities, including the ability to develop reasoning, meet semantic web requirements, and combine several database formats. Protégé and its UML keeping backend development plug-in allow for the explicit ontology conversion of UML definitions. The formation of individuals and modeling of inferences are two more specifications that can be incorporated into the ontology. According to the works, modeling ontology should begin with a UML class diagram. Then, using Protégé, this UML description is converted to OWL. The paper evaluates the available literature and notes that present study in healthcare administration is concentrating on knowledge web creation. The study also made note of the fact that existing research does not offer comprehensive instructions for creating web-based DSS utilizing open-source semantic web technologies in the form of medical domain ontologies. In order to make decisions about medical care easier, we want to offer a framework for rule-based argumentation over healthcare management expertise. Graph is used to primarily describe the strategy area of ontology. Using an architecture established on semantic website building systems, Protégé and UML language, the research has created a medical field ontology. The ontology creation framework offers clearly defined procedures, their implementation, and is system autonomous.

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