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An Innovative Intelligent Knowledge-Aware Product Data Dissemination Paradigm Propelled By the Semantic Web

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Abstract: An innovative intelligent knowledge-aware product data dissemination infrastructure has been provided by the semantic web that allows the product should be reused and disseminated across application, community and enterprise boundary. In the light of understood hypothesis on participant's role, intelligence and convenience investigation, the current model has been done. We have first discussed the major achievements in each field of natural languages, metadata, ontology, semantic Web, and then describe this new paradigm with the advances in the Semantic Web and Ontology. We have also developed a prototype to illustrate the use of the proposed diagram.

Keywords: Knowledge Management, Semantic Web, Ontology, Data Consumer, Data Producer, Vendors.

1. INTRODUCTION

Nowadays a business process and product life cycle management is widely used for managing the dissemination and creation of product data in various aspect of the supply chain management system. In a universal disseminated atmosphere for updating, manipulating, analyzing and accessing product information the web has contribute seamless atmosphere. It is required that to make machine – readable disseminated product data. The dissemination of product data in future should be knowledge-aware and intelligent. An Ontology and semantic web give imputes to the maturity of smart knowledge aware dissemination of product data in knowledge management research.

The semantic web has provided a well-known framework that permits the product should be disseminated and reused slantwise in enterprise boundary, community and application. The term of ontology has represented and described the vicinity of product knowledge.

The semantic web and ontology produce the new initiatives that parallel distribute product data with data consumers and product knowledge. These initiatives will produce novel paradigm that product data as well as the obtained product knowledge will be disseminated corporately. The more flexibility and privileges will be granted to consumers of product data to become accustomed software mediators to their functions. In the light of understood hypothesis on participant's role, intelligence and convenience investigation, the current model has been done in this paper. We have explained an innovative knowledge aware paradigm with the help advanced web technology achievements such as ontology and semantic web.

This paper is organized as follows. In section 2 we scrutinize the Semantic Web and Ontology, which constitute the technical foundation of an innovative product data paradigm. We will understand why an innovative way is necessary and feasible. Section 3 introduces the new paradigm and balance made among three participants of product dissemination. Product Knowledge, Search Engine, and Inference Engine in the architecture of Knowledge-aware (Leitao, 2010) Product Data Dissemination Paradigm have been described in section 4. Software prototype system has been described in section 5. Finally conclusions and future work has been given in section 6.

2. Emerging Techniques and Their Challenged

It is common to build product dissemination system upon Web. Tim Berner Lee points out "To date, the World Wide Web has developed most rapidly as a medium of documents for people rather than of information that can be manipulated automatically" (Tim Berneers-Lee, 1999). It continues, "The Semantic Web is an extension of the current web in which information is given well-defined meaning, better enabling computers and people to work in cooperation" (Berneers-Lee, 1998). The feasible implementation principle is that by increasing huge amount of Web pages by adding annotation with data targeted documents on web, we will convert the traditional Web into the Semantic Web. In order to converting traditional web into semantic web machines will be easily find the meaning of semantic data by subsequent hyperlinks to characterization of rules and key terms for reasoning in relation to rationally.

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There are two ways in improving the semantics of the current Web, one of which is to enhance the ability of natural language understanding of software agent and the other is to augment Web pages with metadata.

2.1. Natural Language Understanding

This is an attempt to discover meaningful information by scanning through the text of the document by a computer. In the area of computational linguistics, Natural language understanding has important overlap. The understanding of Natural Language is a subordinate pasture of Artificial Intelligence. The research of Artificial intelligence committed computers to understand the human language written statement. For interaction of human and computer the natural language understanding is extremely charming process. The Natural Language understanding (Weischedel,1986) need widespread knowledge regarding the outside world and capability to manipulate that knowledge therefore it is occasionally referred as AI-complete. The extremely complicated problems in artificial intelligence are known as AI-hard or AI-complete.

The natural language understanding, computer vision and hypothesis and dealing with unpredicted situation for resolving existent world problems are incorporated in AI-complete. It faces major problems such as word boundary detection, word sense disambiguation, syntactic ambiguity, speech acts and plans.

It is ambitious to extract product knowledge just relying on general natural language understanding until now, therefore whose effects could been seen on limited special regular product data applications.

2.2. Metadata

Metadata is data about data, making data meaningful to computer tools and guiding software agents to deal with data. There is only a little modification needed of the current Web architecture. In order to compromise enhancement to the current Web, Metadata can be embedded in the page or managed in metadata server in local or remote computers. When software browses the page, it will be guided how to react to these metadata after the retrieval of relevant metadata.

2.3. Semantic Web

"The first step is putting data on the Web in a form that machines can naturally understand. This creates what I call a Semantic Web – a web of data that can be processed directly or indirectly by machines". Metadata has gives idea that data may be automated shared and reused in enterprise and community boundaries through the common infrastructure which has been provided by semantic web. The most important purpose of semantic is extending existing web, where services and information could be usable and understandable by both human and machines. In order to overcome the ambiguity of web content, increasing number of users, increasing difficulty to present, access and discover trustful content on existing web, semantic web has been developed. To make machines to understand human beings language is not only a goal of semantic web. However the goal of semantic web is how the set of inference rules and universal model of information could be defined as computer can easily process, understand and use related information.

The major benefits of semantic web are enhancing search mechanisms, adding semantic description on concept layer, make web content machine readable and provide excellent communication between software agents. Semantic web is a synergetic struggle persuade by W3C, where the huge number of academicians, industrial partners and researchers have participate.

2.4. Ontology

The major component of semantic web infrastructure, which may be say heart of semantic web, is Ontology. "Ontology is an explicit, formal specification of a shared conceptualization of a domain of interest" (Gruber., 1994.) where formal means computer understandable and shared means acceptable by community or groups. An ontology is used to describing and defining the terms in the area of knowledge representation. According to need of users, knowledge base and various applications are using ontologies to share domain information. The basic machine usable definitions in the domain and their relationship with each other are included in ontologies. The knowledge in a domain is encoded with ontologies. The ontologies with a considerable level of structure are required for the implementation of semantic web. The major kinds of concepts which are described in ontologies are Classes (Common things), Attributes (properties) and their relationships. The high level of accuracy, sound, consistent, and meaningful characteristic are available in the classes, attributes and relations. There are so many tools by using ontologies performing automated reasoning tasks. Ontology based tools support smart applications such as knowledge management system (KMS), decision support system (DSS), customer relationship management system (CRM), electronic commerce and advanced services

3. Paradigm To Bring All Participants And Techniques Together

The Semantic Web and Ontology would act as the promising technical propelling engines in making

transmit from data-centric dissemination to knowledge-aware. Paradigm shift deals with how participants of product data dissemination system, data consumers, third-party software vendors and, data producers, respectively operate machineries in pragmatic and an efficient way. Product data and knowledge (Wang, 2006b) are complicated and shared among different stage of product life cycle. The full utilization of product data depends on precise knowledge about product such as product models. Nowadays, manufactures set up different product data management systems which are responsible for bill of materials and product documents. Much product knowledge is implicit ideas in the minds of engineers. An innovative idea is to make this implicit knowledge explicit and available with the data they produced. The key participants of this novel paradigm are third-party software vendors, data consumers and Data producers,. Whose comprehensive picture will be personified in these questions. What is a function of will data consumers?" "What is a function of data producers?", and "What a function of third-party software vendors?"

3.1. Data producers

The manufacturers of product data are may be a software engineers, system designers, manufactures or , organizations. Product data survives in product data management system or technical documents . Product information management or Product data management systems are the responsible of maintaining information about product information. Product Data Management tools also support very important functionality in engineering change control, configuration management and especially in process management. The major advantages of PDM systems are in time-to-market, improved productivity and improved control. In time-to-market area data is immediately available for all along with contact. Therefore searching time for search product is very much reduced. PDM'S (Xiong Lihua, 2009, and Sung and. Park, 2007) Features are tightly integrated with other product development tools therefore the capability of speed and process has been improved. Mostly engineers are wasting their almost 30% time for retrieving, filling, handling and storing information. However because of structure capabilities and classification PDM system has reduced wasting time in order to improve the speed of productivity. The access control features of the PDM System assure that empowered parties would be able to change or access on proprietary information.

3.2. Data consumers

The aim of semantic technology is shut the division between what computers understand and what humans understand. In fact search engine can smartly understand and categories the websites content physically. Semantic tags are added on the business and product data on content of web sites with the Resource Description Framework (RDF) (Fikes and McGuinness). Semantic Search Engine (Agichtein, *et al.,* 2001) Optimization add tags on product data by using different ontologies and describe data in machine readable form as easily data consumers access that information. GoodRelations (Hepp, 2008) is a formal ontologies which combines web ontology with rules, semantic logic and reasoners (Klinov 2008) to generate procedure for adding semantic tags on product data. Ontologies mapping (Célia *et al.,* 2008) is a question when product data would be surely appear from various ontologies. Without considering the semantic mappings between ontologies information processing across the ontologies is impossible. However finding mapping at large scale manually is not only boring and capable of making an error-prone but impossible. Therefore designing ontology mapping tools are very important for the accomplishment of the semantic web.

3.3. Data Producers

The infrastructure of intelligent knowledge aware product data dissemination (Chiara and Moruzzi 2008) established jointly by the third party software vendors, consumers and producers. At the same time vendors have provide search engines, inference engine (Toramatsu, 1998) the parser of semantic web languages and vendors general ontology engineering tools **(Fig.1)..** These tools elegantly maintaining the middleware, browsers, Web server, database, and network protocol stack. The product knowledge based applications are diverse and so flexible that such tools can be customized and easily integrated with each other.

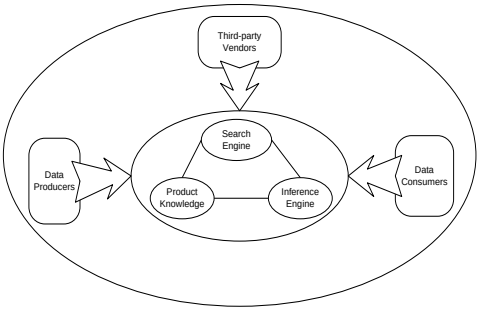

Fig. 1 Architecture of Knowledge-aware Product Data Dissemination Paradigm

4. Architecture of Knowledge-Aware Product Data Dissemination Paradigm

Our novel paradigm is mainly concerns that how to balance the circulation of techniques and functions involving various participants. In our paradigm data producers, data consumers and third party vendors have same privileges. However third-party vendors have more knowledge characteristics than other participants. The following picture gives an entire architecture of our paradigm with a lot of technical

details left aside. The Inference engine Search engine, and Product knowledge, are the center of attention of knowledge-aware product dissemination model.

The ignored technical details include the widespread employed Web database management system, network and Internet, Java and other infrastructure. We don't point out the Semantic Web and Ontology on which product knowledge representation must depend on but their functions can be discerned in the above section. The simple review of three key parts is necessary.

4.1. Product Knowledge

In our novel model the target and source of product data dissemination is product knowledge base. At the present time availability of product knowledge base is in electronic documents, data warehouse, data mart and database. In our novel model product knowledge base paradigm product data will be represented in ontolgies. However for the reason that the need of international standards at the changing stages ontolgies would be penetratingly typical from various manufactures. Therefore we do not consider with the aim of it is a complication. According to the thinking of participant's ontologies is more significant than one standard So differences among ontologies could be tackled with various mapping of ontologies. For ontology mapping we have need constructing the knowledge base. In our paradigm semantic of product name has been analyzed and mapped to the ontology accordingly. Finally the search engine with the help of keywords have get huge valuable semantic description knowledge from coincide product ontology and gracefully support excellence and accurate search results and refine the consumer's search satisfaction.

4.2. Search Engine

The search engine consist many technology like network technology, language processing technology, multimedia technology, artificial intelligence technology etc. The modern search engine technologies are emerged and totally new search engines are available. The recognized accepted search engines are Google, bing, yahoo, AltaVista, cuil. etc are excellent in common search engine. For the Internet development these search engine have build valuable contribution. There is a one new model of search engine called Vertical search engine (Zhang, 2006) The vertical search engine is leading search engine because huge amount of information content search in low time then other ordinary search engines.

The vertical search engine bestowed proficient and beneficial service and information for a peculiar territory like a particular demand or a particular number of peoples. The main purpose of Vertical search engines is target specific area where business peoples are interested and enable companies to target every focused audience.

4.3. Inference Engine

A computer program that retrieves information from a knowledge base with predefined rules is called inference engine. In the field of knowledge representation and using that knowledge solving the specific problems expert systems are very famous. The expert system's essential elements are inference engine, user interface, and knowledge base. Inference engine works as an intermediary between user and product knowledge base. Product knowledge base exists in the form of procedural representation, production rules and semantic nets of the domain of knowledge system. For deduce the conclusion inference engine adopt two method, Forward chaining and backward chaining. Top down procedure precede data and make effort to draw conclusions with the help of rules is known as forward chaining method. In the reverse of forward chaining procedure is called backward chaining method. Backward chaining methods is from bottom to top, it starts with quires and actions and satisfy the condition which are given in rules. In **(Fig. 2)** these conditions and rules are described in Task and Domain ontology. The concepts entertaining for particular domain described

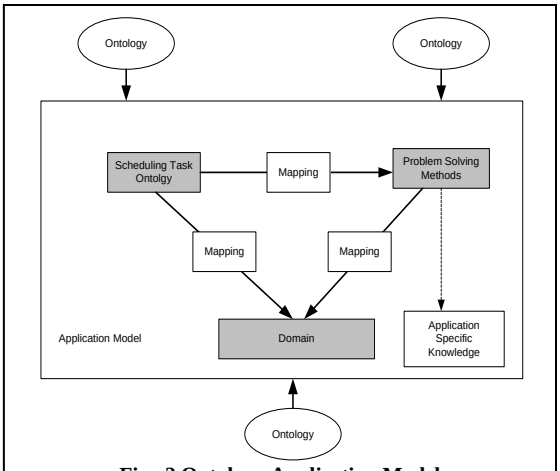

Fig.. 2 Ontology Application Model

in Domain Ontology. All kind of tasks in order to happen inside that domain use these concepts. In some specific domain performing the specific task reasoning concepts and their relationship has been described in task ontology. The domain of factual knowledge is linked with reasoning process by task ontology. Domain factual knowledge, problem solving knowledge, domain data, problem solving is included in the problem solver first level ontology **(Fig. 3)**.

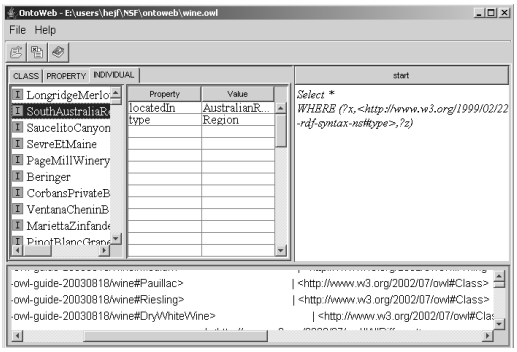

Fig. 3 A Prototype system Onto Web

5. RESULTS AND DISCUSSION

Prototype System

OntoWeb is prototype system designed to put into practice our inventive dreams that product knowledge should be disseminated in parallel with product data and data consumer. Where, data consumers and data producers have given equal privilege to access product knowledge. These thoughts become strong point of our innovative knowledge aware product data dissemination model. Updated specification of semantic web and significant achievements in ontology research the OntoWeb prototype has been designed is an integrated environment With the support of open source Jena, ontology web language OWL and specification of W3C OntoWeb has been implemented. One purpose of designing OWL is supporting the methodology of processing and reading content of web information by machines instead of human beings.The Owl Language has been categorized in to three sentence structure groups. These groups are called and OWL full, OWL Dl, OWL Lite. Some construction which are available in OWL Full are not allowed in OWL DL. In OWL Lite have all constructions of OWL DL and in addition some extra constructions. To construct the assignment of reasoning with the expressions is the main function of OWL Full and Owl Dl. Description logic reasoned is processed more effectively and efficiently by OWL DL.

In fact extended edition of Jena's Model is called Ontology model. The Ontology model permits to right way collection of RDF data. Ontology Model expands ontology by adding more classes, Attributes and Individuals. In the ontology language so many properties are defined for mapping the access methods. The complete information will be retrieved from original statements of RDF when List Super Class () procedure is called from OntClass. In OntoModel by addition of on OntClass states supplementary statement of RDF. The base graph detained these asserted RDF statements and shows a simple graphical interface. By using the base graph and with the support of rules of semantic language Inference engine or reasoner show extra comprehensive set of RDF statements.

We can easily create and edit ontology in OntoWeb prototype, where individual entity, property, class and their relations can be modified, stored and created in determined storage for instance database, remote web server and local file together with search engine and inference engine. The OntoWeb prototype can serve as a knowledge management system tool to browse and disseminate product knowledge and product data in ontology. The inference engine adapt the Jena reasoner facility, the inference engine based on general rule and configure collectively with the set of RDF statements and subset of OWL Full. The data being reasoned over inference model, A domain Ontology,task Ontology and problem solver based on will obtain position of the inference engine in the future.

6. CONCLUSION AND FUTURE WORK

An Innovative knowledge product data dissemination model pragmatic and feasible is designed with the help advanced web technology of semantic web and ontology. This model originated from thought that three participants such as data consumer, data producer and third party vendor should have equal privileges for access and dissemination of product knowledge. Due to ontology safe mechanism is available therefore there is less risk of threats. From the evidence on the conventional web and weakness of the rule based Artificial Intelligence system the semantic web and ontology has take place. On the basis of our thoughts we have implement and introduce a new simple jena based prototype. In this prototype have still some weaknesses such as problem solving methods based on domain ontology and task ontology. We are working on a fundamental query language, which doesn't fit query expression of problematical knowledge base. In future we try to get better functions of our model and extending our performance to support transform legacy product data to ontology instance, improve Ontology Engineering, how get better problem solving capability.

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