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Survey Based on Standards Provided for Database Design for Real World E-commerce Systems

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Abstract—This paper discusses about the structuring and components of the databases for real world E-commerce systems. The purpose of this paper is to study the database models to utilize them efficiently in E-commerce websites. As we know, most the data is still stored in relational database we present an approach to map the stored relational database data into semantic web using RDF query language. To achieve this goal we study XML structures for relational databases of old E-commerce websites and look to map the collected XML data to RDF. Importance is that large amount of relational data is getting converted to XML and RDF in modern systems that would advantage the E-commerce websites. Denormalization algorithms are used for addressing performance and scalability in relational database software. Understanding the structures of e-commerce database systems will help the database engineers effectively develop and maintain e-commerce systems.

Keywords—Database, XML, RDF, E-commerce, Denormalization

I. INTRODUCTION

Data is not stored onto a single computer, because current is the era of information technology and social media, that user provided data can be stored in many computers on the internet, is difficult for them to access quickly and easily. The data is to be in the format as RDF/XML, N-Triples and OWL or with the same specifications [1].
[2]Research in the field of data mining in semantic web analysis and data applied to various algorithms of data mining, such as data classification, association rule mining etc. From the above it can be seen that the present data are not stored in a single computer always. This research is proposed for methods to mine the data in E-commerce systems and improve the efficiency and scalability in relation database systems.

II. SEMANTIC WEB

Semantic web has being developed since the storage word is only understandable to human only but the machine cannot understand it because data is without structure and is stored. Semantic web has been developed to provide useful data on the Internet that can be analyzed and applied to various tasks and thereby improve the overall performance from the user perspective. The language used for defining the data structure is RDF [3]. The semantic web is an abstract representation of the data on World Wide Web, based on the RDF standards and other standards to be defined. [4] (Resource Description Framework) which is written in the form of sentences consists of the subject, predicate and objects show in Fig. 1.

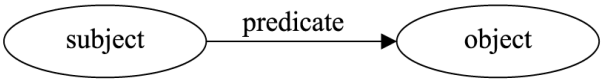

Fig. 1 RDF Triples

The standardization for semantic web in the context of web 3.0 shows in Fig. 2.

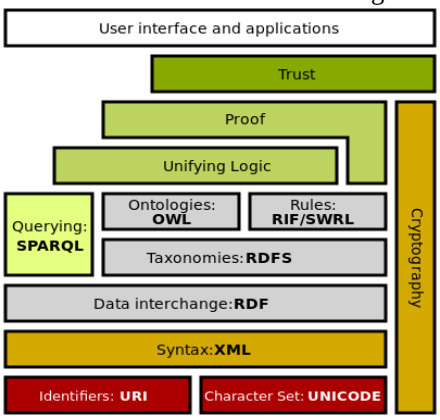

Fig. 2 Standard of semantic web in the context of web 3.0

III. E-COMMERCE CHAIN & DATA REQUIREMENTS

An E-commerce website data value chain represents a set of sequenced business processes that show interactions between online users and backend E-commerce systems. A value chain helps us understand the business processes of E-commerce systems and helps in identifying the relational data requirements for building operational database systems. Treese and Stewart [5] show a four-step value chain methodology that contains of Attract, Interact, Act and React. Attract gets and keeps customer interested in the product to be sold on the E-commerce website. Interactions eventually turns generated interest into placing orders. Act manages the placed orders whereas React services customers that the placed order is delivered to end customer properly within the allotted period of time. The four-step chain model could be considered as a prototype model for a working E-commerce system. We present a more detailed value chain model that contains of eight processes.

Value chain integrates steps such as personalization of the user input, which is usually performed by a separate add-on. Fig. 3 shows the integrated e-commerce value chain with the 8 business processes, their goals and data requirements.

Each phase of the value chain model is considered to be a business procedure and each of the models has its own significance which involves complexity. Each of the business models includes an interaction between E-commerce system and end users for attaining specific goals. Individual business model will have different requirements according to the needs of the E-commerce system.

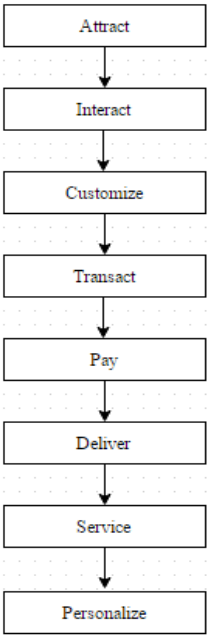

Fig. 3 An e-commerce value chain with 8 business processes

IV. HIGH-LEVEL LOGICAL COMPONENTS

A database schema model which contains all user data for a real-world E-commerce system is significantly complicated. Figure 2 shows a diagram that shows components of an E-commerce database system [6]. A package in UML is to construct those groups that are interrelated in the modeling elements. In Fig 4, each package contains one or more related tables.

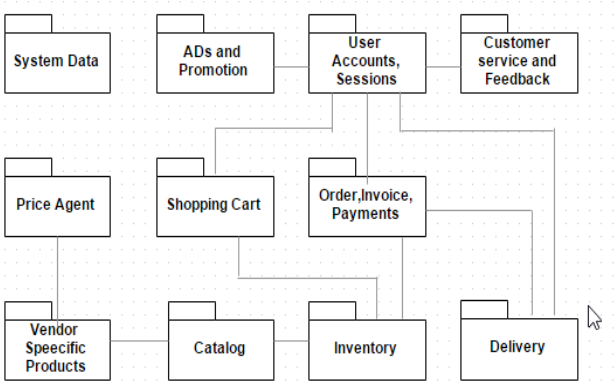

Fig. 4 A Package diagram with logical components of e-commerce systems

V. ERM TO RDF

Below figure shows how an ERM model is transformed into a RDF model. Two resources, one for a customer instance and another for a product instance is required for the description of the below mentioned model. Relationship between customer and its related product is shown through the customer instance. An RDF model is about linking the different instances, whereas an ERM system is about linking entities and its relationships.

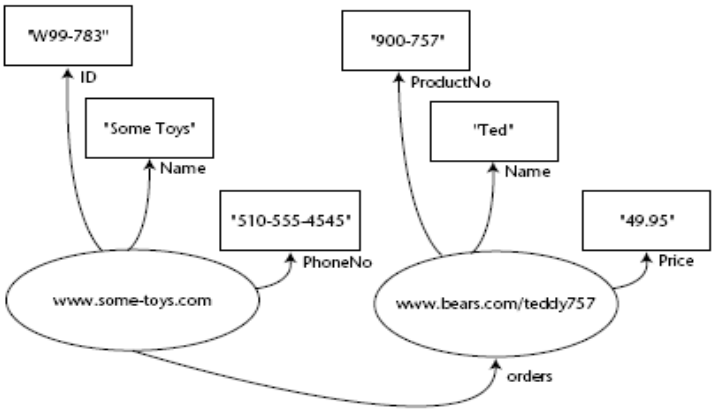

Fig. 5 Convert ERM to RDF

Following code snippet shows RDF serialization of an Entity Relation as in Figure 5. [7]

```
<rdf:RDF>
<rdf:Description about=”http://www.some-toys.com”>
<sales:ID> W99-783 </sales:ID>
<sales:Name> Some Toys </sales:Name>
<sales:PhoneNo> 510-555-4545</sales:PhoneNo>
<sales:orders
rdf:resource=”http://www.bears.com/teddy757”/>
</rdf:Description>
<rdf:Description about=”http://www.bears.com/teddy757”>
<bears:ProductNo> 900-757 </bears:ID>
<bears:Name> Ted </bears:Name>
<bears:Price> 49.95 </bears:Price>
</rdf:Description>
</rdf:RDF>
```

VI. DENORMALIZATION

Database Denormalization is a well-known way of achieving performance improvements. Denormalization is the process to optimize the performance of a database by structuring data from an unstructured data or by grouping data. In some cases, Denormalization can actually increase the performance or scalability in relational database software.

In the suggested system, the database administrator can define the Entity Relationship Model of the schema, and use the queries that are built and mapped using Process Action Diagram language. Then the administrator can select the tables to join, and the system can automatically transforms the queries to match the new schema model. The system keeps a record of the mappings between the denormalized fields and the base fields from which they are derived and if the base fields were to be selected or updated, the new fields are returned or modified. The described system hides the denormalization process from the database users by converting the internal queries into structured or grouping. In our work, we need a similar method which can denormalize the database schema and rebuild the queries for a new schema. [8]

VII. PRIVACY AND SECURITY

Security is a challenge for the E-commerce websites. The success or failure of an E-commerce website depends on various factors, including the business model, team, customers, site admins, products, and security of the data that is being communicated from the client to the server. [9]

VIII. ISSUE IN PREVIOUS APPROACH

E-commerce tools increase the speed of the development process, but still lack certain features such as pending orders, return orders, and email notification to users. Therefore, understanding the structure of e-commerce database systems will help the database designers to create, develop and maintain the E- commerce system, regardless of the approach taken.

Organizations have to use different tools to structure the relational data in the E-commerce websites which is time consuming and does not satisfy all the requirements. Handling metadata and capturing data for customization and personalization such as navigation data within the context.

The following security challenges are faced during the previous approach:

- Internet was initially designed without focusing on the security aspect.
- Proper remediations are not taken by many lead companies to protect system from external attacks which could affect the entire system.
- Security precautions are expensive {firewalls, secure web servers, encryption mechanisms}.
- Security is difficult to achieve.

IX. METHODOLOGY

IX. – A. OLD APPROACH

Step 1 – Define the entity relationship model
Step 2 – Express the queries using process action diagram language
Step 3 – Administrator can select the schema & system transforms the queries to match schema
Step 4 – Mappings between the denormalized fields & the base fields by which base fields from which they are derived, new fields are returned or modified.

IX. – B. NEW APPROACH

Step 1 – Study of different structures used for database in E-commerce system.
Step 2 – Using metadata, head tags from <h1> to <h6> tags and differentiate entities and their relationships.
Step 3 – Mapping raw and unstructured data from relational database to RDF/XML formats in a structured manner.
Step 4 – Applying standard process by denormalization of data using denormalization algorithm.
Step 5 – Using resulting data we can suggest the general formats of database for E-commerce system with privacy and security.

X. CONCLUSIONS

This research aims to study about standard format of database design for E-commerce systems using RDF/XML format. We have introduced an algorithm that can automatically denormalize the initial data structure and also translate the predefined queries along with the schemas which improves the performance and scalability of the E-commerce system.
From the database designing, an interesting research issue is what database structures are needed to support customization and personalization most effectively. [10]
A lot of work is being done in studying different methods of database designs for E-commerce systems but not being much done providing standard format. This paper gives an idea of standard format of database design for real world E-commerce system.

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