AN ARCHITECTURAL MODEL OF INTEGRATED INFORMATION TECHNOLOGY AND PRODUCT DATA MANAGEMENT

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***Abstract**: Traditional product data management (PDM) applications rarely makes full use of information technology (IT) to enhance the performance and service of the systems. This paper presents a simple model of combined IT and PDM to only bridge the technology gap, but also compliment each other in terms of their performance.*

1. BACKGROUND AND MOTIVATION

The advent of world wide web (WWW) has brought about the proliferation of wide-area electronic information systems. E-commerce is the predominant example of such exploitation. Numerous innovations of information technology (IT) help propel the applications of inter-connecting previously isolated information vaults, forming an elaborated on-line network of distributed information world. These on-line archives now become boundless sources of information exchange. Various software tools have been devised to facilitate user access and retrieval, generating myriad of transactions that have become the culprit of network overloading. As such, many corporations resort to alternative means of connectivity to link up their network for virtually congestion free service. Typical ones are Intranet and Extranet. In so doing, the domain of electronic information systems has shifted toward virtual integration of disperse resources within the organization.

This paper presents an integrated product information system which has been heralded as a key technology to the next millennium. The organization of this paper is as follows: Section 2 discusses the essence of electronic information systems architecture. Section 3 introduces a new paradigm of product development and its life cycle. Some fundamentals of product data management (PDM) are given in Section 4 to establish a new paradigm of information exchange. Section 5 furnishes a case application that makes use of virtual integration PDM. Some concluding remarks are elucidated in Section 6.

2. ELECTRONIC INFORMATION SYSTEMS

The introduction of computer has brought about fast and efficient information exchange. Documents are created and transmitted instantly from one location to another. The term *office automation* was coined and quickly became a thing of the past. Unfortunately, most corporations lack proper administration of their existing computer facilities. Thus, all electronically created documents form islands of information that virtually useless in terms of information assimilation. Many corporation resort to Intranet or Extranet as a means for their business communications. This further complicates the situation due to the proximity and distribution of the information sources. There are many applications involved in keeping the disperse information repositories synchronized at all times, for instance, data mining [3], security [2], resource replication, executive/enterprise information systems, etc.

The burden associated with information systems (IT) impacts the cost and operational efficiency every modern company. Some companies start implementing a new architectural IT model known as *virtual corporation*. Organizations focus on their primary goals and outsource other responsibilities to their affiliates or external suppliers, forming an interconnecting information

network. This enables companies to exploit their expertise and diversify the business locally and internationally, hence *globalization*.

Basic virtual information system architecture takes the forms of distributed or shared configuration. The former connects heterogeneous data repositories into federated information exchange, whereas the latter allocates a common work area for sharing information among homogeneous data repositories. The strength of such architectures is provision for flexible expansion or consolidation, interoperability, and integration of physically dispersed facilities and affiliations.

3. PRODUCT DEVELOPMENT LIFECYCLE

Conventional product lifecycle employs a serialized stepwise refinement process to develop new products. The cycle usually begins with conceptual design, engineering design, engineering analysis, prototyping, cost estimation, production design, manufacturing, marketing, and distribution. This span is too long a process to undertake and often results in product obsolescence prior to market introduction. An alternative to shorten this lifecycle is Concurrent Engineering, whereby many sub-activities of the first six steps are stacked as information becomes available for subsequent steps. In so doing, the product lifecycle is reduced considerably.

This lifecycle reduction accomplishment did not come without a cost. As life span becomes shorter, the need for timely available pieces of information becomes more crucial. Enterprise-wide resource planning is essential for product evolution. Prototyping quickly becomes too time-consuming and expensive to operate under such a fast pace information world. New products for configuration management, various standards, and product realization call for an information integrator that combines all the pieces of scattered product model into virtual development environment. It is, therefore, inevitable to customize the aforementioned information models so as to establish an information scheme suitable for new product development paradigms. One such paradigm is an integrated virtual PDM environment.

4. FUNDAMENTALS OF PRODUCT DATA MANAGEMENT (PDM)

Product Data Management (PDM) has been introduced since the early 1980's to merely provide tool support for product drawing and other detailed product data necessary for manufacturing (also known as Bill of Material or BOM). From the operation standpoint, PDM is an integrated engineering database management systems serving all parties involved in product fabrication. In today's world, PDM has becomes many organizations strategic mainstay of business operations. Departmental operations are interoperated by means of shared or federated hooked up, depending upon the underlying information model. In essence, they operate on client/server architectural set up. One of the major drawbacks of such setting are unevenly distributed workload imposed on the server. The proposed model makes use of the new three-tier paradigm [4] by separating the vital database portion on DB Server tier, leaving application and libraries flexibly modifiable on the Application Server tier and no middleware [1] involved. The schematic architectural model is shown in Figure 1.

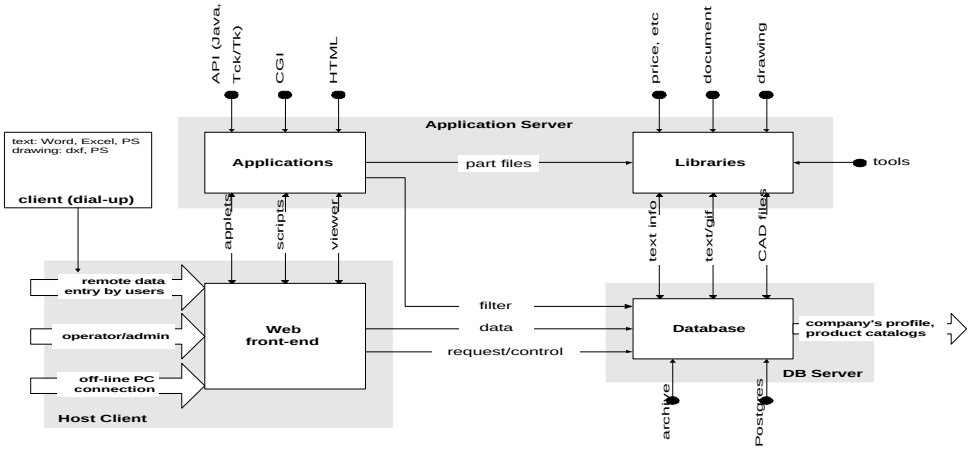

FIGURE 1: FUNCTIONAL DIAGRAM OF PDM SYSTEMS

Based on the above functional specifications, host client exchanges initial information with application module such as authentication, application maps, and library support. Once the desired information is identified, the host client will transmit data from the DB server directly. This set up not only minimizes DB server's workload considerably, but also permits flexible component customization and replacement in Application server.

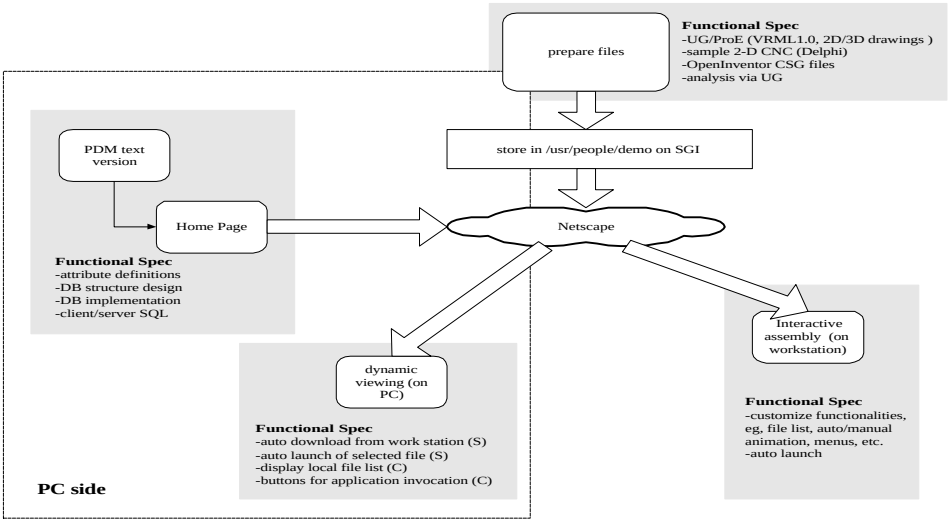

FIGURE 2: WORKSTATION FUNCTIONALITY OF ENGINEERING BROWSER

Figure 2 depicts an engineering aspect of engineering design and engineering analysis steps of product development lifecycle under virtual information environment. Data are prepared prior to user access and retrieval.

5. APPLICATION OF PDM

In order to fully realize the potential of PDM application, a whole product approach to E-commerce is presented in Figure 3. A networking model of PDM systems furnishes off/online customer contacts, as well as domestic and international E-commerce information. The systems provides a number of value added functionality conducive toward strategic business values such as customized design, up-to-date product information and documentation, online services, etc. This application model allows all the data originally generated at local sites to be published instantly (the so-called "*create once, use many times*" philosophy). The data can continue to reside or decommission at the company's discretion.

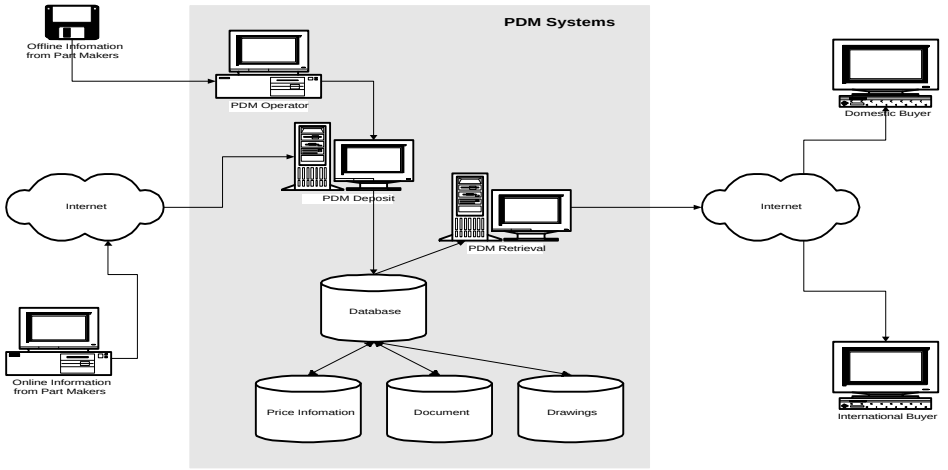

FIGURE 3: NETWORKING MODEL OF PDM SYSTEMS

Note that the model does not include any security concerns [2] since the issues are not the main theme of this paper.

Figure 4 illustrates essential software components of the systems implemented as a prototype of small-scale PDM systems. The systems employ Common Gateway Interface (CGI) solely for maximal flexibility and customization. Input data are collected and stored in central repository for subsequent online retrieval.

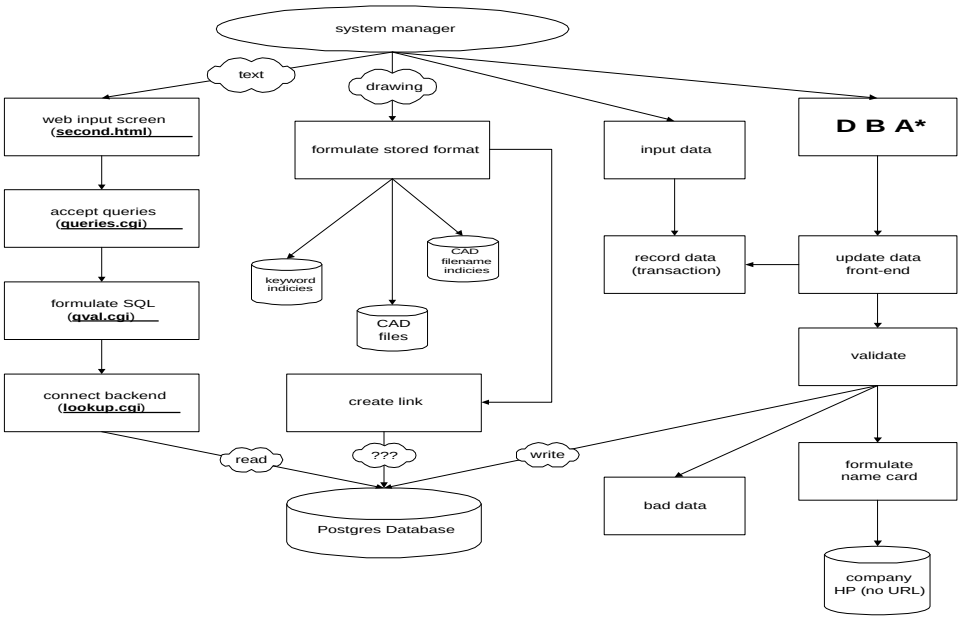

FIGURE 4: MODULE INTERCONNECTION OF PDM SYSTEMS

6. CONCLUSION

Traditional PDM applications serves as an island of information which, in most cases, inaccessible to those who need it. Despite numerous innovations in IT, there is virtually no IT vehicle to bridge this information island so as to exploit the potential of PDM applications. System implementors should focus on how to integrate dispersed enterprise resources to fully realize their potential. The amalgamation of academic view and business strategy will perhaps offer a solution to optimal use of PDM/IT.

7. REFERENCES

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