CONTRIBUTION OF E-HUB FOR INITIATIVES ON E-BUSINESS

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Abstract: *In the current and past, E-HUBs have been successful, also in the type of public market or as private trade policies within endeavors. E-HUBs contain be used in a extensive variety of industry sectors they are Shipping and Trucking, Warehousing, Perishable Goods, Chemicals, Travel, Entertainment, Real Estate, Insurance Services, Manufacturing, Financial Services, and Media. E-HUBs have obviously established their power as a synchronized, worldwide allotment market by dissolving the restrictions of time and characteristics and made it feasible for consumers, B2B and B2C to become more fully affianced. E-HUBs create value by aggregating buyers and sellers, creating marketplace liquidity, and reducing transaction costs and time. E-HUBs are changing traditional business transactions and the relationships between enterprises by integrating the supply and demand of an enterprise with its customers, suppliers and partners, and automating business transactions and information sharing. They create unprecedented levels of market transparency and lower the cost of transactions. This article describes the functions of e-business with the association of E-HUB with various technologies, services and problems, challenges.*

Keywords: *E-HUB, E-Business, Classification, Services and Problems, and Potential Challenges on E-HUB*

1. INTRODUCTION

Industry users are able to liquidate their service products, establish exchange networks, and build collaborations through E-HUBs. Companies use E-HUBs to synchronize operations with their demand and supply chains to change product lifecycle. By bringing a large number of suppliers and customers together and facilitating transaction and collaboration between these players, E-HUBs are able to:

- Configure a multi-channel sell-side solution. It enables a company to market and sell more inventories to existing customers and to establish new customer relationships by connecting to e-marketplaces and portals. E-HUBs allow companies to control and manage all of its sales channels from a single interface.

- Reduce costs significantly due to the enhanced contract pricing leverages during supplier negotiations, transactions, and product development such

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as reducing paperwork, travelling costs, and inventory costs, allowing multiple sales, and integrating and consolidating payment.

- Increase market transparency as customers and suppliers can track and monitor the whole transaction process, profile their purchases and customers and administration of contracts and authorizations.
- Facilitate the supply chains among enterprises to speed time-to market through collaboration with suppliers and customers. Steps required for design, execution, prototyping, and changes become workflows in which information is shared seamlessly with partners to create the right design in a shorter period with a quicker ramp to high-volume manufacturing.
- Coordinate logistics and capital management with the business and production process.

1.1. E-hub Functions and Services

E-HUBs have been continuously being studied over the past two decades. The understandings to E-HUBs have also been changing with the quickly expanded E-HUB contents, architectures, functions and services, development techniques, and application environments. The result is that the definitions of E-HUBs vary significantly due to different services E-HUBs provide and people's views of E-HUBs. Therefore, under the same umbrella, E-HUBs can be quite different things to different researchers, from a simple B2C (Business-to-Consumer) e-marketplace to a comprehensive virtual enterprise facilitator.

E- Hub examples

- Cyber Business Centre defines an E-HUB as an alternative name for an e-marketplace, and in particular for any sub-category thereof such as a forward aggregator or a reverse aggregator. E-Marketplace is a Business to Business (B2B) online trading forum, often dedicated to e-business between companies and their customers and suppliers in a particular industry or sector thereof.
- An ID (URL4) describes an E-HUB as a telephone company which passes information from one place to another. The company providing services is invisible to the dealers. E-HUBs can handle the transfer event in either XML- or EDI-based information. Since an E-HUB is an utility in nature, it actually adds nothing to the transaction. As the programs are written to convert data from one place to the next, its work is simply to pass on data.
- Kaplan and Sawhney (1999) define E-HUBs as neutral Internet-based intermediaries that focus on specific industry verticals or specific business processes, host electronic marketplaces, and use various market making mechanisms to mediate any-to-any transactions among businesses. They

create value by aggregating buyers and sellers, creating marketplace liquidity, and reducing transaction costs.

- Mejia and Molina (2001) specify an E-HUB as a business entity, which is responsible for searching opportunities in the global environment and enables the creation of virtual enterprises. The Hub performs the processes of partner search and selection, and configures suitable infrastructures for virtual enterprise formation/commitment (physical, legal, social/cultural, information). To achieve its goals the Hub uses the services provided by virtual industry clusters.

These definitions indicate the different levels of E-HUBs' services. Nevertheless, it can be seen that the core of E-HUBs is that they are Internet-enabled entities which allow users to exchange information for the purpose of value adding.

2. E-HUB WEB SERVICES

Either as pure e-marketplaces or complex business entities, E-HUBs achieve their services through Web Services, which represent a revolution with layered services; it enables a dynamic e-business model, fosters collaboration with layered services, and opens the door to new business opportunities.

2.1. Web Services

Web Services are configured with new technologies such as SOAP (Simple Object Access Protocol), WSDL (Servers, and the Web Services Description Language), WSIL (Web Service Inspection Language), and UDDI (Universal Description, Discovery, Integration). These technologies consist of a model for exchanging XML information, a language for describing services and workflow between business partners, and a directory for finding new business partners, respectively. Together, they enable Web Services for various E-HUBs. The innovative use of Web Services provides industries with an effective approach to reconfiguring the key business and engineering processes to achieve breakthrough improvements in business opportunities, cost, time, quality, and customer satisfaction. Essentially, they strengthen the ability to communicate, track information and therefore allow different collaborating partners to work on a common set of issues.

2.2. Other Services Offered By E-hub

The services provided by E-HUBs have considerably expanded over the past years. Early efforts focused on enabling users to buy and sell by converting catalogues to HTML and putting up a simple transaction interface. The next level of E-HUBs evolution via XML creates rich environments for execution and coordination of complex business transactions and interactions. A further

Table 1
Web Services Pattern

Web Services	Tools	Supported Services
General web communications	• Internet, Intranet, Extranet. • Email. • Video conferencing	Collaboration
Web information exchange	• Design examination • Visualizing • Audience • Protected	Information management
Easy way to organize web	• Workflow modeling • Collaborative portals • Online language translation • Expertise sharing • Group decision-making • Logistics support	Synchronization
Easy way to access Legal solutions through web	• Authentication • Contract negotiation	Serviceable

development is the adoption of E-HUBs to facilitate the activities in the entire value chain with focus on value added services. Morgan Stanley (2000) summarizes E-HUBs' services as five layers: order matching, one to one marketing, content aggregation, transaction fulfillment, and demand and supply chain collaboration (Figure 1). Below three major services:

   ➢   E-buying and selling,

   ➢   E-transaction fulfillment and
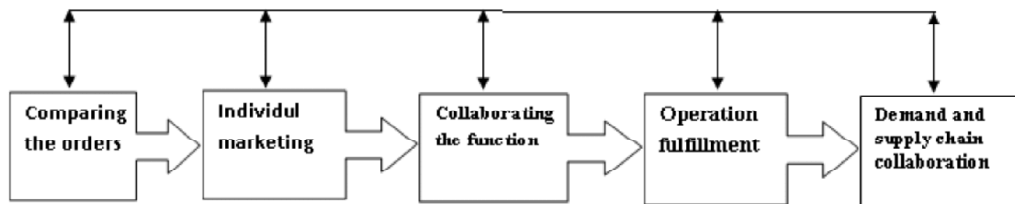
   ➢   E-collaboration is discussed.

Figure 1: Service Layers of E-HUB

2.3. E-Buying and Selling

Traditional E-HUBs such as FreeMarkets.com, e-Bid.co.uk, and eBay.com mainly aim to expand users' business opportunities through matching and aggregating approaches. Some may also facilitate simple business transaction processes such as the declaration of payment approach and delivery method. These

functions, although with limited added value, are still essential for the most comprehensive E-HUBs today. Many of such E-HUBs have expanded their service objects from product to services (e.g. medical or legal advice). Typical of such E-HUB services are:

- Firstly, an E-HUB establishes a relationship between buyer and seller where no relationship existed before.
- Secondly, the E-HUB can provide a mechanism, often via online auctions, by which efficient transactions may be conducted.
- Thirdly, the E-HUB can be an information source, providing useful information about both the products traded and the trades themselves.
- Finally, some E-HUBs may support decision-making by helping participating enterprises identify potential matches and decide if a potential match should be pursued.

2.4. E-Transaction Fulfillment

With the development of E-HUBs, the customers of E-HUBs are changing from individual (small amount Web shopping, typically B2C) to enterprises (large and complex industrial procurement, typically B2B). The users' requirements have changed considerably and the E-HUBs' services thus have significantly expended. At present, most E-HUBs have moved beyond order matching to supporting the entire transaction fulfillment process. E Hubs such as Coprocure.com (URL20), GCC (URL11), and PI E-HUB (URL12) can provide comprehensive services to support the overall business transaction process such as identification, evolution, negotiation, and configuration of optimal grouping of trading partners and business processes into a supply chain network so that users can respond to changing market demands with greater efficiency.

2.5. E-Collaboration

In most of the B2B marketplaces, relationships are not just about order matching and aggregation, collaboration is particularly important for industrial problems. Industries are pooling significant resources to form E-HUB consortia, where a company can concentrate on its link in the demand and supply chains while taking advantage of recombinant business models. Highly skilled and specialized companies collaborate in both synchronized and a synchronized basis as more services can be outsourced within the consortium. E-HUBs unite businesses and help the traditional point-to-point connections to evolve towards spoke collaborating relationships. This improves key processes in the product life cycle such as: improving resource scheduling and allocation; facilitating collaborative product design, creating more efficient inter-enterprise processes; integrating product data within and across enterprise borders and keeping information up-

to-date in real time; improving product quality control; and reducing risk throughout the supply chain.

2.6. Engineering E-hub

This section presents an engineering E-HUB which has been particularly developed for engineering service outsourcing. The engineering E-HUBs are envisaged to provide an Internet-enabled interface for enterprise wide product development processes and remote Engineering Service Providers (ESPs). Unlike those E-HUBs collaborating virtual enterprises where E-HUBs play a project manager's role, the engineering E-HUB works much like a mediator which mainly focuses on the activities at strategic and tactical levels rather than at operational level. ESPs undertake the real engineering activities whilst E-HUB facilitates collaboration at different levels and stages.

3. E-HUB'S FUNCTIONAL ARCHITECTURE

The development of the E-HUB is backed by multi-level knowledge and technologies such as collaboration platforms offering shared project workspaces for team building, group communication, project management methods, portal 'store front' functionality for marketing, contract management, process representation, sharing and execution, knowledge capturing and sharing. These technologies, supported by available engineering Web Services, form the basis of the E-HUB. With a properly designed functional architecture, they can be integrated seamlessly to form a collaboration gateway that provides a systematic, transparent, traceable and controllable, and effective collaboration approach. Workspaces for team building, group communication, project management methods, portal 'store front' functionality for marketing, contract management, process representation, sharing and execution, knowledge capturing and sharing.

These technologies, supported by available engineering Web Services, form the basis of the E-HUB. With a properly designed functional architecture, they can be integrated seamlessly to form a collaboration gateway that provides a systematic, transparent, traceable and controllable, and effective collaboration approach are thus generally performed in the same order in the majority of projects, while the facilitating processes are dependent on the nature and structure of the project. Such general PP processes are considered as generic and structured. Based on these theoretical studies, a generic PPM for engineering service outsources projects has been developed. By following the PPM, and using related attribute templates, SMEs are able to define and negotiate the details of the engineering services.

3.1. PP Dedicated Collaboration

PP offers an opportunity for project participants to share and balance their objectives, resources, expertise, and constraints. PP generally has a form of iterative

loop, or of a dialogue, in which client's requirements and provider's proposals are continuously discussed and gradually refined. Clients, usually have problems with clarification of what is possible and what is desirable to expect from the project in return for invested resources, while providers want to balance available resources and expected efforts, associated with fulfillment of a client's requirements. The generic PPM provides structured guidelines for SMEs to collaborate, detailing what should be defined at which stage.

3.2. Supporting Technology

Best-of-breed technologies for Internet-based communication, team collaboration, and operational e-engineering are the baseline of the E-HUB development. They are positioned at the core of the E-HUBs. The specific information technologies deployed for the PP extensions are workflow management system and a basic collaboration platform.

3.3. Workflow Management System for Process Management

WFMC (2000, 2001) defines workflow as: 'The automation of a business process, in whole or part, during which documents, information or tasks are passed from one participant to another for action, according to a set of procedural rules'. Gerogakopoulos *et al.* (1995) give a more explicit description of a workflow process. They define a workflow as a collection of activities organized to accomplish some business goals. An activity can be performed by software system(s), human(s), or a combination of these. In addition to a collection of activities, a workflow may include constraints that influence the order of performing activities as well as information flow between them.

The essential workflow characteristics are persons, activities, application tools, and resources. Marshak (1994, 1997) defines the '3Rs' and the '3Ps' of workflow technology:

- ➢ Rules: Workflow systems take various business rules into account.
- ➢ Routes: A route is strongly coupled to the concept of information logistic that typically supports organization flows of all kinds of objects including documents, forms, and processes.
- ➢ Roles: Information is routed to roles rather than to a particular person. The role in an organization is a group of people with the required skills and authority.
- ➢ Processes: Business/engineering processes span over organization units and legacy information systems.
- ➢ Policies: Policies correspond to a normative process model that describes how certain processes should be handled.

➢ Practices: This is the way that work is actually performed in the organization.

The three major solutions which a WFMS provides to business and engineering problems are summarized as follows

- A unique and systematic approach to model business or engineering processes were the key features involved in the business or engineering processes such as roles, activities, inter dependencies, routes, and resources are considered.

- An effective tool to administrate contract management.

- An approach to facilitating knowledge management, records management, and process monitoring.

3.4. Technologies for Collaboration

To facilitate collaboration, a Basic Collaboration Platform (BCP) has been developed in the E-HUBs project, built on Java and J2EE technology. The BCP is a best-of-breed collaborative virtual environment that provides two levels of services: common services and engineering services. Some of the key features of the common services include:

- ❖ **User Management:** registration, building user profile, access controls via groups/roles, directory.

- ❖ **Collaboration Features:** email, forum, online chatting, newsgroups, discussion groups, calendar, and meeting support.

- ❖ **Document management:** upload and download, access right, version control, copy right, and Enterprise Applications Integration (EAI).

- ❖ **Internationalization:** portal support for different character sets, portal support for different date formats and time zones.

- ❖ **Security:** encryption of key data as required, access control, restricting access to data and documents, cross-authentication or single-sign-on mechanisms.

- ❖ **Others:** browser compatibility, Graphical User Interface (GUI), searching, access to Web Services, mobile/wireless computing, openness. In the BCP a set of activity components are added to support specific needs. Among them are a PP whiteboard, annotation function, and a specific contract editor as example of embedded external services.

- ❖ **The PP Whiteboard** allows users discussing a particular section of project plan online both textually and graphically. Users can import\ screenshots from planning documents or use a drawing toolbox to create sketches, use online chatting and drawing to discuss the details, and save the animated discussions into files.

❖ **The annotation function** allows users marking and explaining changes on existing standard documents. This is helpful to make the E-HUB a transparent and traceable environment for joint work plan definition and negotiation.

❖ **External services** such as e-LEGAL contract editor and Gantt project. Although such services are not technically integrated as an E-HUB service, the logical binding between the E-HUB and contract editor is achieved through the use of customizable workflows.

3.5. Functional Architecture

The functional architecture of the E-HUB, which harmonizes the group collaboration functionality provided by the BCP with the dedicated PP functional components, is described in this section. Collaborative PP is viewed by the E-HUB as a managed collaborative process that transparently generates a comprehensive 'project plan', consisting of a set of interlinked documents. Documents are either structured models or unstructured information. The added value of the E-HUB is that the generation process is composed of logically ordered activities that drive the collaborative generation of structured content. The logical ordering of activities and their relationship to structured content is embodied in a formal PPM as explained above. The PPM is a set of WF models, each of which operates on one or more content templates. Figure 2 shows the functional architecture for this. Figure.3 shows a workflow model that defines that a task is to be assigned to a particular project planner, while three fields of the information template have been defined to be accessible by this task. At the time of enactment, the project planner that is assigned this task will fill these fields with specific information. In doing so, s/he may use links to internal documents and external resources whenever appropriate, as indicated in Figure 3. It is very important that workflows can be started at will and run concurrently, reflecting the multitasking and multi-threading working styles of real-life PP. Planners typically work on different issues concurrently, Figure 3 shows the typical situation where a PP team deploys a PPM with four workflows. In this case three workflows have executed, or are executing concurrently (WF1, WF2, WF3). WF3 has been uploaded in the workspace but has not been executed, whereas WF2 is executing but has not yet reached the state where interaction with information templates has taken place.

In the figure, it is assumed that the four workflows have been defined to interact with five different information templates. Each template has a set of fields and different members of the project team have inserted information in these fields as mandated by the logic in the workflows. It is also indicated that fields may contain hyperlinks to stored documents and other fields thus making the space of project documents a rich information resource, which can be navigated in many different ways. It is now possible to define filters in the E-HUB workspace that transform

the generated project information into structured reports, contract templates, and project execution schedules. Figure.3 shows the high-level architecture of the E-HUB distinguishing the five major functional modules and how they operate on communities, document, workflow logic, and templates.

The figure shows how the community manager module maintains the identities of all users, and assigns access rights to engineering domains and any active project within the engineering domains. Every engineering domain has an open marketplace, to which every registered domain user has automatic access. The communication manager module controls chat, email, Web meeting, and other events; whereas the document manager provides access to document. The workflow management module stores and manages the PPM, creates instances of workflows, and exports instances to the WF run-time environment. Coordinators of project groups decide which PPM, or which packages within a PPM will be made available to the project It is one of the longer-term objectives of PP communities to harness the commonality of PP steps and store them as PPM templates. The E-HUB business entity could act as the custodian of these templates
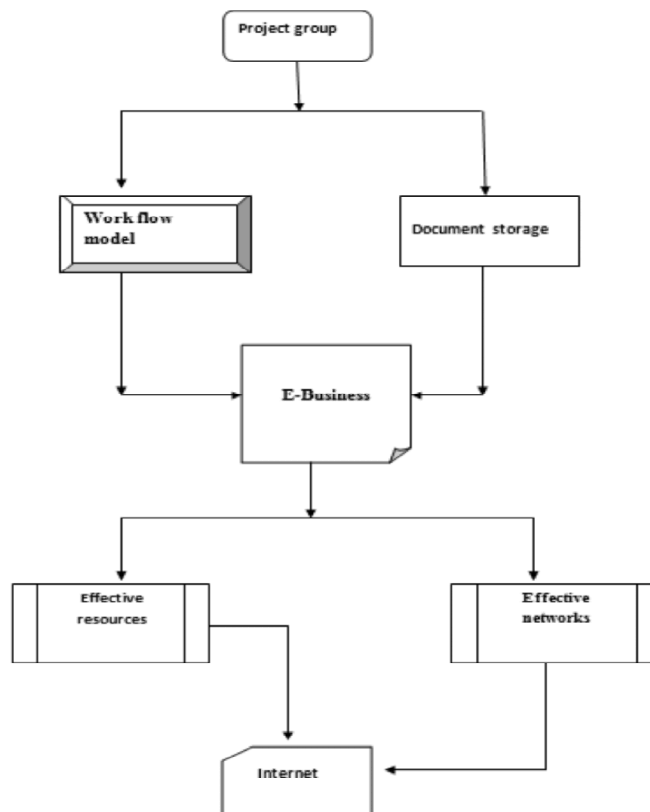

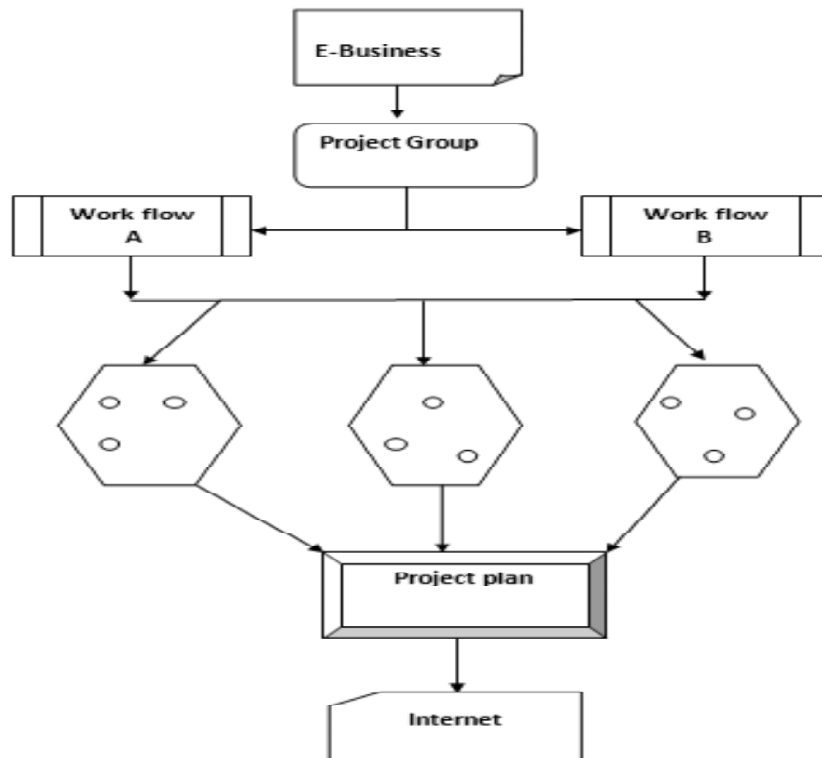**Figure 2: Architecture of Project Planning Model**

Figure 3: Functions of Work Flow

and make them available to new PP teams in the same domain. If the PPM templates contain proprietary client knowledge it is more likely that the client will retain the intellectual property and will make models only available to internal project teams. In either case, the E-HUB business entity will offer services (either public or for specific clients) that allow the cultivation, extension, and testing of PPM templates.

3.6. Engineering Services

Based on the functional architecture, the E-HUB provides a series of engineering services, which have been tested in both construction and manufacturing engineering test beds. In the construction scenario, a Dutch design firm needs to subcontract the seismic risk analysis work to a seismic analysis consultant located in Southern Italy through the E-HUB. In this case, the Client and the ESP need to define three major issues:

✓ **Cost estimate:** Both parties are concerned about the project cost. If they cannot reach an agreement, they would not carry on the negotiation. Before

they can negotiate the project cost, however, they need to reach an agreement on some of the initial project requirements.

✓ **Project schedule**: The Client needs to address a number of detailed execution plans including: schedule, quality plan, and change protocol. Of these, the Client is particularly interested in project schedule because s/he needs to arrange other related activities accordingly.

✓ **Contract and conditions of contract**: The Client and the ESP need to finalize the contract and related conditions.

4. PROBLEMS AND CHALLENGES

Although E-HUBs have created great benefits to businesses and industries, many problems have been encountered and need to be solved in the development and application of E-HUBs. Customers have taken full advantage of E-HUBs. According to Stevens (2001), the empirical results show that:

✓ B2B E-HUBs are unlikely to enable a reduction in overall transaction costs, sufficient to facilitate entry into new global markets.

✓ B2B E-HUB providers do not appear to be providing the types of services that firms need to engage in transaction preparation and completion.

✓ Most E-HUBs focus on minimizing information search costs – bringing 'stranger' together – 'buyer and seller beware'.

✓ Product certification, product quality, or trading partner reputation is not easily accessible at E-HUBs.

The reasons for these are multi-fold. Essentially, several aspects are lacking in terms of using Web Services for e-souring and enterprise integration such as:

✓ Unclear E-HUBs development strategy.

✓ Limited or no control over the integrated business logic that involves other partners or enterprises.

✓ No service provision and subscription capability.

✓ Lack of efficient UDDI search for e-business integration.

✓ Lack of relationship defined in current Web Services specification for integration.

✓ Lack of message tracking.

✓ No inherent scalability.

✓ No inherent security.

✓ Lack of effective transaction support.

✓ Unclear trust and legal aspects.

5. CONCLUSIONS

Business E-HUBs are growing very rapidly due to the great benefits they offer to users and developers. To obtain a high-level view of E-HUBs, this chapter reviewed several key aspects of E-HUBs including definition, classification, services and problems, and potential challenges with emphases on E-HUB's services. E-HUBs, as a general platform, greatly enhance business opportunities and improve business and engineering process. This global network of servers is used by many industry leaders to liquidate their service products and establish exchange networks that they now call E-HUBs. E-HUBs have clearly demonstrated the power of the Internet to perform as a real-time, global distribution network by dissolving the constraints of time and geography and made it possible for buyers, business-to-business, business-to-consumers, and business-to-industry to become more fully engaged. E-HUBs create value by aggregating buyers and sellers, creating marketplace liquidity, and reducing transaction costs and time. Essentially, E-HUBs' services can be regarded as three levels core services and value-added services.

References

Geroga Kopoulos, D., Hornick, M., and Sheet, A., (1995), An overview of workflow management: Form process modeling to workflow automation infrastructure. *Distributed and Parallel Databases*, 3(2), 119–153.

Kaplan, S., and Sawhney, M., (1999), Available at *http://www.umsl.edu/~viehland/IS491week6.html.*

Marshak, R T., (1994), Workflow White Paper: An overview of workflow software. In: WORKFLOW'94 Conference Proceedings, San Jose, USA.

Marshak, R. T., (1997), In Concert workflow: Independent from XSOFT, In Concert Inc. provides flexible workflow underlying engineering team support. Workgroup Computing Report, Patricia Seybold Group.

McCarthy, D. R., and Sarin, S. K., (1993), Workflow and transaction in, In Concert. Bulletin of the Technical Committee on Data Engineering, Special Issues on workflow extended transaction systems, IEEE **16**(2), June.

Mejia, R., and Molina, A., (2001), Virtual enterprise broker: Processes, methods and tools. Progress Report, CSIM-ITESM.

Morgan Stanley Dean Witter Internet Research (2000), Collaborations in action, hubs and spoke always beats point-to-point. Collaborative Commerce, April. Prior C. (2003) Workflow and process management. In Workflow Handbook 2003 (L. Fischer ed). Future Strategies Inc., Florida, pp. 17–25.

PMI (2000), A Guide to the Project Management Body of Knowledge. Project Management Institute Inc., Newtown Square, Pennsylvania, USA.

Ren, Z., Anumba, C J., and Hassan, T M., (2002), A review of E-HUBs and their services. Technical Report, Lough borough University, UK.

Ren, Z., Hassan, T.M., Anumba, C.J., Augenbroe, G., and Mangini, M., (2004), Electronic Contracting in the E-engineering hub. In: The Proceedings of the 5th IFIP Working Conference on Virtual Enterprises (PRO-VE 2004), Toulouse, France, pp. 235–244.

Ren, Z., Anumba, C.J., Hassan, T.M., Augenbroe, G. and Mangini, M. (2006), Collaborative project planning: A novel approach through an e-engineering hub – A case study of seismic risk analysis. *Computer in Industries*, 57(3), 218–230.

WfMC (2000), Proposal for an asynchronous HTTP binding of WF-XML. Workflow Management Coalition. Future Strategies Inc. WfMC (2001) The WfMC glossary. Workflow Handbook 2001, Future Strategies Inc.

WfMC (2002), The workflow management coalition workflow standard, workflow process definition interface – XML process definition language. Workflow Management Coalition, Future Strategies Inc.