WEB SERVICES AS AN INFORMATION ENABLER IN THE RETAIL INDUSTRY

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Keywords: Web services, retail, business intelligence, RFID, POS.

Abstract: Retail organizations works on thin margins and hence it is very imperative that they utilize information technology to achieve optimization on time and space in the entire retail supply chain in order to remain competitive. Web services is an emerging technology holding tremendous promise as a platform neutral, easy to implement mechanism to achieve information and business process integration in the extended enterprise. In this paper, we review how Web services in consonance with other technologies can prove to be an effective business enabler for the retail business when adopted in a phased manner.

1 INTRODUCTION

The retail industry works on thin margins (Banks, 2003) and competitive advantage lies in being able to achieve supply of goods at the best possible price and at the right moment without any interruption up in the retail supply chain and in being able to deliver the goods to the end customer ensuring highest customer satisfaction down the supply chain (Kent & Mentzer, 2003). Needless to say, this would depend upon the organization's ability to mobilize and disseminate the right information at the right moment to the decision makers and to those who would implement those decisions.

In the next section, we look into the basics of the retail business and the retail supply chain. In section 3, we analyze the capabilities of Web services technology and its symbiosis with other emerging technology in serving as an effective information enabling mechanism. In section 4, we finally propose a road map approach to applying the Web services technology to the information enabling needs of the retail business, keeping in mind the current maturity level of this promising new technology.

2 THE RETAIL BUSINESS

A typical retail organization has the business objective of procuring goods from suppliers and reselling them to end customers or consumers (Mason & Burns, 1993). The chief value add functions provided by the retail organization are in terms providing a buffer or cushioning effect between the supply and demand, stimulating the demand and arranging for adequate supplies to meet the renewed demand and customer service. Internet has also given birth to the online retail model – the online market place like the Amazon.com, eBay.com, etc.

3 WEB SERVICES AS AN INFORMATION ENABLER

The term Web services has come to denote a universally accepted XML standards based mechanism for exposing business functionality over the internet (Ogbuji, 2002) and is based on a service oriented architecture (SOA). Hence, it can be exploited both for simple information exchange and execution of full-fledged multi-step business transactions and workflows. Interoperability and

universally acceptability of the Web services standards are important issues to ensure effective use of this technology (Kotok, 2004). This has not been achieved yet for all the layers (reliability, security, workflow and transactions, etc.) of the Web services stack except for the foundational core standards for service exposure, service usage and service message exchange format – SOAP, WSDL and UDDI (Mallick et al. 2004). This means it would not be incorrect to say that Web services standards in their current maturity may have limited applicability in the role of a true business process integrator.

However, due to its tremendous potential as an information exchange mechanism, it can enhance the potential of other data collection, data processing and information dissemination mechanisms and applications. Being available in two modes – synchronous (based on the RPC model) (Adams, 2002) and asynchronous it can be utilized in either real-time mode or otherwise. Business intelligence (BI) Web services (Business Intelligence Web services, 2003) could be embedded in operational applications like ERP, SCM, CRM (Mello, 2002), etc. Real time data from RFID (Violino, 2003) and POS systems could be made available for business activity monitoring (BAM) using synchronous Web services based information integration. Web services could be used for information dissemination over mobile, hand-held devices, etc. (XInternet technologies). Finally, information items from diverse applications running on diverse platforms could be integrated into an Enterprise level dashboard using the Web services standards for enterprise portlets – WSRP (OASIS, 2004).

4 ROAD MAP FOR THE ADOPTION OF WEB SERVICES IN THE RETAIL BUSINESS

In this section we propose a road map approach to application of Web services in the retail organization and the retail supply chain. In stage 1 (Figure 1) we propose that the retail organization use Web services for simple information exchange among enterprise applications in a limited way requiring minimal security infrastructure and perhaps behind the firewalls of the organization. This would require use of the core SOAP and WSDL standards. In stage 2 the organization having gained experience with this new technology could move ahead for information exchange across the firewalls and over the internet. This could include data exchange across the supply chain with the trading partners of information not

requiring stringent security aspects like that for financial transactions. In this stage, the information could be collected from XInternet technologies like RFID and POS systems and made available to the plethora of mobile and hand-held devices over the internet / intranet on a selective basis. But before they could do so some form of agreement on the data standards among the supply chain partners would need to be worked out. In stage 2, the retail organization having a well developed common information model (CIM) in place and also having gained some experience with tackling security aspects across the firewalls, the organization could move ahead towards a scenario where data having stringent security requirements like customer profile, financial information, etc. could be exchanged over the internet. This would be stage 3. By this stage, the retail organization would have gained experience with simple, single-step and secure information exchange across applications and devices within and across the firewalls using Web services, paving the way for more complex scenarios. In stage 4, the Web services standards for transactions and workflow and reliable message exchange could be utilized for accomplishing complex, security critical, multi-step business transactions and workflow within and across the firewall (Little et al., 2003).

Stage 1
Stores / Delivery channel
- Stores applications – diverse POS systems (Tarpley, 2001) could be integrated.
- Shelf management – RFID data on product uptake and customer purchase behavior inside the store can be shared online with the stores managers on their mobile devices.

Retailer back office
- Data from operational applications could be made available to line managers through mobile devices, enterprise portals, etc.
- Inputs on historical data from data warehouses as well as RFID data could be integrated into Enterprise dashboards/portals for analysis and planning.

Stage 2
Stores / Delivery channel
- Real time POS and RFID data on sales, could be sent back to retail office line managers, field sales agents on their mobile devices, terminals.
- Latest information on new product release and price catalogs could be made available to field
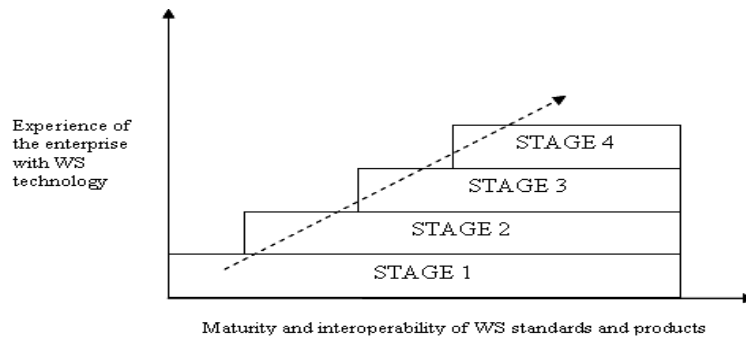
Legend:
STAGE 1 – Limited information exchange within firewalls (using SOAP, WSDL)
STAGE 2 – Information exchange across firewalls of items having medium to low security requirements (using SOAP, WSDL, UDDI, Web services reliability standards, encryption mechanisms)
STAGE 3 – Limited information exchange across firewalls with partners, delivery channels of items having stringent security requirements (using SOAP, WSDL, UDDI, Web services security and identity standards)
STAGE 4 – Reliable, secure, multi-step business transactions and workflow with business partners (using SOAP, WSDL, UDDI, Web services security and identity standards, business process execution, choreography standards)

Figure 1: Suggested stages for adoption of Web services in the retail business.

- sales personnel, store managers on their mobile devices.

Retailer back office
- Line managers could execute lightweight queries on BI applications from their mobile and hand-held devices.
- Inventory level information from DCs and warehouses could be accessed real-time (using RFID technology) for merchandise planning.

Supplier
- Can update their product catalog, product availability information maintained at the retailer's vendor portal at real-time.
- CPFR (Ashcroft, 2005) on a selective basis – POS and RFID data from the stores, DCs could be made available to the supplier – for certain critical, fast moving products or LOBs.

Stage 3
Stores / Delivery channel
- Customer could update their profile and view targeted sales information on their mobile devices and over the internet.
- Stores could be sent advance shipping notes (ASN) by the retailer to enable proactive planning.

Retailer
- Retail head office could receive data on stores performance (top sellers), price deviations by stores by receiving updates on sales and product

price from diverse stores applications. This information could be fed into the merchandise planning systems for BPM and for making stores supply, commission, discount related decisions.
- Multi-channel delivery – coordination of product delivery and dissemination of promotion related information across multiple delivery channels could be achieved by accessing real time information about customer behavior, DC and stores inventory and channel performance.

Supplier
- CPFR on a wider scale – real time sales and inventory information could be accessed on critical products like the fast moving items, new product releases to fine tune their replenishment and supply activities.

Stage 4
Stores / Delivery channel
- Mobile checkout could be enabled for the customer at the stores, kiosks.
- Stores personnel management applications (time & attendance, salary, commission, etc.) on diverse platforms could be integrated with the HR and Financial applications of the retailer head office.

Retailer
- Real time events such as falling inventory levels at the stores, kiosks, DCs could be

viewed by the managers for merchandise planning. Integrating this real time information from the stores, kiosks and DCs with the merchandise planning system using Web services could enable automated triggers for undertaking replenishment activities paving the way for BPM.

- Auto PO acknowledgement when retailer places an order, notification of the beginning of the fulfillment process, notification of the pick, ASN (advance ship notice) from the supplier, notification to the supplier about rejection of goods delivered due to faulty documents could be enabled using RFID and Web services based workflow.

Supplier

- Automated replenishment, order placement, fulfillment and settlement could be achieved by Web services based integration of the vendors' and retailer's merchandise management system, financial management system.
- Changes in the vendors' policies, contractual agreements, compliance issues could be worked out in a workflow by integrating the B2B systems of the retailer and the vendor.

5 CONCLUSION

In this paper we analyzed that adoption of Web services in the retail industry. Web services in consonance with other enabling technologies like BI, mobile and hand held devices, enterprise portals and operation applications can serve as an application, data and business process integrator. However, due to lack of maturity of standards in the entire Web services protocol stack it could be used with certain limitations. It is recommended in this paper that Web services be adopted first as an information integrator in the retail supply chain.

REFERENCES

Banks, Andy (2003/2004, December/January). Retail supply chain trends [Electronic Version]. *IEE Computing and Control Engineering,* 32-33.

Kent, John L., Mentzer, J.T. (2003). The effect of investment in inter-organizational information technology in a retail supply chain [Electronic Version]. *Journal of Business Logistics*, 24(2), 155 – 175.

Mason, J. Barry, Burns, David J. (1993). *Retailing.* Richard D. Irwin.

Ogbuji, Uche (2002, September 28). The Past, Present and Future of Web Services, part 1. *WebServices.Org.* Retrieved January 11, 2004 from http://www.webservices.org/index.php/article/article view/663/

Kotok, Alan (2004, February 17). XML-2004 Making gains with Web services by setting limits. *WebServices.Org.* Retrieved January 11, 2005 from http://www.webservices.org/index.php/ws/content/vi ew/full/49800

Mallick, S., Kumar, B.V. & Subrahmanya, S.V. (2004). Servicing the Future: Web services. *Proceedings of the International Symposium on Web services and Applications, ISWS'04, Las Vegas, Nevada, CSREA Press*, II, 773-782.

Adams, Holt (2002, April 1). Asynchronous operations and Web services. Part 1: A primer on asynchronous transactions. *IBM developerWorks article.* Retrieved January 11, 2004 from http://www-106.ibm.com/developerworks/library/ws-asynch1.html

Business Intelligence Web services (2003). *Business Objects whitepaper.* Retrieved January 11, 2005 from http://www.businessobjects.com

Mello, Adrian (2002, April 3). When CRM and Web services Collide. *TechUpdate*. Retrieved January 11, 2005 from http://techupdate.zdnet.com/techupdate/stories/main/ 0,14179,2859862,00.html

Violino, Bob (2003, October 6). Linking RFID with Web services [Electronic Version]. *RFID Journal*. Retrieved January 11, 2005 from http://www.globeranger.com/papers/Article%20-%20RFID%20Journal%20RFID%20&%20Web%20 Services.pdf

OASIS Web services for Remote Portlets (WSRP) TC (2004). Retrieved January 11, 2005 from http://www.oasis-open.org/committees/tc_home.php?wg_abbrev=wsrp

Little, Mark & Freund, T.J. (2003, October 7). A comparison of Web services transaction protocols. *IBM developerWorks article.* Retrieved January 11, 2005 from http://www-106.ibm.com/developerworks/webservices/library/w s-comproto/#1

Tarpley, Dean (2001, December). Minding the store: Retail Business Intelligence. *CRMToday*. Retrieved January 11, 2005 from http://www.crm2day.com/library/EpuZVuluAEbHfp pZHm.php

Ashcroft, Jeff. CPFR – The New Business Essential. *About.com*. Retrieved January 11, 2005 from http://logistics.about.com/library/weekly/aa113001.h tm