BUSINESS FLOW INTEGRATION FOR E-COMMERCE AND ERP SYSTEM

Shing-Han Li
Department of Accounting Information,
National Taipei University of Business, Taipei, Taiwan

Yung-Hsin Wang
Department of Information Management,
Tatung University, Taipei, Taiwan

Chung-Chiang Hu
Department of Information Management,
Tatung University, Taipei, Taiwan

Wei-Yu Chen
Department of Mass Communication,
Chinese Culture University, Taipei, Taiwan

Ya-Wen Hsu
Department of Information Management,
Tatung University, Taipei, Taiwan

Abstract—In an enterprise, e-commerce system and ERP system are two systems that can work in sequence to complete business transactions. In practice, e-commerce system takes orders from customers and ERP system integrates information from business processes related the transaction into the accounting module. However, without proper integration, data in e-commerce system and ERP system may be inconsistent, incomplete, and incorrect, increasing employees’ burden of manual operation. Based on the traditional point-to-point integration concept, this study proposed a method to integrate e-commerce system and ERP system within an enterprise, and apply the method successfully in a leading semiconductor component distributor in Taiwan. The proposed integration method can be generalized to related information system integration within enterprises to improve the efficiency of information systems and process flow integration.

Keywords—E-business, Electronic Commerce, E-commerce, Enterprise Resources Planning, ERP, Information System Integration

Introduction

This study chose the e-commerce (EC) and ERP (Enterprise Resource Planning) accounting systems to realize the integration of two heterogeneous databases, using automated computer programming. Transaction data recorded in the e-commerce system is automatically transferred into the ERP accounting system through traditional point-to-point integration [1]. Data generated in the e-commerce system are saved in intermediate data files. The ERP system uses batch reading to periodically access the saved data for generating customers’ transaction and payment information, as well as the transaction information with suppliers.

Through the integration method proposed by this study, the following objectives can be achieved:

- Through data transfer between the e-commerce and the ERP accounting system, all transactions occurring in the e-commerce system will be shown instantly in
the ERP accounting system, enabling the access to customer’ transaction and payment information as well as the transaction information with suppliers from the ERP accounting system.

- Based on the operation needs of the ERP accounting system, data in the e-commerce system are transformed into standardized formats using various data integration method and then transferred into the ERP accounting system.

Through automatic data transfer, information in two heterogeneous databases is integrated with the save of time and human resources. The internal operation procedures within an enterprise are made more concise and data error caused by human intervention is minimized.

**Literature Review**

**Barriers to the integration of information systems**

According to Ms. Li, the marketing manager of the Server Platform Department in the Microsoft, the common challenges to data integration include the following [2]:

- Different sources of the heterogeneous data
- The clarification of the logic operation within the process flows
- Instant data acquisition and synchronized data modification
- The consistency of data format and semantics
- Centralize data management for error analysis
- Periodically data transfer
- Clarification of data source and transfer history
- Management and monitoring
- Security concerns regarding data integration
- The compromise between flexibility and efficiency
- Customization

**Methods of information system integration**

According to the Gartner Group (1999), the tasks of system integration include:

- Interfacing: Importing and exporting data through application interface
- Transforming: Transforming data into formats accepted by the targeted system
- Distributing: Transferring data from the source system to the targeted system
- Routing: Determine the destination of data transfer,
- Management: Manage and control the process flow of data transfer

All five tasks should be check to for completeness during integration of information systems.

As for the methods used for data integration, according to Wang (2004), four different modes were typically chosen for data integration, as shown in Table I, Figure 1 further clarifies the concepts of different data integration modes [4].

<table>
<thead>
<tr>
<th>TABLE I. MODES OF DATA INTEGRATION [4]</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Integration Mode</strong></td>
</tr>
<tr>
<td>---------------------</td>
</tr>
<tr>
<td>1 Active Mode</td>
</tr>
<tr>
<td>2 Passive Mode</td>
</tr>
<tr>
<td>3 Intermediate Mode</td>
</tr>
<tr>
<td>4 Tool Integration</td>
</tr>
</tbody>
</table>
The mode of incompatibility between System A and System B, for which an interface program or data transformation program must be created to transform data between System A and System B, is a common challenge in system integration.

<table>
<thead>
<tr>
<th>Mode</th>
<th>Incompatibility between System A and System B, a data transformation or interface program must be created to transform data between System A and System B.</th>
</tr>
</thead>
</table>

The tool integration mode (Mode 4) is a method based on the Enterprise Application Integration (EAI), a technology recently explored by many enterprises. In tool integration mode, a concentrated integration platform is needed to process data transformation among different information systems, as shown in Figure 3).

**Fig. 1. Illustration of Different Modes of Data Integration [4]**

The integration mode 1 thru mode 3 listed in Table I can be categorized as traditional point-to-point methods of integration. The point-to-point integration is suitable in the circumstances where the architectures of the original information systems remain independent and data between systems are integrated using customized programs. Figure 2 demonstrated the use of point-to-point data integration.

**Fig. 2. Point-to-point Data Integration [4]**

Although point-to-point integration cannot effectively improve the quality and efficiency of system and process integration, and may lead to high integration cost and low overall efficiency [4], compared with tool integration, it saves the cost for enterprises to purchase new information systems. In addition, by keeping the current information systems, IT staffs of enterprises do not need to pursue system integration while they still need time to get familiar with new integration systems. Therefore, so far most enterprises still adopt point-to-point modes for heterogeneous system integration.

**Analysis of Process Flow Integration of E-Commerce and ERP Accounting System**

This study applied the intermediate mode of point-to-point integration to integrate the e-commerce system and the ERP accounting system. Information in the e-commerce system is written into an intermediate file or datasheet for the ERP system to read and then automatically perform related operations [5].

Based on the current ERP operation rules, this study planned two methods to write the information in the e-
commerce system into an intermediate file or datasheet and chose one way depending on the circumstances. One method is to utilize the standard import function of the ERP system. As shown in Figure 4, when a transaction occurs in the e-commerce system, the transaction data is transformed by a data transformation program and written into the standard interface datasheet of ERP. The ERP system sets up a routine schedule to import the interface data and verify the correctness of the data. If any anomaly occurs in the data, an anomaly report will be generated; otherwise, the transaction data stored in the interface datasheet will be used to generate regular ERP statement. The advantage of this method is that it saves the work to create a customized program for data transferring.

The other method is to create a customized temporary datasheet in the ERP system and write the transaction data in the e-commerce system into the temporary datasheet (Figure 5). The ERP system can then create a customized program and set up a schedule to routinely call the Application Programming Interface (API) program to access the temporary datasheet and generate needed data in the ERP system. It takes extra work to create the customized temporary datasheet and the customized program for the data transferring; however, it is the necessary procedure if the ERP system does not provide the standard interface datasheet.

Direct Shipment
When an enterprise receives a customer order, it directly ships the merchants to the customer. Enterprises using the Direct Shipment model can easily be pressured by the inventory and the cash flow.

Vendor Drop Shipment
When an enterprise receives order from the customer, it contacts suppliers to purchase the merchants and asks the suppliers to ship the merchants directly using the name of the enterprise. The suppliers will charge the enterprise instead of the customer. The Vendor Drop Shipment model helps enterprises save costs of shipping and inventory management. Also, there is no inventory pressure to the enterprise.

Framework of Process Flow Integration of E-commerce System and ERP Accounting System
This section explained the process flows of E-commerce system and ERP system, and compares process flows before and after integration. Finally, the effectiveness and efficiency of system integration was analyzed.

Original E-commerce Process Flow
Direct Shipping (as shown in Figure 6)
After a customer sends out the purchase order, e-

commerce system receives the online order and notifies a sales staff to change the online order to a formal order. A proforma invoice will be sent from the sales staff to the customer to remind the customer to pay. On receiving the customer’s payment, the financial staff will notify the e-commerce about the payment and the check number, and then inform the sales staff to change the formal order to shipping order for shipping the merchant to the customer and then confirm with the customer for the shipping.

![Diagram](image_url)

**Fig. 6. E-commerce Process Flow for Direct Shipping**

**Vendor Drop Shipping (as shown in Figure 7)**

After a customer sends out the purchase order, e-commerce system receives the online order and notifies the sales staff. The sales staff will first confirm with the supplier about the shipping date and amount and then change the online order to a formal order to send out the proforma invoice to remind the customer to pay. On receiving the customer’s payment, the financial staff will notify the e-commerce about the payment amount and check number, and then inform the sales staff to change the formal order to shipping order, and the e-commerce system will generate the purchase order to the supplier. After the supplier ships the merchants to the customer, the sales staff will confirm with the customer about the shipping.

![Diagram](image_url)

**Fig. 7. E-commerce Process Flow for Vendor Drop Shipping**

**Original ERP Account System Process Flow**

**Direct Shipping (as shown in Figure 8)**

After the order is changed to shipping order and shipping confirmation with the customer is done, the order management system will transfer the related information to the interface datasheet of the backend ERP accounting management system for the system to routinely generate account receivable information from the interface datasheet. After receiving the customer’s payment, the financial staff will enter the received T/T and check information including bank, bank account, payment received, check number, and service charge, into the payment datasheet and then finish the write-off process.
Fig. 8. ERP Accounting System Process Flow for Direct Shipping

**Vendor Drop Shipping (as shown in Figure 9)**

In vendor drop shipping, processes related to the customer remain unchanged, but when the formal order is changed to shipping order, the sales staff will inform the purchase assistant to generate the purchase order to the supplier. After the supplier finish shipment to the customer, the purchase management system will generate data in the interface datasheet of the ERP accounting system for importing into the system to generate account payable information.

Fig. 9. ERP Accounting System Process Flow for Vendor Drop Shipping

**Combined E-commerce and ERP Process Flow without Data Integration**

**Direct Shipping (as shown in Figure 10)**

After a customer sends out the purchase order, e-commerce system receives the online order and notifies a sale staff to change the online order to a formal order. A proforma invoice will be sent from the sales staff to the customer to remind the customer to pay. On receiving the customer’s payment, the financial staff will notify the e-commerce about the payment and the check number, process the payment in the ERP accounting system, and inform the sales staff to change the formal order to shipping order for shipping the merchant to the customer. After confirming with the customer for the shipping, the sales staff will inform the financial staff to process the transaction in the ERP system, including generating account receivable information and executing the write-off process for the received payment.

Fig. 10. Combined Direct Shipping Process Flow of E-commerce System and ERP System without Data Integration
**Vendor Drop Shipping (as shown in Figure 11)**

After a customer sends out the purchase order, e-commerce system receives the online order and notifies the sales staff. The sales staff will first confirm with the supplier about the shipping date and amount and then change the online order to a formal order to sends out the proforma invoice to remind the customer to pay. On receiving the customer’s payment, the financial staff will notify the e-commerce about the payment amount and check number, process the payment, and inform the sales staff to change the formal order to shipping order. The e-commerce system will then generate the purchase order to the supplier. After the supplier ships the merchants to the customer, the sales staff will confirm with the customer about the shipping and then notify the financial staff to process the establishment and write-off of account receivable, as well as the establishment of account payable for the supplier.

**Combined E-commerce and ERP Process Flow without Data Integration**

**Direct Shipping (as shown in Figure 12)**

After the financial staff receives the payment from the customer and processes the payment in the e-commerce system, the system will automatically transfer data into the temporary datasheet of the ERP system. The ERP system will routinely execute the customized program to call the API program in the ERP system for automatically establishing the account receivable information. On the other hand, after the sales staff confirms the shipment with the customer, the e-commerce system will automatically transfer transaction data into the standard interface datasheet of the ERP system. The ERP system will routinely execute the standard program to access the interface datasheet and generate transaction information in the ERP system.

**Vendor Drop Shipping (as shown in Figure 12)**

After the financial staff receives the payment from the customer and processes the payment in the e-commerce system, the system will automatically transfer data into the temporary datasheet of the ERP system. The ERP system will routinely execute the customized program to call the API program in the ERP system for automatically establishing the account receivable information. On the other hand, after the sales staff confirms the shipment with the customer, the e-commerce system will automatically transfer transaction data of both the customer and the supplier into the standard interface datasheet of the ERP system. The ERP system will routinely execute the standard program to access the interface datasheet and generate transaction information in the ERP system.
process flow automation, can be found in the process of heterogeneous database integration.

- Review of internal process flow during integration
- Standardization of data transformation
- Information instantaneity
- Quality improvement of payment collection

In the future, the integration should aim at reducing staff process flows and automating internal processes to facilitate staff’s transition to the new process flows. Although this study focused on the integration of e-commerce and ERP systems, the data integration models and methods can be used in the integration of other heterogeneous systems within enterprises.

**Acknowledgment**

The authors gratefully acknowledge the financial support of the Ministry of Science and Technology, Taiwan, R.O.C. through its grants MOST 105-2410-H-141-010-.

**References**


