Planning a revenue stream system in an e-business environment

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Abstract
Many organizations are adopting an integrated approach to implementing and managing important elements of their revenue stream activities, particularly as applied to conducting business on the Internet. Integrated information systems are an important part of this effort to improve service to customers. Describes what management can expect from recent advances in integrated revenue software applications, outlines major system deliverables, and reports critical success factors for traditional and e-business revenue stream system projects.

Introduction

With companies facing global competition and increased pressure from customers and competitors to do business on the Internet, revenue system management has emerged as a key strategic planning factor. Managers must respond quickly to competitor actions and changing business models to make intelligent, effective business decisions regarding product placement, order fulfillment, and other critical elements of doing business online.

To compete successfully, companies must improve the quality, speed and responsiveness of their customer service. Attaining these objectives requires integrated information systems that support strategic management of revenue drivers. This requires an entirely new approach to integration, where companies use Web-based applications and interfaces to integrate their business processes and information systems with those of their customers (Radding, 2000).

An electronic commerce (e-commerce) application should eliminate gaps between ordering, distribution and payment (Yang and Papazoglou, 2000). The information systems comprising the revenue cycle are a key component of this effort and represent a major focus of any information systems project designed to improve customer satisfaction, organizational efficiency and profitability.

The purpose of this paper is to highlight a number of important considerations in planning the revenue stream segment of a business information system. Particular emphasis is placed on the major issues facing developers of a revenue stream system project, especially new developments in e-commerce applications. Many new software products provide dramatic improvements in

capability compared with software from the 1990s.

Primary functions of the revenue stream information system

The revenue stream includes sales order receipt and processing, credit verification, pricing, invoicing, revenue recording, return processing, and cash collection. Revenue stream information systems provide the foundation for:
- processing of clerical functions, such as billing and journal entries;
- linking sales, order processing, order status, customer service and cash receipts;
- customer relations support;
- control of uncollectable accounts; and
- reporting to management and regulatory agencies.

Traditional accounts receivable (AR) and billing (BL) systems represent the transaction-based portions of the revenue stream that provide data to the financial accounting and reporting system.

The mission of a revenue stream information system project team should be to provide a flexible, integrated business process that enables real-time customer service and process control. Specific elements of this mission include identifying system deliverables that allow employees to respond to internal and market needs by providing real-time pricing capabilities (such as, for example, flexibility in price promotion programs). Other elements of the system include modules for reporting revenue information to management, posting transactions to the general ledger, enabling a variety of cash collection strategies, furnishing measurement and analysis tools for credit management, and generating documents (e.g. sales invoices and credit memos).

Project scope and planning

The strategic role of systems experts in envisioning and developing a new revenue stream environment includes designing business processes and technology structures capable of achieving the organization's revenue information goals. Discussion sessions with key personnel are useful to determine the scope of the project and to prepare a preliminary plan. These actions should lead to a vision of improved processes that will take advantage of the specific hardware and software platforms being implemented as part of the project.

The first step in a revenue stream system project is to define the project's scope. Revenue stream activities and specific information system elements that affect this process must be identified and evaluated for inclusion in the project. Figure 1 illustrates a scope model for a typical revenue stream system project. The figure depicts a number of revenue stream processes that should be considered. A general approach to planning a revenue stream information system project is:

1 Catalog reports, statements, and system interfaces.
2 Interview key personnel.
3 Map existing revenue stream processes.
4 Evaluate current revenue stream environment.
5 Determine data requirements, interfaces, and implications on the revenue stream.
6 Envision the new revenue stream environment.
7 Map business processes and process prototyping with software.
8 Review and refine recommendations of the design and advisory teams.
9 Obtain approval on recommendations for new revenue stream design.

A few of the planning steps listed above warrant some additional comments. The primary objective of interviewing key personnel is to identify opportunities for improvement within the scope of the revenue stream project, not only in relation to current business practices, but also in anticipation of

Figure 1
A scope model for revenue stream system project
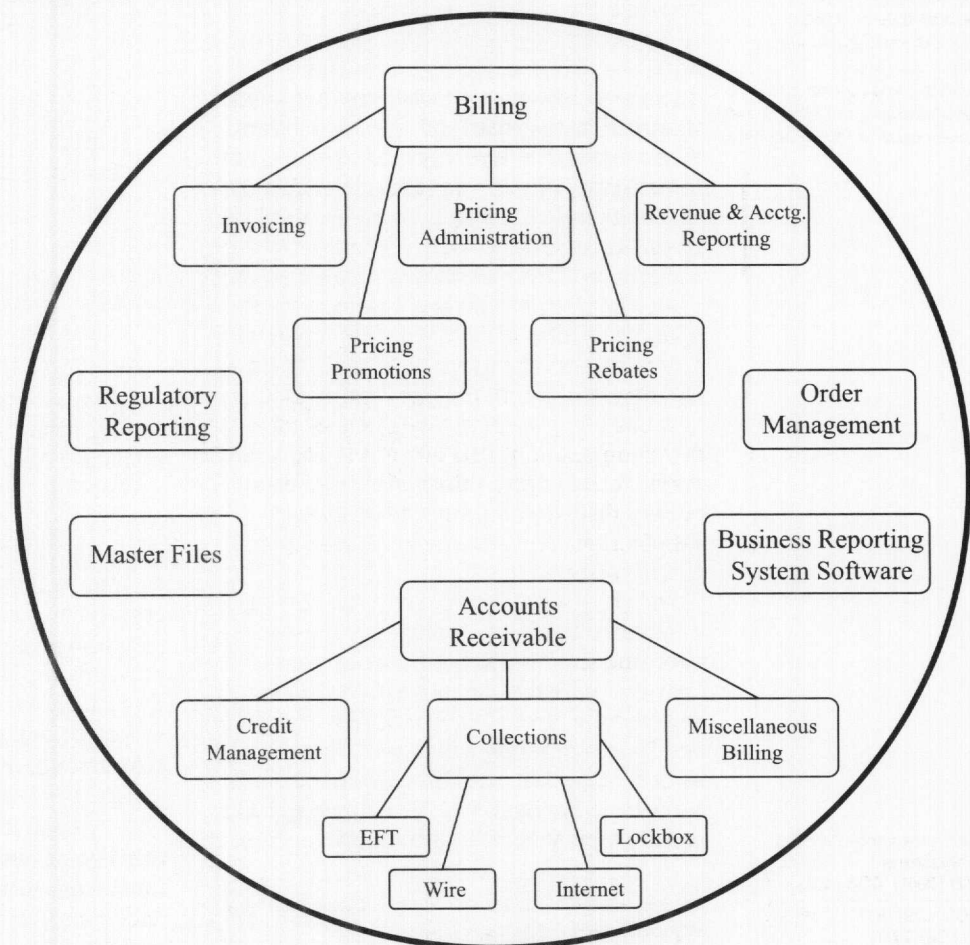
future developments. The information and recommendations gathered in this process provide a framework for future changes in the revenue stream structure's design.

Evaluation of the current revenue stream environment is also facilitated through interviews with key personnel. The objective of these interviews is to identify key revenue stream components such as: pricing administration, price promotions and rebates, revenue reporting, billing, credit management, cash collections and bad debt management, and government reporting. An adequate understanding of the current system environment is essential to determine the scope of changes and opportunities for improvements to the design of the revenue stream.

Pricing administration
Pricing administration refers to the degree of centralization in making pricing decisions. In some organizations pricing is highly centralized, while in others pricing is heavily influenced by decentralized business units or by individual salespersons in response to market conditions or competitors' actions. An integrated pricing administration module that provides current market information in a timely, integrated and accurate manner can give management the ability to act quickly in response to market changes. Major deliverables of current integrated revenue stream systems include:
- access authorization;
- pricing flexibility by various customer levels and groupings;
- pricing by brand, location, package type, and other identifiable attributes;
- pricing maintenance options;
- warehousing of historical pricing data.

Price promotions and rebates
Price promotions and rebate programs are key elements of a business marketing strategy. The revenue stream information system must be able to track promotion programs in a timely and accurate manner. Major system deliverables for promotion monitoring are:
- remote access for updating or entering price promotion data;
- price edit and validation processes;
- flexibility in price reductions, including the ability to run simultaneous price promotion and reduction programs;
- integration of price promotion rules to monitor legal compliance.

Revenue reporting
Revenue reports are tools that allow management to monitor company performance. These reports provide information to measure current performance and to analyze performance against goals. In addition, revenue reports allow management to make informed decisions regarding pricing strategies and to be proactive in dealing with changing market conditions.

Major system deliverables for revenue reporting include:
- facilitating the definition and documentation of management information requirements;
- a standardized reporting system that meets specific periodic reporting requirements;
- *ad hoc* query capabilities for customized reports to authorized users;
- accurate, timely and flexible journal updates to the general ledger;
- "drill-down" capabilities to the transaction, line item, and brand/package/geographical level;
- compatibility with existing executive and decision support information systems.

Billing
Generating invoices for goods sold or services rendered is the basic function of a billing system. The invoice format should be standardized to meet the organization's overall information requirements, yet flexible enough to support different information needs across divisions, product lines, etc. The ability to update and access invoice data and records in near-real time is essential, and the billing system must be configurable to handle a variety of business transactions.

Major system deliverables for the billing module include:
- accurate, error-free invoicing;
- flexibility in defining invoice line items and their attributes;
- capability of using different revenue objects and classes (domestic, international, intercompany, miscellaneous);
- capability of using multiple languages, currencies, and units of measure.

Credit management
The financial health of an organization depends on good credit management. Timeliness and accessibility of financial data from business partners and distributors are required for proper analysis. The impact of credit policies and management on distributors and customers can be significant. For example, orders may be rejected or held, if a customer is denied credit. Various credit terms should be

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available to the organization's customers, based on volume, past payment history, or other strategic factors. Efficient credit analysis tools are important to perform payment history and trend analysis.

Major deliverables for this portion of the system include:
- well-defined credit management requirements;
- the ability to apply multiple credit terms across customers, products, volume levels, etc.;
- availability of both standard credit management reports and *ad hoc* query capability;
- risk analysis capabilities for both existing and prospective customers.

Cash collection and bad debt management
Major goals in managing the revenue stream include efficient and timely collection of cash, minimizing bad debt and collection losses, improving the audit trail, and providing timely account information. The cash collection system should support alternative payments methods such as electronic funds transfer, wire transfer, and lockbox systems as well as traditional check deposit methods. The system should support a high level of automation in collection practices.

Government reporting
Another important consideration in the scope of a revenue stream system project is government reporting. The primary objective is to fulfill administrative and regulatory reporting requirements for governmental agencies and thereby reduce the risk of regulatory fines and penalties. Contemporary revenue systems must support monthly government reporting requirements, even when the organization's reporting periods differ. The chief deliverable from this component of the system is to support government reporting requirements in an accurate and timely fashion.

Finally, the revenue information system must support (or, ideally, seamlessly integrate with) an organization's promotion management, inventory management, forecast analysis, revenue planning, and profit planning information systems. If the organization has geographically dispersed sales operations, the system must permit remote access by field pricing, forecasting, and market analysis personnel for responsive decision making. Field units are accountable for volume, quality, customer service, profit, and spending measures.

Internet-based revenue systems
Security
The ability to conduct e-commerce is becoming increasingly important to a company's business strategy and its ultimate survival in the "new economy." However, the volume of online payments has not grown as rapidly as predicted (Putland *et al.*, 1999). In addition, some industries such as health care continue to operate with archaic billing and payment systems (Schmitz, 1999). Among the unique challenges of developing and maintaining an e-commerce presence on the Internet are the increased risk exposures from allowing outside access to the company's information system (for example, to allow customers to inquire about the status of an order online). The blurring of traditional organizational boundaries requires a revenue system that will support both increased security and increased flexibility.

Security concerns mainly deal with the level of access permitted by customers and other outsiders to the revenue system. Increasingly, current and potential customers are seeking online access to an organization's information system for such purposes as checking availability of merchandise, placing an order, or checking the status of an existing order. For e-commerce to be successful, access must be permitted to internal systems that traditionally have not been available to non-employees.

The balance between access and security requires system designers to make trade-offs. For example, a virtual access point outside the company's firewall makes access simple for casual site browsers (e.g. inventory stock levels), but any information stored outside the firewall is most vulnerable to theft or corruption by hackers. At the other extreme, allowing virtual access to information stored inside the firewall increases security by requiring greater levels of user identification and authentication. However, permitting virtual access by outsiders to information inside the firewall puts data on the company's internal network at greater risk. One solution is to create a "demilitarized zone" (DMZ) between external and internal firewalls. Information stored in the DMZ is easily accessible by outsiders, yet is afforded protection from casual hackers by the external firewall (Boona, 2000). Sensitive or proprietary internal information is stored behind the internal firewall.

Web site design issues
In addition to security concerns, e-commerce raises issues involving the Web site's design

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and how the site interfaces with the internal revenue information system. Care must be taken, for example, to ensure that revenue process business rules are properly embedded into the Web software. Other issues include how to integrate Web-based revenue transactions into the revenue process workflow and ensure an adequate audit trail for "paperless" transactions that are initiated and completed entirely online. Organizations that have re-engineered their revenue processes should generally have an easier time integrating e-commerce revenue transactions than organizations that still emphasize functional divisions in workflow and a traditional paper-based transaction process (Yang and Papazoglou, 2000).

Electronic payments

An increasingly important consideration in planning revenue stream projects for many companies is the ability to accept electronic payments over the Internet. Jupiter Communications, Inc. estimates that by 2002 more than 15 million US households will have their monthly bills delivered online (Sturdevant, 1999). Companies will be able to improve cash flow by ensuring prompt payments, in addition to reducing costs associated with generating, mailing, and processing paper bills. A successful system of electronic payments must guarantee authenticity of transmitted information and the atomicity requirements of a transaction (Garceau *et al.*, 1998).

Electronic payment systems encompass a wide variety of technology products, ranging from simple pre-payment systems for phone cards and mobile phones to complex mainstream firm models of traditional billing systems. The absence of a global standard for the settlement of e-commerce transactions is a complicating factor. However, the variety of payment methods needed to support new business models is increasing.

Requirements for online receipt processes will vary depending on the monetary amount of the transaction and how an individual transaction fits within the overall receipt process. The complete sales/receipt process typically includes the following components:
- *Order entry*. The customer uses a Web form or catalog system to purchase items directly.
- *Pricing*. Generally, there is a direct relationship between goods/services and prices. However, complications arise in situations where there are usage-based or recurring charges.
- *Discounts and taxes*. Companies with a larger number or a greater variety of customers generally require more complex receipt systems. In addition, the current lack of consensus over how Internet sales should be taxed adds considerable uncertainty to the planning process.
- *Invoicing*. Electronic invoices are usually provided via either e-mail or online view.
- *Collections*. Collection is made following confirmation and authorization by the customer's financial service provider.

Business-to-consumer (B2C) models

Separate consideration of B2C and business-to-business (B2B) e-commerce is necessary because of several significant structural and economic differences between these two transaction types (Putland *et al.*, 1999). In designing a revenue system, B2C receipts should be segregated into low- and high-value transactions. Receipts from low-value transactions can be processed in the same manner as receipts from traditional sales and thus do not require significant computer resources, an elaborate electronic audit trail, or a separate customer support system. Low-value systems often combine many small purchases into one payment.

Low-value B2C payments may involve a "software wallet," which is essentially an electronic "smart card." Purchasers download software that is programmed with the user's account details, including the original value of the wallet and details of subsequent transactions. One type of "wallet" uses encryption technology to protect the account information, which is stored on the user's local computer. Transmitted information is also encrypted. A second type uses secure host servers to maintain and protect account details. A user can access the wallet server from any client connected to the Internet. A revenue system should be able to accommodate either type of wallet software.

High-value B2C transactions typically involve credit or debit cards. Internet technology has progressed in three areas for credit card transactions: payment application program interfaces (APIs), secure electronic transaction protocols (SET), and user wallets. Most online software providers now include a choice of payment APIs to improve integration with other system software and to simplify processing of credit card orders. The use of SET is not proceeding as quickly as expected because of delays in establishing uniform specifications, high cost, and lack of progress in establishing a viable public-key infrastructure (PKI) (Andress, 2000). Finally, user wallets are being incorporated into standard desktop

components (e.g. Microsoft) and merchants are able to more easily accept these transactions with improved functionality.

B2B

B2B e-commerce transactions have different characteristics from B2C transactions (Putland *et al.*, 1999). For example, in a B2C transaction, the consumer generally pays immediately (at the point of order), while most B2B transactions involve payment upon receipt of goods/services by the customer. In addition, commercial organizations typically have formalized approval processes for payments. The impact on revenue system planning is that, for B2B transactions, there needs to be integration between the payment event and the accounting and invoicing software, instead of merely automating the payment method.

Business on the Internet is currently moving into a new and more advanced phase, business-to-business integration (B2Bi) (ObjectSpace, Inc., 2000). In this form of e-commerce, isolated systems and applications must be integrated with strategic partners and customers. The value chain is no longer confined to internal processes, programs, and data repositories. Instead, these components interoperate with other such systems that support the links in the supply chain (Yang and Papazoglou, 2000). Organizations are also using XBRL (eXtensible Business Reporting Language, a form of XML) coupled with business process or transaction abstraction and advanced security systems to provide a framework for business data exchange to overcome differences in system architecture and hold down costs (ObjectSpace, Inc., 2000).

Payment protocols and multi-currency capabilities

At present, network protocols governing electronic trading and payment are not standardized. There are numerous proprietary solutions serving a fragmented market. However, several industry groups, including the World Wide Web Consortium (W3C), the Internet Engineering Task Force, and the Open Financial Exchange (OFX), are working toward specification protocols. The efforts of these groups should serve to standardize the technology and facilitate sale transactions for buyers and sellers.

Multi-currency capability is very important for any business wishing to transact on the Internet. Unfortunately, most US-based payment system providers have developed solutions based solely on dollar-denominated transactions. However, several European companies such as KLELine and

Worldpay currently provide multi-currency support, including real-time exchange rate information (Putland *et al.*, 1999).

Guaranteeing payment

Another important concern of enterprises involved in e-commerce is the ability to verify the authenticity of transactions and guarantee payment. Several companies are selling software and systems to alleviate this concern (Banham, 2000). Examples of these companies include TradeCard, Inc., eCharge Corp., and AlphaTrust.com.

TradeCard, Inc., based in New York, acts as a transaction settlement company. Buyers create electronic purchase orders that are validated and encrypted. If a seller agrees to the terms of the order, the TradeCard system approves the transaction and generates an electronic invoice. After delivery and inspection are authenticated, the seller receives payment assurance.

eCharge Corp. makes it possible for customers to have Internet purchases billed to payment systems other than credit cards, e.g. a utility or telephone bill. eCharge is able to accomplish this through partnerships with the billing companies. Thus, if an electronic transaction is paid for through the customer's telecommunications company account, then the charge is reflected as a call to a 1-900 number to the vendor. The vendor pays a nominal amount to eCharge that is shared with the billing company.

Finally, AlphaTrust.com enables e-mailed documents to have the same legal authority as ink-and-paper documents. Electronic documents shared between parties that are members of AlphaTrust are encrypted and known to be authorized and legal. Confirmations and acknowledgements are exchanged and payment is released.

The recent passage of digital signature legislation in the USA is expected to expand the market for these products and similar digital authentication and non-repudiation systems significantly. Products such as Entrust/TruePass provide for digital signatures and receipts, in addition to better authentication than is normally possible in Web-based transactions (Rapoza, 2000). The evolution of standards to support online billing systems such as OFX (Open Financial Exchange) and IOTP (Internet Open Trading Protocol) should lead to a rapid increase in consumer acceptance of e-commerce as a mainstream business tool (Putland *et al.*, 1999).

Critical success factors

The revenue stream process supports the direct functions of supplying and selling products. Effective strategic management

requires that accurate, reliable and timely information is available to support individual and business requirements. Management should evaluate revenue stream software on its ability to achieve a number of critical success factors (CSF). Each CSF should have a defined outcome and be measurable.

Revenue stream systems should be integrated in a single, non-redundant data repository. An integrated computing environment permits employees and management to easily share data applications and technologies in the most efficient manner. One of the major benefits of an integrated system is that all data are updated only once, are stored in one place, and provide a single source for reports. Legacy systems transfer data between files and report contents may differ depending on which system was accessed. Multiple input sources lessen the likelihood that all duplicated fields are updated identically. Validation exercises are performed to ensure balanced totals; however, non-numeric fields are not validated for appropriate content. Maintaining multiple systems and interfaces is expensive and duplication is extensive.

With an integrated system, data duplication is eliminated, all reports reflect identical content, data fields are standardized, data integrity problems are eliminated and system maintenance is reduced. The successful system will have reduced maintenance time and cost and non-value added data validation exercises are eliminated.

The new system should exhibit improved flexibility and user-friendliness over legacy systems. Flexible systems permit changes to be made at the user level via table updates. Table updates are governed by control parameters, so that all data updates comply with database integrity rules as well as approved business practices. Validation rules also limit system access. In an integrated system, validation of data occurs at the time of entry, eliminating the need for costly *ex post* data validation routines. Simultaneous data validation will reduce the amount of back end edits and corrections. *Ad hoc* reporting modules using structured query language (SQL)-based interfaces allow users to specify reporting enhancements rather than be forced to rely on "canned" or pre-formatted reports.

A cautionary note

While the promise and potential of e-business are great, it is critical that management

perform a realistic needs and skills assessment before undertaking a major redesign of the revenue process to support e-commerce transactions. Successful integration of "clicks and bricks" will require that management take a critical look at the following factors:
* *Technology requirements.* A thorough review of existing and planned additions to hardware and software is necessary. Of particular concern is how the Web-based hardware and software integrate with the back-office accounting system, and whether the overall system capacity is sufficient to meet anticipated customer demand and Web site traffic.
* *Staffing.* Increases in customer traffic will bring increased requests for customer assistance with technology issues. At the same time, the increased complexity and sophistication of an integrated revenue stream information system will undoubtedly increase internal help desk traffic. Assuming that the current shortage of technological-savvy finance and accounting professionals is likely to continue into the foreseeable future, adequate staffing of the e-business revenue function may be the largest single impediment to the rapid growth of an Internet sales presence for many firms.
* *Integration with existing business processes and corporate culture.* One of the major reasons cited for most implementation failures of integrated information processes such as ERPs is management's failure to recognize and anticipate the impact of reengineering business processes on the organization as a whole. Proper coordination of new system roll-out, continuous communication with those affected by the change-over, and lengthy and intensive training of personnel will be necessary for success. In particular, communicating to affected employees that the ability to access relevant information on demand is empowering, rather than threatening, is a key factor (West and Shields, 1998).

Other common mistakes in integrated systems implementation include early cut-over to the new system without adequate testing and incomplete back-ups of critical data prior to cut-over.

Conclusion

Integrated revenue systems are vital to a successful e-business presence. In addition to the power and flexibility they offer to internal information customers, integrated

revenue systems can create value for the organization by building and maintaining customer loyalty, particularly in the hotly-competitive B2C sector. Successful e-commerce enterprises must have a deep understanding of their customer base and the factors that drive customer satisfaction. Integrated revenue systems are a powerful tool for gathering customer data. For example, integrated systems can "learn" customer preferences through mapping of previous online purchase data into an online analytical processing (OLAP) model. The resulting customer profiles can be used to suggest additional purchases or to display information about related products. The model is continuously updated with new customer and revenue data.

The ability to leverage knowledge about customers to create sustainable and profitable relationships, coupled with an intuitive and easy-to-use ordering and payment system, will be central to the emergence of world-class organizations in e-commerce. Companies that encourage and support the "virtual customer" will build market share at a fraction of the cost of the traditional "bricks and mortar" selling model.

Implementing an integrated revenue system is both a risky and a costly venture. However, with careful planning, proper involvement of all stakeholders, the proper level of reliance on consultants, and adequate oversight by IS and strategic management, the implementation can be a success. The potential for such a system to improve business processes, cut costs, and increase customer satisfaction is immense. Finally, because e-business is rapidly evolving from an option to a necessity for most businesses, an integrated revenue system that both supports and fosters e-commerce is the centerpiece for a successful business plan.

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