

## Credit Card Transaction Processing for the Internet Total Cost of Ownership Study

### Executive Summary

Essentially all organizations doing business on the Internet are required to provide some method for accepting and processing credit cards for payment. Since the processing of credit card transactions is usually independent of the type of e-commerce exchange there are multiple options for processing credit card payments on the Internet. This study analyzes the cost of implementation and ownership for CyberSource Credit Card Services, an outsourced credit card transaction processing solution, and compares it with other options for self-managed, in-house credit card transaction applications.

The factors to consider in making a decision between outsourced and self-managed solutions are both qualitative and quantitative. Outsourced solutions deliver quick deployment, scalability, performance, an extensive reliability infrastructure for access and fail over, and lower startup and transaction costs. Self-managed solutions provide the benefits of local control and more flexibility for development of custom applications and reporting.

An accurate cost comparison of outsourced versus self-managed solutions is dependent on many variables. These variables include the type of e-commerce application the payment system is implemented with, the cost of development, hardware and software

costs, the number of transactions and the projected transaction growth rate.

In most cases, the following criteria dictate an outsourced solution such as CyberSource: quick deployment needed, limited development resources available, high scalability required, additional features required (fraud protection, fulfillment management, digital delivery, etc.), transaction volumes that are low, medium, and high-burst, low startup costs required, and the need for accurate, per-transaction costing. The conditions that prescribe a self-managed solution are high, non-bursting transaction volume, accurate long-term growth projections, and environments with ample in-house hardware, software, development, and support resources.

E-commerce transaction solutions fall loosely into two categories with the following characteristics. A 'low-end' solution is generally Microsoft NT based, built using standard storefront software and PC based hardware, and averages 1000-5000 transactions per month. A 'high-end' solution is generally custom developed, based on UNIX with Sun hardware, and can exceed 100,000 transactions per month. Taking all implementation and ownership factors into consideration, sample 'low-end' and 'high-end' environments can expect the following average per transaction costs and two year accumulated costs.

		Average Cost Per Transaction	Total 1 <sup>st</sup> & 2 <sup>nd</sup> Year Costs
<b>Low-end</b>	CyberSource	\$.258	\$33,000
	Self-Managed	\$1.275	\$113,000
<b>High-end</b>	CyberSource	\$.160	\$175,000
	Self-Managed	\$.589	\$389,000

Other, more detailed cost of implementation and ownership comparisons are included at the end of this report.

## Credit Card Transaction Processing Overview

E-commerce, as has been amply predicted, is growing at unprecedented rates. More than \$13 billion was spent on the Internet in 1998, and online commerce should reach \$17 billion in 2001, according to Forrester Research. The Boston Consulting Group predicts the value of sales made online by retailers to rise 150% over last year. CDB Research & Consulting said it found nearly one out of every three (31 percent) Internet users is making online purchases. A Harris Interactive survey estimates \$9.5 billion in online sales for the 1999 holiday season.

Since a large portion of e-commerce will consist of credit card purchases, it is important for businesses and organizations that rely on income from e-commerce to understand the options available and the costs associated with credit card transaction processing on the Internet. There are two general options for credit card transaction processing: *outsourced* and *self-managed*.

With an outsourced solution such as CyberSource, the merchant transmits payment information from their Web site to the payment service provider. After purchase and credit card information is collected from customers, it is communicated to the payment service provider where connections are made to credit card processors for authorization and/or settlement. The hardware infrastructure, the software applications, the interface with the processor, etc. are all managed by the service provider and are transparent to the merchant.

With a self-managed credit card payment solution, the merchant or e-commerce organization implements and manages the hardware, software, and bank connections in-house. This usually involves design, development, and implementation cycles and then ongoing maintenance and management.

E-commerce implementations can range from very inexpensive and simple to very expensive and complex. Our research found e-commerce implementations are grouped loosely in two categories: *'low-end'* and *'high-end'*. A *'low-end'* implementation is generally Microsoft NT based and uses off-the-shelf hardware and software solutions. Standard storefront or merchant software is used with common solutions such as Microsoft Site Server Commerce Edition, INTERSHOP, iCat, Internet Factory, Mercantec, etc.. Credit card transaction processing for both outsourced and self-managed e-commerce solutions is usually implemented through a component plug-in (i.e. ActiveX or COM objects). Many component solutions are pre-configured or pre-tested and do not require extensive design or development cycles. Typical transaction loads for *'low-end'* environments are light with less than 5,000 transactions per month.

A *'high-end'* implementation generally accommodates a much larger transaction volume (15,000 to 100,000+ transactions per month). The e-commerce solution is customized and provides a high degree of flexibility but also requires a high level of expertise and ongoing support and maintenance. Hardware and software requirements are more substantial with Unix based applications running on medium to high-end Sun hardware. The integration of a *'high-end'* outsourced or self-managed credit card transaction processing solution requires skilled development talent and the ability to write to custom application programming interfaces (APIs).

Determining which type of credit card transaction processing system to implement requires assessing your current and future e-commerce needs, analyzing the qualitative factors that can effect your ability to do business, and then quantifying the costs associated with each option.

## Factors to Consider

### Qualitative Factors

The following qualitative factors should be considered when making an outsource versus self-managed decision for credit card transaction processing. The weighting applied to these factors depends on your specific environment, implementation resources, transaction volume and growth projections.

#### **Security**

Several aspects of security should be considered. The primary concern of new Internet merchants (and customers) is the security of credit card information that is transmitted from customer to merchant to the credit card processor or acquiring bank. Two common standards have emerged, SSL and SET. SSL (secure sockets layer) provides encryption of the data channel as information is passed between two transmission points. It is the most common form of Internet data security and is adequate for credit card transactions. SET (secure electronic transaction) is more involved with special client software that ensures a three way secure communication between customer, merchant and bank. SET is not widely in use and adoption has been slow. Most credit card transaction processing solutions use SSL and some of them support SET; CyberSource supports both SSL and SET.

Another security factor to consider is physical access to the payment processing hardware and software. In many cases, a payment server is placed in a regular Web server environment where access can be gained by anyone in the company. Restricted physical access should be part of any self-managed design. CyberSource processing servers are placed in a 24x7 guarded facility with restricted access and constant surveillance.

#### **Scalability**

One of the most difficult factors to predict with e-commerce systems is projected growth. The number of initial transactions

and the growth rate at which those transactions increase will dictate the degree of scalability required. Using vendor figures for total transactions possible in a given timeframe is risky at best. Although a system may claim 2,500 transactions per hour, that realistically only equates to one transaction every 1.5 seconds. High transaction volume bursts require that a distributed system be able to offload all or part of an authorization or settlement. The ability to incrementally add additional servers or components to accommodate high transaction bursts or heavy sustained growth is a key factor to consider.

CyberSource has developed proprietary technology that is accommodating the growth of some of the Internet's fastest growing e-commerce sites. The distributed and modular nature of the CyberSource infrastructure provides solutions for high growth merchants without the need to replace or invasively add additional capacity.

#### **Fraud Detection**

Credit card fraud can be a major problem for Internet merchants. In the event of a fraudulent credit card purchase, the merchant is responsible for refunding the entire value of the purchase to the card association or card purchaser. While some self-managed credit card payment solutions have fraud detection, most do not. Most self-managed fraud detection mechanisms consist of a simple address verification service (AVS) where the city or street address obtained from the customer is verified against the billing address of the credit card number. If the AVS check is positive but the credit card was fraudulently obtained, the merchant is still liable for the chargeback. Fraud detection and prevention above and beyond AVS is critical.

CyberSource Internet Fraud Screen provides an extensive array of fraud detection mechanisms and uses artificial intelligence algorithms specifically designed to evaluate the characteristics of a particular Internet transaction. Internet Fraud Screen uses

variables supplied by the customer, as well as attributes unique to the Internet, and an Internet-specific transaction history database comprised of millions of Internet transactions since 1995. Fraud can be limited to less than 1%.

### **Reliability**

Reliability is a function of several factors including single point of failure, stability of hardware, and stability of software. With many self-managed solutions the payment server resides on a single machine with no fail-over capability. While it is possible to implement a fail-over system, many merchants choose not to because of the additional cost. With 'low-end' solutions, the stability of the system is dependent on the quality of the hardware. NT, while stable with some self-managed solutions, often becomes unstable under increased loads. 'High-end' solutions are often more stable but again at a higher cost. Software that is newly released or untested under real world, high load situations can also be unpredictable.

CyberSource has a historically proven system that also is supported with full fail-over capability. Due to the volume of transactions and the size of the CyberSource infrastructure, there are multiple connections with credit card processors and banking networks, and multiple points of access throughout the Internet. Transactions can be rerouted even in the event of ISP or telco failures.

### **Speed of Deployment**

Implementing a credit card transaction processing system can take from one day up to six months. Factors that determine the time required to deploy include hardware and software setup, storefront integration, bank network connections, and database and report development. Using commercial, off-the-shelf, NT-based e-commerce solutions definitely reduces the amount of time required for deployment. Plug-in components are much quicker to integrate than writing to APIs.

The quickest outsourced solution from CyberSource would use a standard component plug-in (NT Site Server for example) and would require only integration with the storefront server. No additional hardware, software or bank connection setup is required. Implementation times range from a few hours with an NT-based solution to a few days with Unix.

### **Optimal Use of Internal Resources**

The size and quality of internal development staff are important factors to consider. Many smaller companies are stretched for Web development resources that can integrate, administer and support a self-managed system. Larger companies with adequate staff may be able to assume these responsibilities. If in-house resources are available, the determining criteria should be consideration of opportunity costs; would these resources be better utilized on other projects such as improving Web site interaction or innovations that pull more customers to a Web site?

### **Control**

The primary advantage of a self-managed system is control. Integration with applications can be modified, reporting can be altered, databases can be augmented to include additional information, etc. CyberSource still provides a significant level of control. Merchants have the option to modify interfaces, establish rules and parameters for processing transactions, and integrate with their other back-office applications.

### **Support and Maintenance**

With self-managed solutions, the first line of support is the merchant's IT department. Vendor support is usually obtainable at additional cost. 24x7 support is usually available at additional cost. Access to new versions and upgrades are optionally available from most vendors, again at additional cost. Cost considerations need to be made for upgrading, installing new versions, testing, and cutting over to the new system with self-managed solutions.

CyberSource provides two levels of merchant support for a monthly fee which provide customers with continuously upgraded and enhanced services. Software and service upgrades are tested and implemented by CyberSource at CyberSource data centers so there is no need for modifications at the merchant site or any merchant intervention.

### ***Anticipated Life Cycle***

Research for this study pointed out that e-commerce solutions are rarely static once implemented due to new innovations and the evolving nature of Web technology. The expected average life cycle of a self-managed system is approximately two years. (Some customers we interviewed were upgrading or changing solutions after only one year.) The useful life of a system directly affects the overall cost. If you anticipate an evolving system or significant changes an outsourced service would be the preferred option, at least until your e-commerce solution is relatively complete and variables such as transaction volume and growth rates have stabilized.

## **Quantitative Factors**

Several decision factors are definable and measurable including features lists, performance, and cost.

### ***Features***

There is a significant difference in the number of features that are available from various self-managed vendors. Consider which of the following features you may or may not need.

**Payment Services** - This includes pre-authorization, authorization, credits, reversals, and settlements. Also consider the desirability of real-time verses off-line authorization.

**Fraud Detection** - Fraud prevention includes address verification, fraud pattern matching, database checking, and artificial intelligence algorithms.

**Electronic Software Download** - This includes the ability to order, authorize purchases, and deliver digital goods. CyberSource has expanded the definition of ESD to include delivery of all types of digital content including music, images, documents, video, and software.

**Shipping** - With many e-commerce transactions there is a requirement for correlation between the payment and the shipping of the goods purchased which includes shipping address verification.

**Tax** - Calculating sales, state, and local taxes is an integral part of many transactions. A solution that provides this tax calculation as part of the transaction process can be very beneficial.

**Export Policy Compliance** - US government restrictions on exporting can be enforced automatically through physical address, Internet address, and policy compliance checking. Integrating this capability with payment transactions can streamline the process.

**Fulfillment Messaging** - Notifying merchants and customers of the status of transactions is a valuable feature in maintaining and enhancing levels of customer service.

**Currency Conversion** - A large number of Internet e-commerce transactions are international. The ability to calculate and settle transactions in foreign currency without additional steps also streamlines the payment process.

**Marketing Promotion** - A few transaction options allow the ability to include marketing screens or promotion images as part of digital downloads. These options can increase product awareness and generate incremental sales.

When evaluating these features for a payment transaction system, it is important to consider how easy it is to incrementally add additional features. CyberSource allows you to select any or all of the features listed

above and only pay for those that you use. Access to these services is through a single API so there is minimal effort to add additional features or services.

### **Performance**

As has been indicated, measuring performance of credit card transaction processes can be difficult but there are factors that can significantly affect transaction speed.

With most self-managed systems, there is a connection from the payment system to the bank or processor network. This connection can be through a dial-up line, a dedicated line, or in some cases through an Internet IP connection. The bottleneck in most self-managed solutions is this bank connection. Dial-up links require that a phone connection to be established before the transaction can be completed. ISDN or dedicated lines speed the process to a point that is adequate for most merchants. New services are being offered with direct Internet connections to a limited number of banks or processors.

CyberSource is directly connected to all major credit card processors and most major banks. This facilitates faster transaction processing by 1-2 seconds and puts the average time required for a complete transaction at 2-6 seconds.

Performance is also affected by the speed and memory of the payment server processor, the efficiency of the integration between the storefront and the payment system, and the performance of the transaction database. Fast hardware and optimized databases can affect payment processing performance but not significantly.

### **Cost**

Costs for a credit card processing system can vary dramatically depending on the vendor selected, volume of transactions, integration times, development requirements, and ongoing maintenance and support costs. For a breakdown of manageable costs see the next section.

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## **Cost of Ownership**

### **Self-Managed Costs**

For this study, 'low-end' and 'high-end' offerings from major self-managed vendors were analyzed and average costs were calculated for each. 'Low-end' and 'high-end' options were also analyzed for CyberSource. When analyzing costs for self-managed solutions the following categories need to be considered:

**Integration** - This includes integration of a payment system with an organization's storefront or e-commerce solution. For 'low-end' installations, this usually requires implementing an ActiveX control or COM object into a standard storefront like Microsoft Site Server Commerce Edition or

INTERSHOP. Development skills required are C programming, HTML, and CGI or PERL. Average time to implement is approximately two weeks. For 'high-end' installations this process is usually much more involved and can take three to six months. Skills required include programming and database configuration. Some vendors recommend training courses for implementation; these courses are three to five days and cost around \$2000.

**License Fees** - Self-managed solutions are sold with a one-time license fee and an optional maintenance and support fee. In most cases, the license fee is not based on the volume of transactions and Unix based solutions tend to have higher license fees.

Prices for a credit card transaction processing applications vary dramatically and run from \$1000 to \$125,000. There are also license fees required for an operating system such as NT or Solaris, and a database such as Oracle, SQL Server or Sybase.

**Hardware Costs** - Although self-managed vendors claim that the software payment sever can run on the same hardware as the storefront or Web server, most customers opt to run it on a separate machine. The database may or may not run on a separate hardware server. The reasons for separate servers are better stability and the desire to keep the payment server behind a firewall. Hardware costs again can vary by platform with a fully configured NT server starting at \$12,000 to a Sun system at \$50,000 or more. Line connection hardware consists of a modem or in most cases an ISDN router. Routers run from \$600-\$1500. If any type of backup or fail-over system is implemented, these costs can actually double.

**Line Connection Costs** - Merchants must implement a communications gateway using a protocol specified by the merchant bank. Setup procedures and costs vary from bank to bank. Changing banks can require new gateway setup and connection costs. Additionally, physical connections to the processor are established via ISDN lines. Monthly costs range from \$60 to \$180 depending on location.

**Administration and Management** - Depending on the solution selected, there may be ongoing maintenance and administration costs. Backups, upgrades, database optimization, etc. require in-house resources. In some 'low-end' cases this can be a minimal requirement of a few hours per month. In 'high-end' cases this can require full-time, dedicated administration and database development resources.

## **CyberSource Costs**

The cost of outsourcing credit card transactions with CyberSource can be significantly less than self-managed solutions in most situations. Initial integration is still required but there are no hardware costs, license fees, investments in a gateway and line connections, or ongoing administration requirements. CyberSource requires a minimum setup and support fee and then charges for each transaction.

**Integration** - When implementing CyberSource with merchant software or a storefront there are the same basic options as with a self-managed solution. CyberSource has developed plug-in components that work with all of the major storefront packages and implementing one of these can take as little as a few hours. At the high-end, applications are written to the CyberSource open API. This process is more extensive and depends on the complexity of your e-commerce application. CyberSource has two, prepackaged integration support options which are usually adequate when implementing CyberSource services. These run from \$4,495 to \$9,995.

**Setup Costs** - There is a one-time merchant registration setup fee. The cost of this registration fee depends on the number of services selected but for basic credit card transaction processing the fee is \$495.

**Support** - Standard support is included with a minimum transaction fee of \$95 per month. A premium support package (providing 24x7 support and higher service level commitments) is available at \$495 per month.

**Transaction Fees** - CyberSource charges a per transaction fee that is graduated depending on the number of transactions per month. For credit card authorization and settlement these charges start at \$.17 per transaction and can go as low as \$.094.

## Cost Comparisons: CyberSource vs. Self Managed

The following charts compare cost of implementation and ownership of self-managed and CyberSource for both 'low-end' and 'high-end' solutions. Information on implementation and cost of ownership was obtained from interviews with customers who have implemented credit card payment systems and integrators who specialize in Internet e-commerce solutions. Cost of ownership averages were based on implementations of the following products: CyberSource, Open Market Transact, PaylinX Payment Server, Clear Commerce Merchant Engine, CyberCash NetVerify, and VeriFone vPOS.

The costs in each chart are based on the following assumptions:

CyberSource 'low-end'	NT based, plug-in storefront component, minimum support, 2000 transactions per month, 10% per month transaction growth rate
Self Managed 'low-end'	NT based OS, database, standard storefront, dedicated connection, PC based hardware, average in-house support, 2000 transactions per month, 10% per month transaction growth rate
CyberSource 'high-end'	NT or Unix based, Rapid Start Premier implementation, Premier Support, 15,000 transactions per month, 10% per month transaction growth rate
Self Managed 'high-end'	Unix based, custom merchant/database integration, dedicated in-house support, 15,000 transactions per month, 10% per month transaction growth rate

(Hardware and software costs are amortized over two years.)

The first two charts illustrate the **cost of ownership** over a two year period of low-end and high-end implementations for both self managed and CyberSource solutions. The next two charts illustrate the **cost per transaction** for each option over a 12 month period with a monthly growth rate of 10%; again, hardware and software is depreciated over two years. The third set of charts show the **total accumulated costs** for each solution for the first two years.

## TCO Low-end (2 year life cycle) Transaction Costs

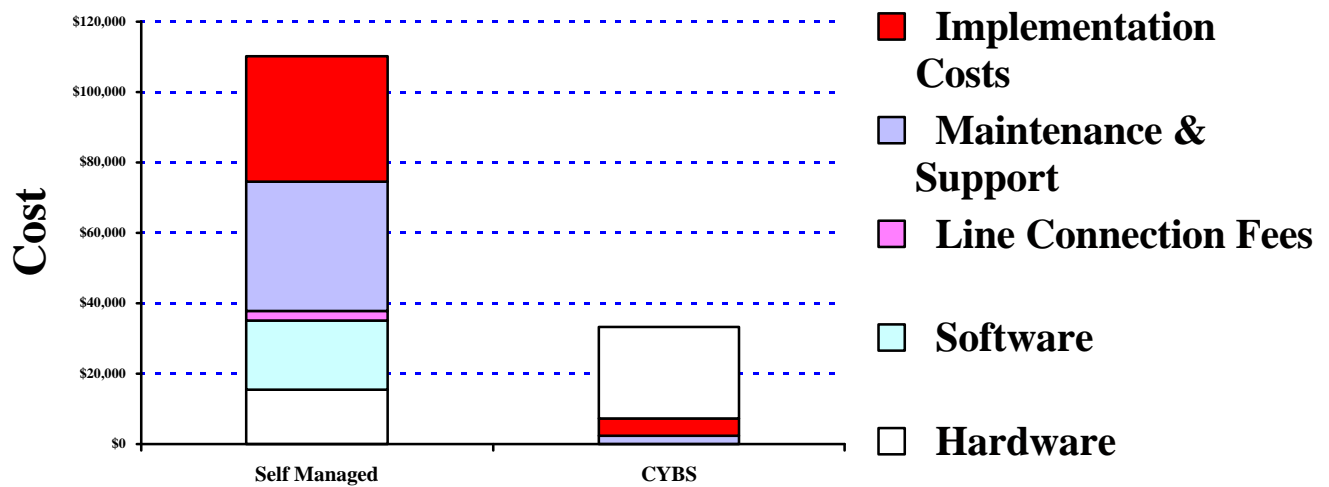


Chart 1: Total cost of ownership for 'low-end' solutions

## TCO High-end (2 year life cycle) Transaction Costs

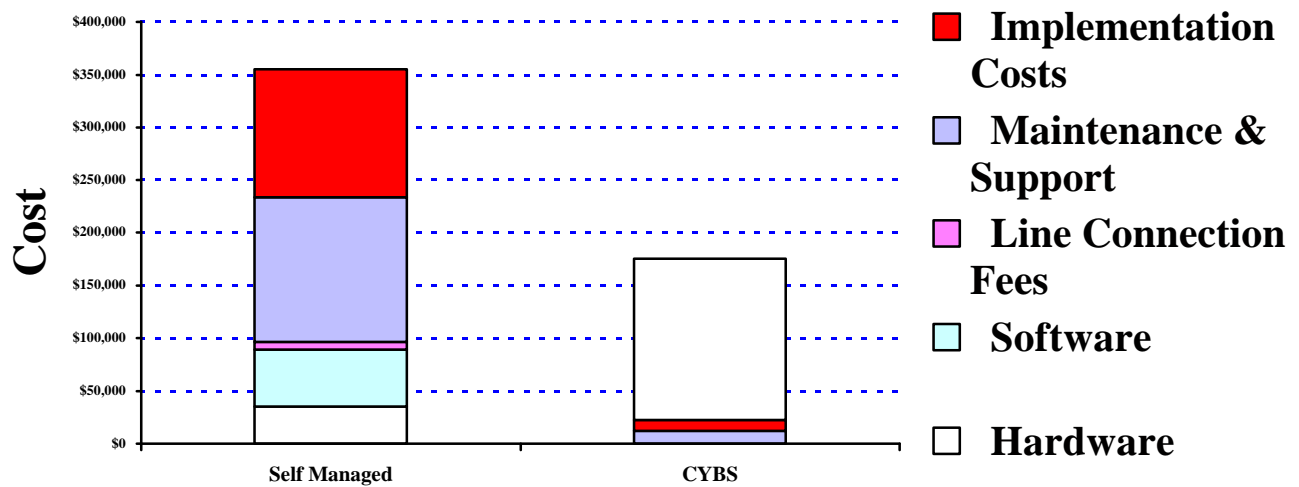


Chart 2: Total cost of ownership for 'high-end' solutions

## Cost per Transaction

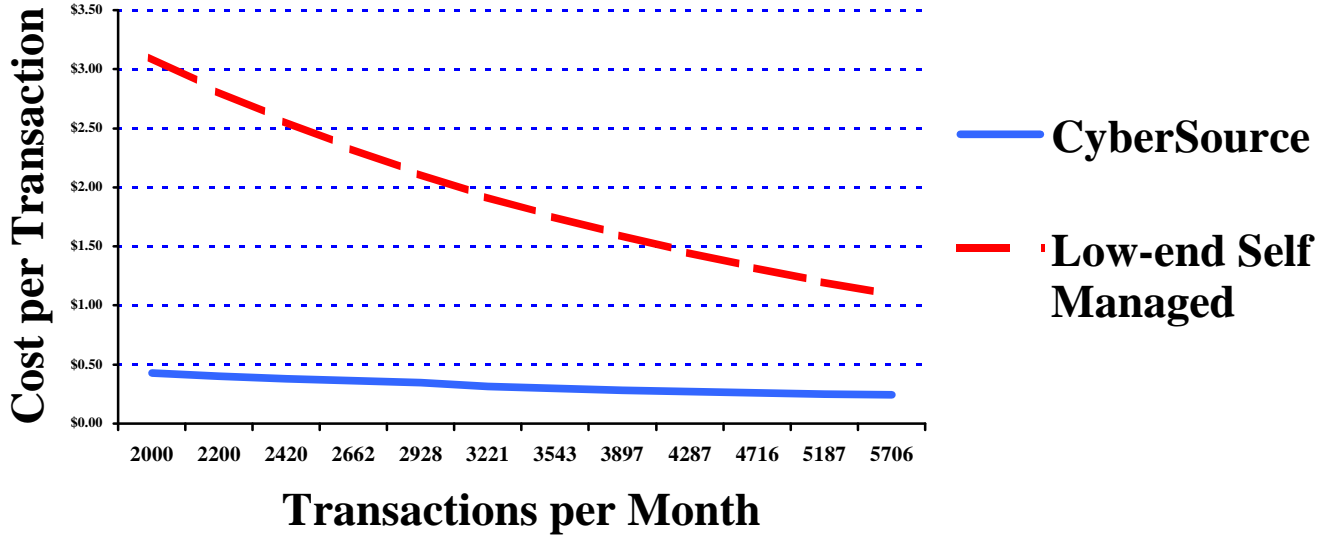


Chart 3: Cost per transaction for 'low-end' solutions

## Cost per Transaction

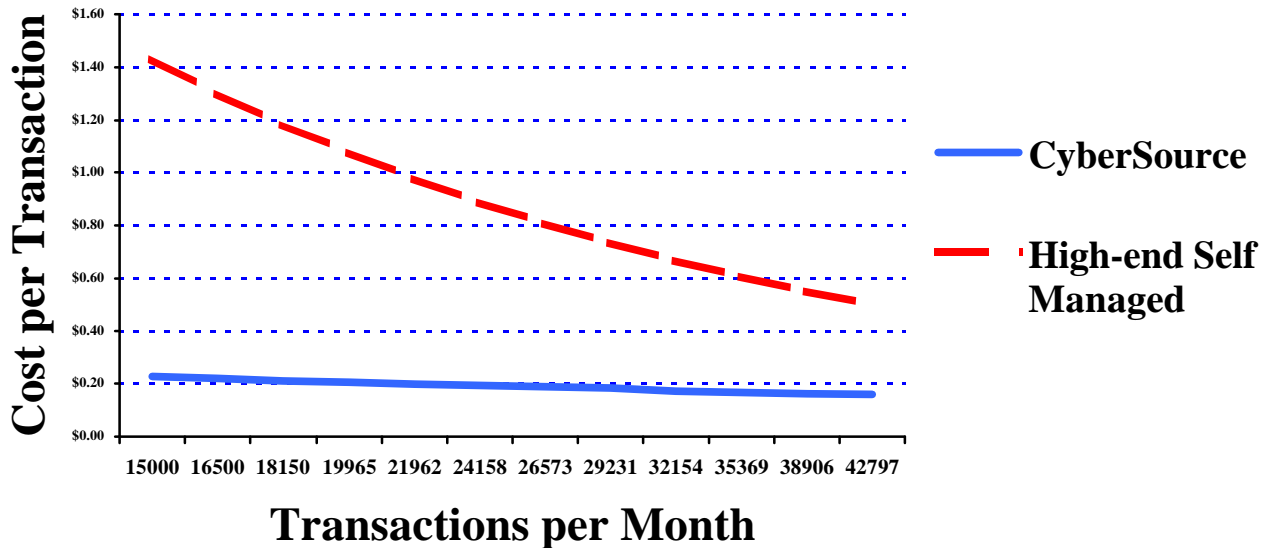


Chart 4: Cost per transaction for 'high-end' solutions

## Accumulated Total Cost

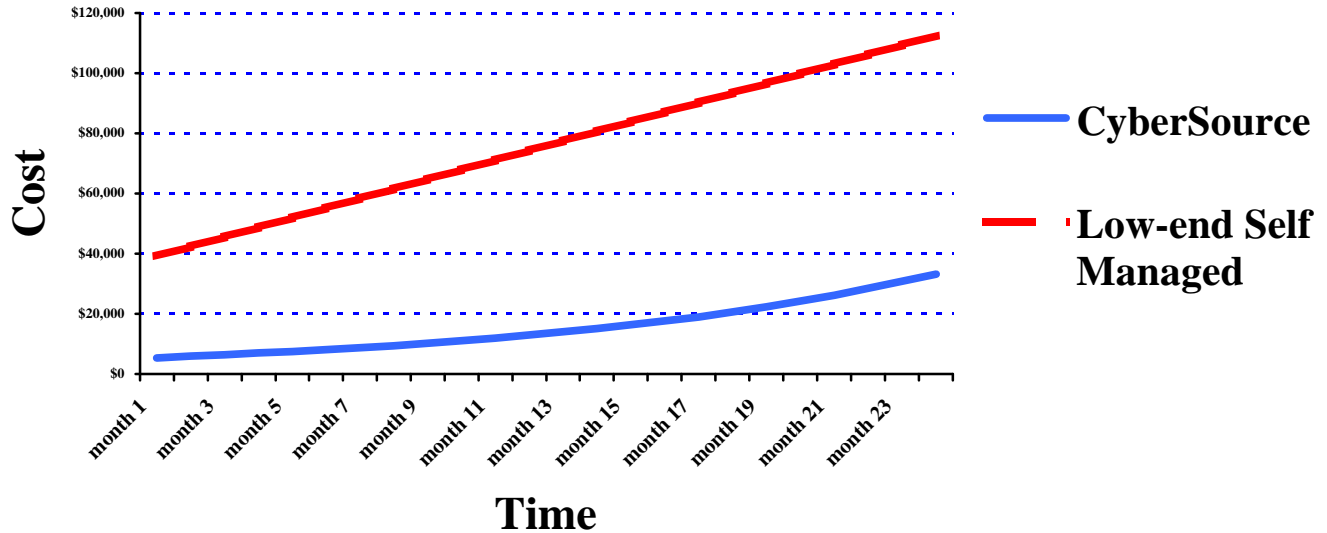


Chart 5: Accumulated total costs for 'low-end' solutions

## Accumulated Total Cost

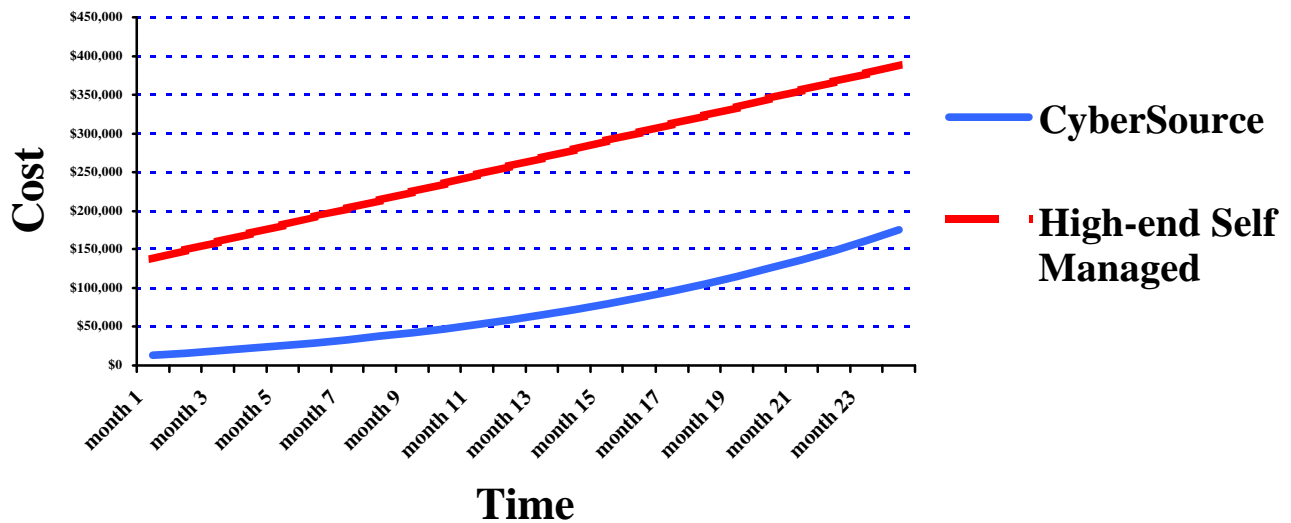


Chart 6: Accumulated total cost for 'high-end' solutions

## Summary

We recommend that organizations implementing credit card payment systems consider each of the qualitative and quantitative factors mentioned above and evaluate them in light of their particular needs and environment. Our general conclusions are that if an organization is implementing an NT-based e-commerce solution and anticipates an initial transaction volume of 5000 transactions per month or less and a growth rate of 15% per month or less with an average life cycle of two years, CyberSource is the best low cost solution. The lower the number of transactions (or growth) below these minimums, the more cost effective CyberSource becomes.

If an organization's e-commerce environment is 'high-end', Unix based and custom developed, with an initial transaction rate of 20,000 transactions per month or less and a growth rate of 15% per month or less, and an average life cycle of two years, CyberSource is also the least cost solution.

Self managed solutions in both low- and high-end environments become cost effective at high transaction volumes over long life cycles. However, several factors should be considered in addition to cost of implementation and ownership. In the event of downtime (due to system failure, lack of scalability, or maintenance and upgrade shutdowns) there are opportunity costs and/or redundant system costs. Opportunity costs are the result of lost sales and customer dissatisfaction when a system is slow or not accessible. Redundant system costs include the cost for additional fail-over hardware, software, and 24x7 monitoring staff. A complete fail-over system can significantly increase the cost of ownership.

Another cost consideration is the price or effort required to later include additional services. Adding shipping or tax calculation capabilities to a self-managed system may require extensive development, testing, and downtime for integration. There is wide variation between self-managed vendors as to feature sets, hardware requirements, license fees and support costs so a detailed comparison between specific potential vendors should be considered before purchase.

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