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# **Second Generation of Electronic Commerce**

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A WHITE PAPER



By  
**Zona Research, Inc.**  
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## SECOND GENERATION OF ELECTRONIC COMMERCE

*Abstract: The art of creating electronic commerce implementations using Web technology has undergone a generational evolution. This generational change is driving down the overall cost of bringing a company into online commerce, resulting in the broadening of electronic commerce opportunities into the medium and smaller company strata. The change is coming about primarily from the solidification of what was once totally-custom software into reusable modules and templates that can be tailored, rather than re-invented, for subsequent users. Among the major ecommerce toolkits now being offered to provide this functionality are IBM's Net.Commerce, Microsoft's Site Server Commerce Edition, and Oracle's Internet Commerce Server. While the cost of these packages is dwarfed by the cost of the custom systems integration necessary to implement ecommerce solutions, the net effect of this software is to dramatically reduce the time required to create a custom ecommerce site, with a proportionate reduction in the overall cost of getting into ecommerce. This paper postulates what an ideal ecommerce toolkit should provide in the areas of catalog creation, graphical interface design, business process logic implementation, and backend connectivity, and measures the offerings of IBM, Microsoft and Oracle against that ideal.*

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## Introduction

Web-based electronic commerce has undergone a generational change, brought about by the availability of pre-fabricated software modules that perform many of the tasks necessary to implement an ecommerce solution. These second-generation product offerings have had a two-fold effect, dramatically shortening the time required to bring an ecommerce application to life, and reducing the overall cost for a company to join the ecommerce community. The net effect, especially of the latter, cost-reduction factors, has been an opening up of ecommerce participation to medium-sized and smaller companies with the kind of sophisticated, interactive ecommerce sites that had formerly been only within the reach of much larger companies. As a rule of thumb, the first generation of ecommerce solutions cost well over \$1 million to implement, and took eighteen months or more to complete. This is in sharp contrast to the second generation of ecommerce solutions that fall in the \$50,000 to \$250,000 price range, and taking between three weeks and six months to implement.

The transition from physical world workflow to ecommerce involves many smaller steps, and since each company has a unique corporate identity and look-and-feel, internal business processes for implementing sales and maintenance, and data backends that need to be integrated into ecommerce applications, the cookie-cutter approach to ecommerce can only stretch so far. Still, many of the workflow and implementation issues lend themselves to software replication. These include such issues as:

- Verifying a credit card transaction
- Processing invoices from business to business
- What databases hold transactional information
- Easily creating, populating, and updating a catalog
- Tracking site visitors for cross-selling and upselling purposes
- How business-to-business procurement can be implemented
- What additional logic can be added to a transaction to match Web transactions to company processes
- What templates, wizards, or samples the toolkits hold to implement specific shopping functions or data integration functions, in order to avoid having to write them yourself
- Finding the IT talent needed to put this all together

In this paper, we examine the offerings from three major players, IBM, Oracle and Microsoft, to assess the progress each has made toward presenting the ideal second generation ecommerce solution.

## **What is the ideal EC solution?**

There is no way to pretend that the software available today presents an ideal solution to every ecommerce need. However, there are software tasks that no longer need be re-invented when an ecommerce Web site is created. Examples of these:

- Graphical Web interface creation that maintains a company's style, identity, and look and feel
- An underlying database that can scale to accommodate a growing Web business
- Catalog creation capabilities, that are as automated as possible, including population devices for the catalog
- Catalog-indexing and search capabilities
- Easy to operate facilities for quickly changing prices, product descriptions, and business processes
- Transaction capabilities, including credit card authorization
- Facilities for cross-selling, upselling, banner ads
- Connection facilities to existing corporate data sources
- Connection facilities to corporate middleware, such as messaging, EDI, and ERP systems

Whenever possible, the ideal ecommerce package should supply software templates instead of requiring the customer or Web integrator to come up with new code. Wizards, templates, store examples should be supplied at every turn, so that the user is making choices, not programming tasks. Business processes such as re-ordering of regularly purchased items should be built into the software, and not require specialized coding by the integrator.

There is also the more daunting task of integrating a community of suppliers into a company's Web application. This presents the extra task of making software interoperate across the firewalls of multiple partners. Since Web technology is fundamentally a stateless technology, the maintenance of the state in the rollback of transactions among

multiple companies must be accomplished by separate programming modules. The ideal ecommerce package provides such capabilities to maintain state across firewall boundaries.

In selecting an ecommerce foundation, there are three major scalability issues that a company must consider before deploying a solution. These involve the operating platforms that will carry the ecommerce applications and data, the choice of database that will drive the Website, and the software features and functionality of the different prepackaged ecommerce offerings.

## **Platform Scalability Issues**

The issue of scalability is fundamental in the selection of an ecommerce platform. Yet, at the same time, it is one that is also fundamentally in flux. The biggest question, to paraphrase Hamlet, is "To NT, or not to NT?"

None of the first generation ecommerce solutions were built upon Windows NT, in large part because NT was not ready for prime time scalability. Even now, the state of the art for Windows NT is represented in IBM Netfinity and Compaq four-processor Pentium III servers. IBM has taken it further by demonstrating the ability to use VI architecture to cluster 32 such 4-way systems into a 128-processor unit operating Windows NT. This configuration became generally available at the end of June. This cycling up of horsepower implies that NT may, under some circumstances, be ready for prime time.

Despite a barrage of claims and counter-claims on the benchmark of the day, there simply is no comprehensive and sound data to support a definitive decision on the scalability of the Windows NT platform itself. We believe that it will unquestionably get there; the question is whether that time is now, or in a later evolution of Windows 2000 server. The current Windows NT can demonstrate failover of CPU servers--an important feature for maintaining 24x7 uptime on an ecommerce site, and it can demonstrate a large number of transactions per second in benchmarks tests.

UNIX platforms have historically demonstrated very scalable architectures with up to 64 processors deployed and sophisticated failover schemes at the hardware, data, transaction, and object access levels.

The choice of database is also important in selecting an ecommerce platform. Although Microsoft SQL Server is riding the expansive wave of Windows NT, it faces competition on that platform from IBM's DB2 and Oracle's 8i databases.

Microsoft SQL Server has been playing a game of catch-up with both Oracle and IBM DB2 during the past five years, and has made up considerable ground while both Oracle

and IBM DB2 have proven to be moving targets. Both IBM and Oracle customers have deployed Terabyte-plus databases in real applications, while Microsoft has only shown a patchwork Terabyte database made up of many partitions in an effort to demonstrate scalability. In addition, both IBM and Oracle have enabled users to easily create custom data types that are readily absorbed by the database architecture.

We believe that the features of the databases underlying ecommerce application will eventually even out, but that may take several years. Version 7 of Microsoft SQL Server, for example, has only recently incorporated the row-level locking feature necessary to give fine-grained data security systems robust performance, but in the meantime both Oracle and IBM have moved on to advanced data typing that facilitates the interaction of object-oriented programs and data storage facilities. While Microsoft has pushed its DCOM object model, IBM has forged ahead in Java programming capabilities and Oracle has transitioned from its earlier CORBA emphasis to a Java programming model as well. While Microsoft SQL Server has come a long way, it still has ground to make up on IBM and Oracle in the areas of heterogeneous data management, federated data management, object-relational capabilities, integrated analysis functions and raw performance.

Oracle has just begun to deliver its 8i databases, and the jury is still out on the performance implications of the Internet File System embedded in that database. On the plus side, it allows facile local manipulation of objects in the file system. On the minus side, it must copy all of those objects into the IFS file system in order to access them, and that takes time.

IBM DB2 has been considered the Mercedes Benz of the group with its strong data typing and scalable performance, but the question has always been pricing. Recently, IBM has made moves in that area to become aggressively competitive. A full copy of the DB2 database is included in the \$5,000 Start version of its Net.Commerce package, for example, with no limitations on its use other than that it be used only for ecommerce applications. With its new version 6.1 of DB2 UDB, IBM has also moved to per-processor pricing rather than per-user pricing, which simplifies the buying decision.

## **Ecommerce Integrators' Estimates**

The price of ecommerce toolkits such as IBM's Net.Commerce PRO or Microsoft's Site Server Commerce Edition are just a token investment compared to the cost of programming man-days required implementing a typical mid-sized company's ecommerce site. Based on interviews of ecommerce integrators there appear to be no such thing as a "typical" ecommerce project. Each company has its own unique backend data structures, its own operational applications carrying corporate data, and its own data transformation needs.



The following is a composite chart of the cost estimates indicating that, while a toolkit like Net.Commerce or Site Server Commerce Edition may cost on the order of \$20,000, the overall ecommerce project is going to cost on the order of \$250,000.

<b>EC Site Building Labor: Where Does the Money Go?</b>			
<b>Percent</b>	<b>Tasks</b>	<b>Man-days</b>	<b>Cost</b>
10%	User Interface Design	31	\$ 25,000
20%	Sequencing of activities on the Web site	63	\$ 50,000
40%	Catalog preparation and data aggregation	125	\$100,000
20%	Transactional Integration with Backends	63	\$ 50,000
5%	Security and Performance tuning	16	\$ 12,500
5%	Management and maintenance	16	\$ 12,500
100%	<b>Total</b>	313	\$250,000

The tenfold increase in cost is brought about by the high-skill programming and architectural design labor involved. We invented our own fictitious mid-sized sporting goods company, gave it a backend ERP system, and asked the integrators about the cost variables. We wanted transaction enablement, catalog searching capabilities, a tie into the existing ERP system, and sales analysis and site management facilities.

Overall, compared to doing the same job two years ago without current generation ecommerce toolkits, the overall project cost is down by a factor of two, and the time to market of the project is down by a factor of two as well. What would have taken \$450K to \$500K and be a 3.5 month project in 1996-97, has now become a \$200K to \$250K project accomplished with the same number of people in 45-60 days.

By far the largest portion of the ecommerce project effort is in the catalog preparation and data aggregation phase, often representing 30% to 40% of the project, and this is where the toolkits have been somewhat helpful. In this phase, integrators assure us that whatever state the original company data is in, it is not in a form directly usable by an ecommerce application. The efforts range from extraction of SKU numbers, product specifications, text and data from a relational database to companies that literally have paper catalogs based upon paper images. One integrator cited an ecommerce project in which the customer company had over 250,000 variants of products, and this phase consumed 70% to 80% of the overall project time and cost.

The formal transaction integration into such environments as Encina, Tuxedo, CICS and other transactional backends typically takes 20% to 30% of the project effort. Net.Commerce Pro has plug-ins for CICS, MQSeries and Microsoft has integration to the Microsoft Transaction Server and to the Microsoft Message Queue, but integrators

assure us that there are no standard "plug-ins" for SAP and other ERP systems. In fact, most of the backend ERP systems that their customers have are home-brew systems, not one of the major ERP brands.

The take-home point from the price estimation of our fictitious sporting goods company was that, while ecommerce toolkits can dramatically facilitate individual tasks, there is no universal "magic bullet" on the horizon that can turn any company's brick-and-mortar operation into an ecommerce site overnight. What we do see is an overall factor of two times improvement in time to market brought about by these toolkits, and a halving of the overall cost of integrating ecommerce into an existing company.

## **What Are the Alternatives?**

We need to note that the missing ingredient---talented programming integration labor---is actually the largest single cost factor involved in linking a medium-sized company's infrastructure to an ecommerce site. While these second generation products represent the toolsets necessary to create ecommerce sites, the third-party labor needed to tie data sources into ecommerce applications, and to program the applications themselves, can easily become five to ten times larger cost factors than the toolsets themselves.

### **IBM: Net.Commerce**

Net.Commerce has backend data connectors and middleware connectors that save the application programmer from some commonly necessary programming tasks like transactional integration with CICS, IMS, EDI, and messaging with MQSeries. The new utilities listed below with version 3.2 are each in themselves savers of weeks worth of programming time. The cataloging facilities are about as advanced as it gets, including the automated features for populating the catalog from existing data sources.

Measured across platforms, Net.Commerce comes closest to the ideal ecommerce toolkit of any of the three vendors we examined. This is based both upon the feature set offered, and upon the scalability available on Unix, AS/400 and S/390 platforms. On Windows NT, IBM's biggest drawback is that it is not Microsoft, and therefore does not control the internal hooks to the Windows NT operating system itself. Thus, it has not oriented Net.Commerce for tight integration with the Microsoft Transaction Server as Microsoft has done with the Site Server Commerce Edition. The other side of this coin is that Net.Commerce applications originally written for a Windows NT platform can be much more easily moved to more upscale machines like multiprocessor Unix systems.

Net.Commerce Pro makes it possible to create a robust ecommerce site with a toolset costing \$25,000 or so, making possible a factor of two or better improvement upon the cost of first-generation start-from-scratch efforts.

This product is not representative of the dinosaur IBM of the past, but rather that from a price-competitive tiger. IBM has bundled the DB2 Universal Database into the Net.Commerce product, along with three pre-built sample stores with predefined catalog templates, registration, shopping cart, order form and payment components. In the Pro version, they add a Catalog Architect and a Product Advisor that enables intelligent catalog searches to guide product selection.

The Pro version also includes tools for back-end integration with the CICS transactional environment, MQSeries messaging, IMS data, and SAP R/3 applications. IBM has added an option for SSL processing to its the original option for SET that it embedded in the IBM Payment Server. SSL has become a popular means of achieving ecommerce security.

Like Oracle, IBM maintains an advantage of scalability over Microsoft in being able to stretch from the Windows NT platforms to Sun Solaris, S/390 systems, AS/400 systems, an RS/6000 Unix systems.

Net.Commerce has a Starter package priced at \$5,000 and a Pro package priced at \$20,000. The Starter package contains the DB2 database, the Lotus Go Web server, Net.Data connectors for managing interfaces between Web servers and databases, and either SET or SSL-based e-payment modules.

The Pro package has all of those things mentioned above, and adds cataloging tools called the Product Advisor, Product Exploration, Sales Assistance, and Product Comparison. It also adds system interfaces for IBM MQSeries messaging, mainframe IMS data, and CICS, as well as EDI and an SAP R/3 interface.

Net.Commerce takes aim at many of our solution ideals with a module called Store Manager, which is basically a fill-in-the-blanks wizard that allows store managers to quickly update prices or product attributes. It implements the change in the underlying database, so that one change is distributed to all relevant dynamic Web pages. It also adds shipping options, customer numbers and shopper group classification.

This wizard-based approach is extended to catalog management with the Sales Assistance module giving user companies a rules-based wizard for guiding novice customers through different product configurations.

The Product Exploration module fulfills search and indexing requirements using IBM's Intelligent Miner for Data to reveal relationships from data stored in relational databases, and Intelligent Miner for Text for discovering relationships and mining text in Web-crawled data and search engines.

When one adds the labor and skills ingredient, by way of a third party systems integration house like Trifecta or The Alliance Group, the total price for ecommerce integration goes up according to the number of legacy databases that need to be

integrated into the solution, the complexity of the data conversion for existing SKU's and the level of customization of the business rules and analysis logic for cross-selling and upselling. A typical implementation from an IBM-related system integrator is \$150,000 to \$250,000.

### **Microsoft: Site Server Commerce Edition**

We believe that Microsoft, rather than Oracle, will become the fiercest competitor to IBM in the ecommerce space. The combination of Microsoft's Site Server Commerce Edition, SQL Server, and NT Server 4.0 will go head-to-head with IBM's Net.Commerce in the \$25,000 to \$250,000 ecommerce development space, and we expect a genuine battle of giants here. Oracle, for now, has ruled itself out of this market segment, preferring to focus on solutions that begin in the \$400,000 and up category.

The Microsoft Site Server Commerce Edition (SSC) meets some of our criteria of an ideal ecommerce server, but there are a couple of areas that need improvement. One is in the development of currency-handling routines that can enable a single application to market products in multiple currencies, and handle the various taxation and global fulfillment issues. The SCCE product itself provides sample store catalogs, but does not supply a tool for the rapid development of catalog population schemas.

Microsoft has tightly integrated its Commerce Edition with the transactional capabilities of the Microsoft Transaction Server, and can take advantage of the Microsoft Message Queuing (MSMQ) technology. The Commerce Interchange Pipeline (CIP), part of the Commerce Edition package, enables multiple businesses to exchange data in any format compatible with HTTP protocols, and will support the BizTalk server, an XML server that embeds super-schema that Microsoft is creating with various industry groups. Microsoft's CIP does enable interchange of information between multiple vendors forming a "virtual company", but it does not enable two-phase commit or the rollback of transactions among multiple parties using CIP, because CIP does not maintain state information across the Web. The CIP also requires that each party exchanging data be doing so from a Windows NT server.

The Microsoft Commerce Edition's Engage feature set adds an ad server, personalization and membership and user profiles. It is capable of analyzing where customers came from when they enter your ecommerce site, and of doing intelligent cross selling. Commerce Edition also includes Web analysis and customer profiling capabilities. Its cataloging capabilities are not as sophisticated as IBM's Catalog Architect, but one can go to a third party, such as Saqqara, to add this kind of functionality to Commerce Edition.

Microsoft is limiting itself to the COM object architecture that it controls. Basically, this means Windows NT, although Microsoft has made token efforts to host DCOM on some non-Microsoft platforms. For medium-scale to larger ecommerce providers, this

raises the scalability limitations of Windows NT servers. Current Wolfpack clustering capabilities limit Windows NT to two- or three-server failover configurations.

At about the \$50,000 level, Microsoft also has Complete Commerce, which adds tax processing, payment processing, and shipping and handling. This solution is targeted primarily at ISPs.

Where Microsoft may swipe an advantage over Oracle and IBM is in its aggressive pursuit of XML server schema standards. Although these standards will be open to implementations by IBM and Oracle, the fact that Microsoft is attempting to lead the charge may give the company a time-to-market advantage in the XML ecommerce interchange space.

The choice of database is also important in selecting an ecommerce platform. Although Microsoft SQL Server is riding the expansive wave of Windows NT, it faces competition on that platform from IBM's DB2 and Oracle's 8i databases.

### **Oracle: Internet Commerce Server**

Because the Internet initially emerged on Unix platforms and because Oracle's particular strength has been the use of its databases and toolsets on Unix platforms, Oracle technology has consequently been involved in one form or another in many of the early efforts in electronic commerce.

Oracle has concentrated its efforts on ecommerce solutions for larger companies, and prefers to focus on ecommerce deployments costing in excess of \$1 million. It maintains a staff of 18,000 consultants that generate approximately 30% of Oracle's annual sales.

Oracle's basic offering for electronic commerce enablement is its Internet Commerce Server version 3i, which began shipping with the Oracle 8i application server in March.

It includes a shopping cart, ordering mechanism, catalog, tax calculation, shipping calculation, and a payment facility. For between \$70,000 and \$100,000, the basic storefront includes the Oracle 8i database for one CPU and one module of the Internet Commerce Server serving 8 concurrent users. It has Oracle Reports, Vignette content management, Annuncio data warehousing connection, Tan Data shipping module, Net Perceptions targeted collaboration filter, Oracle Discoverer and Web DB. To this one can add an Oracle Financials module, which adds \$300,000 to the total.

Since Oracle has just begun to deliver its 8i databases, the jury is still out on the performance implications of the Internet File System embedded in that database and whether this will have any net impact. On the plus side, it allows facile local manipulation of objects in the file system. On the minus side, it must copy all of those objects into the IFS file system in order to access them, and that takes time.

While Oracle made early gains in creating custom solutions in ecommerce, it has not kept pace with both IBM and Microsoft in driving down the cost of ecommerce through a cohesive offering of pre-fabricated ecommerce parts. Oracle has offered an iPayment module, and an iBill billing module, but does not externalize its pricing structure of these modules as part of an overall solution.

Oracle meets several of the criteria of our ideal ecommerce solution, but has only long-term plans to drive down the pricing of its tools and services. As a result, Oracle is focused primarily on companies of \$250 million/year in size, preferring seven-figure solutions where the highest level of profitability per project can be gleaned.

Oracle does offer some excellent backend sales analysis tools, particularly Oracle Discoverer, which is useful for massaging site transaction data into relationship discovery. Its catalog creation capabilities, however, including updating and population, are not as facile in the creation of schema as our ideal solution.

The apparent movement in the application development community away from SQL-based applications and toward Java threatens what has been a very lucrative proprietary tool business for Oracle. The company seems to see the handwriting on the wall as it is re-orienting its middleware architecture from a CORBA base to a Java base.

On the packaging front, Oracle has introduced its Fast Forward programs. These include the Oracle Fast Forward Internet Procurement program. It costs about \$400,000 for 25 named users. The Internet Procurement program includes Release 11 of Oracle's Enterprise Application Software, plus technical support, implementation, education, and Oracle Service Providers. It also includes Ariba's cataloging software.

Oracle is promising 60 day implementations of the Internet Procurement software, and quotes customers as reporting 10% savings on goods procured as well as 50% speedups in procurement itself. Speed of implementation rather than overall costs seems to be where Oracle is finding its roots in our ideal solution.

Oracle's Strategic Procurement program, which is not part of the FastForward program, adds workflow capabilities. It tracks not just multiple approvers of a request, but the entire life cycle of the request, as well as maverick buying and contract leakage. Since it is not part of the FastForward program, however, it is priced on a custom basis.

We believe its current strategy will yield Oracle large margins in the short run, but the company will have to substantially drive down its prices to compete for medium- and small-sized companies in the long run. We expect the price competition in these latter areas to be fierce, both in the application rental and application purchase spaces.

## What It All Means

A new generation of ecommerce-building tools, including IBM's Net.Commerce, Microsoft's Site Server Commerce Edition, and Oracle's Internet Commerce Server, have made it possible for medium-sized companies to get into the ecommerce game faster and with considerably less expense than in the build-it-from scratch days of only two years ago. There is still no magic wand that can analyze various corporate backend structures and existing applications to come up with automatic ecommerce solutions, but a number of facilities have been created that connect ecommerce applications into a wide variety of enterprise data sources, ERP applications, and security systems.

In addition, these second-generation toolsets are paying particular attention to both the Internet shopping functions and to the process of ecommerce catalog creation, populating and editing. The new Net.Commerce version 3.2 shopping functions, in particular, appear to save programmers from re-inventing a number of common shopping tasks such as reordering, accessorizing, and cross selling.

As the competition appears to be shaping up, Oracle and IBM have staked out territory in the high-volume and high priced ecommerce transaction arena, while Microsoft and IBM are vying for dominance among mid-sized and smaller companies. This dualistic market strategy should give IBM some advantages as companies grow and their ecommerce needs expand rapidly.

As these toolsets evolve, we expect to see more facilities in the underlying catalog creation utilities such as the Saqqara schema creation engine. Much of that has already been incorporated in IBM's Catalog Architect, while we would also expect to see it emerge in a future version of Microsoft's own Commerce Edition.

The net effect of these toolsets is to reduce the time to market of new ecommerce Websites, from the eighteen to twenty-four month projects that characterized the first generation EC sites, to time frames on the order of four to six weeks. The concomitant costs, likewise, are being reduced from a \$2 million ticket to the sub-\$100,000 neighborhood.



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