



Essential E-Analytics

The Essential Role of E-Analytics in
the New E-Business Model

A White Paper by Nigel Pendse

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ESSENTIAL E-ANALYTICS

The essential role of e-analytics in the new e-business model.

In the mad scramble to move to an e-business model, companies tend to put much more emphasis on the transaction and marketing systems than the analytics to make them succeed. This paper looks at why e-analytics have an essential role in the move to new forms of business.

E-analytics are the new breed of analysis and reporting systems for e-business. E-analytics take advantage of the same technologies, to deliver fast, relevant information to all the business people who need them, both within and outside the corporation. Without these systems, key decisions would be made everyday without knowing what is really happening in the business—a risk too far in the fast moving e-business world with its razor-thin margins.

Just as most companies have no choice but to move rapidly to an e-business model, they must also deploy e-analytics at the same time—not to do so could jeopardize the whole enterprise. Thus, e-analytics are a key business imperative and not just something for IT to worry about after the e-business systems have bedded down. The executives leading the move to the new model should be every bit as concerned about how they will monitor, understand and direct the new business as they are about the new business model itself.

THE NEW ECONOMY

Regardless of their industry, few companies have any choice about getting involved in e-business. Even if they are reluctant to move, perhaps seeing little short-term

advantage, their customers, suppliers and partners will undoubtedly force the change, while competitive pressures will accelerate it. And in some industries—like PC sales, retail financial services, book and music selling or travel agents—the old style of business may simply not survive much longer, because the Web based approach can be as much as 40 times cheaper to operate. Major manufacturers are already moving all their procurement to the Internet, and many new services are being invented to take advantage of the Web.

Of course, smart companies don't wait to be forced, but take the initiative in order to be the first to benefit from the potential advantages of e-business in their sector. As early leaders, they aim to capture the sustainable mind share and brand loyalty associated with the new revenue streams and sales channels, and to create defensible niches.

Unfortunately, it's far easier to get into e-business than it is to make money from it. The set-up and promotion costs are high and often the initial revenue is low (or even zero). This is most apparent from the public dot.coms, most of which are currently experiencing losses. In time, large profits will probably be made, but only by the leaders; many other hopefuls may never even get into the black.

Painful Clicks-and-Mortar Hybrids

For the moment (but not indefinitely), investors are apparently happy to speculate on dot.coms, regardless of their losses, in

the hope that, with enough investment, they may catapult into the lead. However, the dot.coms that fail to become leaders will soon become "dot gones". Already, high profile dot.coms are shedding staff as losses deepen.

Conventional bricks and mortar companies venturing into e-business do not have the cushion of free, almost limitless, venture capitalist funds or a tolerance for huge losses—they are expected to generate steadily growing overall earnings, despite the high set-up costs of an e-business model.

This expectation of a smoother financial performance does not mean that conventional companies find it easier to profit from e-business: in fact, their success rate is thought to be even lower than for the pure dot.coms. However, it is easier for established business to hide e-business disasters, sometimes even from themselves, by burying the embarrassing figures deep within the larger legacy base.

This is very dangerous, and conventional companies who venture into the unpredictable, fast moving world of e-business without high quality, reliable e-analytics are taking a grave risk, not only with their new investment, but with their core business as well. Some challenges these companies face as they move to an e-business model that mandate the need for accurate and timely e-analytics include:

- **Cannibalization**—if the new channels are aimed at the same customers as the existing business, channel conflict is almost inevitable. The shift is likely to undermine the old way of doing

business, by undercutting prices or bypassing and therefore alienating partners and distributors. If the new revenue stream does not fully compensate for the erosion of the conventional business, the company may shrink and become less profitable. This migration process needs to be carefully planned, monitored and sensitively managed—none of which is possible without good quality, continuous analysis. To delay making the move, on the other hand, because of a fear of cannibalization is equally risky: competitors will do it instead.

- **New markets**—to minimize the risk to existing markets, many companies target their initial e-business activities at new niches. This could mean dealing with smaller customers or suppliers, offering services in geographic regions outside the range of existing distribution, adding new product lines or seeking new customers with different demographics (for example, younger or higher income buyers). This has the advantage of not undermining the current revenue stream, but has the obvious drawback that the company will be venturing into areas where it lacks skills and experience. It will probably have to learn to cope with a new set of competitors, without being able to base its efforts on any established brand loyalty in the segment. This takes significant marketing investment. It would be foolhardy to spend this money without having good analytical systems to plan and analyze the new revenues and costs, and to help all the managers making unfamiliar decisions by giving them timely, reliable information on performance.

- **Overlaps**—if the same markets are being addressed as before, then many of the ‘new’ customers or suppliers may actually be long established partners. It is advisable to consolidate the new and old business from such partners, so their total business can be measured and analyzed, as well as looking at the totals for new and old-style business. This is unlikely to be possible in the standard transaction system reports, so a consolidated data warehouse may be needed to merge and integrate the data streams.
- **Service levels**—the all-too-frequent glitches in the new e-business systems (through bad design, overload, system failure or lack of testing) could mean that expensively obtained new customers rapidly lose patience. Not only may they abandon the new e-business channel, but any traditional business from them may also be lost. It is therefore important to carefully monitor service levels, in terms of Web site problems, order errors, shipping delays, missed promises, accounting inaccuracies, complaints, etc so that irate customers can be quickly identified and placated. This requires explicit action to continually measure and monitor service levels, not just as snap shots, but also as trends: good service must be achieved consistently, not intermittently.
- **Profitability**—calculating profitability in a clicks-and-mortar business is not easy. While it may be relatively easy to track the revenue sources, it is much harder to allocate costs accurately between the new and old businesses. Misallocation of costs distorts the true profitability of both

businesses, with one looking artificially better at the expense of the other—this could happen accidentally, or might be driven by internal politics (with politically powerful managers successfully getting costs unfairly assigned to businesses run by their less politically adept colleagues). Whatever the cause, hidden subsidies are always misleading in business, and they must be identified as soon as possible. This means that profitability models have to be dynamic, transparent and actively reviewed, because they will often be the deciding factor in directing future investment. Only a good analytic tool is suitable for this.

- **Managing the transition**—a true e-business will have low overheads, with as much as possible outsourced. Conventional large companies often have the opposite approach, with cumbersome infrastructures set up to perform most activities in-house. Moving from the latter to the former usually causes painfully difficult changes, and to do it successfully requires a good understanding of which cost stream supports which revenues. Detailed reports and analyses will be needed to support this process—and a modern, lean and mean business will have to do it without the luxury of fleets of analysts.

Compressed Chaos

“Internet years” now last just a few weeks. Not only does technology change relentlessly (and unpredictably), but new competitors emerge from nowhere, often well supported by venture capital. New virtual companies can rapidly establish themselves without the high street presence,

manufacturing plants, fancy offices, thousands of employees or cash-draining inventory of the traditional giants. They can buy in almost everything, and blast their way into sleepy markets using just a tiny core team and the cash from deep-pocketed investors. Existing, established companies could suddenly find that the costly assets and large, well-trained workforces that they have proudly acquired over the years suddenly become expensive liabilities that stop them from moving fast enough.

The awesome valuations of Internet businesses allows them to acquire far larger conventional businesses. These baffling developments can overturn many existing alliances and partnerships—which means that the competitive landscape never settles down. Your former partners could be unexpectedly acquired by your main competitor, thus forcing you overnight to find new channels, products or suppliers.

Surviving and prospering in this chaotic new world takes decisive leadership and lots of luck, but you can increase your odds significantly with good analytics. Conventional, leisurely monthly reporting is simply not fast or flexible enough to spot new trends, avoid unsuspected pitfalls and capitalize on unexpected success. And information needs to be available in a suitable, convenient form to everyone who makes decisions (not just top managers and specialist analysts). If external events force the company to have to suddenly change its strategies and methods, it is dangerous to do this without having a good measure on the existing business.

This dramatic change cannot be made without error—a slow, cautious approach will lead, at best, to mediocrity. But the smart companies will be those that spot, learn from and avoid repetitions of errors. Waiting for the pioneers to make all the mistakes first and for the educational business books and consultant seminars to emerge before taking the plunge is to guarantee relative failure. The winners will be those who move fast, take deliberate risks, measure what happens, quickly learn from both their successes and failures, and move on to the next challenge—and this is only possible with strong analytical support. But there's a sting in the tail: analytical systems intended to enable change will themselves be impacted by change. This means that e-analytics must be able to change and adapt as the organization evolves, rather than lagging behind.

Virtual Businesses

The old style monolithic company that made and did everything itself is long gone. Even before the e-economy, companies were divesting non-core activities and outsourcing many functions. For example, every major airline would once own, service and maintain its own planes and vehicles, employ its own ground handling staff, prepare its own meals and operate its own reservations system. Some even owned luxury hotel chains. Now, third parties can provide any or all of these activities more efficiently and at lower cost, so most airlines outsource at least some of them.

Thanks to the ease of integrating systems via the Internet, it is easier than ever to form fluid groupings of functions both within and outside an organization that

collaborate on a specific project or activity. What should look to the customer like a single, seamless entity may actually be much more of a virtual company, with each activity performed by a different partner or subcontractor. Beyond that, there may be trading circles of suppliers and buyers, bidding and auctioning for supplies. Such virtual companies can not only save costs, but can adapt to meet new needs much more rapidly, simply by regrouping as often as necessary. A single business may participate in many such overlapping groupings.

These temporary groupings cannot function in the absence of information. The complex network of competing and collaborating companies has to behave as a "transparent supply chain", linked through their back-office infrastructures. They not only have the same shared analytical needs that the single equivalent company would have, but also need to monitor their individual financial performance and service levels. And they must do it without the integrated senior management structure that a single entity might have had, which means all the relevant individuals in these units must be kept up to date with the project status, financial figures, performance, problem alerts and plans that they need to function effectively. Planning, in particular, becomes a more complex activity when multiple semi-independent businesses have to collaborate: there is no possibility for the unified top-down approach beloved of conventional business managers.

THE NEW BUSINESS MODEL

E-business is not just old business done over the Internet. There are real changes in how business is transacted, and these make a big difference to how it can be analyzed.

More Data to Analyze

For many reasons, the volumes of data available for analysis are much higher than ever before:

- **More transactions**—the overhead cost of an automatic, electronic transaction is tiny, so the volume of transactions is rising dramatically, both in business-to-business (B2B) and in business-to-consumers (B2C). Suppliers are expected to deliver smaller consignments at short notice in a just-in-time economy, and consumers place small Web orders with an expectation of quick deliveries. This means that data volumes capable of analysis rise significantly. But there is also a benefit in having this fine-grained data: there are more dimensions of analysis available, from which valuable insights can be gleaned.
- **More errors**—the increased volume of business, much of it conducted without human involvement on either side, means that it is easier for major errors to go unnoticed. People make many more mistakes than computers, but they also spot gross blunders much faster. For example, there have been well-publicized cases of goods being accidentally offered for sale at absurdly low prices (like \$1 for a laptop PC or \$5 for a TV set). If this happened in a conventional store, it would be noticed and fixed on the first transaction, but Web sites happily accept thousands of disastrous orders. In the worst case, the orders may be fulfilled at the low price without anyone noticing; even in the best case, it will still be very embarrassing and will require some sort of placatory offer to the people whose confirmed orders are subsequently rejected (like free shipping if they re-order the product at the correct

price). Pro-active analytics would spot the huge, unexpected burst in orders, and possibly their low value, and quickly alert a human being empowered to fix the problem.

- **Clickstream data**—huge volumes of marketing data are now available based on who visited a Web site, the route they took through it, where they came from, how long they spent in the site, which was the last screen viewed, and most importantly of all, whether they conducted a successful transaction. It is often also possible to know how often they visit, their buying patterns, their demographics and which other sites they visit. This information can indicate the success of advertising, the site's ease of use, the relative popularity of different offerings, the interests of visitors, and can quickly highlight problems with the site.

Because Web sites can be changed far more easily, quickly and cheaply than can conventional stores, it is possible to make rapid alterations to a site and then test whether they have achieved the desired effect. In fact, it is almost expected that Web sites advance at a much faster pace than conventional stores.

Conventional retailers never had this level of information about customers and window shoppers, and so could not fine-tune their stores to such optimal levels. But the volumes of data are potentially huge, which means that analyzing the data can get expensive. It is only worth embarking on the analysis if there is a real commitment to using the results—which means that they need to be made available quickly to anyone

who needs them, not just a few ivory tower analysts. At the very least, there should be some basic summary and performance monitoring reporting for everyone who needs it.

- **Spotting failures**—the Internet is full of malfunctioning sites, with unlinked pages, pages that do not display properly for most visitors or are unreadable, and links that do not work. Another use of the clickstream data is to look for symptoms of this, such as unvisited pages or other pages that seem to drive visitors away.

Fickle Customers

For the first time in history, customers (both businesses and end consumers) are largely freed from the constraints of geography and ignorance. They can trade with suppliers that are physically remote and can check out prices and availability anywhere in the world, regardless of time zone or distance. Skipping from one Web site to another is effortless, unlike visiting multiple physical suppliers in different locations, and search engines make it easy to find alternatives.

As a result, customers can and do switch suppliers with very little provocation:

- **Price**—it is now easy to compare prices of both traditional and new suppliers, even in other countries. For commodity or identical products, this may be the main difference between suppliers and even a small discount may be enough to get people to switch their business. Shipping costs are now low enough that an efficient distant supplier can often undercut an inefficient, complacent local vendor. And Internet auctions will be the typical procurement system for

commodity items. So it is essential in a price sensitive market to have the analytical systems in place that can detect sudden increases or decreases in sales and also to price accurately, based on the desired margins or market share objectives.

- **Product range**—in the era of the virtual company, it is much easier for an e-business to apparently stock a wide range of products (such as books) than any conventional local store. And one e-business may attract customers from another through being able to offer a wider choice. Of course, the goods themselves are unlikely to have ever been stored in one location, but behind-the-scenes electronic systems can make this appear seamless. But calculating profitability in a multi-partner virtual organization like this is not easy.
- **Speed of supply**—suppliers can earn loyalty through rapid, reliable delivery. This needs to be proactively monitored, and any failings corrected.
- **Ease of doing business**—Web sites can make it very easy, or very hard, to make transactions. Most do a poor job, and statistics show a far (typically ten times) higher rate of uncompleted transactions on Web sites than in call centers. Even allowing for the casual nature of Web surfing, this suggests that many sites are losing business opportunities through being too slow, cumbersome or unclear. Conversely, a few sites are fast, require minimal effort for regular customers because details are all remembered, and indicate clearly what the user should do next, and what has happened so far.

These are the sites that create customer loyalty and attract repeat business.

- **Information**—it is surprising how sites can be improved through providing what amounts to analytical information to visitors, both about their own transaction history and about the collective experience of others. For example, some sites already tell visitors which products in each category are top sellers (a ranked multidimensional sales analysis by category) or bargains (a ranked list by price), provide information on other products that are popular with buyers of products ordered (the result of an off-line data mining exercise) and even which products are popular with people in certain regions or who have some other connection, like working for a large employer (another form of multidimensional ranked sales analysis). Sites can also inform visitors of their own purchase history and of their accumulated loyalty points benefits (a customer sales analysis), to persuade them to buy more. They can also offer targeted special deals based on the known interests of a previous buyer (by running an on-line, pre-defined simple data mining model). All of this pertinent information will help tempt fickle customers back, even if the site is not offering better products, prices or service.

Of course, fickle customers are both an opportunity and a threat. While your own customers are always at risk, you now have a better chance than ever of stealing your competitors' business. For instance, if true total costs are calculated more accurately, prices can be cut when needed without risking unplanned losses. But in the race to

capture market share, it is worth remembering that some customers are more profitable than others, possibly based on the regularity and size of their orders, their purchase profiles, their payment history, support costs, etc. If this is known (through analysis), more strenuous efforts can be made to retain the profitable customers, by offering loyalty bonuses or other attractions. Less profitable customers can be offered lower or no loyalty bonuses. If sales to profitable customers decline, perhaps indicating a loss to a competitor, they should be offered special terms to tempt them back. Of course, this is only possible if early warning analytical systems are in place to detect and warn of customer defections.

Lower Margins

The Internet provides a low-overhead way of doing business, which offers the opportunity to cut costs and prices. But this benefits all e-business users, so margins are squeezed for those who do not take full advantage—the ease of making comparisons and conducting auctions between e-suppliers puts real price pressure on all. For lean and mean new businesses (particularly those under no pressure to make profits), this is a great opportunity to undercut traditional businesses saddled with high fixed costs. So, for any company keen to remain profitable, good analytics are key to handling the price pressure, so that true costs are known. In extreme cases, it may force companies to withdraw from markets dogged by suicidal price-cutting, and the quicker they understand when to do this, the better.

The squeezed margins mean there is less fat to absorb the costs of mistakes, just at a time when the rapidly changing nature of the new business model makes mistakes more likely. This makes it all the more important to have fast-acting analytical systems to keep everyone informed, so that essential actions and corrections are made without delay.

Personalization

Every customer of a bricks and mortar establishment sees the same physical premises, the same product range, the same prices and has essentially the same experience. This should not be the case on the Web. It is easy to remember who a user is, and to offer a different product range, prices, special offers, language and even navigation. By remembering accounting information, the whole buying process can be made much quicker and easier, and the best Web sites compete to offer the fewest clicks and screens to their regular customers. But many Web sites are infuriatingly forgetful, and make users enter the same information repeatedly, or only tell them something that kills their interest at the end of a long bout of form filling.

Part of this desirable personalization can be carried out automatically, based on previous choices and behavior of the customer, so the site is seen to learn from previous visits. But the personalization can extend to automatically including mini analytical reports to remind the visitor of what they have purchased previously or what special discounts are on offer to them based on their loyalty or interests. This could extend to showing how an extra purchase could move the buyer to a higher discount step

or earn them an extra reward based on their accumulated spending.

This personalization can extend to pro-actively alerting (consenting) customers of short-term special offers or new products that they like buying or simply reminding them of their regular orders for consumables. Doing this via email is very cheap and less intrusive to the recipient than other forms of communication.

Personalization probably has its greatest potential value when dealing not with the final customer, but with an agent or distributor who may also represent other competing vendors, or with a supplier. The agents can be offered analyses showing their commissions earned to date, amounts that need to be sold to meet current period targets, special bonuses on offer if they exceed targets, extra discounts on additional purchases, credit available, etc. They can also be offered reports which include industry data and information from other regions, so they could discover if their product mix is uncharacteristic or if they could make more money by selling different products (because of better margins or faster sales). Such support systems could bias them to sell more of your products than an otherwise similar range from a competitor.

HOW ARE E-ANALYTICS DIFFERENT?

Analytical systems have been around for almost as long as computerized transaction-processing systems, so many of the principles behind the new e-analytics are well established. But the changes in e-business mean the systems differ in scale, scope and rate of change.

More than ever, e-analytics have to be a continuum ranging from simple presentation of basic summaries through operational reports through multidimensional analyses to data mining and statistical models. In all cases, the data has added value compared to the transaction level reporting, through summarization, selection, derived calculations, comparisons, alerts or presentation. The majority of the "new" users will have relatively simple analytical needs, so the proportion of low-end users will

rise, as can be seen in the chart in Figure 1. They will want to start with pre-defined reports with appropriate "ready-to-use" metrics that are easy to understand, though not necessarily easy for the system to calculate.

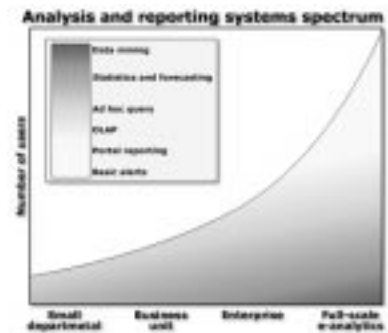


Figure 1

Most people start by looking at standard reports, but they need to be able to change what and how they look at information, because every answer is liable to raise a different question—so simple, fixed reports alone are not enough, even though the average user will also have little or no interest in designing new reports from scratch. Many users will get access through pre-built analytical applications, rather than just standard reports. These will be based on workflow needs, and will often provide guided analysis to help users interpret and take action on what they see.

Though there are relatively fewer specialist analysts than before, those that remain will concentrate more on building systems, complex analytics, applications and models than on helping individual users run new reports. They may need to use a variety of powerful server based technologies to do the heavy lifting, but regardless of how many and how complex these systems are, the end users should be presented with seamless, integrated access to analytical tools—which almost certainly means via a Web portal approach that blurs the distinction between operational and analytical reporting. Users should be presented with clear, comprehensible, relevant information without having to be concerned with the tools and systems that produced it.

The Changes and the Implications

There are many ways to compare how conventional analytics must evolve to meet the need of e-business:

ITEM	CONVENTIONAL BUSINESS	E-BUSINESS	IMPLICATIONS
ORGANIZATIONS SUPPORTED	One—all users work for the same company.	Many—users can be customers, partners, suppliers, trade bodies and external regulators.	External users cannot be expected to use particular hardware, license special client software or to use the company's own net-work. In some cases, it may also be necessary to keep a log of queries and to bill users for access based on their usage.
SECURITY	Simple, as the users are all within the fire-wall and probably have similar access needs. Relatively unimportant if one user sees another's data.	Complex, as both suppliers and customers may need to access the system, and even change plans and forecasts. Many users will be outside the firewall, and there may be severe legal constraints on seeing each other's data.	Systems must cross firewalls and provide provable security controls over who sees or can update what. The security may be complex, depending on the multiple user groups users may belong to. Encryption standards also differ around the world.
NUMBER OF USERS	Relatively few for any single system.	Potentially thousands, both within and outside the organization.	The system must be able to handle the diverse needs and the processing load of many different people. Puts pressure on hardware capacity, bandwidth and administration.
NUMBER OF USERS	Very little—every user gets the same system. At most, they can save their favorite views. Differences in style have to be programmed in.	Plenty—every user can have a unique view, partly self-selected and partly automatically generated. Users should be able to alter these in a self-service manner.	The servers needs to remember the content and presentation preferences of potentially thousands of different users. These need to be updated automatically as available information changes, and may need also to automatically tune themselves based on how users work.
GEOGRAPHY	Most users are probably physically close to each other, on the same LAN or WAN, and in roughly one time zone.	Users can be anywhere in the world, in every time zone, and are not on a single corporate network. They may have different working days, currencies and languages.	Systems must communicate via the Internet and have near 24x7 availability, which makes batch data loads and system maintenance hard. Support may also be needed on a 24x7 basis.

DATA VOLUMES

Relatively modest—databases of more than a few gigabytes were considered large.

Potentially enormous: multi-terabyte databases will become common, because of the additional volume of electronic transactions, access to more external data and a deluge of clickstream data.

Difficult to manage these large data volumes from multiple sources, while still delivering fast, reliable systems. Users expect a near instant response, and reliable information, regardless of data volumes. Data may need to be sampled or pre-summarized to preserve the response. Users also need to understand what the data means.

DATA INTEGRATION ISSUES

Relatively simple—almost all the data comes from within the company.

Lots—data comes from partners in a virtual company, customers, suppliers, industry syndicates, trade bodies, market researchers, public databases and government sources.

Complex metadata issues to resolve in order to reliably merge data from multiple sources. Also need efficient, secure data interchange links to partners. Likely to involve emerging XML standards.

NATURE OF OPERATION

Mainly pull—users run reports or analyses as required.

Mainly push—users expect to be promptly alerted whenever there is information they should see. Few users have time to explore and analyze frequently changing, voluminous data or to look for errors.

Need to orient systems to dynamically generate reports and alerts based on pre-defined or dynamic data triggers. Reports and alerts needs to be distributed by email, phone and pager as well as on screen. Screen-based systems should automatically highlight anomalies or unexpected events.

FREQUENCY OF DATA UPDATE

Often monthly, sometimes weekly, rarely daily.

Often daily, sometimes more than once a day. Users need to get feedback from external or internal events immediately, both to spot problems and to react quickly to unsuspected opportunities.

Systems need to be able to cope with frequent incremental updates without going off-line. Data integration from multiple sources needs to be automated. Alerts need to be processed and distributed whenever data changes.

FALL-BACK INFORMATION SYSTEMS

Existing legacy reports and ad hoc systems can continue to be used if new analytical systems are forgotten, late or do not work properly (which often happens).

No existing legacy reporting systems available, so e-analytics must be in place as soon as new e-business applications are implemented.

High quality, new e-analytical applications should be planned and implemented concurrent with new e-business applications, not after the event. The business consequences of their not being available will be severe, so it may be necessary to start small and simple, if the alternative would be to have no working e-analytics at all.

USER SKILLS REQUIRED

The users can be trained and expected to use whatever systems are provided. The consequences of a bad system may be internal gripes and a loss of productivity, but the overall business consequences will be modest.

Many of the users are outside the organization and cannot be expected to use a non-intuitive system. External users probably have a choice—they will shun a company whose systems are difficult, slow or unreliable. This could lead to serious business harm.

There is much greater pressure to deliver systems that any average Web user can pick up and use effortlessly. This puts much greater pressure on those IT people who were previously able to force users to tolerate slow, complex, unreliable, inflexible systems. E-analytic reporting should be as easy to use as any consumer Web site.

ANALYTICAL SUPPORT

Specialist analysts available, either within the IT group and/or business units.

Fewer full-time analytical specialists remaining, and most users are unlikely to have direct access to them.

Users of varying skill levels should be able to go from seeing simple reports to delving into more detailed analyses, without help or training—requires much more sophisticated integrated solutions than in the past.

SYSTEM EVOLUTION

Once implemented, systems need only be updated occasionally. Only minimal resources need be allocated to the enhancement of working systems.

Systems need to be changed continually, to meet new business needs and marketing demands. Obsolete systems can become unacceptable very quickly.

E-analytical systems should never be expected to settle down or to be "completed". Development resources must remain available to extend their scope, capabilities and appearance.

TECHNOLOGIES

Stable for years on end. Mainframes, midrange systems and PCs only change at a slow rate, and a reporting system can have the architecture hardwired in without serious problems.

Constantly changing. Platform, browser, data interchange, database and bandwidth standards changing rapidly. New mobile devices with wireless communications are emerging and then becoming obsolete almost overnight.

Systems have a short life. Also, not all users will keep pace with the latest technologies, so the system should be compatible with older hardware and software while allowing exploitation of the latest innovations.

New, but not Immature

Clearly, E-analytics differ from conventional analysis and reporting in both scale and scope—but they represent more than thirty years of evolution in computerized analysis. The earliest analysis was done on expensive mainframes in the mid 1960s, using languages like APL and Fortran that only programmers could use. Only the largest companies could afford such tools, and they had only a few, highly qualified, technical users.

The first analytical and statistical packages were launched on timesharing mainframe computers in the early 1970s. These did not necessarily need professional programming skills, but they were still aimed at analytical specialists.

From the early 1980s, spreadsheets on personal computers became very popular because they were fast, cheap and easy, but data connectivity and scalability remained difficult. And maintenance was a nightmare.

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By the mid 1980s, the first executive information systems (EIS) were in use, providing very easy, fast access to high-level corporate data. But these systems were very expensive and hard to maintain, so their use did not spread far out of the executive suite—and few survived the departure of their sponsors. Client/server OLAP tools were also introduced and became a big success in the following decade. Both EIS and OLAP tools had to deal with data integration issues, usually well before data warehouses were available.

Many of these threads merged in the 1990s. The new, fast, easy to use, scalable systems were affordable enough to spread to all the decision makers of many companies. Many were supported by data warehouses, so data quality and maintenance were much improved (though far from perfect). By the late 1990s, the Internet had cut software management and communications costs and made it possible to deliver useful analytical systems to many more people, including outsiders such as suppliers and customers.

One surprise is that the trend is to make systems less sophisticated: in the early days, operational researchers went to great lengths to perform advanced analyses like goal seeking, non-linear optimization, 'what if?' tests, Box-Jenkins, Monte Carlo simulations, multiple regressions and time series analysis. Now, although all those techniques still exist, the vast majority of users ignore them. A small number of specialists use these and other, more modern, data mining algorithms, but typical end users want systems that are fast, reliable, relevant, easy to understand and pro-active.

Though the challenges should not be underestimated, the next stage of e-analytics is not a venture into the dark: every issue has already been confronted before, though not all have been addressed in any single system. The one certainty is that there is no reason to start from scratch

and risk all the problems that off-the-shelf commercial software has already conquered.

A PLAN FOR ACTION

The most obvious point is that e-analytics should be regarded as an essential, intrinsic part of the implementation of an e-business model, not an afterthought that the IT people can get to once the new e-commerce systems are working. The key attributes can be summed up in an appropriate acronym as:

Fast: The systems must be implemented and changed as fast as the transaction systems that feed them, and the business needs that depend on them. These are, for once, truly mission-critical systems.

External: Many of the users and much of the data will be external to the organization, so systems must have the fine-grained multi-dimensional security to cope with firewalls and users in different roles, levels and entities. They also need the metadata integration capabilities to merge data from multiple organizations.

Volumes: Data volumes will be much larger than before, because of increased transactions, more external data and the deluge of clickstream data. But users should still be able to navigate easily and the system should scale to cope with the volumes.

Easy: Most of the users will be casual, and many will be outsiders, so the systems must be truly intuitive, for both viewing and investigating further. Most will not be regular users, and few will have any training. So, "easy to use" must mean just that—users should not even realize they are using an analytical system.

Responsive: The system must respond to queries rapidly, and provide alerts to users when new information and analyses that they need to see is available.

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