



Achieving High ROI Benefits Through Intelligent Device Management

A straightforward approach to developing a return on investment business case shows how intelligent device management can lower costs and increase revenues to organizations that service and support equipment in the field or at customer sites.

Michael C. Hulfactor, Ph.D.
Senior Partner, Customer Insights Group

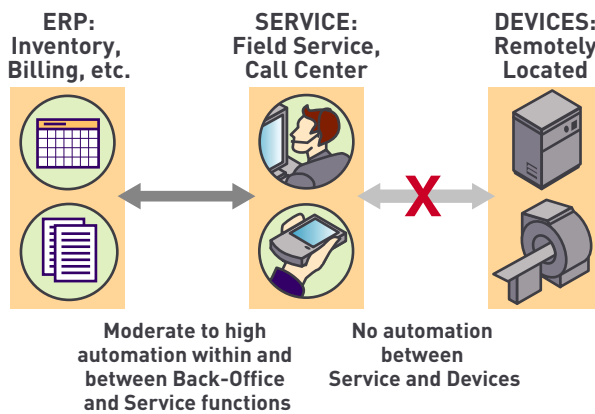
Table of Contents

The Gap in Automated Service Systems	2
Why Conduct an ROI Business Case Analysis?	3
IDM Benefits Analysis	4
Realizing Cost Savings with IDM	4
Revenue Enhancement with IDM	7
The Bottom Line: Is IDM Worth the Investment?	8
Conclusions	10

The Gap in Automated Service Systems

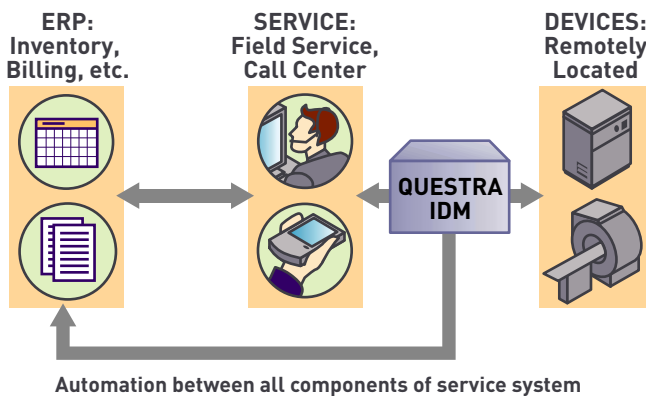
Most major equipment manufacturers have added IT automation to their service centers to wring out greater efficiency and effectiveness. It is now common for centers to use CRM and field service IT solutions to produce trouble-tickets, customer tracking reports, and schedules for call center and field technicians. In turn, these systems are often connected with company-wide ERP systems for reporting and billing. Yet, while service centers have linked their people to automated service systems, there is an enormous gap in these systems: **the devices they maintain and repair are still largely invisible to them.**¹ As a result, service organizations use highly labor-intensive approaches to troubleshoot and repair devices. These approaches involve costly call center troubleshooting with customers, field service truck rolls, and overstocking of spare parts inventories.

The Gap in Current Automated Service Systems



The missing link in automated service is technology that integrates devices located at sites around the city or around the world into service systems. Over the past two years, Qestra has deployed Intelligent Device Management (IDM) systems and applications that bring operational data from remote devices into the automated service system. The technology bridges the gap between devices and other automated service system components. IDM enables devices to have dialog with existing service packages such as call-center and field service support. Furthermore, IDM supports ERP back-office applications such as billing and inventory/order management. IDM helps deliver on the promise of a fully automated service system.

Qestra IDM Provides the Missing Link in Automated Service Systems



Most major equipment manufacturers have added IT automation to their service centers to wring out greater efficiency and effectiveness.

¹ Some service centers use software that controls a session with a remote device on occasion, but this software has minimal or no automation capabilities.

Why Conduct an ROI Business Case Analysis?

For many companies, a new technology project such as IDM requires justification before resources can be allocated to it. Managers in the service, IT, or R&D departments that initiate the project need to answer questions that assess the technology’s financial impact on the company:

- Is a new technology investment worth it? That is, how long will it take to be paid back through cost savings and new revenue enhancements?
- Will the project generate additional financial returns?

Managers can answer these questions by conducting a business case return-on-investment (ROI) analysis. ROI analyses are increasingly important business case and evaluation tools. Understanding the financial implications of a technology purchase is particularly important in the present economic environment, because department technology budgets are experiencing competing demands for scarce budgetary money.

Questra’s ROI Calculator makes this analysis a straightforward process by including the major steps of an ROI business case, with details specifically relevant to IDM. These details come from experience Questra customers have had with IDM. With the calculator, managers can model their investment in IDM, and make payback estimates for:

- A pilot or full IDM installation
- Adding or subtracting devices from the IDM installation at any given time

ROI Calculator

Enter Data	1	Baseline	◀ Enter instrument forecast, price, service contract price, etc.
	2	Investment	◀ Enter total cost to implement IDM.
	3	Incremental Revenues	◀ Enter incremental revenue streams due to IDM.
	4	Decreased Costs	◀ Enter cost savings due to IDM.
Results	5	Results	◀ Immediate results.
	6	Cashflow	◀ 5 year cashflow.
	7	Summary	◀ Summary of results, suitable for presentation.

This white paper uses the Questra ROI Calculator to show the basic elements of an ROI business case analysis for IDM, with detailed and realistic examples of fully implemented systems. The first step to conducting an analysis is to identify possible benefits IDM can bring to a company. Benefits include cost savings over existing technologies and additional revenues generated. The ROI analysis translates as many of these benefits as possible into financial terms. Next, with knowledge of deployment targets and investment levels, it is possible to measure the financial effects of IDM over a period of time. Finally, the white paper shows the necessary steps a company can take to make a “go” or “no go” decision about the IDM technology project based on the ROI analysis.

ROI business case analyses are unique to each company and industry because no two sets of inputs are alike. Ask your Questra representative to demonstrate the Questra ROI Calculator to you.

IDM Benefits Analysis

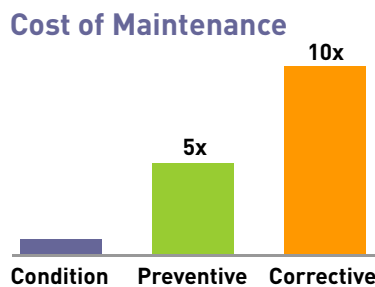
An IDM automated service system offers benefits over current service systems. These benefits form the initial elements of an ROI business case analysis. Some benefits can be measured directly, such as the number of customers who sign up for service contracts after warranty periods have expired. Data supporting these metrics exist in a company’s internal purchasing and service systems. Other benefits are more difficult to pin down, such as the improvement in a company’s reputation for making quality products. This metric is made up of many factors, one of which is device uptime.

Many IDM benefits are summarized in the table, and companies can add to or subtract from the list to suit their circumstances. Each benefit is categorized either as a cost savings over the current automated service system or as a source of new revenue. Benefits that are not easily measurable should be included in the ROI business case, but they cannot be modeled financially without supporting data.

Benefit	Cost Savings?	Revenue enhancing?	Can be measured?
Change mix of field service calls: less emergency, more routine	✓		✓
Reduce number of field service calls (increase staff productivity)	✓		✓
Increase call center efficiencies	✓		✓
Reduce inventory costs	✓		✓
Increase device uptime and throughput		✓	✓
Increase use of consumables		✓	✓
Customers purchase more service contracts		✓	✓
Customers purchase value-added service contracts		✓	✓
Increase customer satisfaction/loyalty		✓	
Increase company reputation for making quality products		✓	
Increase reputation for service efficiency and effectiveness		✓	

Realizing Cost Savings with IDM

Service managers have strong incentives to carve out cost savings from their service centers, particularly in the areas of labor and inventory. Because IDM brings prognostic and diagnostic information from devices to the service center in real time, it contributes efficiencies that translate into substantial cost savings. How to quantify these savings varies for each service system. In general, however, industry experts estimate the cost of condition-based, or predictive, maintenance to be only one-fifth of preventive maintenance. It is only one-tenth of corrective maintenance.²



Major areas where IDM can contribute cost savings to an automated service system are field service operations, call centers, and inventory management. These are discussed below, with generalized examples for a fully implemented IDM system.

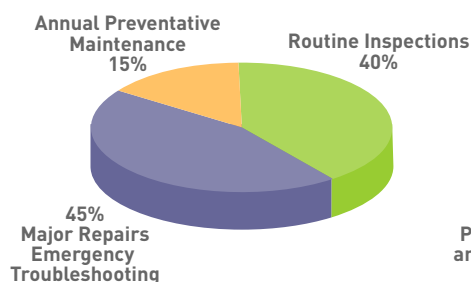
Industry experts estimate the cost of predictive maintenance to be only one-fifth of preventive maintenance. It is only one-tenth of corrective maintenance.

² Jay Lee, "Advanced Infotonics Technologies for Smart Life Cycle Support," NSF Industry/University Cooperative Research Center on Intelligent Maintenance Systems (IMS), slide presentation, n.d.

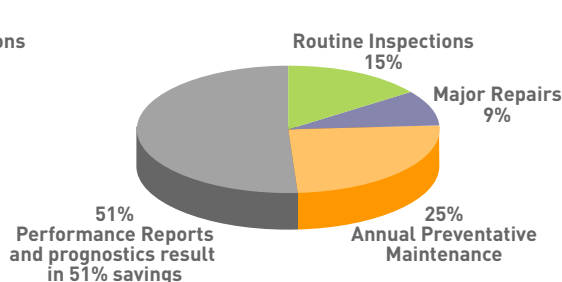
Field Service Costs

IDM has a significant impact on field service costs through the shifting of expensive emergency troubleshooting and major repair work to more routine inspections and preventive maintenance and through call avoidance. The NSF Industry/University Cooperative Research Center on IMS estimates a large portion of current field service operations expenses could be saved by using advanced technology such as IDM that provides diagnostic and prognostic information.³ This affects the mix of service calls: up to 80% of all emergency responses could be avoided through an automated and optimized service capability.⁴

Typical work breakdown in a service agreement without prognostics and diagnostics



Typical work breakdown in a service agreement with prognostics and diagnostics



But cost savings aren't limited to shifting the mix of service call types. Additional cost savings can be realized through call avoidance. NSF/IMS estimates about half of field visits could be eliminated.⁶ This estimate is supported by an ARC Advisory Group study⁷ that found over half of planned instrument maintenance could be unnecessary. In most instances field technicians found no problems with the instruments they routinely checked. Anytime maintenance can be replaced by automated IDM diagnostics and prognostics reporting, there are subsequent labor costs savings.

Example 1

Assume a manufacturer sells 1,000 IDM-suitable devices for an average of \$50,000 apiece. (One thousand devices are used in this example, but results are extendable to 10, 100, or even 10,000+ devices and amounts in-between.)⁵ Examples of devices are medical and laboratory instruments, automated plant equipment, and production machines. Following the NSF/IMS work, currently 55% of field service calls are preventive maintenance and routine inspections, and 45% are emergency troubleshooting and major repairs. The average cost for a routine inspection is \$600, but the cost for an emergency repair skyrockets to \$1,200 when transportation, lodging, and overtime costs are included. With an average of two service calls per year, the calculated cost of field service in the current system is \$1,740,000 per year for the 1,000 devices, or an average of \$1,740 each. Now when IDM is implemented many emergency repairs become routine maintenance, resulting in a new service type mix of 80% routine/maintenance and 20% emergency. With IDM deployed, the service mix shifts to increased levels of routine maintenance and yields cost savings of \$375,000 per year, or a savings of 17% over the current system.

³ NSF Industry/University Cooperative Research Center on Intelligent Maintenance Systems (IMS), University of Wisconsin at Milwaukee and the University of Michigan at Ann Arbor, 2001.

⁴ This estimate is derived from the NSF/IMS work as follows: Without prognostics and diagnostics, 45% of field service work is devoted to major repairs/troubleshooting. With prognostics and diagnostics, 9% of service calls are major repairs/troubleshooting, which represents an 80% savings from the original 45% that are major repairs/troubleshooting without prognostics and diagnostics.

⁵ However, keep in mind economies and diseconomies of scale.

⁶ This estimate is derived from the NSF/IMS work as follows: Fifty-one percent of field service calls are unnecessary when the service system includes device prognostics and diagnostics. In other words, about half of the service calls can be avoided.

⁷ Jay Lee, op. cit.

With IDM in place, the number of annual field service calls for a device is cut in half, from two calls to one call. Given the new mix of routine and emergency calls for 1,000 devices, the additional cost savings over the current system is **\$720,000 or 41%**.⁸

To summarize this example, with IDM changing the mix of service calls and reducing the number of calls, the total field service savings over a non-IDM service system is **\$1,020,000 for a 59% savings**. In other words, without IDM, field service runs nearly \$1.75 million annually for 1,000 devices; with IDM, field service costs for these devices is less than \$0.75 million.

Call Center Costs

On a per-call basis, call center costs are a small fraction of field service costs because of centralization, high levels of automation, and economies of scale. With IDM implemented, some calls that were handled by field service will be turned over to call center tech support staff. On balance, though, IDM creates new efficiencies and reduces costs in these centers. It does this by:

- Decreasing the number of call center calls per instrument as problems are handled by the automated IDM system
- Increasing call center efficiency by giving agents rapid access to detailed device information through the IDM system

Example 2

For 1,000 devices call center costs are \$400,000 per year, or an average of \$400 for each device, made up of 20 calls per device at \$20 per call. The implementation of IDM results in 10% fewer calls and 10% less cost per call. The savings with IDM is **\$76,000 or 19%** of the total call center budget.

Inventory Management Costs

A major cost area for service centers is spare parts inventory management. Costs involve not only the parts themselves—and critical parts are often overstocked to maintain contracted SLA or customer satisfaction metrics—but carrying costs like warehousing and capital costs.

IDM-enabled service offerings permit savings in inventory management in three ways:

- Fewer critical parts on hand for emergency repairs as IDM reduces this type of service
- Fewer parts needed by field service technicians on a field call, since pre-visit IDM troubleshooting can pinpoint a problem area and prevent unwarranted parts replacement⁹
- Reduction in overstocking of parts because IDM provides a more metered approach to problems by developing histories of device-type problems

Example 3

The annual cost for a service center's spare parts inventory is \$1,100,000 for 1,000 devices, or \$1,100 each. This represents the cost of the inventory and its carrying costs, which include expenses related to capital, storage, deterioration, obsolescence, insurance, and taxes. With IDM implemented the service center realizes a 10% decrease in inventory needed on hand and a 10% increase in spare parts management efficiency, resulting in a savings of **\$132,000 or 12%**.

IDM can help service centers make more money for their companies.

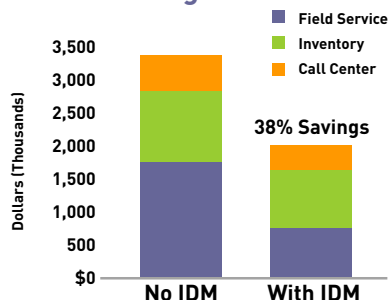
⁸ Total cost savings are correctly estimated by including service mix changes and reduction of service calls in the calculation. The 41% additional cost savings from call avoidance is the result of netting out the savings from changing the service mix only.

⁹ Field service technicians are under pressure from their managers to achieve first-call resolution, and under pressure from the customer to bring equipment back up as quickly as possible. When a problem is not well understood, technicians will often swap out a variety of parts to make sure that the problem is fixed on the first visit. This situation is reduced in an IDM service system.

These examples suggest that IDM within an automated service system creates cost savings in many service system areas. The most significant savings come from the most labor-intensive part of most service systems: field service operations. Compared to an automated service system without IDM, IDM can achieve an overall **38% savings** in the entire service system in these examples.

For device manufacturers, the bottom line is that lower service costs create higher profit margins for service. In addition, some service savings can be passed to end-user customers to create a competitive advantage: the manufacturer is able to provide better service than competitors at a substantially lower price.

Cost Savings



Revenue Enhancement with IDM

Many companies think of their service organizations more as cost centers and less as profit centers. IDM certainly has substantial cost saving components, but it also can help service centers make more money for their companies. As customers experience greater accuracy in their devices, less downtime and greater throughput, their satisfaction and loyalty will rise.¹⁰ IDM can positively impact a company's market share and earnings by improving customer "stickiness," improving a reputation for quality, and by adding competitive differentiation. In short, everything else being equal, the company will sell more devices. But customer loyalty, reputation, and competitive differentiation are difficult to quantify in ROI models, though they are important to point out in business cases.¹¹

Some ROI metrics that measurably impact revenue and profit are increased device uptime and throughput (resulting in higher consumables usage), higher contract renewal rates, and new value-added contract offerings.

Increased Device Uptime Effects

Increasing system uptime by as little as 1% can add almost four extra days of device availability each year. IDM can help a company increase its device uptime and availability through prognostics and diagnostics. For end-user customers, this translates into more product production and revenue. It is also a competitive advantage in those industries where uptime is critical, such as drug discovery and semiconductor manufacturing. Higher uptime also enhances revenue for device manufacturers that charge customers based on number of hours of device use, number of tests completed, or pages printed. Those that provide consumables such as toner, reagents, fluids or gases, can realize additional incremental income.

Example 4

*For 1,000 devices the average device uptime is 97%. IDM enables a company to increase uptime to 99%. The manufacturer has a per-use revenue model that generates revenue of \$100 per use, with a 30% gross profit margin. The average number of uses per device is 200 a year. With IDM implemented, the additional gross profit generated with a 2% increase in overall uptime is **\$120,000**.*

*Assuming the average device income for consumables is \$10,000 per device for 1,000 devices, with a gross profit margin of 30%, as uptime goes up to 99%, the manufacturer achieves an **additional \$60,000** per year in gross profit from consumables.*

Increasing system uptime by as little as 1% can add almost four extra days of device availability each year.

¹⁰ See, for example, Michael Hulfactor, *The Impact of Lab Equipment Downtime in Life Sciences*, Qestra, 2003, for empirical research relating end-user customer satisfaction to service breakdowns.

¹¹ If a company can marshal data to bear on these areas, such as customer satisfaction estimates, it should by all means include them in the ROI business model. See, for good examples, Jack M. Keen and Bonnie Digrius, *Making Technology Investments Profitable: ROI Road Map to Better Business Cases*, Wiley, 2003.

Service Contracts

An IDM-based service system provides new opportunities to generate revenue from service contracts. There are two basic ways this can happen:

- By selling more service contracts
- By offering a premium service offering with better service level agreements

A benefit of IDM-driven service is increased customer satisfaction and loyalty. It can help stimulate some customers whose devices are beyond the one-to-two year warranty period to purchase service contracts when they wouldn't otherwise. IDM also adds so much additional capability to the automated service system that some companies can use it to develop premium services. These services can have higher availability or reliability guarantees and faster response times.

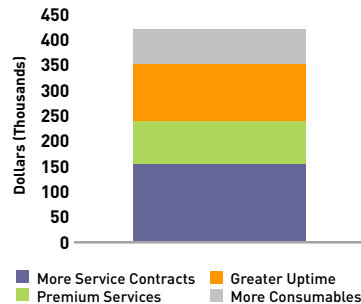
Example 5

*For 1,000 devices the average current contract price per device is \$5,000 after the one-year warranty expires, with a gross profit margin of 30%. Presently, the contract purchase and renewal rate averages 50% of devices. With IDM implemented, the renewal rate increases to 60% the second year. The company will receive an **additional \$150,000** in services gross profit that year.*

*For these same 1,000 devices, the manufacturer has created a tiered offering of service level agreements and can charge a premium for the tiers that utilize IDM functionality. If the average cost of a service contract increases 10%, from \$5,000 to \$5,500 as more customers opt into the IDM tiers, the company will earn an **additional \$90,000** in gross profit on these contracts.*

Overall, with IDM implemented and improvements in device uptime and in service contracts, these examples are estimated to generate over **\$400K in additional returns** for the company. These additional revenues not only help the service center's bottom line, but also help it meet a strategic goals of becoming a profit center for the company.

Returns with IDM



A benefit of IDM-driven service is increased customer satisfaction and loyalty.

The Bottom Line: Is IDM Worth the Investment?

The key part of an ROI business case analysis for IDM is answering two bottom line management questions:

- How long will it take a given investment to be paid back through cost savings and new revenues?
- Can it contribute acceptable levels of financial returns?

In order to answer these questions, it is important to determine the amount of investment required over a given period of time. Investment is then compared to expected cost savings and revenues. Finally, the results are assessed according to thresholds that management set for the payback of the investment and desired financial returns of the project.

Investment

Implementing an IDM-based system requires an initial investment plus ongoing expenses:

- The initial investment includes licensing and hardware costs (additional servers, if needed), implementation costs, and training costs
- On-going expenses include annual support, software and hardware maintenance costs, and training costs

Questa has IDM product offerings that are tailored to companies’ specific circumstances.¹² These products identify initial and continuing product and service costs. A company, too, should estimate any additional internal costs in order to obtain an accurate estimate of all expenses associated with the investment.

Payback and Financial Returns

The first key management question is, how much time will it take to recover the project’s investment? The point at which the returns from IDM are equal to the investment outlay is called the breakeven point. The first step is to calculate the **Total Effect of IDM**. This refers to the total of financial returns the company could realize with an IDM enabled service system replacing the current service system, and is simply the sum of reduced costs and increased revenue for any particular year.

The second and final step to finding the breakeven point is to calculate the **Net Effect of IDM**. This is the Total Effect of IDM minus the costs of the initial and continuing investment in IDM. These values, projected over time, also answer the second key management question about the financial returns of IDM compared to the current technology.

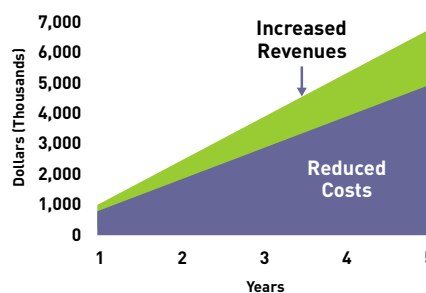
Example 6

A company plans to deploy IDM with 1,000 devices for the first year, and will add 1,000 additional devices each year for the next four years. With the same cost expense and revenue enhancement categories used previously, but with adjustments made for deployment lags during the first year, a five-year outlook for cost savings and revenue increases shows dramatically the growing returns from an IDM service system, with the majority of returns from cost savings.

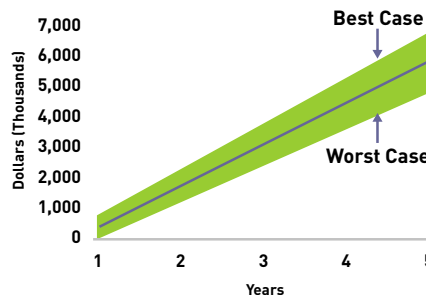
Using information about the initial and continuing investment for the devices over the five-year period, the Net Effect of IDM base case is calculated. Since this information is a management decision tool, an uncertainty term of ±20% of the base case is also included. This produces best and worst case scenarios, with the base case scenario in the middle.

Once the Net Effect of IDM is calculated, it is possible to estimate how long it will take to recover an investment; that is, reach the breakeven point. The financial returns the project will generate over a period, such as the internal rate of return (IRR) and other financial metrics, can also be determined. These

Total Effect of IDM



Net Effect of IDM



Questa’s IDM technology helps device manufacturers that are using automation in their service systems achieve greater efficiencies and overall profitability.

¹² Talk with your Questa representative for current product offerings and pricing.

calculations are compared to breakeven and IRR thresholds that management use to evaluate projects. For the example here, even with an uncertainty factor of +- 20%, IDM quickly produces financial returns in the **millions of dollars**.

Conclusions

Questa's IDM technology helps device manufacturers that are using automation in their service systems achieve greater efficiencies and overall profitability. IDM makes devices visible to these systems, and can also integrate with other automated system components. A straightforward ROI business case analysis enables IT, R&D and service managers to capture, quantify, and financially model important IDM elements when compared to a non-IDM system. Elements include, but are not limited to:

Cost Savings

- Reductions in field service costs through changing the mix of service call types and the numbers of service calls
- Reduction in call center costs
- Reduction in inventory costs

Revenue Enhancement

- Increases in device availability and throughput
- Higher contract renewal rates
- Value-added contract offerings

When these elements are taken together and compared with the investment required for Questa IDM technology, a company will find it can achieve high ROI benefits. How many benefits and their financial value will depend on its circumstances, which it can model with the Questa ROI Calculator. Results from the calculator can help it develop a business case that confidently estimates when the system will pay for itself and what additional financial returns are possible with IDM. Payoffs are not only in increased device uptime and throughput, customer satisfaction and loyalty, and service center productivity, but also in meeting strategic cost cutting and revenue generating goals.

About the Author

Michael Hulfactor, Senior Partner for Customer Insights Group, focuses on customer demand and targeting in business markets in the U.S. and worldwide. He has managed numerous proprietary studies over the past eleven years with global technology companies including IBM, Oracle, Sun, Netscape and Apple, as well as startup companies. Specializing in quantitative research management and analysis, he was formerly chief analyst for the Division of Academic Computing at the University of California, San Diego. He has a Ph.D. in administration and policy analysis from Stanford University.



Customer Insights Group
Mountain View, CA 94040
www.customerinsights.net
650.969.4535



Questa Corporation
333 Twin Dolphin Drive
Redwood City, CA 94065
650.632.4011