



Trends in Technology

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Introduction

Management is on the verge of a major breakthrough in understanding how company success depends on the interactions between the flows of information, materials, money, manpower and capital equipment. The way these five flow systems interlock to amplify one another and to cause change and fluctuation will form the basis for anticipating the effects of decisions, policies, organizational forms and investment choices.¹

Almost 50 years ago, Jay Forrester introduced a theory of management that recognized the integrated nature of organization relationships. He identified key management issues and illustrated the dynamics associated with what we now refer to as supply chain management (SCM). Discussing the future, Forrester proposed that after a period of research and development involving basic analytic techniques,

...there will come a general recognition of the advantage enjoyed by the pioneering management who have been the first to improve their understanding of the interrelationships between separate company functions and between the company and its markets, its industry and the national economy. (p. 52)

Evidence of the advantages gained by improving such management understanding is often cited in stories touting the success of companies such as Wal-Mart® stores, Dell™ computers and others.² Implementing innovative strategies, including the early adoption of new technologies, has helped these companies recognize and respond more effectively to market dynamics. The results are reflected in impressive patterns of revenue growth, productivity and profitability.

As with business organizations, government agencies are influenced by market dynamics. Operating success in government is more concerned with service and accountability to the public rather than profitability, though the particular agency goals may differ. In the case of military and homeland security organizations, service is associated with public safety and local, state and national security. In other instances, such as the U.S. Food and Drug Administration or the U.S. Department of Health and Human Services, service may be evaluated in terms associated with public health.

Despite seemingly different goals, many of the dynamics influencing operations in private and public organizations are similar and can benefit from the application of similar technologies and management methods. Just as companies

learn from their peers in different industries, government agencies have an opportunity to learn about improved management techniques and systems from business as well as from other government entities.

This year's inaugural report on trends in technology draws from public- and private-sector sources to identify technologies that either currently contribute, or are expected to contribute, to improved planning and management. More specifically, this report addresses technologies supporting planning and management in the functional areas of finance and supply chain management. The purpose of this report is to point out those technologies that are expected to make a significant contribution to improved operating performance independent of industry. Furthermore, it describes how the technologies may be applied, key components and definitions, and anticipated benefits from implementation.

Technologies Enable Better Decision-Making

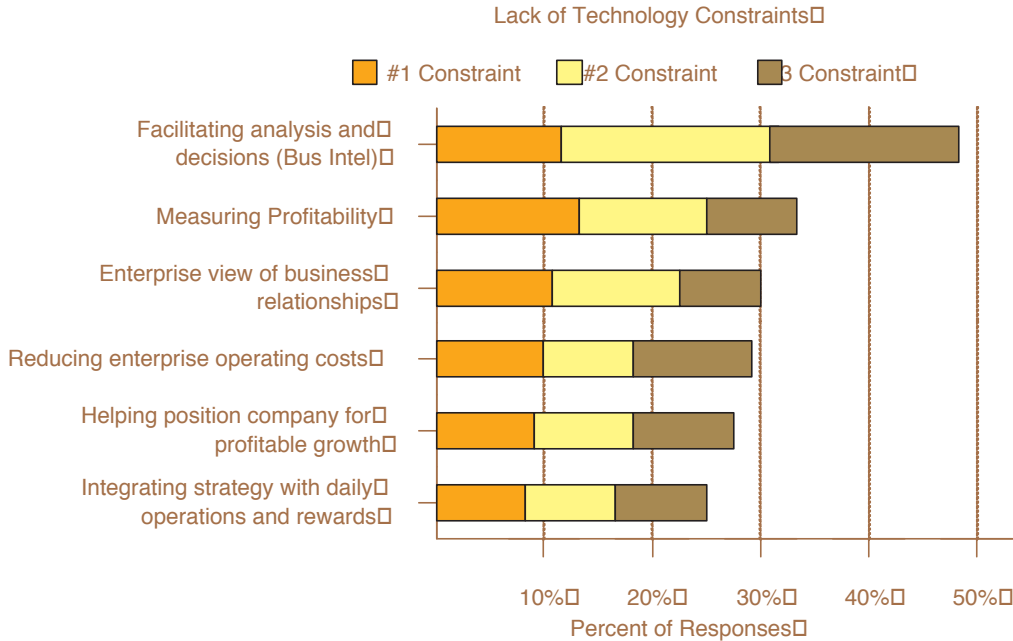
The implementation of new systems and technologies in planning and management can influence the way individual jobs and entire organizations function. Whether the technology involves bar code scanning or radio frequency identification (RFID) or perhaps shop floor control or network optimization, technology advances are helping individuals and organizations focus on making *better-informed decisions*.

At the transaction level, technology is helping to manage process flows and ensure that more accurate data are being collected in a more consistent and timely fashion. At the same time, processes that once relied on manual activities are frequently being automated, eliminating mundane tasks and speeding processing. Data storage capacities have expanded dramatically, lowering the cost to collect and maintain more precise records of current and historical activities. Computer processing power is increasing, as envisioned in Moore's Law, allowing for more complex analyses involving greater amounts of data.³

In the seventh annual *Technology Issues for Financial Executives* survey, sponsored jointly by the Financial Executives Research Foundation (FERF) and Computer Sciences Corporation (CSC), the detailed assessment of the information technology (IT) practices, priorities and problems that confront today's senior financial leaders provided insight for the challenges, constraints, and opportunities they face. *Figure 1* illustrates the responses when 782 of these executives were asked to rank the top three areas believed to be most constrained by a lack of appropriate technology solutions. Participants, who included both private and public entities, identified support for analysis and decision-making, as well as support for enterprise-wide operations and relationships as key constraints.

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Figure 1: Top three areas believed to be most constrained by a lack of appropriate technology solutions



The capabilities being offered through the implementation of new technologies will have a dramatic effect on the nature of work and the support requirements of the future work force. As the implementation of new technologies help to reduce or eliminate manual tasks, individuals will be able to focus on more complex issues. Doing so will require more critical thinking and collaboration skills. Fortunately, individuals now entering the work force may be better prepared for these circumstances because of their greater familiarity, and likely less trepidation, with technology. There is some evidence that even computer gaming may improve decision-making skills. In addition, the apparent ubiquitous existence of instant messaging via computer and text messaging via phones and personal digital assistants (PDAs) are creating an environment that encourages collaboration. The challenge for government and industry will come from the transition period during which either current, more mature workers are not prepared for change or the adoption of new technology does not occur fast enough to ward off new worker frustration.

An overarching reason for implementing various technologies is to improve the quality of management information. In its Statement of Concepts Number 1, the Federal Accounting Standards Advisory Board (FASAB) describes the characteristics and attributes of quality information. We further organize the characteristics into three groupings with associated attributes as follows:

- **Relevance**—information that is timely, provides feedback value and predictive value to the user.
- **Reliability**—information that is valid, verifiable and unbiased.
- **Understandability**—information that is consistent and comparable

Figure 2 illustrates the technology-enabled characteristics that support the information needs of management.

The remainder of this report will address six key technology areas expected to make a significant contribution to future enterprise planning and management. Each technology area concludes with a table outlining the contributions of the technology discussed toward developing quality information. In addition, the implications from the application of each technology in supply chain and financial management are highlighted. The six technology areas include:

- **Business Intelligence:** These systems offer organizations a means to draw valuable information and provide decision support from the increasing volume of data being collected throughout government enterprises.
- **Compliance Management:** Similar to the record requirements dictated to public companies resulting from the Sarbanes-Oxley Act of 2002, government organizations

Figure 2: Attributes of Quality Information

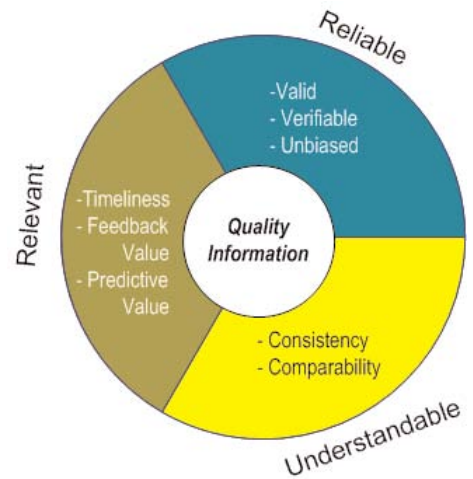
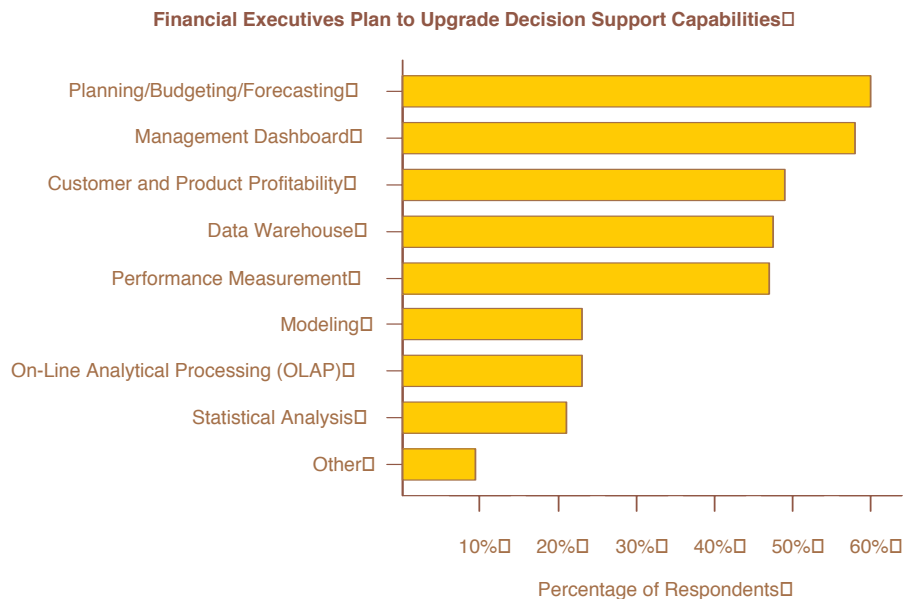


Figure 3: Areas of decisions support expected to be upgraded



have compliance requirements to address with greater rigor. These systems provide a means to improve record-keeping and productivity with regard to this information.

- **Business Process Management:** Business process management systems help more clearly define, organize and manage processes throughout an organization.
- **Portfolio Management:** These systems are providing organizations with a more complete analysis of system and project performance. They offer a means to consider risk, performance, and the allocation of current and future capital investment.
- **Radio Frequency Identification (RFID):** Experiencing significant growth in adoption, RFID is providing a means to monitor assets on a near-real-time basis. Such systems are expected to make a dramatic contribution to planning and management throughout enterprise supply chains.
- **Wireless Technology:** With applications directed at voice and data communications, wireless technologies are finding application in all areas of enterprise management. Of four emerging wireless technologies (RFID, Bluetooth®, wireless fidelity [Wi-Fi], and global systems for mobile communications [GSM]), two are expected to have a significant impact on business transformation. Bluetooth and GSM are not receiving as much attention and adoption. It is possible that Wi-Fi, through its variant versions, will consume Bluetooth, because they are actually complementary technologies. GSM, widespread as it is at the moment, will be superseded by a newer version of its emerging platform.

Business Intelligence Systems

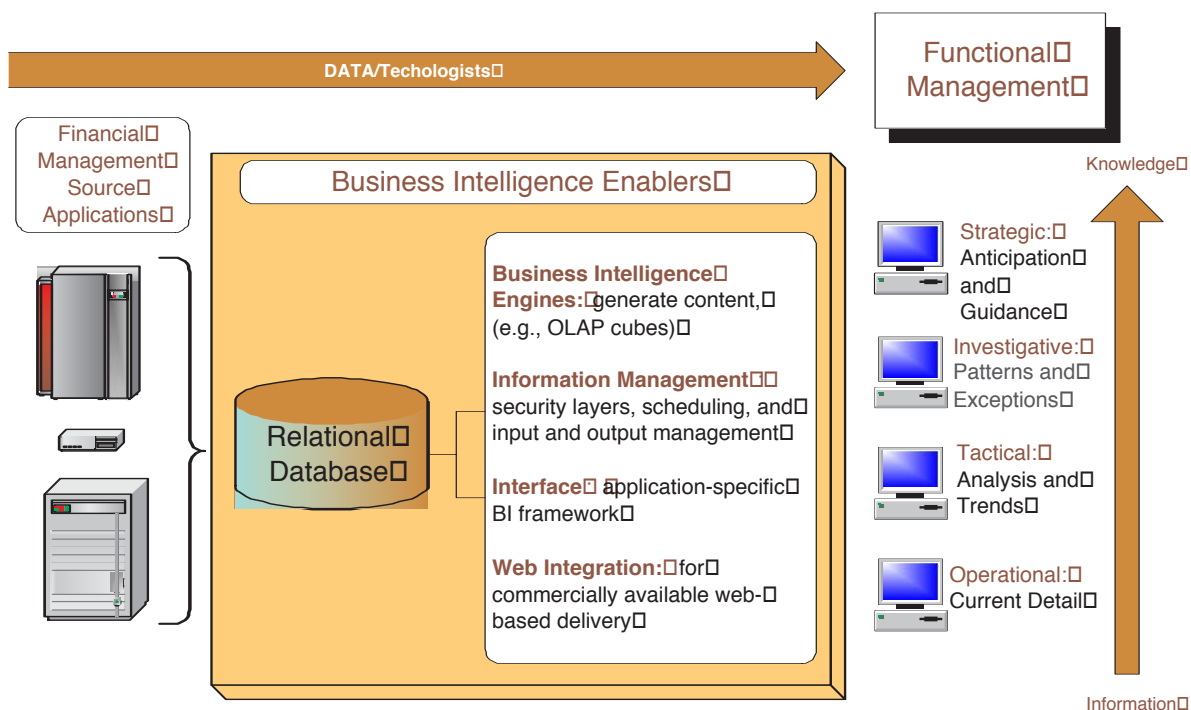
Just as in the private sector, one of the public-sector trends for technology is the coming of age of business intelligence applications. The robust reporting and analytical features of business intelligence tools support e-gov initiatives and performance measurement and improve the information available for decision-making.

Business intelligence (BI) can be described as the process of enhancing data into information and then into knowledge. It is the art of wading through massive amounts of data for relevance and presenting information upon which management may make decisions.⁴ Enhanced BI tools and techniques will play a critical part in the integration of financial management information with the functional management of public resources.

In the 2005 *Annual Report on Technology Issues for Financial Executives*, most respondents (60 percent) plan to continue to invest to improve their analytical information. The figure above indicates that most plan to improve their information availability in predictive analytics, followed closely by executive- and management-level dashboard indicators.

The business intelligence landscape can be segmented into technology enablers and functional applications, as displayed in *Figure 4*. (Each element of the BI landscape is discussed in the narrative following the figure.)

Figure 4: Business intelligence enablers



In the realm of the technologists and data wranglers, regardless of the specific BI application, transforming transactional data from financial management sources into the information and knowledge for functional management requires five prerequisites (Figure 4):

Relational Database: Stores data culled from financial management systems across the organization. This is the feature that will actually execute queries and return raw results of those queries for processing into business intelligence. This database, designed to favor efficient data analysis and reporting, may include data warehouses, which are primarily a record of an enterprise’s past transactional and operational information. The ability to store increasingly large amounts of data (for example, terabits or 10^{12} bits) in relatively compact areas has been a key technology enabler for the development of data warehouses.

Business Intelligence Engines: Provides the platform to create a layer above the relational database for users to interact with. Security can be applied here because users cannot see the entire database, but rather the relational designs constructed uniquely for each project in the business intelligence engines. This allows designers to construct queries to extract appropriate data from the database, using a lexicon unique to the organization, and structures the raw results of those queries into business intelligence content. For online analytical processing (OLAP), a snapshot is taken of the relational database, and it is restructured into a

dimensional database, which supports complex queries more efficiently than the relational source database. This structure, the OLAP cube, can potentially contain all the answers to every query that can be answered from the data. Often, only a predetermined number of answers are fully calculated, while the remaining calculations may be triggered upon demand. Some BI applications spin the results off into third-party supporting applications, such as Microsoft’s Excel or Adobe Acrobat’s portable document format (PDF).

Information Management: Manages the BI documents, coordinating schedules, and input and output requests. The technical aspects of security, access and delivery are managed for all the interacting elements of the BI application.

User Interface: Provides the “look and feel” unique to the specific BI application. The parameters for user queries and the displays, reports and specific analysis tools are all elements for the user interface.

Web Integration: Involves enabling a web-based delivery system. This system includes some level of integration with commercially available web servers.

From a functional management perspective, BI adds value in transforming the raw data harvested from the financial management systems into quality information. This quality information is predicated on the availability of reliable data—made a reality in the public sector with the modernization of the financial management systems

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Table 1: Business intelligence systems application support

Perspective	Requirements	BI Support
Operational	Current, detailed, fully integrated data on a scheduled basis	Standardized queries for detailed information with limited scope
Tactical	Consistent, reliable, reproducible results with limited detail required for well-defined and consistent queries.	Multidimensional information with limited depth.
Investigative	Reasonable response time, with support for free-form, unstructured query capabilities, occurring infrequently or on an unscheduled basis, with the ability to scan large amounts of data for patterns or behavior or confirmation of a hypothesis	Information for identifying and addressing process exceptions, and knowledge base for establishing patterns of behavior
Strategic	Dashboard identifiers, alarms and alerts, with drill-down capability and integrated query manipulation tools	Knowledge about the organization as a whole, and performance indicators for guiding future allocation of resources

featuring integrated internal controls for data that are valid, verifiable, and unbiased. The relevance of the information BI provides is ensured, with features such as dashboard displays and drill-down and custom query capabilities, by which BI effectively tailors the information landscape to the user's perspective. Each perspective for the operation, management, monitoring and guidance of the organization has specific requirements for translating data into role-appropriate information.

Understandable information, related to the defined and disciplined processes standardized in enterprise-wide architecture and business modeling, has been critical to the development of BI applications in the public sector.

The trend toward applying robust business intelligence tools in the public sector is driven by the increasing importance of quantifiable performance metrics, the explosion of data available and the expansion of the user population.

Quantifiable performance metrics—measuring the success of the mission and program against defined goals—will continue to influence the nature, timing and funding for maintaining ongoing efforts and initiating new ones. With the analytic support capabilities and flexible query support, BI will play an important part in enabling quantifiable performance metrics.

With an increasingly enterprise-wide perspective, leveraging communication, and compilation technologies, raw data will continue to be amassed and accessible for analysis and review. With the increase of raw data available, functional management will come to rely on BI tools for retrieving relevant information.

In the environment of increasingly commonplace Internet and web-based delivery systems, the user population will continue to expand, as government-to-business, government-to-citizen, and government-to-government relationships are further developed. BI tools will become increasingly essential to selectively provide information that will support these relationships without violating privacy or proprietary concerns.

Not all BI tools are created equal. Specific features that will help shape BI as an emerging trend include:

- Capability to perform predictive analytics
- Standard report and query structures
- Flexibility for customizing reports and queries
- Interface support for multiple data streams
- Security-authentication and authorization

The U.S. Department of Commerce, like many organizations in the public sector, faces the challenges of a diverse organization with widespread responsibilities. Building a consolidated reporting system (using SAS Financial Intelligence), Commerce was able to provide managers and executives with a single, integrated information source for financial and performance data. This tool integrates budgeting, procurement, administrative and personnel data while providing complete and accurate financial performance results for the entire department. Using the web-based dashboard, executive managers can easily assess and report on the status of their organizations, explore and query near-real-time data, and view financial and performance data, including status reports for major projects and staffing reports for various personnel categories. More than 100 managers and executives currently use the system to help measure and improve performance within the department.

BI tools, incorporating features such as those listed above, will enable the public and private sectors to harvest knowledge that will support better functional management through solid information and rational analysis.

Table 2: Business Intelligence Software Vendors

VENDOR	PRODUCT
Cognos®	PowerPlay
Hyperion®	Essbase
MIS®	Alea
Oracle®	Discoverer
SAP®	BW
SAS®	Financial Intelligence

Business Intelligence Software—Competitive Landscape

Business intelligence tools have a broad array of configurations and applications, supporting the wide variety of performance and knowledge harvesting required for the unique missions of the public agency.

The vendors and products presented above are representative of the business intelligence technologies supported in the marketplace.

Implications for Functional Management

With the maturation of BI systems, the public sector will continue to explore and leverage the robust reporting and analytical features of business intelligence tools to support strategic and tactical decisions in both supply chain and financial management facets of functional management. (See Table 3)

Compliance Management Systems

With the enactment of the Sarbanes-Oxley Act of 2002 (SOX), the corporate world pioneered the best practices for containing the costs of compliance and leveraging the compliance experience into strategic applications. In the public sector, the automated compliance management system (CMS) will become an essential application for creating, monitoring and reporting regulatory compliance as CMSs are adapted for the federal regulatory environment and act as agents of change for business transformation.

Software developed and tested for SOX compliance will continue to be adapted to manage the complex compliance and performance measurement requirements in the public sector. In combining documentation of existing processes,

measurement of performance objectives, and refinement of internal controls, these applications will be a powerful tool in the organization's IT arsenal.

With this maturing technology, there is no one standard industry definition for a compliance management system, but each instance includes these features to some degree:

1. Integrated communication options-allowing information to be shared across the organization and reporting to appropriate third-party entities
2. Documentation management and workflow capture-ensuring accountability is assigned, monitored, and documented
3. Data mining and interface support-providing secure data capture, transfer, and storage for multi-sourced data
4. Performance measurement and analytic capabilities-permitting measurement against predefined goals, with trend and exception analysis

The trend for CMS in the public sector will focus on real-time compliance tools for an enterprise-wide perspective for internal control and compliance reporting. This type of software allows for one repository of financial and compliance information through support for interfaces directly with the organization's financial management transactional data. Optimally, these applications will incorporate real-time performance management indicators, customized to the user in a dashboard format. Acting as a single repository for all compliance information, with dashboard and standard report formats supported, the real-time compliance management system ultimately acts as a catalyst for long-term organizational change as compliance states are captured, prioritized and monitored across the organization.

The implementation of the U.S. Office of Management and Budget's (OMB's) revised Circular A-123, *Management's Responsibility for Internal Control*, with its close resemblance to the SOX 404 requirements, will be one of the primary drivers for CMS integration at the entity level.

Differing from previous guidance in its emphasis on the "need for integrated and coordinated internal control assessments that synchronize all internal control-related activities," OMB Circular A-123 recognizes that the true benefit of effective and efficient controls can only be achieved if accomplished within the context of the organization's mission. Under this new directive, the responsibili-

Table 3: Business Intelligence Software Implications for Functional Management

Business Intelligence Systems		
Provides Quality Information	Implications for Supply Chain	Implications for Financial Management
Relevant: Real-time capture of data directly from source	<ul style="list-style-type: none"> • Identification of stocking and delivery patterns • Cause-and-effect analysis 	<ul style="list-style-type: none"> • Cross-functional quantitative financial performance evaluation • Maintain enterprise-wide performance metrics
Reliable: Structured data storage and retrieval	<ul style="list-style-type: none"> • Operational and strategic supply chain perspectives 	<ul style="list-style-type: none"> • Audit tool for identifying exceptions
Understandable: Integrated dashboard and graphical interfaces supported by on-demand detailed information		

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ty for internal controls is fixed with the leadership of federal agencies and requires direct management involvement.

Effective compliance management systems for OMB Circular A-123 will provide a comprehensive, end-to-end solution for:

- Designing and documenting the compliance environment, organizational roles and responsibilities, objectives and risks, and control hierarchy
- Ongoing evaluation and testing of internal controls to ensure their effectiveness
- Remediation and disclosure of material weaknesses that may be detected
- Monitoring internal controls processes through executive-level dashboards and real-time reporting on metrics related to compliance activities

As a catalyst for transformation, an effective compliance management system:

- *Maintains an integrated, holistic approach*
- *Identifies goals for meeting mission objectives*
- *Defines tasks, milestones and prioritization criteria*
- *Captures and monitors accountability*

As a catalyst for transformation, effective OMB Circular A-123 compliance management systems define the control environment required to support the specific program goals constituting the agency’s mission directives. The specific internal controls at the system and application levels are structured within the organization’s overall control environment and assign priority based on the dependencies and critical organization mission objectives. Responsibility for the actions and delivery dates for remedial actions are assigned and tracked at the individual assignee level.

Compliance Management Systems Software—Competitive Landscape

SOX applications began to appear on the market in the first half of 2003. The vendors in Table 4 and their products comprise some of the market landscape:

Specialists were the first to emerge and, in most cases, provide a more mature functionality; however, they struggle with integration.

Enterprise Resource Planning (ERP) or Enterprise Application Vendors provide seamless integration with documenting controls and risks and reporting/monitoring, but have difficulty with document management and integration of records management capabilities.

ECM or Enterprise Content Management Vendors are strong in document management, workflow, and records

Table 4: Compliance Management Software Vendors

VENDOR	PRODUCT
SPECIALISTS	
HandySoft	SOXA Accelerator
Movaris®	Certainty
Nth Orbit	Certus™
OpenPages	SOX Express
Paisley Consulting	Risk Navigator
ERP VENDORS	
Oracle®	IC Manager
SAP®	MIC, IAS, WB
ECM VENDORS	
Documentum	Corporate Governance and Compliance
FileNet®	Compliance Framework
IBM®	Lotus Workspace
Open Text	Livelihood ECM™
CMS HYBRID	
CSC	Metric Stream

management, but vary in robustness regarding the Committee of Sponsoring Organizations of the Treadway Commission (COSO) framework, which is the industry standard for a structured control environment.⁵

CMS Hybrid Vendors employ more flexible and adaptable tools that respond to the fluid nature of changing requirements. They incorporate technology that enhances ease-of-use, access, and collaboration—all key to optimizing compliance success.

Implications for Functional Management—Software initially developed and tested for measuring and monitoring SOX compliance continues to be leveraged in the public sector to create, monitor, and report regulatory compliance and act as agents of change for business transformation (Table 5). The strengthening and monitoring of the control environment for functional management will have implications in both supply chain and financial management.

Table 5: Compliance Management Software Implications for Functional Management

Compliance Management Systems		
Provides Quality Information	Implications for Supply Chain	Implications for Financial Management
<p>Relevant: Automatically updated with most recent data and maintains current compliance elements</p> <p>Reliable: Review and approval processes, with exception errors incorporated</p> <p>Understandable: Standard elements for compliance measurement</p>	<ul style="list-style-type: none"> • Real-time monitoring and implementation of risk mitigation strategies • Functional role and responsibility assignment for control environment 	<ul style="list-style-type: none"> • Real-time, integrated support for compliance assertions • Prioritization of process and financial system improvements for compliance aligned with strategic goals

Business Process Management

A study from Gartner found that 78 percent of successful business process management (BPM) projects delivered an internal rate of return greater than 15 percent, with some returns as high as 100 percent or more.⁶ In addition to financial returns, users consistently cite as important benefits the ability of BPM to reduce errors, improve service levels and increase visibility.

Business processes can be grouped into three categories: process-to-process, person-to-process and person-to-person. Process-to-process activities are exemplified in ERP systems where there are frequent standard data transactions and transfers. The complexity of the process is low, and the transaction is typically short in duration.

Person-to-process activities may involve repeatable processes that require periodic attention to variations or exceptions (for example, insurance claims management systems, where an individual must interact with the system to complete a claim).

Person-to-person processes involve activities that require collaboration and are frequently knowledge-driven. Project management activities will frequently require such coordination and collaboration between individuals. (See Table 6)

Historically, business process management solutions have been used to reduce and eliminate paper transactions, map and streamline processes, and analyze and improve productivity internal to organizations. In addition to these areas, application of such systems is now beginning to address cross-organizational processes and support the extended enterprise.

Workflow systems have been the common solution for person-to-person processes; however, they tend to include people as part of the system-to-system processes, rather than mediating interactions between people. Such systems have proved useful in situations such as call centers and environments where repetitive work must be automated to drive consistency and efficiency; however, it is not as effective in capturing the dynamic human interactions inherent in everyday business. Workflow technology frequently draws from the concept of a “task list,” to define how people should interact with computer systems. Such an approach, while effective for assessing the completion time of work, does little to gain visibility and support process innovation and improvements.

An alternative approach to workflow systems has been the application of e-mail as a more flexible means to manage processes. Such an approach, however, ignores the potential for miscommunication and misinterpretation. How many times have you received a request via e-mail where the sender has assumed that you will do what they ask, without regard for the circumstances and resources available? These communications are frequently accompanied by further assumptions regarding such items as timing and acceptability of work. The e-mail message may contain statements such as “can you,” “will you,” and “please”; however, the system that delivers the message to you knows nothing about the content and intentions behind the messages.

Table 6: Process types

	Process Complexity	Process Duration	Process Focus
Process-to-Process	Low	Short	Data Transformation
Person-to-Process	Medium	Medium	Transaction Completion
Person-to-Person	Higher	Longer	Collaboration

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In a person-to-person process environment, exceptions are the norm. They are the patterns of behavior that fall outside a typical workflow. As a result, users don't get an end-to-end view of any one business process or a single point of access for managing related processes.

Companies are recognizing that process improvement rests upon an understanding of how people work together in processes and work together to improve processes. The Gartner study found a strong focus on business processes with significant human involvement, rather than pure system-to-system integration efforts.

Person-to-person-related process management applications being implemented in organizations recognize the interaction among workers in a diverse range of activities. A BPM application offered by Action Technologies (Figure 5), for example, executes person-to-person processes, using a vocabulary of speech acts that clearly define the way work is performed. Process interactions incorporate requests, promises, declarations, offers, counteroffers, assertions, agreements, cancellations and other terms.

Through these speech acts, the cycle of communications between customer and performer can be monitored through the system, which provides a means to evaluate performance and identify opportunities to improve on the process. The system performs the role of a transaction management system for how people work together. It tracks work from the initial request to the point where the customer declares satisfaction.

The value of such a solution for person-to-person process management has been demonstrated in new product development, customer self-service, supply chain, corporate performance management, orders and fulfillment, provisioning of services, marketing processes, high-touch sales, contract management, engagement management, vendor relationship management, human resource outsourcing, legal and compliance processes, budget review and approvals, and capital purchase approvals. Applications for this approach also exist in the domains of logistics, insurance claims processing, IT service delivery processes, change management, fast-moving consumer goods, help desks and management processes, reflecting the breadth of the solution.

Process Management Systems Software— Competitive Landscape

Process management applications can be categorized based on the types of processes they support, including process-to-process, person-to-process and person-to-person. While applications tend to cross boundaries to some degree, Table 7 indicates primary areas of focus.

Figure 5: Process communications cycle (Action Technologies)



Table 7: Business Process Management Vendors and Products

VENDOR	APPLICATION
PROCESS-TO-PROCESS	
TIBCO®	Staffware Process Suite
webMethods®	Fabric™
PERSON-TO-PROCESS	
Versata®	Logic Studio
Savvion®	Business Manager™
HandySoft	BizFlow®
PERSON-TO-PERSON	
Ultimus®	BPM Suite
Action Technologies	ActionWorks®

Process-to-process: System-related, where there are frequent standard data transactions and transfers
Person-to-process: Involve repeatable processes that require periodic attention to variations or exceptions
Person-to-person: Facilitate patterns of behavior that fall outside a typical workflow

Implications for Functional Management

The ability of BPM to reduce errors, improve service levels and increase visibility—as well as the financial returns—provides important benefits in both supply chain and financial management (Table 8).

Project Portfolio Management (PPM) Systems

Most individuals are familiar with portfolio management from its application as a tool for personal finance. A portfolio in this case includes investments in stock and bonds aligned with the individual’s goals, expectations of performance and risk considerations. Periodic review of the

portfolio provides the investor with a means to continually assess the relative performance of each asset, changing risks, and the impact on the performance of the portfolio as a whole. As a result, the blend of investments may change in an effort to improve performance. The Clinger-Cohen Act of 1996 instituted a portfolio management approach for federal agencies, where decisions on IT investments are based on potential return and decisions to change the investment “mix” by terminating or making additional investment types are based on performance.⁷ As oversight organizations continue to measure and monitor the relative effectiveness and efficiency of asset management, the use of portfolio management tools will become common to more agencies.⁸

The recent addition of technologies to facilitate project portfolio management in business is providing organizations with tools to better evaluate projects and activities based on relevant performance criteria. Portfolio management, in this case, helps to rationalize decisions at the strategic level, to ensure alignment with other areas of the organization, and at the operational level, where it can be used to more rigorously assess investment, evaluate fit and reprioritize resources. In an environment where research indicates that 30 percent of software-related IT projects fail and 50 percent run to twice their budgets, take twice the time to complete, and deliver half the effectiveness, automated portfolio management offers an important tool for project assessments and reevaluations. In a practical sense, these tools may be used, within the agency’s enterprise architecture framework, to support budget submissions for major capital spending plans (Exhibit 300) and to help meet the Federal Information Security Management Act requirements.⁹

Portfolio management is relevant to project analysis in all functional areas of an organization. It considers individual projects in relation to the known project population and evaluates factors such as:

- the strategic value of the investment;
- financial benefits, costs and metrics;
- inhibitors and risks, both internal and external; and

Table 8: Business Process Management Implications for Functional Management

Business Process Management Systems		
Provides Quality Information	Implications for Supply Chain	Implications for Financial Management
<p>Relevant: Action assignments communicated and accepted in real time</p> <p>Reliable: Review and approval process integrated</p> <p>Understandable: Standard measurements and methods for transfer of information</p>	<ul style="list-style-type: none"> • Facilitates structured and unstructured enterprise-wide and cross-enterprise process design and implementation 	<ul style="list-style-type: none"> • Documents the human, as well as the system, contributors to the financial management process

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- implementation timeliness and the impact of delays in launching a project or realizing the benefits.

As illustrated in *Figure 6*, portfolio management systems give organizations the ability to review their systems landscape and evaluate the need for specific system capabilities due to operating requirements, as a result of their contribution to return on investment (ROI), or as part of their core operating strategy.

Fortunately, businesses have been quick to implement portfolio management. A CSC survey of executives at business and government organizations in Asia, Europe, the United States and South Africa indicates that nearly half of the respondents use IT portfolio management at both the strategic and operational levels. An additional 27 percent use IT portfolio management at either the strategic or operational level. Of those that were not already doing IT portfolio management, a quarter said they were planning to implement soon. (See *Figure 7*)

Chief information officers (CIOs) are looking to portfolio management to improve IT alignment with organizational strategy and operations and in efforts to manage risk. “Bet-

ter align IT with business objectives” was selected by 92 percent of executives as a reason for adopting IT portfolio management, and “justify and communicate the value of IT” by 77 percent. Improve cost control, manage and reduce risk, and find ways to reallocate resources were also cited as significant reasons for IT portfolio management programs. (See *Figure 8*)

A significant contribution from adopting a portfolio management approach to systems and organization analysis comes from the inventorying of projects. Organizations find projects that are non-strategic or redundant in nature. A META Group study indicates that up to 80 percent of IT portfolios have an imbalance between individual system risk and performance and the performance of the entire portfolio. Results of the analysis can lead to significant savings and budget realignment.

Figure 6: Portfolio management review process

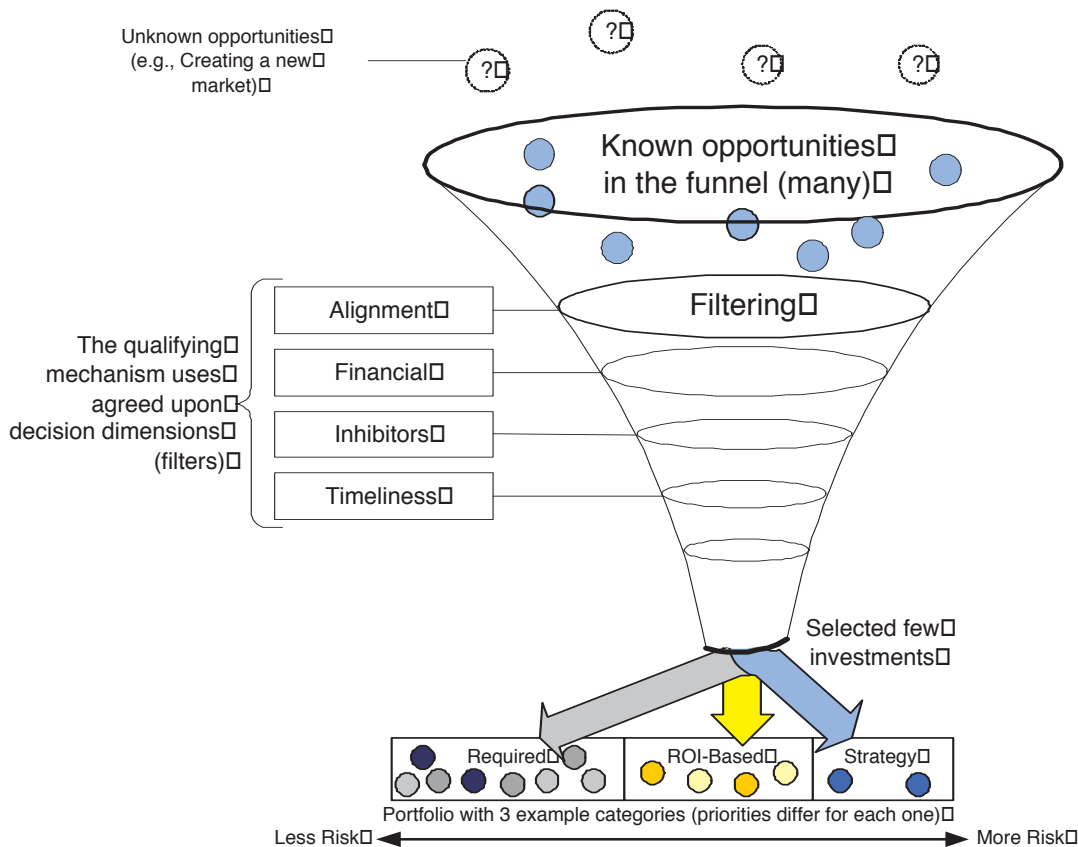


Figure 7: Respondents using IT portfolio management

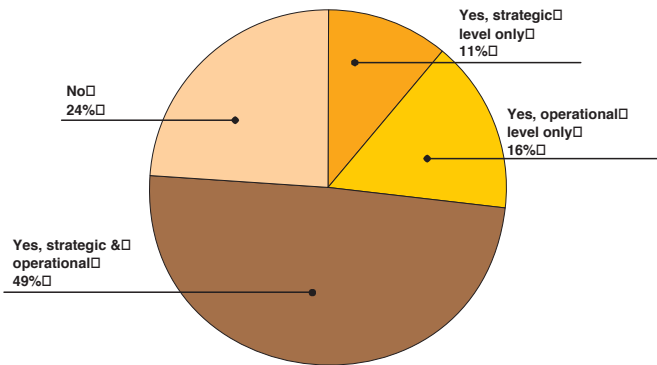


Table 9: Project Portfolio Management Software Vendors and Products

VENDOR	PRODUCT
CSC	e4
Legadero™	Tempo™ Portfolio Management
MaestroTec™, Inc.	Maestro-EPM
PlanView	PlanView Enterprise
Pacific Edge® Software	Portfolio Management
ProSight®	Portfolios

Project Portfolio Management (PPM) Systems Software—Competitive Landscape

Gartner anticipates that by 2009, most IT organizations will have adopted PPM applications to plan project portfolios; allocate resources to projects and support tasks; support project team collaboration; and track schedules, resource utilization and costs. (See Table 9)

Figure 8: Reasons for adopting IT portfolio management, and achievement of those goals

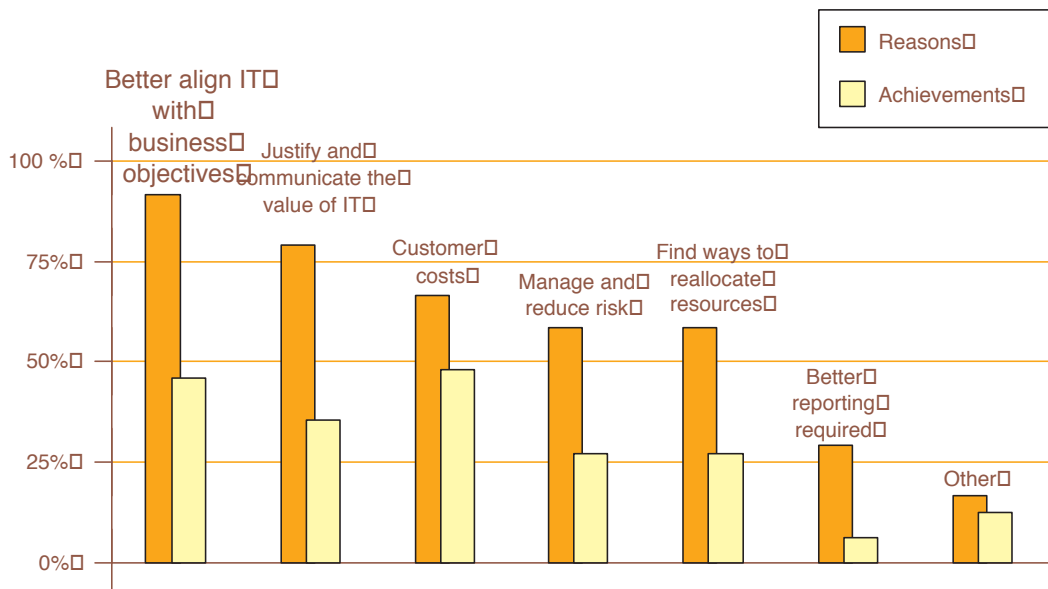


Table 10: Portfolio Management Software Implications for Functional Management

Portfolio Management Software		
Provides Quality Information	Implications for Supply Chain	Implications for Financial Management
<p>Relevant: Includes current IT resources and is updated as organizational mission and strategic vision changes</p> <p>Reliable: Unbiased investment evaluation criteria included</p> <p>Understandable: Standard data captured for each IT investment</p>	<ul style="list-style-type: none"> Application extends to the evaluation of new and existing supply-chain-related projects and systems 	<ul style="list-style-type: none"> Support for budget submissions for major capital spending plans (e.g., Exhibit 300) Align technology investments with strategic goals

Implications for Functional Management

The trend toward leveraging technology to facilitate project portfolio management provides tools to better evaluate projects and activities, based on relevant performance criteria for both supply chain and financial management.

Radio Frequency Identification (RFID)

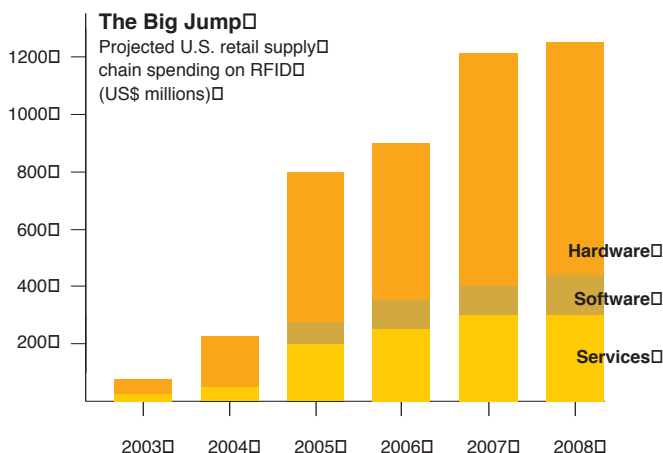
All planning and management systems rely on basic data for automation and decision support processes. Information on sales, distribution, production, procurement, maintenance and overhead, financial markets and other areas of operations are important inputs to planning and management. Data collection technologies have transitioned over the past decades from manual processes to automated collection and communications. For example, order manage-

ment, which has been (and in some organizations, is still) completed via phone, fax or mail is more frequently being processed online, where orders placed by customers flow directly into enterprise systems.

Perhaps the most common technology used for automated data acquisition today involves bar code scanning. Recognized most frequently at grocery and retail store counters, the technology is used throughout the supply chain to record movement and storage of individual items, cases, pallets, containers and other units of measure. In addition to logistics- and retail-related applications, bar codes are used for asset management, where the code attached to an item can be cross-referenced in a database to a location, owner, date, time and other attributes.

Radio frequency identification (RFID) offers a method of identifying an object and associated attributes via radio waves. It is receiving a great deal of press of late, in part because of actions by the U.S. Department of Defense (DoD) and Wal-Mart®, which have mandated its application by their respective supplier bases. (Both DoD and Wal-Mart® have mandated that top suppliers use RFID, effective January 2005.)

Figure 9: Growth trend for RFID in retail



SOURCE: IDC

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RFID has been in use for a number of years. The technology may be most familiar in three areas:

- When incorporated into smart cards, RFID technology allows millions of employees to enter secured buildings, plants and office areas simply by waving a card in front of a reader. While doing so, the systems can record the time of such access for security.
- When integrated into a slightly larger tag and attached to automotive windshields, RFID is used to record when cars enter toll roads and bridges. A reader (also referred to as an interrogator), located on specific lanes, records when the vehicle has passed and triggers a debit of the toll cost from owner's account.
- When the RFID tag is contained in a small capsule-shaped device, it can easily be implanted under the skin of a favorite pet. If the pet were to get lost, veterinarians have scanners that can read the serial number from the tag and cross-reference the number to a national database that contains the owner's contact information.

RFID hardware includes the tags and the readers (interrogators) to communicate with the tags and provide a

framework for the application of data collection and communications. Two other significant components associated with the application of RFID in practice include the data format standards and the middleware that manages the collection and distribution of information from readers. Combined, these components can be used to develop a network that offers near-real-time access to information for assets throughout the supply chain. RFID tags are designed as read-only or with a read-write capability. Tags can be further classified based on their communication method. These classifications include:

- **Passive Tags**, which store data and draw power from a reader whose electromagnetic wave induces a current in the tag's antenna for short-range communication (up to 10 meters).
- **Semi-passive Tags**, which incorporate a battery to run the chip's circuitry, but draw power from the reader to communicate.
- **Active Tags**, which incorporate a battery, are programmable, actively transmit and receive data, and can communicate over greater distances (up to 100 meters).

Figure 10: RFID tag types and applications

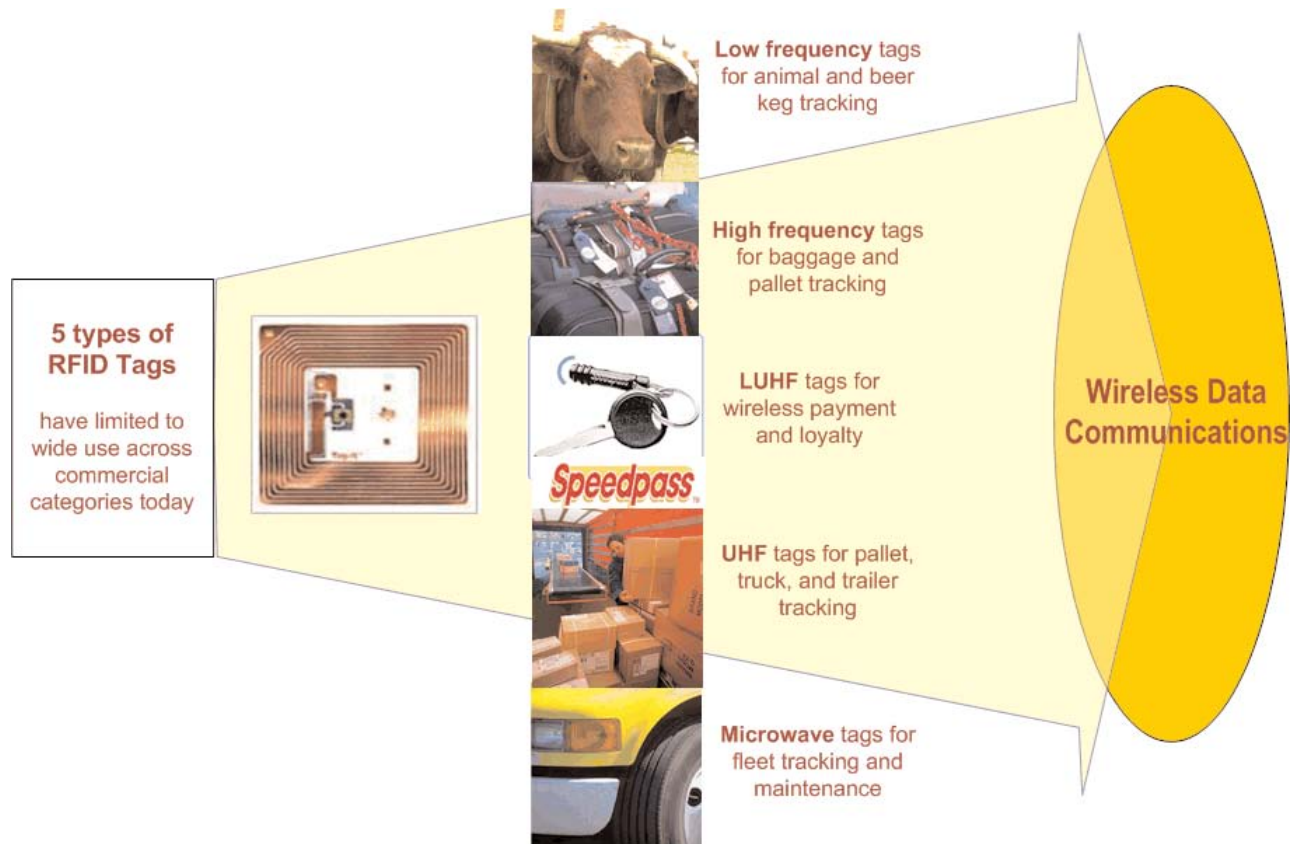


Table 11: Contributions of RFID in supply chain

Costs	Revenue	Operational Effectiveness
Reduced Labor	Improved Availability	Improved Product Visibility
Lower Shrinkage	Increased Collaboration	Improved Asset & Labor Visibility
Lower Inventory	Enhanced Decision	Improved Data Accuracy
Reduced Reconciliation Costs		Reduced Handling Requirements
Reduced Returns Costs		Better Rotation and Monitoring
		Improved Planning & Forecasting

The emergence of RFID has the potential to transform finance and supply chain management by delivering near-real-time asset visibility. Such is the case for DoD, which has achieved significant improvements in availability and inventory savings during the operation Enduring Freedom by using RFID to track equipment and supply shipments. By spring 2003, consolidated shipments moving to Iraq were tagged with active RFID tags. The memory available on the tags contained a serial number associated with the shipping unit (pallet or container), as well as a manifest of the contents. Readers (interrogators) are located throughout the world at various warehouse and transshipment points, including more than 100 interrogators within Iraq that were moved as supply routes changed. As shipments move through the supply lines, the transponder broadcasts the electronic data to the reader, and software drivers interpret the raw data before communicating to an information system via middleware. The drivers are incorporated within the readers, so data can be processed locally without the need to transmit over the network. The serial number is used to identify the shipment and its history over the Internet. This information is then available to the network, providing a dynamic picture of supply movement. Key contributions from RFID are highlighted in Table 11.

Another defense application can be found at Hill Air Force Base in Utah. “For example, an in-house application for tracking aircraft parts and other material has been recently extended to both Wi-Fi and wireless cellular networks. That makes it easier for trucks to speed up deliveries to dozens of hangar bays where F-16 and A-10 aircraft are maintained.

“Drivers carry wireless handheld devices equipped with bar code scanners. An inventory list received on the device tells the drivers the pallet of parts to scan in. A Wi-Fi net-

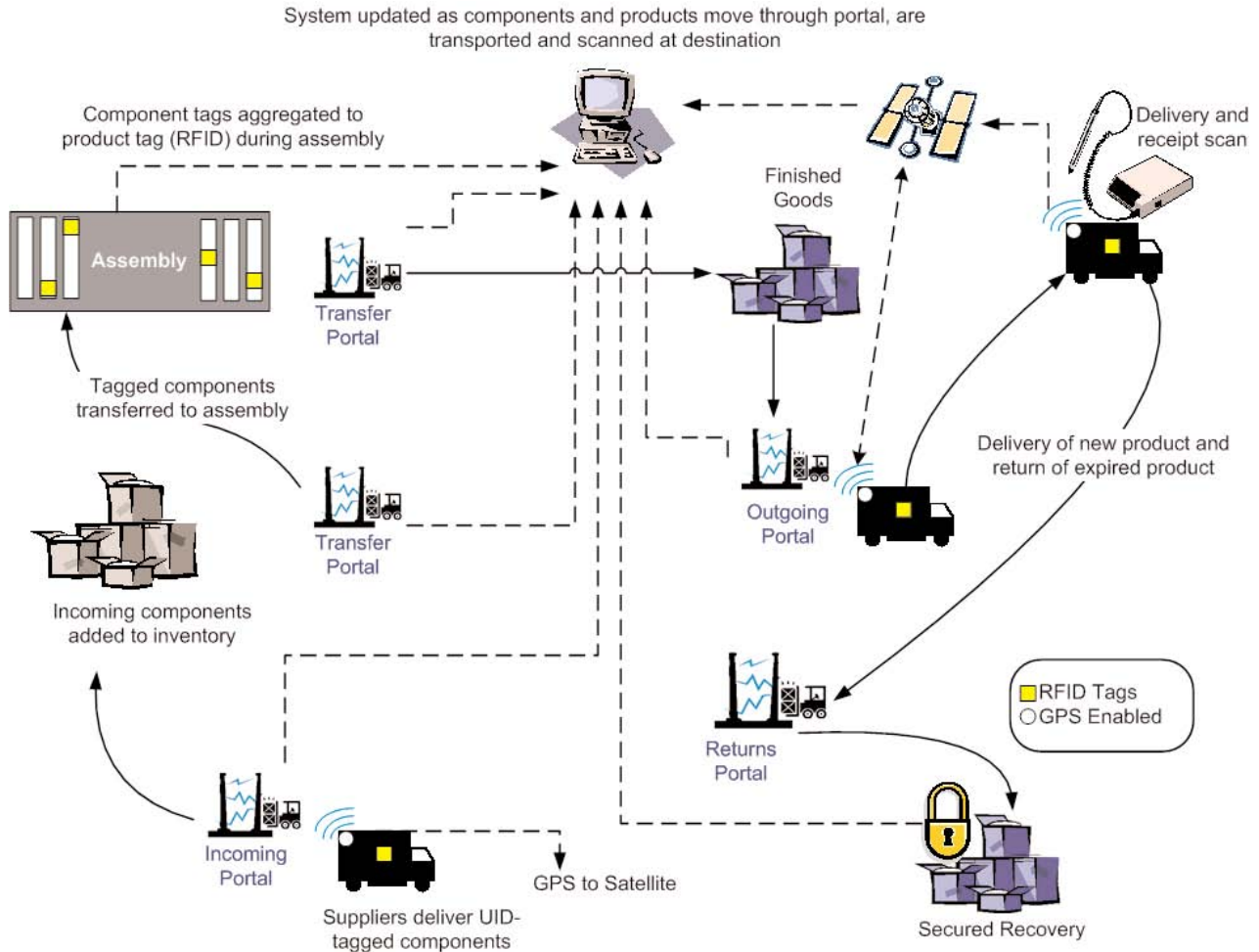
work serves the driver’s device in many locations, but because the base is so large, drivers often wander off the WLAN. In that case, they receive information over a cellular network. The devices are equipped to handle both networks, and roaming is relatively seamless, with only milliseconds of delay when crossing a network boundary.

“The project at Hill Air Force Base has served as a pilot for a system that is expected to be adopted at Warner Robins Air Force Base in Georgia and Tinker Air Force Base in Oklahoma. RFID might be deployed in a year at Hill.”¹⁰

The U.S. Department of State incorporation of RFID technology in passports—with a chip containing the name, date and place of birth, issuing office and a digitized version of the photo—provides a case study in the risk environment for adoption of this technology. The potential for personal privacy to be compromised without adequate controls has been a critical concern with the implementation of this RFID technology. Without controls in place, data on the tag can be read by any compliant reader, data transmitted through the air can be intercepted and read by unauthorized devices, and data stored in the databases can be accessed by unauthorized users.¹¹ To address the perceived risks with the RFID-enabled passport, the U.S. Department of State has adopted a risk mitigation strategy that covers the traditional, wireless and the physical risks associated with RFID. This strategy incorporates a combination of a physical barrier around the passport and holder so that it cannot transmit radio frequencies when closed and coordination with readers using sophisticated encryption, as well as consideration for sophisticated communication encryption for the transmission of the data between the passport and the reader.¹²

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Figure 11: RFID communications network example



Integration with other technologies can also influence the potential application of RFID in an organization. For example, RFID tags can be integrated with monitoring equipment in a manner that can provide real-time access to shipment conditions such as temperature control or vibration. It can also be used with fixed assets to collect information regarding operating performance or condition. This becomes a useful means for remote monitoring for system maintenance.

With all its potential, a few areas will challenge RFID application. Along with security concerns related to the collection and transmission of data, the volume of data that may be created from the implementation of such technologies can be substantial.

Consider the scenario where a major retail chain will be tagging all its goods in all its stores, at the single item level. The number of tagged items in this scenario can easily reach 10 billion or more. This means that the data identifying the 10 billion items amounts to 120 gigabytes (10 billion x 12 bytes per tag). If these items were read once every 5 minutes somewhere in the supply chain, they would generate nearly 15 terabytes of tracking data every day (120 gigabytes x 12 times per hour x 10 hours per day). That's 15 terabytes of additional data generated by one retail chain every day. Using this formula, 10 major retailers tagging and tracking every item will generate 150 terabytes of data. This is bigger than the estimated 136 terabytes of data from 17 million books in the U.S. Library of Congress.

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RFID Systems and Hardware—Competitive Landscape

Within the public sector, RFID adoption has been led by defense and transportation. Robust vendor support can be found for toll payment and contactless cards, which have been in use for some time, and with the widespread defense logistics applications, vendors have been successful in developing and distributing products and systems to support RFID implementation.

The vendors listed in Table 12 are a sampling of those vendors who have proven capabilities in supporting RFID in the private and public sectors.

Implications for Functional Management

In the public sector, data collection technologies will continue to transition from manual processes to automated collection and communications, with the implementation of RFID technology making near-real-time visibility and seamless transactions a reality, with benefits extending both to supply chain and financial management. (See Table 13)

Table 12: RFID Systems and Hardware Vendors

VENDOR
Alien Technology®
GlobeRanger TM
CSC
HP®
IBM®
Manhattan Associates®
Red Prairie®
SAMSys
Symbol®
Texas Instruments

Wireless Communications

The trend toward a highly mobile workforce, with the resultant reduction in facility and infrastructure costs and elimination of geographic constraints, is a powerful factor in the transformation of how the government does business. Wi-Fi, like RFID and mobile handheld devices, leverages wireless communication capabilities and has the potential to transform how efficiently and effectively we conduct our business and personal lives.

Wi-Fi (or Wi-fi, WiFi, Wifi, wifi), short form for “wireless fidelity,” is a set of international standards for wireless local area networks (WLANs), based on the Institute of Electrical and Electronics Engineers (IEEE) 802.11 specifications. Newer standards like 802.16 (WiMAX) are emerging and offer enhancements from extended range to greater data transfer speeds.

Originally meant for mobile devices and LANs, Wi-Fi is also popular for Internet access. It enables a person with a wireless-enabled computer or personal digital assistant (PDA) to connect to the Internet when in proximity of an access point. The area covered by one or more access points is called a hotspot. Wireless hotspots are proliferating in corporations, libraries, hotels, coffee shops, book stores, airports, airplanes and other public areas, such as city centers. Apart from commercial Wi-Fi hotspots, some universities, small countries, cities and municipalities also offer free Wi-fi spots.

The range of these technologies is important, and their impacts are an unmistakable part of our lives. Table 14 on the next page illustrates the characteristics of different wireless systems.

The public sector stands out in deployment of wireless technology, from defense applications to mundane office applications that replace paper. An example of a defense application can be found at the U.S. Joint Forces Command in Suffolk, VA, where “wireless deployment provides nearly 400 users with secure Wi-Fi access from laptops and tablet computers over systems built entirely from commercially available products.” To keep the application secure, “all wireless network users are isolated from the wired networks through a separate 2Gbit/sec. backbone. Walls were erected with metal wallpaper to prevent wireless eavesdropping, and a combination of Layer 2 encryption and wireless gateway passwords keep the system secure.”¹³

The advancement of technology increases the scope of cyber security. As data are shared between the functional aspects of an organization, using the Internet or airwaves as the most efficient route for information, both traditional and evolutionary risks must be identified and mitigated.

Table 13: RFID, Wireless and Handheld Implications for Functional Management

	RFID, Wireless and Handheld	
Provides Quality Information	Implications for Supply Chain	Implications for Financial Management
Relevant: Real-time capture of data directly from source	<ul style="list-style-type: none"> Near-real-time asset visibility Improved planning and forecasting 	<ul style="list-style-type: none"> Audit support for inventory and asset management
Reliable: Supports audit trail and limits human input error	<ul style="list-style-type: none"> Reduced handling requirements Better rotation and monitoring 	<ul style="list-style-type: none"> Capture of real-time financial transactions with limited opportunity for human error
Understandable: Consistent data captured		

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Table 14: Wireless technology characteristics

Technology	Purpose	Range	Devices
Bluetooth®	Connects computer peripherals, printers, PDAs, cameras	Up to 33 feet (10 meters); affected by building materials	Printers, cameras, cellular phones, PDAs, other peripherals
802.11a	Wireless Internet access	25 to 75 feet indoors; can be affected by building materials	Laptop computers, PDAs, cellular phones
802.11b	Wireless Internet access	Up to 300 feet indoors; can be affected by building materials	Laptop computers, PDAs, cellular phones
802.11g	Wireless Internet access	Up to 150 feet indoors; can be affected by building materials	Laptop computers
802.16 (WiMAX)	Wireless metropolitan area networks	Several miles	Emerging
GSM (Global System for Mobile Communications)	Digital cellular: most-used system worldwide	Determined by host network	GSM-enabled cellular phones, PDAs, pagers
3GSM	Third-generation GSM network	Determined by host network	3GSM-enabled cellular phones, PDAs, pagers
GPRS (General Packet Radio Service)	Overlaid on existing GSM networks, to allow for Internet	Determined by host network	GPRS-enabled cellular phones and networks
CDMA (Code Division Multiple Access)	Digital telephone system used mainly by U.S. networks	Coverage area of host network	Mobile phones on CDMA networks
CDMA2000	Third-generation CDMA-based network	Coverage area of host network	Mobile phones on CDMA2000 networks
CDPD (Cellular Digital Packet Data)	Used to transmit data over analog cellular networks	Coverage area of host network	Cellular phones, PDAs, pagers
TDMA (Time Division Multiple Access)	Digital cellular telephone systems	Coverage are of host network	TDMA cellular phones

The Federal Information Security Management Act of 2002 (FISMA) requires agencies to prepare organizational security risk assessments and security plans. Authorization, requirement identification and security controls must be integrated into the organization's control environment. In addition to the FISMA reporting requirements, the integration of IT security with the Federal Enterprise Architecture plus the enforcement of application system certification and accreditation policies ensure that federal managers will continue to be held accountable for IT security.

The traditional cyber-security threats-worms, viruses, intrusions and software vulnerabilities-have become more sophisticated. The security issues, vulnerabilities and exploits that are summarized each week by the U.S. Computer Emergency Readiness Team (US-CERT) bear witness to the proliferation of traditional intrusion threats in cyber space.¹⁴

With the advent of wireless technology, additional security risks have evolved. In the recent U.S. Government Accountability Office (GAO) report addressing the need for federal agencies to improve their controls over wireless networks, threats identified included:

- Eavesdropping-content interception

- Traffic Analysis-intelligence gathered based on the pattern of communication
- Masquerading-exploiting unprotected user access points
- Message Modification-content alteration or deletion
- Replay-intercepting, then transmitting the data
- Jamming-intentionally blocking the stream of communication¹⁵

Contemporary threats to transmitted data include "blue-jacking," which is using sophisticated equipment to download all the data stored on a portable electronic device, and "war-driving," where unprotected wireless networks and their IDs are mapped with a laptop while driving through a specific area for possible interception and corruption.

Physical security must also be expanded to address intrusion and interception risks. As the units used to record, store and share data become smaller and easier to transport, physical security (such as locking or alarm mechanisms) becomes essential to prevent the theft of critical data and prevent unauthorized system access. For wireless data transmission, the physical placement of wireless devices is a critical consideration for mitigation of the risk for signal leakage, with its related risks for data theft and corruption.

Wireless Communications—Competitive Landscape

In the competitive landscape, vendors support two main architectural models. Access points connected directly to the wired Ethernet network, containing wireless transmitters and antennas that broadcast a signal that receivers can pick up, constitute the older and better-established models. In the newer models, security and management are centralized in a network switch that is connected to “thin” access points that are essentially radio frequency transmitters with the purpose of extending the network from the switch out to where the users need it.

The representative products and vendors listed in Table 15 show a selection of controllers, access points and bridges that have the capability, flexibility and security features required in public-sector enterprises.

Implications for Functional Management

The functional implications for the trend toward wireless communication reflect the supply chain efficiencies and financial management controls in the real-time capture of data and empowerment of a highly mobile and responsive work force. (See Table 16)

Table 15: Wireless Communications Vendors and Products

VENDOR		PRODUCT
	Controller	
Cisco Systems®		Cisco 2000 Series wireless LAN Controller
Proxim Corp.		ORiNOCO Smart Wireless Controller
	Access Point	
3Com® Corp.		3Com Office Connect Wireless 108 Mbps 11g PoE Access Point
Cisco Systems®		Cisco Aironet 1200 Series Access Point
Nortel Networks (includes switch)		WLAN 2000 Series
	Bridge	
Proxim Corp.		Tsunami QuickBridge.11

Conclusion

The systems and technologies investigated in this year’s inaugural *Trends in Technology* report represent current and future opportunities for improved performance at all levels of an organization.

Business intelligence systems support the complex analyses necessary to extract valuable information from larger and larger data warehouse applications. These capabilities will require that individuals continue to develop their analytical and critical thinking skills to take best advantage of the processing possibilities.

Compliance management systems, whose mandated application may appear as a challenge to management, are helping organizations refine their processes and operations in a manner that will help to institutionalize improvements. The implementation of such systems is presenting an opportunity to more clearly define processes and ensure that such processes are transparent to those within and outside the organization.

Business process management systems represent a unique opportunity for significant improvements in operating performance. The design of such systems will not only help to reduce cycle times of seemingly unstructured processes but also have the potential to influence a user’s individual productivity and reduce the frustrations of dealing with such processes.

Project portfolio management systems represent a valuable method to maintain information and evaluate performance across systems, projects and assets. Implementation of such systems will provide agencies with a means to actively manage to meet the strategic goals of the organization and reallocate funds from those efforts deemed ineffective to those that represent more promising opportunities.

The continued adoption of RFID will establish the data collection infrastructure to maintain current, detailed and accurate data that organizations will use to make more effective day-to-day operating decisions. The systems will also provide information for the development of more sophisticated tactical- and strategic-level planning and management systems. Over time, the broad adoption of

Table 16: Wireless Communication Implications for Functional Management

	Wireless Communications	
Provides Quality Information	Implications for Supply Chain	Implications for Financial Management
Relevant: Real-time capture of data directly from source	<ul style="list-style-type: none"> Geographic constraints minimized for universe of transactions Improved planning and forecasting, near-real-time monitoring 	<ul style="list-style-type: none"> Capture of real-time financial transactions, with limited opportunity for human error Support for mobile, responsive field-level or remote work force
Reliable: Limits human input error, eliminates geographic restrictions		
Understandable: Consistent data captured		

RFID will provide for lower-cost data acquisition, which will allow for more effective allocation of budgeted dollars.

Further advancements in wireless communications will provide a blanket of communication capabilities throughout the globe. With the rationalization of technology options, wireless systems will provide a consistent communication backbone for voice and data access that will allow individuals and organizations immediate access to time- and context-sensitive information. As a result, users will expect on-call access to information regarding system status, availability, source material for on-site and just-in-time training, reporting and many other capabilities.

In the universe of existing, emerging and idealized technologies, public and private sources were leveraged to focus on these six technologies that are expected to contribute to improved planning and management in the functional areas of financial and supply chain management in the public sector. These technologies will make a significant impact to improved accountability in supply chain and financial management.

If you or your organization would like to suggest topics for future research, provide case studies for forward-thinking technology applications, or participate in ongoing surveys of technology enablers, please contact CSC's Andrew West at 703.645.5522, awest25@csc.com, or AGA's Anna Miller at 703.684.6931, AMiller@agacgfm.org.

End Notes

1. Forrester, Jay W., "Industrial Dynamics: A Major Breakthrough for Decision Makers," *Harvard Business Review*, Vol. 38, July-August 1958, pp. 37-66.
2. Mentzer, John T, DeWitt, William, Keebler, James S, Min, Soonhong, Et al., "Defining Supply Chain Management," *Journal of Business Logistics*, 2001, www.findarticles.com/p/articles/mi_qa3705/is_200101/ai_n8934606
3. The observation made in 1965 by Gordon Moore, cofounder of Intel that the number of transistors per square inch on integrated circuits had doubled every year since the integrated circuit was invented.
4. Wikipedia, the free encyclopedia, Business Intelligence; http://en.wikipedia.org/wiki/Business_Intelligence.
5. Eric Karofsky, John Hagerty, Will McNeill, "Landscape of Sarbanes-Oxley Compliance Tools," AMR Research, January 2005.
6. BPM Benefits Survey Shows Continued Strong Results, J. Sinur, Gartner, Research Note SPA-23-1715, June 23, 2004.
7. www.army.mil/ciog6/references/legislation_docs/CCA-Book-Final.pdf, Foreword, p. 4/129.
8. Karen D. Schwartz, "Advice+Dissent: Managing Technology—The Big Picture," *Government Executive*, Sept. 1, 2004, www.govexec.com/features/0904-01/0904-01managetech.htm.
9. Colleen O'Hara, "FDA Discovers Portfolio Management Benefits," *fcw.com*, Nov. 15, 2004, www.fcw.com/article84560-11-14-04-Print.
10. Matt Hamblen, "Wireless leaders and laggards: Government," May 16, 2005; www.computerworld.com/governmenttopics/government/story/0,10801,101683,00.html.
11. GAO report 05-555, *Radio Frequency Identification Technology in the Federal Government*, May 2005.
12. According to Frank Moss, Deputy Assistant Secretary for Passport Services at the State Department, as quoted in Alice Lipowicz, "Passport RFIDs are Secure, State Official Says," *Washington Technology*, May 26, 2005; www.washingtontechnology.com/news/1_1/homeland/26286-1.html.
13. Matt Hamblen, "Wireless Leaders and Laggards: Government," *Computerworld*, May 16, 2005; www.computerworld.com.
14. <http://www.us-cert.gov/>.
15. GAO report 05-383, *Federal Agencies Need to Improve Controls over Wireless Networks*, May 2005.



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