

HOW INFORMATION MANAGEMENT CAPABILITY INFLUENCES FIRM PERFORMANCE

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Appendix A

Additional Details on Background and Theory

Table A1. Selected Studies in Information Systems Literature Linking Information Technology and Related Capabilities with Firm Performance[†]				
Study	IT and Related Capabilities Construct	Dimensions of IT and Related Capabilities	Operationalization of IT and Related Capabilities	IT Enabled Mediating Capabilities
Conceptual Studies				
Ross, Beath, and Goodhue (1996)	IT Capability	IT Human resource asset, Technology asset, Relationship asset		
Melville et al. (2004)	IT Resources	Technological IT resources (Infrastructure, business applications), Human IT resources (technical IT skills, managerial IT skills)		
Wade and Hulland (2004)	IS Resources	Manage external relationships, Market responsiveness, IS-business partnerships, IS planning and change management, IS infrastructure, IS technical skills, IS development, Cost effective IS operations		
Cross-Sectional Studies in IS Literature				
Marchand et al. (2000)	Information Orientation	Information technology practices, information management practices, information behaviors and values	Likert scale, Survey approach, Uses data from self-reports of firms	
Tippins and Sohi (2003)	IT Competency	IT knowledge, IT operations, IT objects	Likert scale, Survey approach, Uses data from self-reports of firms	
Duncan (1995)	IT Infrastructure flexibility	Technological components, flexibility characteristics, types of applied flexibility indicators	Likert scale, Survey approach, Uses data from self-reports of firms	
Lewis and Byrd (2003)	IT Infrastructure	CIO, IT planning, IT security, technology integration, advisory committee, enterprise model, data administration	Likert scale, Survey approach, Uses data from self-reports of firms	
Weill and Vitale (2002)	IT Infrastructure capability	IT components, human IT infrastructure, shared IT services, shared standard applications	Likert scale, Survey approach, Uses data from self-reports of firms	
Bharadwaj (2000), Santhanam and Hartono (2003)	IT Capability	IT infrastructure, human IT resources, IT enabled intangibles	Binary measure of IT capability, based on InformationWeek ranking of IT leader firms	
Ray et al. (2005)	IT resources and capabilities	Technical IT skills, generic technologies, IT spending, shared knowledge	Likert scale, Survey approach, Uses data from self-reports of firms	
Ravichandran and Lertwongsatien (2005)	IS capabilities	IS planning sophistication, system development capability, IS support maturity, IS operations capability	Likert scale, Uses data from self-reports of firms	IT support for core competencies
Bhatt and Grover (2005)	IT Capabilities	IT Infrastructure, IT business experience, relationship infrastructure	Likert scale, Uses data from self-reports of firms	
Longitudinal Studies in IS Literature Using a Continuous and Unobtrusive Measure of an IT Capability				
<i>This study (Mithas et al. 2011)</i>	<i>Information Management Capability (a specific dimension of IT capability)</i>	<ul style="list-style-type: none"> <i>The ability to provide data and information to users with the appropriate levels of accuracy, timeliness, reliability, security, and confidentiality</i> <i>The ability to provide universal connectivity and access with adequate reach and range</i> <i>The ability to tailor the infrastructure to emerging business needs and directions</i> 	<i>Continuous measure, based on a verification of self-reports of a firm by multiple examiners external to a firm including site visit assessments</i>	<i>Performance management capability, customer management capability, process management capability</i>

[†]This table is not exhaustive and lists only some representative studies to show the uniqueness and novelty of the current study. Because we are primarily concerned here with effect of IT capability on firm performance, we do not list other studies that focus on effect of IT spending or particular IT applications on intermediate or financial measures of firm performance (e.g., Barua, Kriebel and Mukhopadhyay 1995; Cotteleer and Bendoly 2006).

Table A2. Operationalization of Information Management Capability across Studies

	Survey Operationalization of the 1992 Baldrige Criteria [Used in Flynn and Saladin 2001]	Survey Operationalization of the 1997 Baldrige Criteria [Used in Flynn and Saladin 2001]	Actual Score of Information Management Capability Based on the Baldrige Criteria (e.g., Item 4.2 in 2002 Criteria) [Used in this study [†] (Mithas et al. 2011)]
Information and Analysis Category	<p>Scope of quality data and information</p> <ul style="list-style-type: none"> Charts showing defect rates are posted on the shop floor Charts showing schedule compliance are posted on the shop floor Charts plotting the frequency of machine breakdowns are posted on the shop floor Information on quality performance is readily available to employees Information on productivity is readily available to employees <p>Analysis of company-level data</p> <ul style="list-style-type: none"> We use charts to determine whether our manufacturing processes are under control Process data gathered from manufacturing inspections is stored for subsequent analysis We use statistical methods to recognize the source of problems <p>Comparative comparisons</p> <ul style="list-style-type: none"> In general, our plant's quality performance over the past 3 years has been low, relative to industry norms 	<p>Selection of information and data</p> <ul style="list-style-type: none"> Charts showing defect rates are posted on the shop floor Charts showing schedule compliance are posted on the shop floor Charts plotting the frequency of machine breakdowns are posted on the shop floor Information on quality performance is readily available to employees Information on productivity is readily available to employees <p>Analysis of company performance</p> <ul style="list-style-type: none"> A large percent of the equipment or processes on the shop floor are currently under statistical quality control We make extensive use of statistical techniques to reduce variance in processes We use charts to determine whether our manufacturing processes are under control Process data gathered from manufacturing inspections is stored for subsequent analysis We use statistical methods to recognize the source of problems <p>Selection of comparative data</p> <ul style="list-style-type: none"> No items 	<ul style="list-style-type: none"> The ability to provide data and information to users with the appropriate levels of accuracy, timeliness, reliability, security, and confidentiality The ability to provide universal connectivity and access with adequate reach and range The ability to tailor the infrastructure to emerging business needs and directions
Remarks	<ul style="list-style-type: none"> Heavy focus on manufacturing and quality on shop-floor Sub-constructs of "Information and Analysis" also include dimensions of performance management capability Do not relate to underlying IT assets 	<ul style="list-style-type: none"> Heavy focus on manufacturing and quality on shop-floor Sub-constructs of "Information and Analysis" also include dimensions of performance management capability Do not relate to underlying IT assets 	<ul style="list-style-type: none"> Relatively generic framework with consideration of capabilities of underlying IT assets
References	Flynn and Saladin (2001), p. 646	Flynn and Saladin (2001), p. 648	As an example, see Baldrige Criteria (NIST 2002)

[†]As an illustration, refer to item 4.2 of the Baldrige Criteria (NIST 2002) document for more complete details.

Table A3. Selected Studies in Operations Management Literature Linking Information Technology and Related Capabilities with Firm Performance[†]				
Study	IT and Related Capabilities Construct	Dimensions of IT and Related Capabilities	Operationalization of IT and Related Capabilities	IT Enabled Mediating Capabilities
Cross-Sectional Studies in OM Literature Using Survey Data to Proxy for Actual Baldrige Scores				
Kaynak (2003)	Focuses mainly on product or quality related data as opposed to information management in general		Survey approach, Adapts an old scale developed in late 1980s, Criteria has changed significantly since then	Focuses mainly on validating the entire Baldrige criteria and inter-relationships,
Flynn and Saladin (2001) Flynn and Saladin (2006) uses scale corresponding to 1992 Baldrige criteria	Focuses mainly on product or quality related data as opposed to information management in general	Scope of quality data and information Analysis of company-level data Comparative comparisons	Survey approach based on Baldrige models up to 1997, Baldrige criteria has changed since then	Focuses mainly on validating the entire Baldrige criteria and inter-relationships up to 1997 criteria
Meyer and Collier (2001)	Focuses mainly on product or quality related data as opposed to information management in general		Survey approach, Focuses only on healthcare sector	Focuses mainly on validating the entire Baldrige criteria and inter-relationships
Cross-Sectional Studies in OM Literature Using Baldrige or Equivalent Evaluation Process Scores				
Pannirselvam and Ferguson (2001) Pannirselvam et al. (1998) [‡]	Information Management as in Baldrige model of 1993	Management of data, benchmarks and company level data	Baldrige scores based on first stage assessment of self-reports of a firm by multiple examiners external to a firm	Focuses mainly on validating the entire Baldrige 1993 criteria, instead of examining a theory derived test of IT capability on intermediate organizational capabilities and firm performance
Longitudinal Studies Using Actual Baldrige or Equivalent Evaluation Process Scores				
<i>This study (Mithas et al. 2011)</i>	<i>Information Management Capability (a specific dimension of IT capability)</i>	<ul style="list-style-type: none"> <i>The ability to provide data and information to users with the appropriate levels of accuracy, timeliness, reliability, security, and confidentiality</i> <i>The ability to provide universal connectivity and access with adequate reach and range</i> <i>The ability to tailor the infrastructure to emerging business needs and directions</i> 	<i>Continuous measure, based on a verification of self-reports of a firm by multiple examiners external to a firm including site visit assessments</i>	<i>Performance management capability, customer management capability, process management capability</i>

[†]This table is not exhaustive and lists only some representative studies to show the uniqueness and novelty of the current study. We do not include here other studies that link winning Baldrige award with firm performance (e.g., Hendricks and Singhal 1996; York and Miree 2004).

[‡]1993 criteria scores from Arizona Governor’s quality award modeled after Baldrige (which are somewhat dated and predate the significant change in the Baldrige criteria since then).

Table A4. How Information Management Capability Affects Organizational Capabilities

Dimensions of Information Management Capability	Performance Management Capability	Customer Management Capability	Process Management Capability
The ability to provide data and information to users with the appropriate levels of accuracy, timeliness, reliability, security, and confidentiality	Availability of accurate, timely, reliable, secured and confidential information facilitates accountability and timely intervention by senior managers without the risk of embarrassing and inappropriate disclosures. Reference: Marchand et al. (2002)	Timely and accurate information allows firms to manage their critical customer facing business processes. For example, use of timely information allows Cemex to commit deliveries within a specified time window leading to higher customer satisfaction. References: Karimi et al. (2001); Marchand et al. (2002); Mithas, Almirall, and Krishnan (2006); Mithas et al. (2005)	Use of timely information allows a firm to attain flexibility, speed, and cost economy through the design and management of key business processes such as product design and delivery processes, business growth processes and support processes, such as finance and accounting, facilities management, and human resources management. References: Davenport (1993)
The ability to provide universal connectivity and access with adequate reach and range	Universal connectivity and access with adequate reach and range allows for complete transparency and peer pressure to drive organizational decisions and interventions based on firm-wide benchmarks and performance standards, as opposed to decisions and interventions based on local information. Reference: Marchand et al. (2002)	Better information management capabilities enable firms to capture information about customers and disseminate information to customers through the Internet, virtual communities, and personalized information channels. References: Mithas et al. (2006); Mithas et al. (2005); Nambisan (2002a)	Universal connectivity and access with adequate reach and range can allow firms to design robust and seamless processes across organizational and geographic boundaries thus enabling superior process management capabilities. References: Apte and Mason (1995); Mithas and Whitaker (2007)
The ability to tailor the infrastructure to emerging business needs and directions	Tailoring of IT infrastructure allowed Cemex to move its performance management capability from a “geographical proximity” based heuristics to “cultural proximity” based heuristics and finally to “systems proximity.” Reference: Marchand et al. (2002)	Tailoring of IT infrastructure allows a firm to respond to changing customer needs and to segment and target customers using the potential of newer technologies and to design new products and services for them by involving them in new product development processes. References: Mithas et al. (2006); Mithas et al. (2005); Nambisan (2002b); Peppers and Rogers (2004); Peppers et al. (1999)	Tailoring of IT infrastructure can allow firms to manage the organizational portfolio of processes, including reconfiguring processes for continued effectiveness, designing and using appropriate metrics and controls, and applying processes as strategic options in response to changes in business conditions. References: Kalakota and Robinson (2003); Robinson et al. (2000)

Table A5. Illustrative Description of Variables[†]	
Variable	Description
Information Management Capability (INFMGMT)	<p>Item 4.2 Information Management: Describe how your organization ensures the quality and availability of needed data and information for employees, suppliers/partners, and customers. Within your response, include answers to the following questions:</p> <p>a. Data Availability</p> <ol style="list-style-type: none"> (1) How do you make needed data and information available? How do you make them accessible to employees, suppliers/partners, and customers, as appropriate? (2) How do you ensure data and information integrity, reliability, accuracy, timeliness, security, and confidentiality? (3) How do you keep your data and information availability mechanisms current with business needs and directions? <p>b. Hardware and Software Quality</p> <ol style="list-style-type: none"> (1) How do you ensure that hardware and software are reliable and user friendly? (2) How do you keep your software and hardware systems current with business needs and directions?
Performance Management Capability (PERFMGMT)	<p>Item 4.1 Measurement and Analysis of Organizational Performance: Describe how your organization provides effective performance management systems for measuring, analyzing, aligning, and improving performance at all levels and in all parts of your organization. Within your response, include answers to the following questions:</p> <p>a. Performance Measurement</p> <ol style="list-style-type: none"> (1) How do you gather and integrate data and information from all sources to support daily operations and organizational decision making? (2) How do you select and align measures/indicators for tracking daily operations and overall organizational performance? (3) How do you select and ensure the effective use of key comparative data and information? (4) How do you keep your performance measurement system current with business needs and directions? <p>b. Performance Analysis</p> <ol style="list-style-type: none"> (1) What analyses do you perform to support your senior leaders' organizational performance review and your organization's strategic planning? (2) How do you communicate the results of organizational-level analysis to work group and/or functional level operations to enable effective support for decision making? (3) How do you align the results of organizational-level analysis with your key business results, strategic objectives, and action plans? How do these results provide the basis for projections of continuous and breakthrough improvements in performance?
Customer Management Capability (CUSTMGMT)	<p>Item 3.1 Customer and Market Knowledge: Describe how your organization determines requirements, expectations, and preferences of customers and markets to ensure the continuing relevance of your products/ services and to develop new opportunities. Within your response, include answers to the following questions:</p> <p>a. Customer and Market Knowledge</p> <ol style="list-style-type: none"> (1) How do you determine or target customers, customer groups, and/or market segments? How do you include customers of competitors and other potential customers and/or markets in this determination? (2) How do you listen and learn to determine key customer requirements (including product/service features) and their relative importance/value to customers' purchasing decisions for purposes of product/ service planning, marketing, improvements, and other business development? In this determination, how do you use relevant information from current and former customers, including marketing/sales information, customer retention data, won/lost analysis, and complaints? If determination methods vary for different customers and/or customer groups, describe the key differences in your determination methods. (3) How do you keep your listening and learning methods current with business needs and directions?

[†]For a complete description of all items and categories (including related notes and the assessment guidelines) that map to the variables used in this study, see the Baldrige criteria 2002 document available at the NIST website http://baldrige.nist.gov/Business_Criteria.2002.htm.

Table A5. Illustrative Description of Variables (Continued)

Variable	Description
	<p>Item 3.2 Customer Relationships and Satisfaction: Describe how your organization builds relationships to acquire, satisfy, and retain customers and to develop new opportunities. Describe also how your organization determines customer satisfaction. Within your response, include answers to the following questions:</p> <p>a. Customer Relationships</p> <ol style="list-style-type: none"> (1) How do you build relationships to acquire and satisfy customers and to increase repeat business and positive referrals? (2) How do you determine key customer contact requirements and how they vary for differing modes of access? How do you ensure that these contact requirements are deployed to all people involved in the response chain? Include a summary of your key access mechanisms for customers to seek information, conduct business, and make complaints. (3) What is your complaint management process? Include how you ensure that complaints are resolved effectively and promptly and that all complaints are aggregated and analyzed for use in improvement throughout your organization and by your partners, as appropriate. (4) How do you keep your approaches to building relationships and providing customer access current with business needs and directions? <p>b. Customer Satisfaction Determination</p> <ol style="list-style-type: none"> (1) How do you determine customer satisfaction and dissatisfaction and use this information for improvement? Include how you ensure that your measurements capture actionable information that predicts customers' future business with you and/or potential for positive referral. Describe significant differences in determination methods for different customer groups. (2) How do you follow up with customers on products/services and transactions to receive prompt and actionable feedback? (3) How do you obtain and use information on your customers' satisfaction relative to customers' satisfaction with competitors and/or benchmarks, as appropriate? (4) How do you keep your approaches to determining satisfaction current with business needs and directions?
Process Management Capability (PROCMGMT)	<p>Item 6.1 Product and Service Processes: Describe how your organization manages key processes for product and service design and delivery. Within your response, include answers to the following questions:</p> <p>a. Design Processes</p> <ol style="list-style-type: none"> (1) What are your design processes for products/services and their related production/delivery systems and processes? (2) How do you incorporate changing customer/market requirements into product/service designs and production/delivery systems and processes? (3) How do you incorporate new technology, including e-technology, into products/services and into production/delivery systems and processes, as appropriate? (4) How do your design processes address design quality and cycle time, transfer of learning from past projects and other parts of the organization, cost control, new design technology, productivity, and other efficiency/effectiveness factors? (5) How do you design your production/delivery systems and processes to meet all key operational performance requirements? (6) How do you coordinate and test your design and production/delivery systems and processes? Include how you prevent defects/rework and facilitate trouble-free and timely introduction of products/services. <p>b. Production/Delivery Processes</p> <ol style="list-style-type: none"> (1) What are your key production/delivery processes and their key performance requirements? (2) How does your day-to-day operation of key production/delivery processes ensure meeting key performance requirements? (3) What are your key performance measures/indicators used for the control and improvement of these processes? Include how in-process measures and real-time customer and supplier/partner input are used in managing your product and service processes, as appropriate. (4) How do you perform inspections, tests, and process/performance audits to minimize warranty and/or rework costs, as appropriate? Include your prevention-based processes for controlling inspection and test costs, as appropriate. (5) How do you improve your production/delivery systems and processes to achieve better process performance and improvements to products/services, as appropriate? How are improvements shared with other organizational units and processes and your suppliers/partners, as appropriate?

Table A5. Illustrative Description of Variables (Continued)	
Variable	Description
	<p>Item 6.2 Business Processes: Describe how your organization manages its key processes that lead to business growth and success. Within your response, include answers to the following questions:</p> <p>a. Business Processes</p> <ol style="list-style-type: none"> (1) What are your key business processes for business growth and success? (2) How do you determine key business process requirements, incorporating input from customers and suppliers/partners, as appropriate? What are the key requirements for these processes? (3) How do you design and perform these processes to meet all the key requirements? (4) What are your key performance measures/indicators used for the control and improvement of these processes? Include how in-process measures and customer and supplier feedback are used in managing your business processes, as appropriate. (5) How do you minimize overall costs associated with inspections, tests, and process/performance audits, as appropriate? (6) How do you improve your business processes to achieve better performance and to keep them current with business needs and directions? How are improvements shared with other organizational units and processes, as appropriate? <p>Item 6.3 Support Processes: Describe how your organization manages its key processes that support your daily operations and your employees in delivering products and services. Within your response, include answers to the following questions:</p> <p>a. Support Processes</p> <ol style="list-style-type: none"> (1) What are your key processes for supporting your daily operations and your employees in delivering products and services? (2) How do you determine key support process requirements, incorporating input from internal customers, as appropriate? What are the key operational requirements (such as productivity and cycle time) for these processes? (3) How do you design these processes to meet all the key requirements? (4) How does your day-to-day operation of key support processes ensure meeting key performance requirements? (5) What are your key performance measures/indicators used for the control and improvement of these processes? Include how in-process measures and internal customer feedback are used in managing your support processes, as appropriate. (6) How do you minimize overall costs associated with inspections, tests, and process/performance audits? (7) How do you improve your support processes to achieve better performance and to keep them current with business needs and directions? How are improvements shared with other organizational units and processes, as appropriate?
Customer focused results (CUSTPERF)	<p>Item 7.1 Customer-Focused Results: Summarize your organization's key customer-focused results, including customer satisfaction and product and service performance results. Segment your results by customer groups and market segments, as appropriate. Include appropriate comparative data. Provide data and information to answer the following questions:</p> <p>a. Customer Results</p> <ol style="list-style-type: none"> (1) What are your current levels and trends in key measures/indicators of customer satisfaction and dissatisfaction, including comparisons with competitors' levels of customer satisfaction? (2) What are your current levels and trends in key measures/indicators of customer-perceived value, customer retention, positive referral, and/or other aspects of building relationships with customers, as appropriate? <p>b. Product and Service Results</p> <p>What are your current levels and trends in key measures/indicators of product and service performance that are important to your customers?</p>
Financial Results (FINPERF)	<p>Item 7.2 Financial and Market Results: Summarize your organization's key financial and marketplace performance results by market segments, as appropriate. Include appropriate comparative data. Provide data and information to answer the following questions:</p> <p>a. Financial and Market Results</p> <ol style="list-style-type: none"> (1) What are your current levels and trends in key measures/indicators of financial performance, including aggregate measures of financial return and/or economic value, as appropriate? (2) What are your current levels and trends in key measures/indicators of marketplace performance, including market share/position, business growth, and new markets entered, as appropriate?

Table A5. Illustrative Description of Variables (Continued)

Variable	Description
Human Resource Results (HUMPERF)	<p>Item 7.3 Human Resource Results: Summarize your organization's key human resource results, including employee well-being, satisfaction, and development and work system performance. Segment your results to address the diversity of your workforce and the different types and categories of employees, as appropriate. Include appropriate comparative data. Provide data and information to answer the following questions:</p> <p>a. Human Resource Results</p> <ol style="list-style-type: none"> (1) What are your current levels and trends in key measures/indicators of employee well-being, satisfaction and dissatisfaction, and development? (2) What are your current levels and trends in key measures/indicators of work system performance and effectiveness?
Organizational Effectiveness Results (ORGEFFECT)	<p>Item 7.4 Organizational Effectiveness Results: Summarize your organization's key performance results that contribute to the achievement of organizational effectiveness. Include appropriate comparative data. Provide data and information to answer the following questions:</p> <p>a. Operational Results</p> <ol style="list-style-type: none"> (1) What are your current levels and trends in key measures/indicators of the operational performance of key design, production, delivery, business, and support processes? Include productivity, cycle time, supplier/partner performance, and other appropriate measures of effectiveness and efficiency. (2) What are your results for key measures/indicators of accomplishment of organizational strategy? <p>b. Public Responsibility and Citizenship Results What are your results for key measures/indicators of regulatory/legal compliance and citizenship?</p>
Leadership Quality (LEAD)	<p>Item 1.1 Organizational Leadership: Describe how senior leaders guide your organization, including how they review organizational performance. Within your response, include answers to the following questions:</p> <p>a. Senior Leadership Direction</p> <ol style="list-style-type: none"> (1) How do senior leaders set and deploy organizational values, short- and longer-term directions, and performance expectations, including a focus on creating and balancing value for customers and other stakeholders? Include how senior leaders communicate values, directions, and expectations through your leadership system and to all employees. (2) How do senior leaders create an environment for empowerment, innovation, organizational agility, and organizational and employee learning? <p>b. Organizational Performance Review</p> <ol style="list-style-type: none"> (1) How do senior leaders review organizational performance and capabilities to assess organizational success, competitive performance, progress relative to short- and longer-term goals, and the ability to address changing organizational needs? Include the key performance measures regularly reviewed by your senior leaders. Also, include your key recent performance review findings. (2) How are organizational performance review findings translated into priorities for improvement and opportunities for innovation? How are they deployed throughout your organization and, as appropriate, to your suppliers/partners to ensure organizational alignment? (3) How do senior leaders use organizational performance review findings to improve both their own leadership effectiveness and your leadership system?
Strategic Planning Quality (STRAT)	<p>Item 2.1 Strategy Development: Describe how your organization establishes its strategic objectives, including enhancing its competitive position and overall performance. Within your response, include answers to the following questions:</p> <p>a. Strategy Development Process</p> <ol style="list-style-type: none"> (1) What is your overall strategic planning process? Include key steps, key participants, and your short- and longer-term planning time horizons. (2) How do you ensure that planning addresses the following key factors? Briefly outline how relevant data and information are gathered and analyzed to address these factors: <ul style="list-style-type: none"> • customer and market needs/expectations/opportunities • your competitive environment and your capabilities relative to competitors • technological and other key changes that might affect your products/services and/or how you operate • your strengths and weaknesses, including human and other resources • your supplier/partner strengths and weaknesses • financial, societal, and other potential risks <p>b. Strategic Objectives</p> <ol style="list-style-type: none"> (1) What are your key strategic objectives and your timetable for accomplishing them? Include key goals/targets, as appropriate.

Table A5. Illustrative Description of Variables (Continued)	
Variable	Description
	<p>(2) How do your strategic objectives address the challenges identified in response to P.2 in your Organizational Profile? How do you ensure that your strategic objectives balance the needs of all key stakeholders?</p> <p>Item 2.2 Strategy Deployment: Describe how your organization converts its strategic objectives into action plans. Summarize your organization's action plans and related key performance measures/indicators. Project your organization's future performance on these key performance measures/indicators. Within your response, include answers to the following questions:</p> <p>a. Action Plan Development and Deployment</p> <p>(1) How do you develop and deploy action plans to achieve your key strategic objectives? Include how you allocate resources to ensure accomplishment of your action plans.</p> <p>(2) What are your key short- and longer-term action plans? Include key changes, if any, in your products/ services, your customers/markets, and how you operate.</p> <p>(3) What are your key human resource plans that derive from your short- and longer-term strategic objectives and action plans?</p> <p>(4) What are your key performance measures/indicators for tracking progress relative to your action plans? How do you ensure that your overall action plan measurement system achieves organizational alignment and covers all key deployment areas and stakeholders?</p> <p>b. Performance Projection</p> <p>What are your performance projections for your key measures/indicators for both your short- and longer term planning time horizons? How does your projected performance compare with competitors' performance, key benchmarks, goals, and past performance, as appropriate?</p>
HR Management Capability (HRMGMT)	<p>Item 5.1 Work Systems: Describe how your organization's work and jobs, compensation, career progression, and related workforce practices motivate and enable employees and the organization to achieve high performance. Within your response, include answers to the following questions:</p> <p>a. Work Systems</p> <p>(1) How do you organize and manage work and jobs to promote cooperation, initiative/innovation, your organizational culture, and the flexibility to keep current with business needs? How do you achieve effective communication and knowledge/skill sharing across work units, jobs, and locations, as appropriate?</p> <p>(2) How do you motivate employees to develop and utilize their full potential? Include formal and/or informal mechanisms you use to help employees attain job- and career-related development/learning objectives and the role of managers and supervisors in helping employees attain these objectives.</p> <p>(3) How does your employee performance management system, including feedback to employees, support high performance and a customer and business focus? How do your compensation, recognition, and related reward/incentive practices reinforce these objectives?</p> <p>(4) How do you accomplish effective succession planning for senior leadership and throughout the organization?</p> <p>(5) How do you identify characteristics and skills needed by potential employees? How do you recruit, hire, and retain new employees? How do your work systems capitalize on the diverse ideas, cultures, and thinking of the communities with which you interact (your employee hiring and customer communities)?</p> <p>Item 5.2 Employee Education, Training, and Development: Describe how your organization's education and training support the achievement of your overall objectives, including building employee knowledge, skills, and capabilities and contributing to high performance. Within your response, include answers to the following questions:</p> <p>a. Employee Education, Training, and Development</p> <p>(1) How do education and training contribute to the achievement of your action plans? How does your education and training approach balance short- and longer-term organizational objectives and employee needs, including development, learning, and career progression?</p> <p>(2) How do you seek and use input from employees and their supervisors/managers on education and training needs and delivery options?</p> <p>(3) How do you address in your employee education, training, and development your key organizational needs associated with technological change, management/leadership development, new employee orientation, safety, performance measurement/improvement, and diversity?</p>

Table A5. Illustrative Description of Variables (Continued)

Variable	Description
	<p>(4) How do you deliver education and training? Include formal and informal delivery, including mentoring and other approaches, as appropriate. How do you evaluate the effectiveness of education and training, taking into account individual and organizational performance?</p> <p>(5) How do you reinforce the use of knowledge and skills on the job?</p> <p>Item 5.3 Employee Well-Being and Satisfaction: Describe how your organization maintains a work environment and an employee support climate that contribute to the well-being, satisfaction, and motivation of all employees. Within your response, include answers to the following questions:</p> <p>a. Work Environment How do you improve workplace health, safety, and ergonomics? How do employees take part in improving them? Include performance measures and/or targets for each key environmental factor. Also include significant differences, if any, based on varying work environments for employee groups and/or work units.</p> <p>b. Employee Support and Satisfaction</p> <p>(1) How do you determine the key factors that affect employee well-being, satisfaction, and motivation? How are these factors segmented for a diverse workforce and for varying categories and types of employees, as appropriate?</p> <p>(2) How do you support your employees via services, benefits, and policies? How are these tailored to the needs of a diverse workforce and different categories and types of employees, as appropriate?</p> <p>(3) What formal and/or informal assessment methods and measures do you use to determine employee well-being, satisfaction, and motivation? How do you tailor these methods and measures to a diverse workforce and to different categories and types of employees, as appropriate? How do you use other indicators, such as employee retention, absenteeism, grievances, safety, and productivity, to assess and improve employee well-being, satisfaction, and motivation?</p> <p>(4) How do you relate assessment findings to key business results to identify priorities for improving the work environment and employee support climate?</p>

Appendix B

Additional Analyses

Table B1. Random Effects Models for Organizational Capabilities (N = 160)

	(1)	(2)	(3)
	PERFMGMT	CUSTMGMT	PROCMGMT
INFMGMT	0.237*** (0.001)	0.157** (0.012)	0.197*** (0.002)
LEAD	0.319*** (0.001)	0.404*** (0.000)	0.417*** (0.000)
STRAT	0.183* (0.072)	0.431*** (0.000)	0.349*** (0.000)
R-squared	0.71	0.82	0.81

We estimated all models including an intercept and a dummy variable FIRM (1=firms, 0=intra-organizational units). p values are in parentheses; * $p < .10$, ** $p < .05$, and *** $p < .01$.

Table B2. Random Effects Models for Firm Performance (N = 160)

	(1)	(2)	(3)	(4)
	CUSTPERF	FINPERF	HUMPERF	ORGEFFECT
INFMGMT	0.045 (0.497)	0.382*** (0.000)	0.042 (0.499)	0.035 (0.519)
PERFMGMT	0.268*** (0.001)	-0.032 (0.749)	0.228*** (0.002)	0.406*** (0.000)
PROCMGMT	0.052 (0.563)	0.428*** (0.000)	0.211** (0.012)	0.218*** (0.003)
CUSTMGMT	0.468*** (0.000)	0.215* (0.059)	0.311*** (0.000)	0.136* (0.076)
R-squared	0.75	0.74	0.75	0.77

We estimated all models including an intercept, dummy variables FIRM (1=firms, 0=intra-organizational units) and SERVICE, and a control variable SIZE.

p values are in parentheses; * $p < .10$, ** $p < .05$, and *** $p < .01$.

Table B3. SURE Parameter Estimates of the Firm and Intra-organizational Unit Models for Organizational Capabilities (N=160)

	Firms	Intra-organizational Units
	Constrained Model [†]	Constrained Model [†]
INFMGMT	0.286*** (0.001)	0.201*** (0.000)
LEAD	0.159 (0.124)	0.479*** (0.000)
STRAT	0.493*** (0.000)	0.196** (0.029)
R-squared	0.77, 0.73, 0.81	0.59, 0.81, 0.79

We estimated all models including an intercept.

p values are in parentheses; * $p < .10$, ** $p < .05$, and *** $p < .01$.

[†]This model restricts slope parameters to be equal across three measures of organizational capabilities (i.e., across Equations 1a–1c). R-squared values for this model refer to Equations 1a–1c, respectively.

Table B4. SURE Parameter Estimates of the Firm and Intra-organizational Unit Models for Organizational Performance (N = 160)

	Firms	Intra-organizational Units
	Constrained Model [†]	Constrained Model [†]
INFMGMT	0.135 (0.108)	0.156*** (0.007)
PERFMGMT	0.241** (0.013)	0.169** (0.022)
PROCMGMT	0.238** (0.020)	0.164** (0.038)
CUSTMGMT	0.270*** (0.004)	0.335*** (0.000)
R-squared	0.71, 0.54, 0.76, 0.80	0.70, 0.71, 0.68, 0.67

We estimated all models including an intercept, dummy variable SERVICE, and a control variable SIZE.

p values are in parentheses; * $p < .10$, ** $p < .05$, and *** $p < .01$.

[†]This model restricts slope parameters to be equal across four measures of firm performance (i.e., across Equations 2a–2d). R-squared values for this model refer to Equations 2a–2d, respectively.

Table B5. SURE Parameter Estimates of the Firm Performance Models Controlling for HR Management Capability (N = 160)

	Unconstrained Models				Constrained Model [†]
	(1)	(2)	(3)	(4)	(5)
	CUSTPERF	FINPERF	HUMPERF	ORGEFFECT	Firm Performance
INFMGMT	0.057 (0.406)	0.347*** (0.000)	0.003 (0.959)	0.061 (0.331)	0.119*** (0.010)
PERFMGMT	0.242*** (0.003)	-0.016 (0.872)	0.214*** (0.003)	0.387*** (0.000)	0.210*** (0.000)
PROCMGMT	0.018 (0.864)	0.189 (0.134)	-0.063 (0.497)	0.235** (0.014)	0.104 (0.137)
CUSTMGMT	0.471*** (0.000)	0.048 (0.680)	0.200** (0.021)	0.249*** (0.005)	0.229*** (0.000)
HRMGMT [‡]	0.046 (0.669)	0.476*** (0.000)	0.468*** (0.000)	-0.123 (0.211)	0.215*** (0.003)
R-squared	0.751	0.762	0.784	0.777	0.730, 0.698, 0.763, 0.736

We estimated all models including an intercept, dummy variables FIRM (1=firms, 0=intra-organizational units) and SERVICE, and a control variable SIZE.

p values are in parentheses; **p* < .10, ***p* < .05, and ****p* < .01.

[†]This model restricts slope parameters to be equal across four measures of firm performance (i.e., across Equations 2a–2d after including HR Management capability). R-squared values for this model refer to Equations 2a–2d, respectively.

[‡]For a detailed description of this capability, see Category 5 of the Baldrige criteria 2002 document (available at the NIST Web site at http://baldrige.nist.gov/Business_Criteria.2002.htm).

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