Management Faculty Publications   Management

2017

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**This version dated June 16, 2015
before publication in *Journal of Computer Information Systems***

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ABSTRACT

Despite a generally-acknowledged importance of information technology (IT) in enabling global strategy and a broad understanding of the manner in which IT enhances coordination and reduces cost, few studies have focused precisely on how multinational corporations (MNCs) use IT to facilitate globalization. To address this gap in the literature, we conduct a case study across four large MNCs, and use primary data to develop theoretical propositions on the characteristics of products, processes and customers that impact the ways in which MNCs use IT to manage their global operations.

Keywords: Multinational, MNC, international, information technology, global.

INTRODUCTION

Over the past 50 years, international markets have contributed an increasing share of revenues and profits for multinational corporations (MNCs). For example, the share of international profits as a percentage of total profits for U.S. firms rose from 5% in the 1960s to over 25% during the 2000s [1]. The increase has been particularly dramatic over the past decade, as U.S. corporate overseas profits increased at a double-digit pace for 22 consecutive quarters [49]. U.S. firms have also found higher returns on sales in foreign markets than in domestic markets, and less variability in earnings compared with domestic operations [18].

This trend is expected to continue and accelerate in the future, because globalization is an important vehicle for MNCs to manage revenue growth and cost reduction. Globalization provides opportunities for revenue growth by expanding operations into new geographical areas, and opportunities to reduce costs and increase profitability through economies of scale and scope [4]. It presents multinational firms with strategic opportunities that are not available to purely domestic firms, such as the ability to acquire inputs from multiple locations and serve diverse markets [2]. Globalization also enables firms to access global availability of talent to reduce cycle time, spur innovation, and maintain or improve quality [29]. Among the 30 companies in the Dow Jones Industrial Average, the 10 that get the largest share of their sales abroad were expected to see revenues grow by an average of 8.3%, and the 10 that do the least business outside the U.S. were expected to show much lower average revenue gains of 1.6% [27].

However, the advantages associated with globalization come with several risks in managing business operations across country borders. A presence in diverse locations presents MNCs with higher levels of complexity, variability, unfamiliarity and uncertainty [52]. Entry into foreign markets creates local adaptation costs, and location differences create difficulties to transfer products, services, processes and information between headquarters and subsidiaries in various countries. Executives at MNCs face the challenge to manage the operations of their subsidiaries with each other and with headquarters, to administer the firm as a coordinated global network [11]. To manage these risks and achieve the desired level of administrative coordination, firms deploy a wide range of mechanisms, of which several include a critical role for information technology (IT) systems [19]. Despite a generally-acknowledged importance of

IT in enabling global strategy and a broad understanding of the manner in which IT enhances coordination and reduces cost, few studies have focused precisely on how MNCs use IT to facilitate globalization [36].

The purpose of this paper is to build depth and understanding for the mechanisms through which MNCs use IT to facilitate globalization. We use case study data derived from interviews with the top IT and business executives in four large MNCs to identify differences in application of the mechanisms. This paper contributes to research and practice. From a research perspective, this paper more clearly illustrates the theoretical mechanisms of value chain configuration, value chain coordination and local responsiveness that have been identified in prior research. Based on these theoretical mechanisms, this paper also develops three predictive propositions that will enable researchers to extend their study of IT and globalization. From a practice perspective, our case studies demonstrate that the manner in which global firms use IT will vary based on the type of product, type of process, and type of customer.

BACKGROUND AND THEORETICAL FRAMEWORK

IT enables firm to globalize their operations and achieve foreign revenues and foreign profits through three mechanisms – value chain configuration, value chain coordination, and local responsiveness. Value chain coordination refers to the coordination of similar value chain activities (such as procurement or production) across different geographic locations, and involves the management of information to make decisions related to the activities and the management of knowledge and resources necessary to perform the activities [38]. IT systems facilitate value chain coordination and knowledge flows through provision of rich transmission channels and knowledge management systems for transfer and absorption of knowledge by headquarters and subsidiaries. IT systems greatly expand the type, frequency, speed and volume with which MNCs can input, store, extract and exchange structured information and unstructured knowledge throughout the firm [12]. The systems enable firms to communicate knowledge to personnel in headquarters or subsidiaries who have the best experience and capabilities to make specific decisions, and provide infrastructure to share, distribute and absorb knowledge across geographic and functional boundaries, and to coordinate activities and develop strategic opportunities [20].

Value chain configuration refers to the manner in which firms build the capacity to perform value chain activities globally and disperse those activities across different geographic locations [26]. By reconfiguring its value chain activities, a firm can achieve efficiencies through centralized administrative coordination, control of resources, and performance measurement [45], and can produce and innovate in low cost markets and sell in high return markets. Firms can use IT to extract information and knowledge components of production inputs and business processes, and move those components around the world to perform each value chain activity in the location where it can be best accomplished [34]. IT systems enable MNCs to treat subsidiaries as component pieces, which allows firms to locate activities across subsidiaries and geographies as appropriate [15]. In local responsiveness, firms implement changes in product features, production and distribution approaches, advertising messages and pricing to tailor for local markets [40]. IT systems are an integral component of a local responsiveness [31]. Firms can use their IT and communications architecture to draw together marketing, research and development (R&D), and production experts with the unique skills and knowledge of a particular local market, which enables the firm to respond and adapt with products and services that are tailored for customers in that market [42].

While early global IT research [21] generated helpful insights by mapping IT configurations to the traditional strategy typologies of multi-domestic, global, international and transnational[1] [3], subsequent research notes the need to progress beyond the typologies for at least three reasons. First, typologies with a limited number of options may not be able to explain the full set of considerations firms use to organize their foreign subsidiaries and global IT operations [10]. Second, IT has increased the ability of firms to simultaneously achieve a degree of global efficiencies *and* local responsiveness, which are the traditional strategy tradeoffs [47]. As more firms use IT to pursue global efficiencies and local responsiveness, traditional strategies increasingly become blurred [42]. Third, the strategy typologies are difficult to operationalize, and there may be differences between a firm's actual positioning and its aspiration [25]. Therefore, to complement prior research and generate further insights on global IT, we categorize firms based on more objective measures from prior research, such as whether the firm's primary product is durable vs. non-durable, and whether the end user for the firm's primary product is industrial customers or individual consumers. Because IT powers multiple processes across the firm, we perform our analysis based on a distinction between front office processes and back office processes. Below we provide further background on the distinctions between types of goods, customers and processes.

Durable goods and non-durable goods

Firms can be classified based on the nature of their products and services. For example, manufacturing firms can be classified based on whether they make durable goods or non-durable goods. Durable goods last for a longer period of time and non-durable goods last for a more limited period, and the stability of prices for durable goods is greater than the stability of prices for non-durable goods [28]. The nature of goods impacts processes throughout the firm. Firms that manufacture durable goods must allocate more resources to R&D, and emphasize production efficiency and product quality [16]. Firms that manufacture non-durable goods must focus on the acquisition of market share through competitive pricing, and the constant development of additional markets [13]. As we will discuss below, the use and impacts of IT can differ based on the nature of products and services produced by the firm [53].

Industrial customers and individual consumers

Firms can also be classified based on whether the end users of their products are industrial customers or individual consumers. The market for industrial customers is more concentrated than the market for individual consumers [50]. Industrial customers have larger transaction volumes per customer, while individual consumers have intermittent transactions with lower dollar values per transaction. While industrial products are more standardized because technical specifications do not vary across countries [5], consumer products are less standardized because consumer preferences are more idiosyncratic to local cultures and tastes [46]. Firm relationships with industrial customers are more prevalent, complex, balanced, and long-standing than relationships with individual consumers [17].

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[1] A multi-domestic strategy is based on a portfolio of autonomous domestic companies with a focus on local responsiveness, an international strategy is based on home country expertise with a focus on control, a global strategy is based on scale economies with a focus on integration, and a transnational strategy is based on a headquarters-subsidiary network with a simultaneous focus on global integration and local responsiveness [3].

Front-office and back-office processes

The operations of a firm can be viewed as two sets of business processes – front-office processes and back-office processes [41]. Front-office processes are those through which the firm interacts directly with the customer, and include marketing, sales and service. While back-office processes are also important to the firm's operations, they do not interact directly with the customer. Back-office processes include finance, accounting, IT and human resources (HR). The extent of customer contact influences the challenges inherent in each set of processes, and the resulting focus of the firm [56]. Front-office processes must cope with uncertainly resulting from customer involvement and unique requests, which create inefficiencies and increase operating costs. Firms must configure their front-office processes to address the human relations aspect of customer contact, and to be flexible to customize products and services to customer requirements [37]. Because customers do not directly interact with back-office processes, customers may not perceive back-office processes as part of the firm's value proposition. This places pressure on firms to standardize and automate to enhance the efficiency and effectiveness of back-office processes. Firms generally make larger capital investments related to back-office processes compared with front-office processes, with the objective to reduce the long-term cost of back-office processes [44].

METHODOLOGY AND CASE STUDY FIRMS

We designed this research project as a multi-case study. Case studies involve a holistic, in-depth investigation of phenomena that cannot be studied independently from the context in which they occur [39]. The use of multiple cases enables cross-analysis of a phenomenon in diverse settings, which increases the volume of evidence and robustness of findings [9]. It is desirable to have a common context across cases, to provide a degree of consistency for comparison/contrast and some control factors that allow for generalization [8]. Multi-case studies focus on analytical generalization rather than statistical generalization to the full population [23].

Our selection of four cases for this paper is consistent with the recommendation of 4 – 5 cases for multi-case study research [7], and with the guidance that fewer than four cases may lack empirical grounding [8]. We agreed to provide confidentiality to our case study firms, and we do not disclose the identity of the firms in this paper. One firm manufactures and sells finished equipment to industrial customers, and we call this "Equipment firm" in this paper. The second firm manufactures and sells components to industrial customers, and we call this "Parts firm." The third firm manufacturers and sells durable household goods, and we call this "Household Goods firm." The fourth firm manufactures and sells consumer products, and we call this "Consumer Products firm."

The four firms in our study have a common context. All four firms are included on the 2011 *Forbes* Global 2000 list of the world's largest publicly-traded firms, and have annual revenue over US$1 billion. All four firms are headquartered in Northern Europe, have over 50% of sales outside the home country, and have Europe and North America as two of their top three sales markets. The equities of all four firms are publicly traded on European and U.S. exchanges. Our unit of analysis is the firm, with the European headquarters and North America subsidiary of each firm as sub-units of analysis. Table 1 shows a profile of our four case study firms.

TABLE 1
Corporate Profile of Case Study Firms

	Equipment firm	Parts firm	Household Goods firm	Consumer Products firm
2011 *Forbes* Global 2000 rank	Top 1000	Top 1000	Top 1000	Top 2000
Annual revenue	US$5+ billion	US$5+ billion	US$10+ billion	US$1+ billion
Founded	1800's	Early 1900's	Early 1900's	Early 1900's
Employees	10,000+	30,000+	50,000+	3,000+
Countries with operations	10+	25+	50+	20+
Countries with mfg. facilities	10+	15+	15+	5+
Largest market	Asia	Europe	North America	Europe
2nd largest market	Europe	Asia	Europe	North America
3rd largest market	North America	North America	Latin America	Rest of world

Notes: 1. Data in this table is based primarily on each firm's 2010 annual report, which is closest in time to data collection for this research project.
2. Approximations are intended to maintain anonymity of the case study firms.

While our case study firms have a common context to allow for comparison and contrast, they also represent diverse settings to explore the manner in which MNCs use IT to coordinate global operations. Equipment firm and Household Goods firm manufacture durable products, and Parts firm and Consumer Products firm manufacture non-durable products. Equipment firm and Parts firm products are used by industrial customers, and Household Goods firm and Consumer Products firm products are used by individual consumers. Applying the criteria discussed above to segment firms based on the nature of products and nature of customers, Table 2 shows that we have one firm in each quadrant.

TABLE 2
Categorization of Firms by Product and Customer Characteristics

	Industrial customer	Individual consumer
Durable product	Equipment firm	Household Goods firm
Non-Durable product	Parts firm	Consumer Products firm

We adopted the positivist approach in this research, because we believe the manner in which MNCs use IT to coordinate global operations is an objective phenomenon that can be identified by deductive logic, and that can be accurately described by senior executives in our case study firms with limited room for interview participants to construct their own meaning [39]. Based on the positivist approach, our goal was to combine data sources from the European headquarters and U.S. subsidiary of our case study firms to arrive at a unified set of insights for the manner in which MNCs use IT to coordinate global operations. Consistent with one appropriate application of case study research, we use data from our case study firms to develop predictive propositions that can be tested in future empirical research [55].

Similar to the majority of published IS case studies, we used face-to-face, in-depth, semi-structured interviews as our primary source of data. In-depth interviews enable researchers to

understand participant descriptions and accounts of actions and events [54]. We conducted a total of 21 interviews with 18 interviewees, at the level of 3 – 5 interviews per case and threshold of 20 total interviews recommended by [7]. Even more important than meeting the recommended threshold is our belief that that the number of interviews enabled us to receive a complete picture of IT operations at the European headquarters and U.S. subsidiaries for our case study firms [32]. An important element that strengthens the validity of our data is that we interviewed senior executives that have the most accurate and comprehensive understanding of IT and business strategy at each firm [48]. For example, we interviewed the Chief Information Officer (CIO) for all four firms, and also conducted interviews with other senior executives with titles such as Chief Technology Officer (CTO), Deputy CIO, Regional CIO, Regional IT Vice President (VP), Regional Director, and Regional Controller. Table 3 provides a list of interviewees for our case study firms. In addition to the interviews, members of the research team reviewed some information in annual reports, news coverage, and websites to learn more about the firms and to provide context for case study material. Given the extended timeframe of multi-year IT implementations at our case study firms, observation was not a suitable method to collect data for this research project.

In most cases, the research team initially contacted the CIO, and the CIO provided access and introduction to other IT and business executives in Europe and the U.S. Most interviews were conducted in person at the executive's offices in Europe and the U.S., most interviews lasted between one and two hours, and most interviews involved more than one member of the research team. While most executives were interviewed once, some executives were interviewed multiple times. The research team followed a consistent interview pattern across firms by first meeting with European headquarters personnel, then meeting with U.S. subsidiary personnel, and then meeting again with European personnel. Most interviews were conducted over a period of 15 months from March 2009 to June 2010.

TABLE 3
List of Interviewees

	Europe	North America
Equipment Firm	Global CIO Regional CIO	Regional IT VP Regional IT VP
Parts Firm	Global CIO Deputy CIO (2)	Regional Controller Regional Controller
Household Goods Firm	Global CIO (3) Global CTO Global IT Director (2)	Regional IT Director Regional Controller
Consumer Products Firm	Global CIO Deputy CIO (2)	Regional CIO Regional Director Regional Director

Notes: 1. Numbers in parentheses indicate multiple meetings with an interviewee.
2. Four interviews included two simultaneous participants from the case study firm.
3. The Global CIO of Parts firm departed the firm during the research project.
4. The Global CIO of Consumer Products firm joined the firm during the research project.

We used semi-structured interviews because we were familiar with the questions to be asked but unable to predict the answers, and semi-structured interviews enable researchers to obtain required information while giving participants freedom to respond and illustrate concepts

[39]. Before the interviews, the research team prepared structured interview guides to ensure that all important issues were covered during the interviews, and to increase comparability across firms. Consistent with strategy research that identifies differences between headquarters and subsidiaries, the research team formulated different research questions for European headquarters and U.S. subsidiary personnel to capture their respective perspectives on global business processes and IT operations [14]. The main questionnaire items shown in Appendix A are consistent with prior research on the role of headquarters in an MNC [6], relationship between headquarters and subsidiaries [30], information exchanged between headquarters and subsidiaries [24], responsibilities and decision-making between headquarters and subsidiaries [33], business functions in an MNC [41], role of IT in an MNC [2], and types of IT infrastructure and applications in an MNC [22].

Some interviewees showed and discussed confidential materials during the interviews (for example, one CIO presented material that was to be discussed with the Board of Directors the following week). While the research team took active notes on these materials during the interviews, we did not receive a paper or electronic copy of confidential materials. Shortly after each interview, a research team member prepared detailed notes from the interview [54]. Other team member(s) who attended the interview reviewed, refined and added to the interview notes as necessary. The detailed notes for each interview were then finalized, and maintained in a case collection. We added some background material to the first set of interview notes for each firm, including items such as company and financial information, news coverage, and professional background on the interviewee. Total notes across the four firms included approximately 100 single-space pages containing 45,000 words.

The active involvement of all three research team members in interviews strengthened the validity of data. In addition to triangulation of investigators in data collection, we triangulated data across interviewees and firms during the data analysis, and maintained a linkage between research questions, evidence and conclusions. Before we discuss the analysis and predictive propositions, we begin with a brief summary of each firm in our case study.

Equipment firm

Equipment firm is the second largest business unit of a global equipment firm that was founded during the 1800's, and is one of the world's four largest firms in this segment. Equipment firm sells to industrial customers through independent and firm-owned dealerships. Asia is the leading market for Equipment firm, Europe is the second leading market, and North America is the third leading market. While Equipment firm manufactures most products for the North America market in three manufacturing facilities throughout the Americas, some large equipment products are manufactured only in Asia and then imported to North America. In terms of corporate strategy, Equipment firm is nearing completion of a multi-decade transformation from specialty equipment provider to total solution provider, and this transformation has included multiple acquisitions of rival equipment firms to complete the product portfolio. For example, Equipment firm recently made a major acquisition in North America and acquired majority ownership of an Asian firm. In terms of organization structure, Equipment firm has reorganized from a geographic structure to a functional structure to encourage holistic business processes across regions. The R&D function is responsible to develop new products, the operations function is responsible to build products, and the sales

function is responsible to sell products. In the reorganization, IT is a shared service across business functions with approximately 200 IT personnel.

In terms of IT, Equipment firm initiated a major global ERP implementation during the mid-2000s. The CIO communicated to our research team that the implementation was 70% complete as of Summer 2010, including the transition of legacy systems for some large acquisitions. The ERP system includes modules for global supplier and customer information, order handling and delivery, manufacturing, finance and HR. As Equipment firm progresses with its ERP implementation, the firm is beginning to leverage the ERP for global processes. For example, Equipment firm is beginning to use the ERP to gain visibility to its global customer base to optimize pricing, visibility to its global supplier base to optimize procurement, visibility to its global inventory and manufacturing data to optimize production and inventory management, and visibility to financial data to optimize profitability. However, Equipment firm has not yet defined all of the associated global processes. For example, Equipment firm has not yet identified the global processes for customer information, because dealers have historically been reluctant to provide customer information to Equipment firm because they want to protect their customer relationships.

Since Equipment firm sells a significant volume through independent dealerships, Equipment firm faces the IT challenge that dealer systems are not standardized and not consistently integrated with Equipment firm throughout the dealer network. The North American IT Director estimates that Equipment firm is integrated with 40% of its dealers in that market. Dealers who are integrated have visibility to Equipment firm inventory and order status throughout the dealer network. Equipment firm then has visibility to dealer stock and sales data for Equipment firm products (some dealers also sell products from other firms). Equipment firm is implementing a new dealer management system in Europe, and is encouraging dealers to participate in the implementation so dealers can check inventory and receive support from Equipment firm.

Parts firm

Parts firm was founded over 100 years ago, and quickly became a global firm. Within 15 years, the firm's sales force covered 100 countries across five continents. Parts firm now has over 100 manufacturing and operational sites in over 25 countries, and is supported by over 10,000 distributors in another 100 countries. Europe is the leading market for Parts firm, Asia is the second leading market, and North America is the third leading market. Parts firm has grown organically and through acquisitions. The firm sells four product lines and is organized into three divisions with 40 segments based on the customer's industry. In addition to the divisional structure and customer-facing segments, Parts firm has shared services organizations for back office functions such as finance and IT.

Given the variety of geographies, customer segments and product lines at Parts firm, the divisions operate in a fairly autonomous manner. Core functions related to production, such as R&D and manufacturing, are performed at the divisional or segment level. The divisions require flexibility in production and delivery, because they need to adapt to rapidly-changing customer needs. There is some coordination between divisions and headquarters on product-related functions such as procurement and marketing, and more coordination on back office functions such as finance. The divisions transmit quarterly financial results to headquarters, and

headquarters has a global financial system that synthesizes and integrates the relevant data to provide a global view of financial performance.

The Parts firm IT organization and infrastructure mirrors the corporate structure. Because of the decentralized nature of R&D and manufacturing, and the flexibility required by the divisions, each region and product line may have its own process, applications and data. For example, Parts firm is required to maintain separate and secure data on its sales to the U.S. Department of Defense. The IT organization has 80 full-time equivalent staff at headquarters, and over 1,000 full-time equivalent staff at over 300 locations around the world. Because parts specifications can be fully defined and published in a catalog, Parts firm is increasingly relying on electronic commerce sales in some product lines (over 50% of total orders and approaching 100% for some niche segments). While Parts firm is undertaking some projects to unify the IT infrastructure, in other cases Parts firm has determined that it is not worthwhile to centralize IT systems because the cost of required upgrades and implementation exceeds the scale of the divisions and products.

Household Goods firm

Household Goods firm was founded almost 100 years ago, and is one of the top three global firms in its industry. This industry is heavily concentrated in manufacturing and sales channels, and firms in this industry have faced significant margin pressure in recent years. In response to the competitive environment, Household Goods firm has adopted a focus on cash flow and profitability. Household Goods firm is currently organized based on four regions (Europe, North America, Latin America and Asia) and four functional areas (Branding, HR, Finance, Legal). While the regions are currently autonomous and accountable for their own financial performance, the firm is taking steps to move from a regional structure to a centralized structure. The firm had developed global councils to offer some central coordination for functions such as procurement and marketing. During the time of our case study, Household Goods firm moved beyond global councils to name global directors for procurement, R&D and manufacturing. The firm is undertaking other initiatives to centralize operations. For example, Household Goods firm is considering ways to harmonize and share components in products across regions, and will then investigate sharing product platforms across regions. Household Goods firm is also looking to establish global R&D centers of excellence for each product type, and will then consider establishing global manufacturing centers of excellence in cases where it is feasible to manufacture and transport products and components across geographies.

The IT organization and applications have closely followed overall developments for Household Goods firm. As the firm has faced increased margin pressure, the number of IT staff has declined by 1/3 over the past decade, and the firm has consolidated 60 data centers to two data centers over the past three years. Household Goods firm currently has about 750 IT employees, with 200 IT staff focused on IT architecture, 500 IT staff focused on IT applications, and 50 IT staff focused on IT financial control. Consistent with its strategy to centralize and standardize operations, the firm is undertaking a global technology standardization project that is fully supported by the Chief Executive Officer (CEO). Project objectives are to harmonize processes and improve efficiency to strengthen controls, lower costs, manage risks and increase information transparency that will support better decisions. Household Goods firm is progressing from 30-40 disparate ERP instances to a single ERP system (although some locations may have a different implementation or instance) to achieve common master data, and

the project involves multiple functions including sales and order processing, procurement, manufacturing, financials and HR. One function not planned for standardization is the management of local sales channels.

Consumer Products firm

Consumer Products firm was founded almost 100 years ago, and is a global leader in its segment. Northern Europe is the largest market for Consumer Products firm, and the U.S. is the second largest market. The firm manufactures most products in the region in which the products are sold. Consumer Products firm believes it has significant potential to grow market share and sales in the U.S., and it recently entered into a joint venture with a larger firm to distribute its products in countries outside of Northern Europe and the U.S. In addition to market share and sales growth, Consumer Products firm is pursuing global efficiencies and is in process of changing its organization from a regional structure to a product structure.

Consistent with this change in organizational structure, Consumer Products firm has combined its IT personnel into a single global unit. There are approximately 50 IT personnel in Consumer Products firm. While there are currently no common IT applications or business processes between the European headquarters and U.S. subsidiary, the firm has an objective to centralize the IT platform across geographies for finance, manufacturing, marketing and administration. Consumer Products firm currently sends financial and market share data from the plants and divisions to headquarters, and has a high priority to develop a global supply chain system. However, the firm will maintain unique sales and distribution systems in each region. The different IT platform for sales and distribution is consistent with the difference in business processes and consumer preferences in the Northern European and U.S. markets. For example, in Northern Europe Consumer Products firm owns the distribution channel, and in the U.S. the product is distributed through independent distributors.

Consumer Products firm used IT to overcome an interesting challenge in the U.S. market, where a significant portion is sold through small retailers and the product is not scanned when sold. Because the product is not scanned, Consumer Products firm is not able to receive or analyze consumer purchase data from small retailers. Consumer Products firm addressed the challenge by purchasing delivery data from the independent distributors, not only for its products but also for competitor products. The firm developed an application to analyze data on its sales and competitor sales, and equips its sales personnel with this data and analysis to provide consultative selling and category management expertise to retailers. This example illustrates the unique sales and marketing challenges faced by Consumer Products firm in each market, with the need for tailored IT systems to address market-specific challenges. Table 4 provides a summary of the business profile for each case study firm, and Table 5 provides a summary of the IT profile for each case study firm.

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TABLE 4
Business Profile of Case Study Firms

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	Equipment Firm	Parts Firm	Household Goods Firm	Consumer Products Firm
Strategy	Transformation from specialty to total solution provider	Organic growth and acquisitions	Industry under significant margin pressure	Significant room for U.S. sales and market share growth
Structure	Reorganized from geographic to functional structure	Divisional structure based on customer segments	Moving from regional to global structure	Moving from regional to product structure
Sales channel	Sells through independent and firm-owned dealerships	Sells primarily through distributors	Sells primarily through large retailers	Sells primarily through small retailers in U.S.
IT organization	Shared service across business functions	Shared service across divisions	Significant reduction in IT staff	Combined IT personnel into single global unit

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TABLE 5
IT Profile of Case Study Firms

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	Equipment Firm	Parts Firm	Household Goods Firm	Consumer Products Firm
ERP	Initiated global ERP implementation during mid-2000s, 70% complete as of 2010	Each region and product line has its own applications and data	Progressing from disparate ERP systems to single ERP system to achieve common master data	Objective to centralize platform across geographies for finance, manufacturing, marketing and administration
Processes	Beginning to leverage ERP for global processes, such as visibility to global inventory to optimize production	Each division has its own processes	Goal of technology standardization to harmonize processes and improve efficiency to lower costs and improve decisions	Different business processes based on different consumer preferences in Northern Europe and U.S.
Challenge	Dealer systems not standardized and not integrated with Equipment firm throughout the network	For some divisions not worthwhile to centralize IT systems, because cost exceeds scale of divisions and products	History of regional autonomy may present challenges to technology standardization	Not able to receive purchase data from small retailers because product is not scanned when sold
Next steps	Implement new dealer management system in Europe	Implement global CRM system	Technology standardization will include sales and order processing, procurement, manufacturing, financials and HR	High priority to develop global SCM system

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PROPOSITIONS

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Building on prior research that describes the mechanisms through which IT facilitates globalization, in this paper we enhance understanding of the contexts in which certain

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mechanisms may be more applicable for firms with specific characteristics. Below we provide evidence based on analysis of our case study firms to develop three predictive propositions regarding the manner in which MNCs use IT to manage global operations. These propositions can be tested in future empirical research.

Value chain configuration

While IT systems enable MNCs to disperse value chain activities across geographic locations, the nature of IT use for value chain configuration will vary based on the type of product. Because durable goods require higher levels of R&D and capital investment [16], durable goods manufacturers face increased pressure to centralize production. Therefore, we expect durable goods manufacturers to use IT to support centralized production. The two durable goods manufacturers in our case study have centralized production in low cost countries. Equipment firm produces its largest lines of equipment in two low cost countries, and Household Goods firm has moved production to low cost countries in recent years.

These durable goods manufacturers use IT to support the centralization of production. For example, Equipment firm uses information from sales and marketing (customer demand, pricing, and aftermarket requirements) in the R&D and manufacturing for new products. Equipment firm has relied on acquisitions to round out its product portfolio, and the firm implements its global ERP system to integrate acquisitions into its global network. As Equipment firm brings its operations and acquisitions onto its global ERP system, it can leverage this data for configuration of other value chain activities. For example, Equipment firm can use data on its global supplier base to optimize procurement, data on its global customer base to optimize pricing, data on global manufacturing to optimize production and inventory management, and financial data to optimize profitability. For products produced in the U.S., Household Goods firm sources about 1/3 of its components from low cost countries. Household Goods firm is beginning to look at ways to share components across regions, with a long-term objective to share platforms across regions. The movement of production and sourcing across regions, and the eventual sharing of components and platforms across regions, mean that Household Goods firm will have a continuing role for IT to support value chain configuration.

By comparison, the non-durable goods manufacturers in our case study make less use of IT to configure their value chain activities. With lower required levels of R&D and capital investment, Parts firm manufactures many of its products in the regions where they are sold. Parts firm applies a different set of business processes and IT systems in each region. Consumer Products firm also manufactures many of its products in the regions whether they are sold, and there are currently no common systems between the firm's two largest markets. For these non-durable goods manufacturers, the lack of a global ERP system and lower scale of non-durable products make it infeasible and less necessary to configure value chain activities across regions. Based on findings from our case study firms, we propose that:

Proposition 1: MNC durable goods manufacturers place greater focus on using IT for value chain configuration than MNC non-durable goods manufacturers.

Value chain coordination

Once MNCs configure their value chains, they need to coordinate activities across the value chain. While firms use IT to make decisions and manage resources for activities [11], the nature of IT use will vary based on the nature of activity. As discussed above, firms place greater emphasis on standardizing and automating back-office processes, because customers do not directly interact with back-office processes and may not perceive these processes to be part of the firm's value proposition [44]. Therefore, we expect MNCs to use IT more for the coordination and efficiency of back-office processes across regions than for the coordination of front-office processes.

Findings from our case study firms support this expectation, as all four firms actively use IT to coordinate back-office processes across regions. For example, Equipment firm uses its global ERP system to coordinate the full range of back-office processes related to order handling, capacity planning, material supply, inventory management, manufacturing and invoicing, in addition to HR and finance. Even as Household Goods firm is in process of implementing an ERP system for procurement, manufacturing, HR and finance, the firm maintains a common database to report financial information across regions. Parts firm and Consumer Products firm also exchange and consolidate financial data and results across regions. The CIO future visions for our case study firms indicate that the use of IT to coordinate back-office processes is likely to continue and increase. For example, the Household Goods CIO expects R&D and procurement to become more global processes at the firm in the future, and the Consumer Products CIO envisions that administration and manufacturing will become more global processes at the firm in the future.

On the other hand, our case study firms have much more limited IT-based coordination of front-office processes across regions, for a variety of reasons. For example, the distribution channel for Equipment firm varies by region. Because Equipment firm has a higher proportion of firm-owned dealers in one market and a higher proportion of independent dealers in another market, the firm uses a different dealer management system in each region. Consumer Products firm has widely different market shares across regions, with almost 90% market share in one region and only 20% in another region, which requires different sales and marketing systems based on the needs of each market. The Household Goods industry negotiates different purchase terms and discounts across countries, and accordingly has different order systems for each country. Even as Household Goods firm deploys other global systems as described above, Household Goods plans to maintain local IT solutions for sales and channel management. While Parts firm is doing some work to unify some customer data and processes across regions, the weight of evidence from our case study firms suggests that:

> *Proposition 2: MNCs place greater focus on using IT to coordinate back-office processes than front-office processes.*

Local responsiveness

Back-office processes are more amenable to global coordination because unique front-office processes are required to tailor products for different markets [42]. While industrial specifications have limited difference across markets, consumer preferences are more subject to local culture and tastes [46]. Accordingly, we expect that MNCs with individual consumers will

make greater use of IT to adapt to local markets, and we find this to be the case for the firms in our study. Consumer Products firm currently allows each subsidiary to define its own IT processes. One region in which Consumer Products firm faces greater competition has a range of systems to increase its market share, such as an application for sales personnel to transmit data on competitor pricing and promotions on a real-time basis from a retail location. Consumer Products firm also has an application for sales personnel to help retailers optimize profit mix and profitability for the category, including products from other manufacturers. In the meantime, the region in which Consumer Products firm faces less competition has a separate CRM system tailored for needs in that region. While Consumer Products firm plans to centralize administration and manufacturing, the future state will still have separate sales and marketing applications by region. Household Goods firm currently has different CRM systems in various regions. Even though Household Goods firm plans to implement a single CRM system, the CIO will allow for CRM differences across markets.

On the other hand, MNCs with industrial customers show less use of IT to tailor products and services to each market. For example, Parts firm is reorganizing its sales force to sell all products within a market. Parts firm is also increasingly relying on electronic commerce for some of its product lines, and electronic commerce enforces a more standardized process with industrial customers across regions. In fact, the Parts firm Deputy CIO indicates that electronic commerce is also driving many IT projects to integrate with operational systems, rather than the future differences being anticipated at Household Goods firm and Consumer Products firm. While Equipment firm uses different dealer management systems in different regions, we note that all of the dealer management systems have similar functionality (such as enabling a dealer to check inventory availability and order status), and over time Equipment firm will integrate the dealer management systems into its global ERP system. Based on findings from our case study firms, we propose that:

> *Proposition 3: MNCs with individual consumers place greater focus on using IT to achieve local responsiveness than MNCs with industrial customers.*

DISCUSSION AND CONCLUSION

To address the gap in research on how MNCs use IT to facilitate globalization, we conducted in-depth interviews with top IT and business executives at the European headquarters and North American subsidiary for four MNCs. The common context for these MNCs is that they belong to the 2011 *Forbes* Global 2000 list of the world's largest publicly-traded firms and have annual revenue over US$1 billion, with Europe and North America as two of the three largest sales regions. While the common context provides a degree of consistency and some control factors that allow for analytical generalization, our case study firms also have differentiating characteristics that allow for comparison and contrast. Two of our case study firms manufacture durable products and two firms manufacture non-durable products, and two firms manufacture products for industrial customers and two manufacture products for individual consumers.

We apply our case study data to develop predictive propositions that build depth and understanding for the mechanisms through which IT facilitates globalization. We propose that MNCs that manufacture durable goods place greater focus on using IT for value chain reconfiguration than MNCs that manufacture non-durable goods, and that MNCs place greater

focus on using IT to coordinate back-office processes than front-office processes. We also propose that MNCs with individual consumers place greater focus on using IT to achieve local responsiveness than MNCs with industrial customers.

The case study data and predictive propositions in this paper move IT globalization research forward in two ways. First, this paper illustrates two objective dimensions (durable product vs. non-durable product, industrial customer vs. individual consumer) along which firms can be categorized for empirical research, and our propositions identify three ways in which the use of IT to manage global operations can vary based on these dimensions. This progress is important, because early IT globalization research has only been able to categorize firms based on generic strategy typologies. While this early research has built a helpful foundation, there are some potential shortcomings. A categorization using strategy typologies is subjective, as there is no third-party data source to validate that the strategy of a particular firm is multi-domestic vs. international vs, transnational vs. global. Even if researchers code the strategies based on published materials, those published materials may represent the firm's aspiration rather than its actual strategic positioning. By using objective dimensions such as durable product vs. non-durable product or industrial customer vs. individual consumer, researchers can perform empirical analysis to generate additional insights that will be tailored to specific types of firms.

Second, in addition to identifying a classification scheme for firms, this paper provides useful guidance on other variables that can be considered in future empirical research on IT and globalization. For example, Tables 4 and 5 identify other dimensions along which our case study firms differ, such as the firm's corporate structure or business processes. These dimensions, along with other dimensions such as structure of the IT organization or extent of IT outsourcing, may result in different applications or effects of IT on globalization.

There is a need for future research to better understand the parameters for product, process, customer and firm characteristics that impact the use of IT for globalization, and analytical research could model the relationships among these parameters [51]. While the IT globalization mechanisms of value chain configuration, value chain coordination and local responsiveness have been separately articulated, there is a need for empirical research to identify and test relationships among the mechanisms. For example, once firms configure their value chain activities they must coordinate those activities, and the coordination includes activities that facilitate local responsiveness. While a multi-case study can support analytical generalization, empirical research using archival data will be required to support statistical generalization to the full population. Data for global firms can be collected on a cross-sectional basis to test relationships at a point in time, and on a panel basis to test the implementation of IT for globalization over a period of time. There is also a need for future research to study the outcomes of IT and globalization, such as the extent to which the use of IT enables firms to increase foreign revenues and foreign profits [35].

From a practice perspective, our findings are useful for managers. Our case studies demonstrate that the manner in which global firms use IT will vary based on the type of product, type of process, and type of customer. Our findings enable managers to better align IT initiatives with their corporate strategies based on the products they sell and markets in which they operate [43]. For example, MNCs with individual consumers can expect initiatives to standardize IT infrastructure and applications for back-office processes to meet with less internal resistance and deliver better business results than initiatives to standardize applications for front-office processes. Similarly, MNCs that manufacture durable goods can expect efforts to standardize production systems to yield long-term benefits, while MNCs firms that manufacture non-durable

goods may find that the benefits of standardizing production systems are outweighed by the need to respond to rapid changes in customer needs.

In addition to our recognition that multi-case studies support analytical generalization rather than statistical generalization, we also note the limitation our case study data on each firm is a "snapshot" for a 15-month period. While we attempted to address this limitation by discussing historical context and future plans with the executives of our case study firms, we recognize that over time business conditions can change and/or MNCs may change their corporate strategies and accelerate or delay implementation of various IT projects for those business conditions and corporate strategies.

In conclusion, we conducted case studies of four large firms to learn about the manner in which MNCs use IT to facilitate globalization. Our case study firms represented a range of industries and products, and included a range of processes and customers. We developed three predictive propositions based on our case study findings. These propositions will open the door for future analytical and empirical research, and are important as MNCs expand their global operations and earn an increasing portion of foreign revenue and profits.

APPENDIX A
Main Questionnaire Items for Semi-Structured Interviews

Headquarters questions

1.   What are the strategy and goals for the company as a multi-national corporation (MNC)?
2.   What challenges does the company face in achieving its strategy and goals?
3.   How does the company work to address these challenges [using organizational structure, IT systems, business process changes]?
4.   How does the company evaluate the success/failure of its initiatives [organizational, IT, business process] and with what kind of metrics?
5.   From the perspective of the firm, what is the desired relationship between headquarters and subsidiaries?
6.   What type of information needs to be exchanged between headquarters and subsidiaries to establish and maintain this relationship?
7.   Do headquarters and subsidiaries share a common view on the desired relationship and the need for information exchange?
8.   Are there barriers to a common view and/or information exchange? If so, what are the barriers? How is the company working to overcome the barriers?

Subsidiary questions

1.   Which of the functions listed below are performed at the subsidiary level? Are the associated business processes unique to the subsidiary, or are the processes based on headquarters directives?   (a) R&D/product design, (b) Procurement, (c) Production/manufacturing, (d) Marketing/advertising, (e) Sales/service, (f) IT/IS, (g) Finance/accounting, (h) HR, (i) Other.
2.   Please briefly describe the current IT/IS at the subsidiary level. (a) Network/intranet, (b) Data center, (c) ERP, (d) Procurement, (e) Supply chain management, (f) Warehousing/distribution, (g) CRM, (h) Electronic commerce, (i) Major initiatives underway, and (j) Other.
3.   What are the general strategy and goals for the subsidiary? How are these related to the firm's global strategy? How does the IT/IS function support the subsidiary's goals?
4.   From the subsidiary's perspective, what is the desired relationship between the subsidiary and headquarters?
5.   What type of information is exchanged with headquarters?   What type of information is exchanged with other subsidiaries? Are there any barriers to information exchange, and if so, how does the subsidiary work to overcome these barriers?
6.   Are there any local market aspects that have had a great impact on the current IT/IS state? Are there any corporate functions (see list under subsidiary question 1 above) that present unique requirements for the current IT/IS state?
7.   Where are the major of high-level IT/IS decisions made – at the subsidiary or at headquarters? What role does your position play to define the information and application architecture? To what extent do IT/IS and executive leadership in other areas collaborate to define architecture and application strategy and implementation?

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