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Leadership in the Face of Technological Discontinuities: The Transformation of EarthColor

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Abstract:

Technological discontinuities can fundamentally alter the competitive dynamics of sectors of the economy: IT can create opportunities for those who are able to transform themselves, while simultaneously putting others out of business. Leadership is a key determinant of the outcome of an IT-enabled transformation, but there is limited research on the role of leaders in responding to such disruptions. This article explores the role of the leader in a period of technological change through an extension of the theory of transformational leadership. We illustrate the extended theory through a commercial printer, EarthColor. The commercial printing industry is in a strategic transition, characterized by consolidation and increasing cost pressures that drive profit margins down. We discuss how IT is responsible for the changing rules of competition in this industry, as well as the transformation of printing from a craft-based profession to a digitized business, from a traditional manufacturing "production" industry to a digital information management business. The article documents the experiences of EarthColor and the leadership of its CEO who successfully navigated an industry upheaval precipitated by IT. We generalize the results of our research to our extension of transformational leadership theory that explicitly incorporates the demands of IT-enabled transformations.

Keywords: transformational technology, transactional leader, leadership, organizational change

I. THE NATURE OF IT TRANSFORMATIONS

For every firm that is successful in leveraging the capabilities offered by digital technologies to recreate its business and to redefine the rules of competition, there are countless examples of others that have failed. The recent bankruptcy filing by Borders Bookstore, widely credited to its inability to understand and strategize for technology-driven changes in the book retailing industry [Rosenwald, 2011; Trachtenberg, 2007], is stark testimony to the havoc that new technologies can unleash. Confronted with environmental turbulence where technological innovation occurs at an inexorable pace, how do executives recognize what technologies have transformational potential? How do they assess the potential of an emerging technology for their industry? How do managers make strategic choices about whether to adopt and when to ignore a nascent technology? How should the firm implement a new technology? Is it better to wait and be a follower rather than to be a first-mover? What leader behaviors result in successful transformations?

This article proposes an extension to the theory of transformational leadership and applies it to an analysis of how a leader and the organization he/she steers responds when the firm and its industry are confronted with a technological discontinuity. One particular discontinuity has brought major changes to the industry, commercial printing, and the focal firm, EarthColor. The lens of transformational leadership helps explain how and why EarthColor was able to successfully respond to the simultaneous opportunity and threat posed by technological developments. Our work responds to a call in recent literature to understand both the role of technology within the context of the industry where the IT is being deployed [Chiasson and Davidson, 2005] and the need to focus on more studies that address IT-enabled transformations [Agarwal and Lucas, 2005].

The experience of the company that is the focal case in this article, EarthColor (EC), and its agility in responding to technological shifts in the environment illustrates how senior executives can steer their organizations through such technology-induced change. The challenge EC and Robert Kashan, its CEO, faced was not simply one of using technology to thrive, but leveraging IT to survive in an industry whose very existence was threatened by technology and relentless pressures on margins [Rosen, 2003]. We document the three major discontinuities that EC confronted, and the manner in which its strategy and operations changed as a result. We reflect on the role of the leader in such contexts and present evidence supporting the importance of transformational leadership in EC's success.

The research reported here makes three contributions. First, we extend the theory of transformational leadership to include IT considerations, which are relevant when senior managers are faced with a technology-enabled transformation. Second, the article illustrates one firm's successful response to potentially disruptive technology by adopting three new technologies that collectively transformed its business. Third, we explicate the transformational role played by the CEO when EC was confronted with a series of discontinuities and generalize these findings to our extended theory of transformational leadership.

II. PAST RESEARCH ON TRANSFORMATION AND LEADERSHIP

There is much research on technology and transformation, but little of it is focused on IT-enabled transformations or on the leadership required for them to be successful. Table 1 summarizes key studies of transformational technology; notably, none of these explicitly addressed the role of management in bringing about change.

Reviewing these papers, we find that while a number of them purport to be about transformations, they often say little about the transformation except to assert that one has occurred. Second, few studies explicate criteria for determining when a transformation has taken place, nor do they analyze evidence to show that the phenomenon they observed is a transformation. Third, there are a very limited number of common themes in the research, except a recurrent thread that technology does enable and often force changes on industries, organizations, work groups, and individuals. Each of the papers in Table 1 has adopted its own perspective to explain transformations, and the researchers deploy a variety of research methodologies. Most significantly, none of these studies investigates the role of top echelon leadership, particularly, the CEO, in originating and facilitating change.

Finally, prior research is focused predominantly either at an intra-organizational level where the emphasis is, in the spirit of structuration theory, on understanding how technology changes and is changed by existing structures [e.g., Orlikowksi, 1996], or at the macro level where the researcher examines the impact of technology on the industry as

a whole [e.g., Malone, 2004]. In contrast, we adopt a meso-perspective in this research—we examine the changes occurring in the broader economic and competitive environment of the industry, and use them as the foundation to understand changes occurring within the company.

Table 1: Review of Past IT Transformation Research		
Authors	Setting	Nature of transformation
Bakos et. al. [2005]	e-brokerage, securities industry	Transformation of retail stock brokerage, electronic securities markets
Orlikowski [1996]	Technical support group	Local transformation in the structure of the group and services provided
Robey and Sahay [1996]	Geographic IS in two counties	Changed work and organization in one county: authors observe gradual process of change
Malone [2004]	Numerous examples	Technology enables creation of highly decentralized firms while keeping the advantage of scale economies
Barrett and Walsham [1999]	London insurance market	Batch EDI system for electronic exchanges affecting companies and the work of individuals
Scott Morton [1991]	Management in 1990s research	Research program suggests IT leads to changes in the way work is done, greater integration of business functions, shifts in competition
Crowston and Myers [2004]	Three perspectives on transformations	Economics, institutional, and social and cultural views of transformation

III. WHAT IS A TECHNOLOGY-DRIVEN TRANSFORMATION?

In order to argue that a transformation has taken place at EC, we adopt the criteria for defining a transformation found in Dehning et al. [2003]. A transformation occurs when change:

- Fundamentally alters traditional ways of doing business by redefining business capabilities and/or (internal or external) business processes and relationships

- Potentially involves strategic acquisitions to acquire new capabilities or to enter a new market space

- Exemplifies the use of IT to dramatically change how tasks are carried out, … is the move recognized as being important in enabling the firm to operate in different markets, serve different customers, … gain considerable competitive advantage by doing things differently

This definition for a revolutionary transformation requires interpretation and judgment. When does change go beyond the continuous improvement that is an ongoing process at most firms? When do external developments in technology represent significant discontinuities that require a fundamental rethinking of the way business is done?

IV. TRANSFORMATIONAL LEADERSHIP: AN EXTENSION

The view of IT-enabled transformation described above connotes significant organizational upheaval. As noted earlier, the studies cited in the literature review do not consider the role of the leader in a firm undergoing a transformation precipitated by IT. With respect to the role of leaders, two streams of work are discernible in the extant IS literature. In one stream a primary emphasis is on understanding the behaviors and characteristics of the "functional" leader, i.e., the CIO [e.g., Smaltz, Sambamurthy, and Agarwal, 2006; Agarwal and Beath, 2006]. A second stream makes general assertions about the importance of top management support for the successful implementation of new information technologies [e.g., Lewis, Agarwal, and Sambamurthy, 2003], providing empirical evidence that overt signals from senior managers facilitate implementation by assuring adopters that system use is valued and likely to be rewarded and that appropriate resources will be allocated. Although not focused specifically on "transformations," these prior studies nonetheless acknowledge the role of "leadership" in managing IT related organizational change.

Theories of leadership distinguish between two types of organizational leaders: transactional and transformational. A transformational leader is described as one who exhibits three traits [Bass, Waldman, and Avolio, 1987]:

1. Charisma: a leader who provides vision and values and for whom followers develop intense emotional feelings.

2. Individual consideration: the leader pays attention to individual subordinates, understanding and sharing their concerns, and treating each as an individual.

3. Intellectual stimulation: a leader who helps others think about old problems in new ways; followers develop their own capabilities to solve problems.

Transactional leaders, by contrast, stress contingent rewards and management by exception. Contingent rewards refer to the practice of offering an employee a reward for achieving a specific goal. It is easy to see that the transactional leader's focus on operational problems does not appear to be well-suited for coping with the disruptions created by technological discontinuities. To summarize:

> *The transformational leader attempts to elevate the needs of the follower in line with the leader's own goals and objectives. The transactional leader concentrates on trying to maintain the status quo by satisfying the follower's current psychic and material needs* [Bass, Waldman, and Avolio, 1987].

There is a robust body of literature on transformational leadership. Bass [1999] summarizes some of the findings from two decades of research on the topic. He reports that research has provided compelling evidence of many positive outcomes associated with transformational leadership, including enhanced commitment, involvement, loyalty, and performance of subordinates, while transactional leadership is associated with more stress. Arguably, to the extent that technological discontinuities are inherently stress-prone, transformational leaders who are believed to help subordinates cope with stress, have an important role to play. Lowe, Kroeck, and Sivasubramaniam [1996)] review seventy-five studies of the MLQ, a survey instrument devised to measure transformational versus transactional leadership, and report that transformational leadership is associated with greater work unit effectiveness across the studies. Shamir, House and Arthur [1993] elaborate on the mechanisms through which transformational leaders influence subordinates, including increasing the attractiveness of followers' efforts, increasing their ability to meet expectations, increasing their self-esteem, increasing the attractiveness of goal accomplishment, instilling faith in the future, and creating a personal commitment to a common vision. Broadly, transformational leadership focuses on "changing the status quo" [Zhu, Chew, and Spangler, 2005, p. 40].

The theory of transformational leadership is concerned with management in general and does not specifically address IT leadership in the organization. Drawing on the IT leadership area that has focused on the role of the CIO and her relationship to the top management team [e.g., Armstrong and Sambamurthy, 1999], we propose an extension of transformational leadership theory to delineate the role of the organizational leader during IT-induced transformations. Smaltz, Sambamurthy, and Agarwal [2006] developed a taxonomy of CIO role expectations in the healthcare sector and tested them empirically. A factor analysis of the roles produced five factors that the researchers labeled: strategist, relationship architect, integrator, educator, utilities provider, and information steward.

Five of the role expectations for the CIO from Smalthz, Sambamurty, and Agarwal [2006] have a direct counterpart for the transformational CEO who is facing an Information Technology-enabled transformation. We add these findings from the study of CIOs as a fourth characteristic for transformational CEOs:

4. IT Leadership

- Developing insights on emerging technologies

- Developing and implementing a strategic IT plan that aligns with the business plan

- Building and maintaining a skilled IT staff that matches the firm's technology base

- Directing IT-enabled business process restructuring/reengineering

- Establishing electronic linkages throughout the organization

Why should a CEO be concerned with the issues above? Why not hire a CIO and leave them to her to resolve? The CEO plays a unique role in a firm; she is the person most able to bring change to the organization. Other employees look to the CEO for leadership and respond to the priorities she sets. If a CEO sees potential in an emerging technology and communicates that to other employees, they will investigate that technology. Indeed, signals from leaders that technology use is valued have been implicated as significant determinants of employees' acceptance behaviors [Lewis, Agarwal, and Sambamurthy, 2003]. Recent work further suggests that transformational CEOs are significantly associated with entrepreneurial activity within an organization, mediated by their effects on the top management team [Ling et al., 2008]. CEOs are responsible for strategy and with the changes associated with IT, it is their responsibility to develop a strategic IT plan and ensure its alignment with the business plan.

Further, CEOs allocate resources within the firm and can facilitate the development of an effective IT staff through budgets and by setting priorities. Process changes and reengineering are always difficult to accomplish; with support from the CEO the chances of successful change are much higher [Lewis, Agarwal, and Sambamurthy, 2003].

Finally, it is important for the CEO to be enthusiastic about linking parts of the organization electronically and to encourage others in the firm to create and use these linkages.

To summarize, we have argued that the theory of transformational leadership should be extended to include additional CEO characteristics that specifically address the role this individual plays during period of IT-induced upheaval. The original theory of transformational leadership has one basic proposition: a transformational leader will be more successful than a transactional leader. In the rest of the article, we describe the commercial printing industry and document three major technological discontinuities or "regimes" experienced by the industry in general and EC in particular that qualify as transformational. We present the outcome of the transformations on EC and the commercial printing industry. Finally, we discuss the transformational management role of the CEO in guiding his company; Kashan displays all four of the leadership factors in our extended theory.

V. THE COMMERCIAL PRINTING INDUSTRY IN TRANSITION

Commercial printing includes all custom printing other than newspapers, magazines, and books. The United States commercial printing industry is comprised of 32,000 companies distributed throughout the country. Most commercial printers operate in a single location with fewer than 100 employees and have annual sales of $2 to $10 million. In 2000, total industry revenues were $89.7 billion, and, with 570,000 employees, it was the fourth largest manufacturing employer in the U.S. Although commercial printing is categorized in government statistics as a manufacturing industry, at some companies the bulk of the workforce spends their days operating computer equipment in settings more akin to offices populated by white-collar professionals.

Figure 1 presents graphs of Census Bureau data on the commercial print industry. The most recently available Census Bureau data [1997 to 2002] supports what members of the commercial print industry state anecdotally, that total industry revenues peaked in 2000 and have started to decline. Shipments per employee display a more favorable trend, suggesting that the industry is becoming slightly more productive. Census Bureau data also shows that industry changes differ by industry segment. For the period from 1997 to 2002, many traditional printing firms exited the business, with a large decrease both in number and in percentage in the lithography segment. Starting from small bases, there has been slight growth in screen-printing and more dramatic growth in digital printing. Data from the National Association for Printing Leadership also shows where major industry changes are occurring: in the number of firms with fewer than 100 employees. These shrunk dramatically between 1998 and 2003 and are estimated to decrease further through 2007. Larger firms, those with more than 100 employees, remained at about the same number during this period.
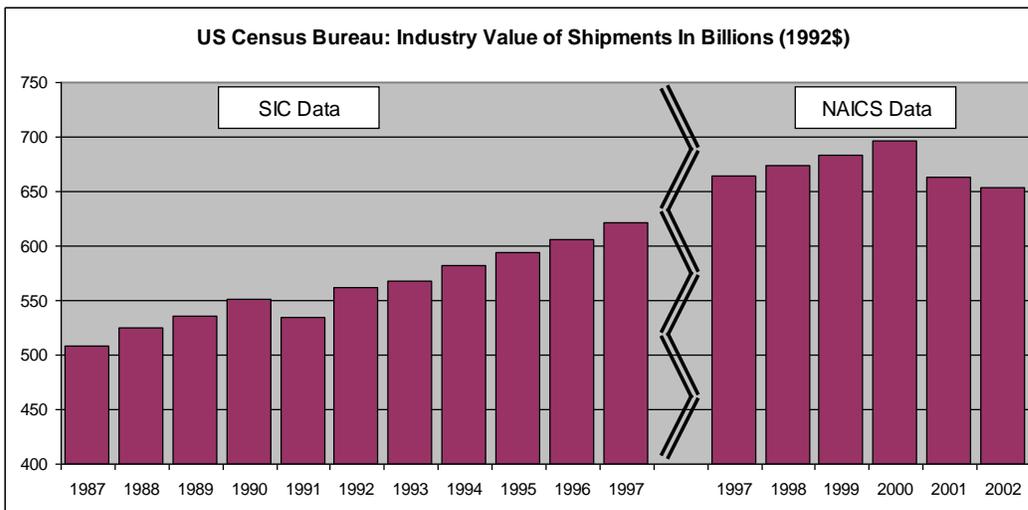

US Census Bureau: Industry Value of Shipments In Billions (1992$)

Figure 1. Commercial Print Industry Shipments

It is interesting to note that increasing capital costs for equipment have occurred at the same time as decreases in variable costs. A printing process that is heavily digital uses significantly fewer consumables (for example, film), particularly during prepress compared to older, craft-based operations. Quality improvements result in lower spoilage and rework during the print process as well. Also, printing equipment that is digital can easily handle
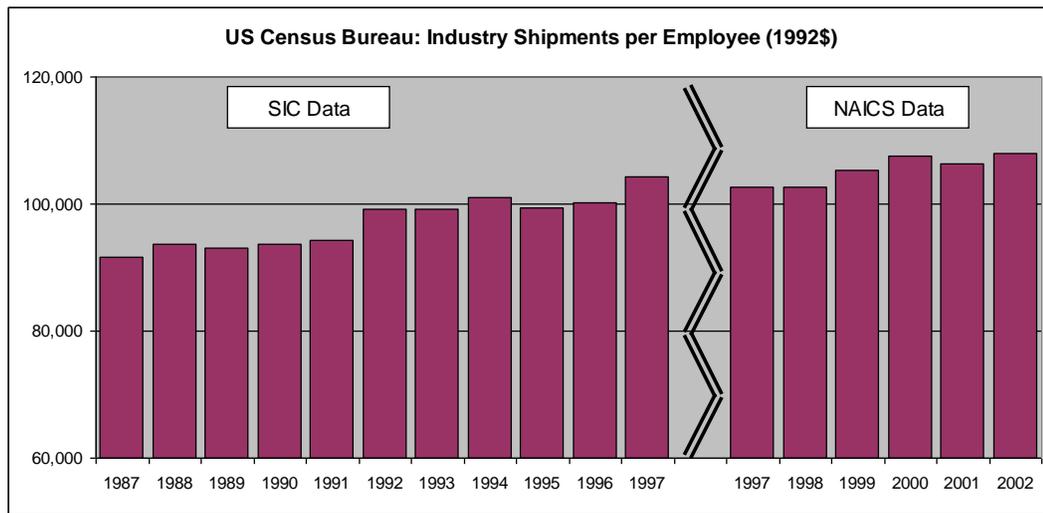
US Census Bureau: Industry Shipments per Employee (1992$)

Figure 1. Commercial Print Industry Shipments - Continued

volume increases, which reduces the expense of adding capacity once sufficient printing infrastructure is in place. These trends strengthen the advantages of companies that have a large base of operations, access to capital, and are knowledgeable about technology.

Rosen [2003] argues that these trends are not an isolated experience, but that the industry is going through a structural change characterized by:

1. Substantial underutilized capacity

2. Heavy price competition

3. Unpredictable sales volumes

4. A continuing evolution in technology

5. Increasing capital requirements

6. Customer demands for service

7. Uncertainty over continuing investments

Rosen [2003] attributes a number of the structural changes to Information Technology. As described above, printers are forced by customers and the competition to invest in new equipment to improve their offerings, quality, and productivity, and the end result is underutilized capacity. The need to acquire expensive new equipment raises the capital requirements for the firm while over-capacity leads to price cutting, with the result of both trends being pressure on margins.

In summary, our analysis of the commercial print industry reveals a sector in considerable upheaval. Change is being wrought on this sector from multiple sources, including macroeconomic forces, developments in technology, and changing customer expectations. How does a firm navigate through this turbulent environment? In particular, how does it respond to changes precipitated by IT in the context of environmental shifts?

VI. RESEARCH METHODS

We use a case study methodology to study IT-enabled transformation in the printing industry, using a theoretical sampling strategy to select a case that represents a successful exemplar of the phenomenon of interest [Eisenhardt, 1989.] Our goal is not to present empirical generalizations, but rather to provide a rich description of events in this company. Yin's classic book on conducting case studies [1984] describes six sources of evidence in a case study including documentation, archival records, interviews, direct observations, participant observation, and physical artifacts. We employed all of these approaches except participant observation.

We collected documents, including photographs that described the before and after business processes at Earth Color. Current and archival data provided information on the impact of the technology on employees and the firm's financial results. We collected qualitative data using semi-structured interviews. Individuals interviewed ranged from

senior executives in charge of the major divisions of the company to prepress workers in the production facility. We were able to obtain considerable variation in the experience of the individuals interviewed—ranging from a finance executive with over thirty years in commercial printing to a digital operator who had joined the industry three years ago. We observed the technology artifacts in action along with all the major printing operations, and we analyzed relevant documentation, including annual reports and strategic plans.

We gathered data through three rounds of interviews. In the first stage of data collection, two members of the research team visited two company facilities. This full-day visit included direct observations of the print processes, which are documented later in the article, and interviews of over a dozen EC employees, including the CEO, controller, the company president, pressman, production supervisor, multiple prepress operators, a division president, and other division-level employees. In the second stage, two members of the research team spent a half-day with the company CEO reviewing photographs of company production equipment. We discussed both the current "standard" digital production equipment, as well as a "legacy" operation (maintained primarily on behalf of one large customer to access a library of predigital assets). In this manner, we elicited a detailed discussion of current and historical business processes. In the third phase, a member of the research team returned to those two EC facilities for a two-day visit. He met with over a dozen people at HQ and six people at a subsidiary. The job titles (or roles) interviewed included the CEO, president, CFO, CTO, prepress operators, pressman, and personnel in sales, marketing, Information Systems, production scheduling, and accounting. The analysis focuses on Robert Kashan, the CEO, as he was the primary driver of change at EC and he could provide both access to other employees and firm data.

Our primary approach to analysis was pattern-matching as described by Yin [1984] because we were trying to describe if and how the CEO of Earth Color exhibited transformational leadership. Two patterns had to be extracted. First we had to first match the technology changes at EC with our definition of transformational technologies to establish that the changes were in fact transformational. Second, we needed to match the behavior of the CEO to the characteristics of a transformational leader described earlier in the article.[1]

At each stage of data gathering, we performed preliminary analysis and sense-making that served as the basis for the next round of interviews and observation. For instance, in the first visit we were struck by the level of digitization in the head-office and the comments made by executives and other workers on the leadership exhibited by Kashen in enabling this. These data led us to explore his leadership role further in subsequent interviews. Following the standard prescriptions for analyzing qualitative data gathered during case studies, interview notes were analyzed for themes and evidence in support of the leader's role and a detailed understanding of the process changes that occurred [Eisenhardt, 1989.] Data from multiple sources were used to triangulate the findings: e.g., comments made during interviews about process change were confirmed using company documentation and direct observation of the work process. In the end we relied on our own extensive experience with technology and in organizations to provide insights from our observations, interviews, and documents from Earth Color.

VII. EARTHCOLOR

EarthColor, founded by Robert Kashan in 1983, has grown to become the New York Metropolitan area's largest commercial printing company. Through a combination of both mergers and acquisitions (see Table 2), as well as organic growth, EC grew sales by 246 percent between 1998 and 2000, earning the number three ranking in American Printer's Top 50 Fastest Growing Printers. EarthColor was ranked number 44 in the 2002 Printing Impressions 500 and ranked number 46 on the 2001 list. In 2002 it was one of 28 companies with revenues between $100 and $150 million.

Table 2: Major Events at EarthColor	
Event	Year
Kashan Lithography founded	1983
Barton Press (NJ) acquired	April, 1997
Media Printing (FL) acquired	Sept., 1999
8 firms merged to form IGI	1999
IGI and EarthColor merged	March, 2000

In 2004 EC had eight U.S. locations providing a wide range of commercial printing services including web inline printing, sheet-fed printing with aqueous and UV coating, digital prepress, computer-to-plate production, digital asset

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[1] We were interviewing employees while on the job in different locations of the office and the printing plants, and it was not possible to record the interviews or apply a numerical scoring technique. We relied on the evidence we saw, our own experience, the triangulation of the interviews, and discussion among the researchers to match the two patterns described above.

management, full bindery capabilities, fulfillment, national publication ad work, and outdoor advertising. Specialty services include online inventory management, product preplanning and reengineering, magazine ad film preparation and distribution, print production management, and magazine insert management. EarthColor's core production capabilities include four multicolor web presses, twenty-two multicolor sheet-fed presses, six computer-to-plate systems, and four locations with complete binding, finishing, and fulfillment capabilities. All of EC's locations are connected by a virtual private network (VPN).

EarthColor has a small corporate staff with minimal levels of management. In some production locations there are no specific quality control personnel, as all employees are responsible for the quality of their own work. This philosophy extends to accounting support in which Kashan stresses the need for employees to be able to get the work done correctly the first time, without redundant levels of confirmation.

VIII. COMMERCIAL PRINTING: TRADITIONAL PROCESSES

In order to appreciate the impact of digitization on commercial printing, it is instructive to examine the business process that existed prior to the application of IT. Figure 2 documents the many steps a printing job goes through to completion. The grey boxes represent processes that interact with the customer, while the yellow and white boxes are internal business processes. First, the client or the client's agency sends the copy to the printer. The printer processes the copy in a prepress operation, and the amount of effort involved depends heavily on the condition of the copy. Increasingly today, the printer receives a copy that is closer to final because the client's agency is using a desktop publishing and art system to prepare it.

When the copy is regarded as complete, the next step is to make a printing plate. Then proof copies are produced and checked carefully for errors, colors and overall quality. The proofing step may result in the need for corrections and the production of a new plate. Once an acceptable plate has been produced, the operator is required to prepare the print run by loading the plate and setting up the press. The print process differs depending on the type of press being used, for example, a sheet-fed press or a web press. The press operator has to be sure that the ink colors are correct before starting a run. When the proof copies from the press are acceptable, the operator runs the job. The final step involves packaging the printed copies and shipping them to the customer.
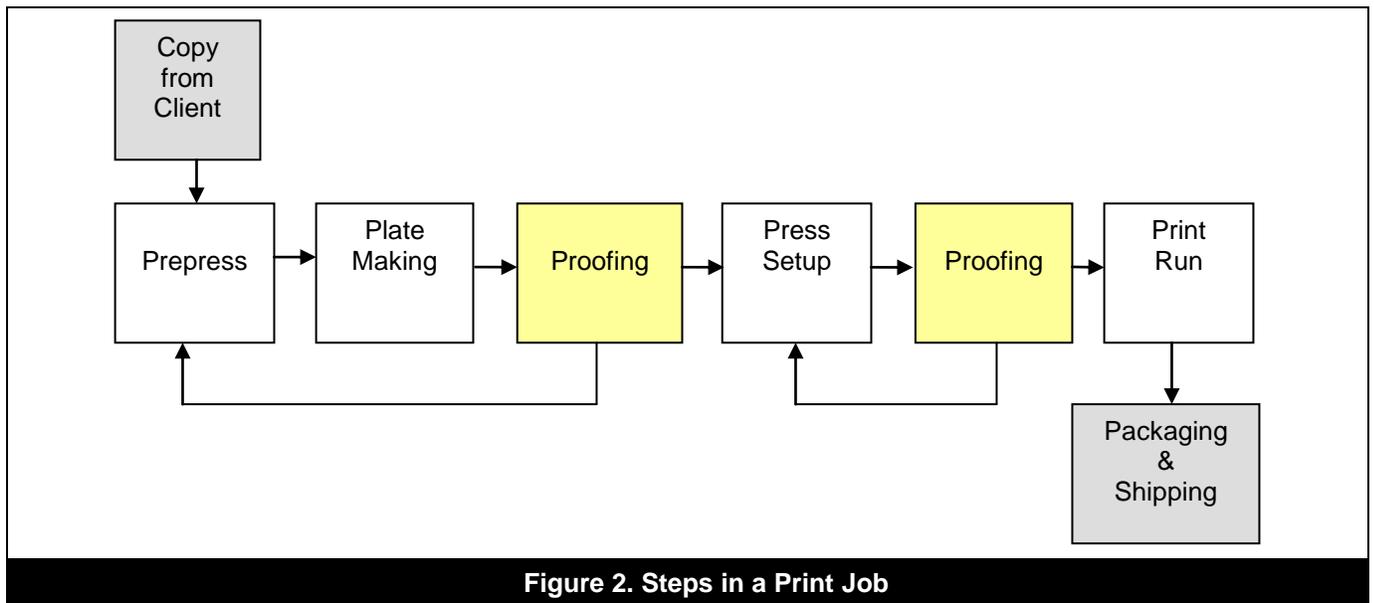

Figure 2. Steps in a Print Job

As is clear from this description, the process is predominantly manual, error prone, and inefficient. Plates are not reusable, and to the extent that errors are not caught early in the process, there can be a significant wastage of resources as multiple proofs are created. Furthermore, the production of a new plate not only represents depletion of raw materials, it also introduces delays into the process. Proofing errors that are detected after the press has been set up consumes operator time in readjusting the press settings and increases overall cycle time.

Information Technology has had a major impact on three aspects of EC's production process: prepress, plate-making, and the flow of work among locations. These impacts correspond to the three technological discontinuities or radical transformations that the company experienced, each characterized not only by changes in the way work was done, but also in the capabilities the company possessed and the range of products and services it could offer its clients. In short, under each regime, IT expanded the business scope of EC.

IX. THREE MAJOR DISCONTINUITIES AT EARTHCOLOR

Discontinuity 1: Digitizing Core Processes

The first technology transformation at EC was the introduction of Macintosh and page make up software in prepress. *Prepress* refers to the operations a printer performs on customer's submissions for printing before creating a printing plate. The amount of work in prepress depends on the degree to which the material from a customer is finished. Prepress might involve creating the image, editing it, or only touching up colors. The following steps describe the prepress process:

- Scanning—When artwork arrives from a client in a nondigital format it is fed through a drum scanner. Today, the drum scanner creates a high-resolution digital image.

- Color separation—In sheet printing, multiple plates are created for each color. During the prepress process the desired colors are separated into individual components. In the predigital era the color separation process was a fine craft requiring a detailed understanding of how to combine colors for maximum effect. Today, this process is completely digitized and automated.

- Stripping—a film stripper lays down the individual film layers, carefully lining them to prepare for plate-making. Each layer of film needs to be precisely aligned so that the printed image generated from multiple plates is also aligned. This process no longer exists in a digital prepress operation.

- Imposition—Most print jobs are a fraction of the size of the printing plate. Therefore, individual pieces are combined to fill up the entire printing size (and are then cut to individual piece size). Today, a graphics program performs the imposition of individual images. Originally, imposition was done completely by hand. As an intermediate technology, a machine called a repeater would repeat a single graphic multiple times to fill up the entire plate.

- Proofing—Before a printing plate is created, a customer is provided with proofs to review and approve. Originally, a proof was created in a custom printing process. Today, the proof comes from special high-resolution printers that require comparatively minimal labor. For certain (lower quality) printing jobs, proofing is moving to a completely digital process.

- Platemaking—By exposing a metal plate to light, the film image is transferred onto the plate surface. Just as the film processing industry has moved from the handcrafted tasks of a dark room to self-contained automated equipment, so has the platemaking process.

Individually, the technological advances in each subprocess have reduced prepress labor. Collectively, they have changed the fundamental nature of prepress from physical materials to bits and bytes. The process input, customer artwork, and process outputs, customer proofs, and, ultimately, printing plates may remain physical items but the intervening steps are performed entirely on computers. As a result, the work environment for employees has experienced a significant transformation as well—the photos in Figure 3 provide a side-by-side comparison of the changes in equipment and resulting work environment after the introduction of the Mac.

Figure 3. Discontinuity One: Traditional and Digital Prepress Equipment

As craft-based industrial positions are replaced by computer-based prepress activities, the improved efficiency is responsible for a significant portion of the overall reduction in EC employees. The small increase in pay for the new positions is more than offset by the reduction in overall headcount, resulting in much lower labor expenses.

Likewise, advances in printing press technology have increased production capacity without increasing associated personnel requirements. Indeed, one source of overall productivity increases is higher quality outputs from the prepress process that reduce the need for expensive production rework.

Discontinuity 2: Enabling Process Flexibility

The second major technological transformation at EC involved digital-to-plate processes (see Figure 4). After the introduction of the Mac, complementary developments occurred in the equipment manufacturing sector. The companies that manufacture plate-making equipment moved to accept digital input when the preprint process became computerized. As a result, it is a matter of a few keystrokes for a prepress employee to generate a new printing plate. The digital-to-plate process has both reduced customer cycle times and improved quality, as it is easy to produce a plate, fix errors, and generate a new plate. Following the lead of the plate makers, press manufacturers developed interfaces so that the initial color settings for ink can be downloaded from a computer. A press operator still has to fine-tune the colors on the press, but by providing the starting point for the mixtures, the computerized process saves considerable time. The digital-to-plate machines are remotely monitored by the equipment supplier providing a further reduction in labor compared to having a staff of mechanics to service plate making equipment.

Figure 4. Discontinuity 2: Advances in Platemaking Technology

Discontinuity 3: Building Virtual Processes

EarthColor's third technology transformation is its network that ties all operations and plants together. The transition from film to digital print production enables location transparency and makes it possible to transfer jobs from one location to another over a network, thereby building a virtual pool of resources that EC can use to service its customers. EarthColor has established such a network among its different locations so that a prepress employee at one location can control a plate-maker at another location. EarthColor uses this capability to balance plant costs and transportation costs with service levels. Each of its plants has a different cost of production, primarily due to regional wage differences. Customers are located around the United States, so the network allows managers to minimize the combination of production and transportation costs, or to meet a looming deadline by processing a job at a plant with extra capacity.

The smooth flow of business between multiple EC locations has encouraged the movement of production equipment from higher cost locations to lower cost locations. For instance, labor costs in NYC can be as much as three times that of lower cost locations such as Florida or Texas. Network capabilities allow those plants to directly transfer plate definition and printing color specifications created by NYC prepress workers.

X. ANALYSIS OF DISCONTINUITIES AT EARTHCOLOR

Has there been a technological transformation at EC that foretells what will happen in commercial printing? As described above, from an economic perspective [Crowston and Myers, 2004], the impacts of IT on commercial printing are tangible and profound. We observe many of the changes identified by Crowston and Myers and others, including a reduction in transaction costs and the boundary of the firm, a change in the nature of the product, and the relative balance of power between buyers and suppliers.

Appendix A presents data about the impact of technology on EC. Table A-1 is a qualitative analysis of the conditions at EC before and after each major technological discontinuity. Figures A-1 through A-3 present quantitative changes in revenue and employment at EC during this period. During the four full years spanning 2000–2003, the number of

EC employees has dropped by a cumulative 42.6 percent. During this same time period, revenue per employee has increased 268 percent.

Reductions in the number of employees can have negative consequences for morale. Unfortunately, we did not have access to employees who had left, nor did we have the ability to measure morale before and after the transformation. Clearly a challenge for a transformational leader is to maintain morale during changes in employment levels that may accompany a major technological discontinuity. For society at large, the cumulative impact of these disruptions is to increase already high levels of unemployment, presenting challenges for policy makers and politicians. Can displaced workers be retrained to take advantage of new technologies? What kind of training programs are likely to be effective?

Several criteria that have been suggested by scholars for determining whether a technology is really transformational [Dehning, Richardson, and Zmud, 2003]. We apply those criteria in light of the EC chronicle.

Changes in strategy, structure, and power in a two-year period.

There have been some structural changes at EC; the organization has always been relatively flat.[2] Its strategy has been to use technology aggressively to expand service offerings and combat pressure on margins in the industry. The skills of employees have changed dramatically as printing at EC has gone digital.

Fundamentally alter traditional ways of doing business by redefining business capabilities and/or (internal or external) business processes and relationships.

Prepress and digital-to-plate have fundamentally altered the nature of work and the skills required. These advances have had a positive impact on customer service and cycle times. The network provides a new vehicle for cost control. The company maintains an advertisement database as a service to customers, so that they can easily find and reuse prior ads.

Potentially involve strategic acquisitions to acquire new capabilities or to enter a new market space.

EC has undertaken these to acquire printing equipment, but not IT. The M&A activity represents a move to acquire capabilities in low-cost locations.

Exemplify the use of IT to dramatically change how tasks are carried out, … is the move recognized as being important in enabling the firm to operate in different markets, serve different customers, … gain considerable competitive advantage by doing things differently.

Prepress, digital-to-plate and the VPN have dramatically altered how tasks are carried out. Now a full-service printer-can operate in multiple markets. Lower cost structures, and the ability to undertake greater variety of print jobs has given EC a clear advantage in a highly competitive market.

Based on this evidence, we conclude that the commercial printing industry and EC the pattern of a major IT-enabled transformation.

XI. THE ROLE OF LEADERSHIP

The challenge for a leader facing one or more technological discontinuities is to, first, stay in business and, second, take advantage of the discontinuities so that the firm is stronger after experiencing a transformation. Some of the motivation for the changes at EC came from intense competition and declining margins in the business; however, other firms have failed facing the same business conditions. EarthColor has a flat organization structure without many layers of management, and there is no official CIO position. The lack of a CIO may force the CEO to be more involved with IT leadership than CEOs in other firms. Even so, considering all of the evidence, we suggest a key factor in EC's successful transformation is the transformational leadership that Kashan exhibited (Table 3).

We recognize that other factors could be partially or totally responsible for the success of technology at Earth Color and the firm's success as well. Suggesting causal relationships in IS research is controversial, and readers have to weigh the research design and evidence to assess the validity of such inferences. In the case of IT at EarthColor, several observations provide evidence for the role of the CEO and technology:

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[2]   Nonetheless, whereas this case study is from the perspective of the successful firm EC, the changes in strategy, structure, and power at the companies absorbed into EC (through M&A) are significant.

- A number of small printers are exiting the industry, unable to afford the technology needed to compete.
- Earth Color's low cost structure, declining employment, and increasing sales per employee are difficult to attribute to any factor other than technology.
- EC's has been able to turn an unprofitable operation (Barton Press) into a profitable unit by installing its technology at Barton and linking it to EC's network.
- The CEO was intimately involved in finding new technologies, adopting them, and redesigning business processes to take advantage of IT.

Table 3: Transformational Leadership and Technological Discontinuities		
Leadership Factor	Leader Behavior	Example at EarthColor
1. Charisma	Provide vision of firm	Vision set as an integrated firm with a low cost structure with full service offerings; vision enacted with sharing of print jobs and other processes across locations
	Scan for new technology	Aggressive implementation of digital printing technology
	Develop new business models	Use capacity-based rather than project-based accounting; offer Web-based digital content-management services for clients.
	Motivate employees to change	Create corporate identity of firm as "winner" and thriving survivor in difficult industry conditions.
2. Individual considerations	Help existing employees adapt	Integrate management of multiple sites to spread best practices and encourage employee cooperation
	Provide training	Existing employees trained and retained in conversion to newer digital technology where feasible
	Integrate new employees and new skills into the organization	M&A handled with combination of a set of corporate standards plus localized operational procedures leveraging employee skills and plant capabilities
3. Intellectual stimulation	Question the status quo and existing business model	Change management process allows individuals to discover new technologies
	Provide vision of a new model and new operational processes	Made each employee responsible for their own QA process
	Adapt new technologies	Individuals encouraged to adapt and improve technology to improve business processes
4. IT Leadership	Develop insights on emerging technologies	Attending trade shows, reading trade literature looking for new technologies
	Developing and implementing a strategic IT plan	There is no formal, written plan, but CEO has vision in his head.
	Building and maintaining a skilled IT staff	EC has a small IT staff; CEO relies on one employee for technological advice.
	Directing business process restructuring/reengineering	CEO is behind all of the major business process changes.
	Establishing electronic linkages throughout the organization	CEO a key player in adopting links from prepress to plate making to printing presses as well as wide-area network among facilities

These observations, our interviews at EC, our time in the company, and our study of the industry have convinced us of the importance of the CEO and technology in confronting a technological discontinuity at Earth Color.

Examining Table 3, we argue that EC's growth reflects Kashan's charismatic leadership traits; his vision was for a company that had enough scale to provide all the services that a client needs and is able to do so at a competitive

cost. He saw the trend among customers to simplify their print supply chains and reduce the number of printers with which they did business. Kashan wanted to be sure that EC was one of the chosen printers. To do so he needed the scale to provide all types of print services, and EC had to be a low-cost producer, as customers were demanding bids rather than awarding print contracts to the most convincing salesperson. To Kashan, the technologies that proved highly disruptive to other printers were ones EC could afford due to its scale. At the same time these technologies were attractive because they helped EC become more efficient and position itself as a full-service, low-cost printer.

Kashan continually scans for new technology, and brings it into the company on an experimental basis. He stimulates employees to think "outside the box," to find new and better ways to perform their jobs. The CEO and an associate first saw the Macs at a trade show and commented to each other that "this won't affect us." In subsequent weeks, they kept thinking and talking about this new technology, and changed their minds: it would affect EC and every other commercial printer. Kashan decided to order the first Macs and experiment with them. Eventually the Macs took over the prepress operation. Kashan's actions in adopting the Macs illustrate the charisma and intellectual stimulation of the transformational leader. He developed a vision for how prepress could be dramatically changed and improved through the Macs and introduced the new equipment and processes, which in turn stimulated others in the organization. Subsequently, he could acquire other printers knowing that he would replace their prepress operations overnight and dramatically change their cost structures and service offerings.

This CEO also exhibits individual consideration for employees. We observed him with a number of workers at EC, and he greeted each by name, knew about their families and life outside of the firm, and treated each as an individual. We believe that his employees have a strong emotional tie to Robert as a leader. EarthColor has retrained workers where possible, and successfully integrated new personnel into the firm to work with new technology. Unfortunately, he has also had to lay off employees who were unable to adapt to new technologies.

Kashan has provided intellectual stimulation at EC, questioning the status quo, bringing in potentially disruptive technologies, and figuring out how to use them to improve the firm's competitive position. Employees have been challenged to help invent and adopt new business processes. He has applied his new business model at acquisitions like Barton Press, which has motivated employees there to think about the nature of their business and how it can be improved.

Does Kashan exhibit the IT leadership traits in the extended transformational leadership model? Does his behavior fit the pattern? We have already alluded to his scanning the environment for new information; he attends trade shows and reads trade literature to find new technology. His strategic plan is mostly in his head; we found no evidence of a published, written plan. However, Kashan does have a vision for technology at EC. He has built a small, dedicated and skilled IT staff that fits Earth Color's technology base. He was behind the adoption of the Macs in the prepress operation, the linking of the Macs to the plate-making machines, and their ultimate connection to the printing presses. Kashan was convinced enough of the benefits from these process changes that EC purchased Barton Press with confidence that EC's new technology could make the business profitable. Kashan was also deeply involved in establishing links among pieces of equipment in each facility and the wide-area network that links all EC locations together.

XII. IMPLICATIONS

This article has implications for both research and practice. Our work is limited to one case study. There is need for further research in other organizations with different leaders to determine if the extended theory of transformational leadership is robust enough to describe events surrounding other technological transformations. The next step would be to develop formal hypotheses from the theory and test them across a number of organizations. Such research will be a challenge because each unit of analysis is a single organization, and the researchers must first be certain that a technological transformation has or is currently taking place.

To the extent that the findings from a single case are generalizable, there are important implications for practice from this work. Our results suggest the key role of the leader in successfully navigating and managing a technological transformation. First the leader has to have the vision to see a role for new technology. He exhibits intellectual stimulation helping others think about problems and processes in new ways. He needs to have charisma so that he can convince others to adopt new technology. At the same time it is important to examine how a transformational technology will impact each individual and to plan its implementation. We observed IT leadership skills at Earth Color: the CEO developed insights on emerging technologies, crated a strategic plan, at least in his head, that aligned IT with the business, built a small IT staff, directed reengineering, and built electronic linkages. We believe that all of these leadership traits are important for other organizations to emulate when responding to the possibility of a technological transformation in their business.

XIII. CONCLUSION

This article has chronicled the account of an industry in transition where firms are increasingly threatened by changing customer expectations and technological developments. Survival in the commercial printing business is crucially dependent on the ability of the firm to craft an appropriate response to a fast-moving strategic and technological environment. EarthColor illustrates how this can be done and the kind of transformational leadership required to be successful. Our analysis of the magnitude of change at EC suggests that this is indeed a transformational change precipitated and enabled by information technology.

This study is not without limitations. We acknowledge that this article specifically emphasizes the role of the CEO, and does not explore other factors that may have contributed to success. Our emphasis is not inconsistent with significant prior research that has stressed the role of the leader in organizational outcomes. It is beyond the scope of this research effort to assess the extent to which the successful leadership at EC can be attributed solely to the CEO. While we suspect that leadership activities were successfully aligned through the senior management team and, indeed, through the entire organization, we do not have data to confirm this assumption. Nonetheless, for this research effort we explicitly adopt a theoretical stance that strong CEO leadership is required to establish an environment consistent with the technological demands facing a firm. Thus, we have focused on the CEO in detailing our conceptualization of a theory of leadership for IT-led transformation.

We would like to generalize from our research to the extended theory of leadership during a time of technological discontinuities. We believe that theories of transformation need to consider the process by which organizations are transformed, and in particular the role of leadership in a transformation. EarthColor's CEO exhibited the four characteristics of a transformational leader from the extended theory: charisma, individual consideration, intellectual stimulation, and IT leadership. This example supports the extended theory and suggests that it has potential. Future research is needed to provide additional evidence for the theory or for modifications to it. This research should provide insights into how leaders in other kinds of organizations can successfully undergo IT-enabled transformations.

REFERENCES

Editor's Note: The following reference list contains hyperlinks to World Wide Web pages. Readers who have the ability to access the Web directly from their word processor or are reading the article on the Web, can gain direct access to these linked references. Readers are warned, however, that:

1. These links existed as of the date of publication but are not guaranteed to be working thereafter.
2. The contents of Web pages may change over time. Where version information is provided in the References, different versions may not contain the information or the conclusions referenced.
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Abrahamson, E. and L. Rosenkopf (1997) "Social Network Effects on the Extent of Innovation Diffusion: A Computer Simulation", *Organization Science* (8)3, pp. 289–309.

Agarwal, R. and C.M. Angst (2006) "Technology-Enabled Transformations in Health Care: Early Findings on Personal Health Records and Individual Use", in Galletta, D. and P. Zhang (eds.) *Human-Computer Interaction in Management Information Systems: Advances in Management Information,* New York, NY: M. E. Sharpe, pp. 357–378.

Agarwal, R. and C.M. Beath (2006) "Grooming the 2010 CIO", SIM International, Chicago, IL.

Agarwal, R. and H.C. Lucas Jr. (2005) "The IS Identity Crisis: Focusing on High-Visibility and High-Impact Research", *MIS Quarterly* (29)3, pp. 381–398.

Anderson, P. and M. Tushman (1990) "Technological Discontinuities and Dominant Designs: A Cyclical Model of Technological Change", *Administrative Science Quarterly* (35)4, pp. 604–633.

Bakos, Y., et al. (2005) "The Impact of E-Commerce on Competition in the Retail Brokerage Industry", *Information Systems Research* (16)4, pp. 352–371.

Barrett, M. and G. Walsham (1999) "Electronic Trading and Work Transformation in the London Insurance Market", *Information Systems Research* (10)1, January, pp. 1–22.

Bass, B. (1999) "Two Decades of Research and Development in Transformational Leadership", *European Journal of Work and Organizational Psychology* (8)1, pp. 9–32.

Bass, B. and B. Avolio (1990) "Developing Transformational Leadership: 1992 and Beyond", *Journal of Industrial Training* (14)5, pp. 21–27.

Bass, B., D. Waldman, and B. Avolio (1987) "Transformational Leadership and the Falling Dominoes Effect", *Group & Organization Studies* (12)1, pp. 73–87.

Bradley, S.P. and R.L. Nolan (1998) "Sense & Respond: Capturing Value in the Network Era", Boston, MA: Harvard Business School Press*.*

Chiasson, M. and E. Davidson (2005) "Taking Industry Seriously in Information Systems Research", *MIS Quarterly* (29)4, pp. 591–605.

Christensen, C. (1997) *The Innovator's Dilemma: How New Technologies Cause Great Firms to Fail,* Boston, MA: Harvard Business School Press.

Christensen, C.M., F.F. Suarez, and J. Utterback (1998) "Strategies for Survival in Fast-Changing Industries", *Management Science* (44)12, pp. 207–220.

Copeland, D.J. and D.L. McKenney (1988) "Airlines Reservations Systems: Lessons from History", *MIS Quarterly* (12)3, pp. 352–370.

Crowston, K. and M.D. Myers (2004) "Information Technology and the Transformation of Industries: Three Research Perspectives", *Journal of Strategic Information Systems* (13), pp. 5–28.

Dehning, B., V. Richardson, and R.W. Zmud (2003) "The Value Relevance of Announcements of Transformational Information Technology Investments", *MIS Quarterly* (27)4, pp. 637–656.

Eisenhardt, K.M. (1989) "Building Theories from Case Study Research", *Academy of Management Review* (14)4, pp. 532–550.

Kohli, R. and W.J. Kettiner (2004) "Informating the Clan: Controlling Physicians' Costs and Outcomes", *MIS Quarterly* (28)3, pp. 363–394.

Lewis, W., R. Agarwal, and V. Sambamurthy (2003) "Spheres of Influence on Beliefs about Technology Use: An Empirical Study of Knowledge Workers", *MIS Quarterly* (27)4, pp. 657-678.

Ling, Y., et al. (2008) "Transformational Leadership's Role in Promoting Corporate Entrepreneurship: Examining the CEO-TMT Interface", *Academy of Management Journal* (51)3, pp. 557–576.

Lowe, K.B., K.G. Kroeck, and N. Sivasubramaniam (1996) "Effectiveness Correlates of Transformational and Transactional Leadership; A Meta-analytic Review of the MLQ Literature", *Leadership Quarterly* (7), pp. 385–425.

Malone, T. (2004) *The Future of Work*, Boston, MA: Harvard Business School Press.

Markus, L. and D. Robey (1988) "Information Technology and Organizational Change: Causal Structure in Theory and Research", *Management Science* (34)5, pp. 583–598.

Mason, R.O., D.L. McKenney, and D.J. Copeland (1997) "Bank of America: The Crest and Trough of Technological Leadership", *MIS Quarterly* (21)3, pp. 321–353.

National Association for Printing Leaderhship Printing Industry Information, http://www.napl.org/newsroom/industry_info.htm (current Nov. 6, 2003).

Orlikowski, W.J. (1996) "Improvising Organizational Transformation Over Time: A Situated Change Perspective", *Information Systems Research* (7)1, pp. 63–92.

Porter, M.E. and V.W. Millar (1985) "How Information Gives You Competitive Advantage", *Harvard Business Review* (79)3, pp. 63–78.

Rogers, E.M. (1995) *Diffusion of Innovation, 4th edition,* New York, NY: The Free Press.

Romanelli, E. and M. Tushman (1994) "Organizational Transformation as Punctuated Equilibrium: An Empirical Test", *Academy of Management Journal* (37)5, pp. 1141–1166.

Rosen, R.H. (2003) *The Graphic Arts CEO,* Honesdale, PA: CEO Roundtable Press.

Rosenwald, M.S. (2011) "Borders Book Chain in Bankruptcy Court", *Washington Post,* Feb. 17, p. A12.

Sahay, S. and D. Robey (1996) "Organizational Context, Social Interpretation, and the Implementation and Consequences of Geographic Information Systems", *Accounting, Management and Information Technologies* (6)4, pp. 255–282.

Scott Morton, M. (ed.) (1991) *The Corporation of the 1990s: Information Technology and Organizational Transformation*, New York, NY: Oxford University Press.

Shamir, B., R.J. House, and M.B. Arthur (1993) "The Motivational Effects of Charismatic Leadership: A Self-Concept Based Theory", *Organization Science* (4), pp. 577–594.

Trachtenberg, J. (2007) "Borders Business Plan Gets a Rewrite", *Wall Street Journal,* Mar. 22, p. B1.

Tushman, M. and P. Anderson (1986) "Technological Discontinuities and Organizational Environments", *Administrative Science Quarterly* (31)3, pp. 439–465.

Venkatraman, N. (1991) "IT Induced Business Reconfiguration" in Scott Morton, M.S. (ed.) *The Corporation of the 1990s*, New York, NY: Oxford University Press, pp. 122–158.

Yin. R. (1984) *Case Study Research*, Beverly Hills, CA: Sage.

Zhu, W., I.K.H. Chew, and W.D. Spangler (2005) "CEO Transformation Leadership and Organizational Outcomes: The Mediating Role of Human-Capital Enhancing Human Resource Management", *Leadership Quarterly* (16), pp. 39–52.

APPENDIX A

| Table A-1: The Impact of IT on EarthColor				
Discontinuity and Business Process	Enabling Technology	Before	After	Impact(s)
1.Digitizing Core Processes: PrePress	PC Hardware (Macs) and Software (early 90's)	Prepress operations involved multiple labor-intensive processes with specific craft skills and expensive consumables (e.g., film and inks).	Fully digital process for retouching of customer artwork, color definition, and other plate definition steps.	Prepress operations require 80% fewer employees, have 66% lower labor costs, with a 200% increase in manufacturing contribution. Some non-revenue-generating tasks, such as production of multiple proofs, are eliminated.
2.Enabling Process Flexibility: Plates	Digital-to-plate (mid-90s)	Plates created manually in a labor-intensive multi-step process.	A single machine creates plates from digital input from standard desktop graphics software.	Reduce labor costs. Increase consistency in production output. Reduce cycle times.
2.Enabling Process Flexibility: Production	CIP3 (late 90s)	Color levels for print job manually set by production staff based on estimated color levels.	Exact color levels set digitally.	Reduce labor costs. Higher quality output with increased consistency.
3.Building Virtual Processes: Account Management	Network (~2000)	Salespeople sold only products offered by the production location they worked at.	Salespeople offer printing services provided by any other EC location.	In 2003 over 17% of work was sold in one location and produced in another.
3.Building Virtual Processes: Prepress	Network (~2000)	Jobs came through local account representative with prepress and production completed in same location.	Jobs may arrive from any EC location and may be produced in any location.	Improve profit margins by moving work to low-cost locations; peak workload balancing (e.g., during earnings reports season).
3.Building Virtual Processes: Production	Network (~2000)	Production limited to jobs provided by local prepress.	Production of jobs created in other EC locations.	Reduce costs by moving work to low cost location. Improve efficiencies through workload balancing.
3.Building Virtual Processes: Production	Remote Cameras (~2003)	All production management performed on-site.	Additional oversight of FL and TX production work performed from NY location.	Reduce costs by minimizing production downtime. Increase ability to meet tight customer delivery timeframes.
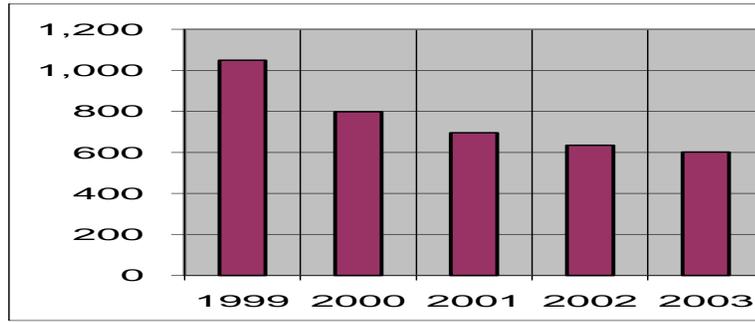
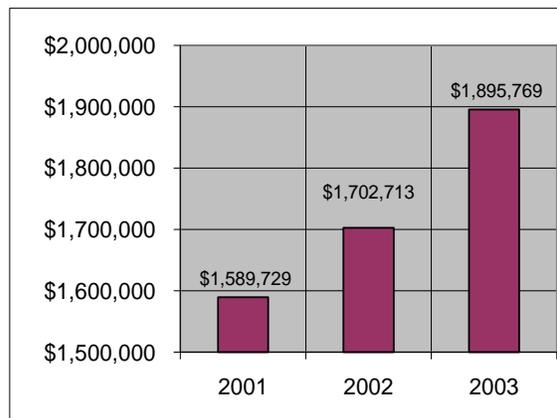**Figure A-1. Number of Employees**
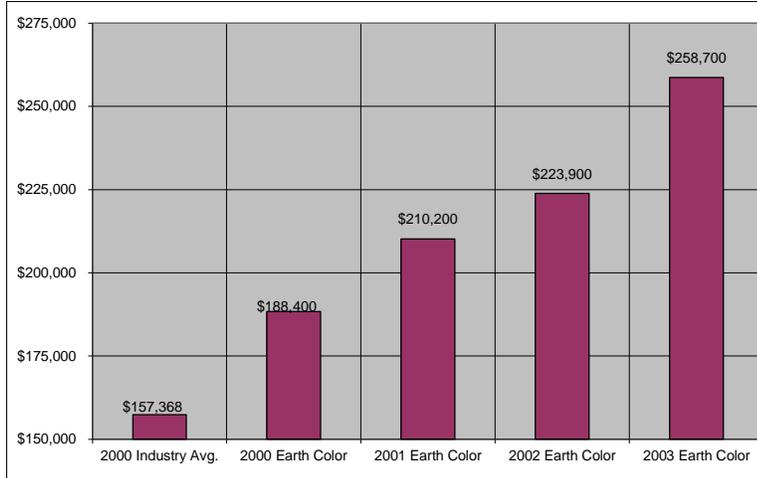
Figure A-2. Revenue per Employee

Figure A-3. Firm Revenue per Prepress Employee

Table A-2: Prepress Employees by Location			
	2001	2002	2003
Barton Press	4.1	2.2	2.0
LCI	9.8	7.6	5.0
NY/NJ	34.3	31.8	35.8
Houston	3.7	6.1	5.5
Media Printing	7.0	7.0	6.0
Cedar Graphics	33.2	28.9	27.9
	92.0	**83.5**	**82.2**

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Communications of the Association for Information Systems