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The Transformation Age: Surviving a Technology Revolution with Robert X. Cringely

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Abstract:

This paper describes a public television documentary, *The Transformation Age: Surviving a Technology Revolution with Robert X. Cringely*, co-produced by the Robert H. Smith School of Business and Maryland Public Television. We discuss the nature of IT-enabled transformations and address the key question of determining when a transformation has or is taking place. The paper presents the contents of the television program; its goals are to inform and educate viewers and to motivate them not to be left behind by the technology revolution. For academics, the goals of the program are to provide material that can be used in the classroom, both for instructional purposes and to excite students about the tremendous opportunities and challenge that information technology creates.

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I. INTRODUCTION

This paper describes a public television documentary, *The Transformation Age: Surviving a Technology Revolution with Robert X. Cringely*, co-produced by the Robert H. Smith School of Business and Maryland Public Television. The documentary was the subject of a panel presented at the International Conference on Information Systems (ICIS), held in December 2007 in Montréal, Canada. Members of the panel included Hank Lucas, of the University of Maryland; Varun Grover, of Clemson University; Robert Cringely, the narrator of the documentary; and Frank Batavic, the producer and director from Maryland Public Television. We begin with a short description of the documentary project and the motivation for it. Next is a discussion of how information technology is enabling major transformations in organizations, industries, markets and in our lives. We address the issue of what constitutes a transformation. One person's transformation may be another's incremental change. How do we distinguish between the two? The next section of the paper describes the contents of the documentary and details the different scenarios in it. We discuss a companion book and Web site to enhance the pedagogical value of the program. The paper concludes with thoughts on how to integrate a transformation theme into our curricula.

II. THE TRANSFORMATION AGE: A DOCUMENTARY¹

The Smith School of Business at the University of Maryland has co-produced a documentary with Maryland Public Television on *The Transformation Age*, a one-hour TV show about IT-enabled transformations (see Figure 1). Our motivation is to educate and inform the public about IT-enabled transformations, prepare viewers to participate in the technology revolution, and to create materials that will make a contribution to the classroom.

The motivation for making the documentary comes from a belief that as educators, we may be missing the most exciting and significant events in our field. The technology really is changing everything. Much of our published research seems to bear little relation to the stories in the popular press about the turmoil in the newspaper industry or the struggles of video content providers to find new business models as they confront the Internet. Kodak has reduced its employment by more than 100,000 people since the company missed the digital photography revolution. How many other Kodaks are waiting to happen?

Our research for the most part has not addressed these kinds of issues, partially because they are difficult to study given the existing research paradigms in the field. Since faculty members often teach topics they are researching, I wonder if our classes are also disconnected from the sweeping transformations taking place courtesy of the technology.

One of the purposes of the documentary is to raise awareness among viewers and faculty about the scope and nature of IT-enabled transformations. The documentary and ancillary materials are available for classroom use, as is a textbook, *Inside the Future: Surviving the Technology Revolution*, Praeger, 2008.²

What Is Being Transformed?

Chapter 2 of the book discusses the nature of the changes from information technology:

1. The tasks that individuals perform at work and at leisure

From the factory to the office to leisure-time activities, the tasks individuals perform differ dramatically from the days of little or no technology. Factory workers monitor automated equipment instead of performing manufacturing operations themselves. Thousands of college professors, managers and office workers are

¹ This part of the panel was presented by Hank Lucas.

² At ICIS, the theme of the panel was "You've Read the Book, Now See the Movie." In addition to Hank Lucas and Varun Grover, Robert Cringely, the narrator of the documentary, and Frank Batavic, the producer and director from Maryland Public Television, participated. Bob spoke about his long experience in the industry and gave some of his perspectives on how the world has and is changing, enabled by the technology. Frank had to remain in the studio to work on the program, but he sent a DVD with an introduction explaining the process of making a documentary.

their own secretaries, keyboarding papers, reports, memos and correspondence. Millions of people download music from iTunes and play it on their iPods. Shouldn't the figure start at the top of the page?

THE TRANSFORMATION AGE

Surviving a Technology Revolution with Robert X. Cringely



Figure 1. The Documentary

2. Time and place of work

Technology makes it possible to change the location of work for a large number of people, and it enables work to take place any time during the day. For the first time since the Industrial Revolution, rural areas are gaining population. Many knowledge workers telecommute at least part of the week.

3. Connectivity

Electronic mail has dramatically changed the nature of communications through its asynchronous nature and our ability to communicate easily across time zones. E-mail has introduced efficiencies in communication and has led to a decrease in the number of letters and the volume of first class mail in the United States. E-mail enables virtual work on a global scale. Cellular communications provide constant phone access. In the near future, cellular and other hand-held devices will become a primary means for connecting to the Internet, especially when the user is traveling.

4. The way in which we structure organizations

One of the most exciting contributions of technology is the way it enables organizations to develop innovative new structures. Companies can use IT to become virtual, assigning projects to task forces scattered around the world who communicate electronically. The technology encourages firms to outsource work because one can instantly route orders to a manufacturing or fulfillment partner. A company can easily concentrate on its core competence and use technology to make it easier to distribute work to partners.



5. New Business Models

The Internet has provided the impetus for the creation of new business models like the portal, eBay, and Web travel services to name a few. IT also enables models like lean production at Dell, and mass customization at Lands End. Many of these models involve the creation of a new marketplace.

6. Coordination and the operation of supply chains

Technology has made it possible for supply chain partners to share information on product demand and availability. The customer's purchase in a store creates a scanner record that the retailer transmits to a supplier. The supplier can share this and other information with its suppliers, creating much more efficient supply chains. Wal-Mart is famous for its innovative use of technology to help keep its prices down.

7. All types of work processes from manufacturing to service to office work

Work flow software lets service companies automatically route and track documents. Bar coding and radio frequency identification devices enable manufacturing control systems to keep track of the location of work in process. Sophisticated systems use this information to plan and schedule production in a factory.

8. Unbundling

The Internet creates a platform for new entrants to force incumbents in an industry to unbundle. Electronic brokerages forced full-service brokers to unbundle research and other services and to offer customers the option of trade execution only. The Internet and peer-to-peer technology is forcing the recorded music industry to unbundle individual songs from albums and make them available for sale.

9. Self-service and the nature of customer service

Organizations are making a concerted effort to have customers interact with them directly using technology to provide better service and to reduce labor costs. Students register for classes, obtain class material, and receive their grades online. Shippers use the Internet to track goods in transit. We make airline reservations on the Internet and check in at the airport at an automated kiosk, or print a boarding pass at home from the airline's Web site. Customers entering their own orders and paying for goods or services online is becoming a common practice.

10. Education and the nature of research

The Internet is truly transforming education. Students of all ages use it to locate material. Schools use classroom support systems like Blackboard and WebCT to distribute materials, host discussion groups on class topics, and communicate regularly with students. This technology has created an industry of online schools and education.

11. Medicine

Technology is responsible for remarkable changes in the practice of medicine, ranging from advanced imaging systems to instruments for minimally invasive surgery. Technology has the potential to transform the practice of medicine as well through electronic patient record systems, online prescriptions, all digital imaging, and automated insurance, to physician to patient links.

12. The emergence of new industries and the restructuring of old ones

Electronic commerce has been responsible for the creation of new businesses. Before the Internet, there were no portals or search engine companies. Auctions took place physically in a single location, though a remote bidder might be able to bid by phone. eBay has changed the way in which individuals and organizations shop. eBay Motors has created a national used car market, something that would have been extremely difficult to accomplish before the Internet.

13. Disintermediation and re-intermediation



The Internet has provided the opportunity to disintermediate businesses like the travel agent, who no longer receives a commission from the airlines and must charge for its services. Various Web travel services constitute a new intermediary, made possible by technology.

14. Individual national economies and the global economy as a whole

The impact of IT on an economy is difficult to measure. A Brookings study by Litan and Rivlin [2000] estimated that the Internet has contributed 0.25 to 0.50 percent to growth in the economy in year 2000 prices. Anecdotal stories of Internet adoption in developing countries suggest that there are significant economic and social benefits possible from the technology.

15. The nature of defense

For better or worse, it is clear that information technology has transformed warfare, including smart weapons, battlefield displays, avionics and the electronic control of weapons, and the collection of intelligence, to name a few.

What Constitutes a Transformation?

Chapter 2 of the book also asks a fundamental question that we must address in discussing IT-enabled transformation: What constitutes a transformation? The technology field is associated with much exaggeration, from vendor promises to the inflated expectations of the dot.com Internet stock market bubble. Is this notion of an IT revolution and transformation more of the same? How does one determine the difference between a true transformation and incremental changes? Webster's definition of transformation is: "to change in composition or structure... to change the outward form or appearance...to change in character or condition." Chandler and Cortada [2000] characterize a transformation as something that will "shape and reshape the economy."

In the organization studies field, "punctuated equilibrium" offers one theoretical lens for understanding the nature and effects of transformational change. This approach describes how industries experience long periods of stability punctuated by major changes in the technology [Tushman and Anderson 1986; Anderson and Tushman 1990]. An example of a major transformation is the change in the airline industry as a result of moving from propeller aircraft to jets. While most observers would agree that the aircraft example is a major discontinuity, technology transformations are often more difficult to identify. They have tended to occur over a long period of time without a well-defined beginning and end point.

In an empirical study of punctuated equilibrium, Romanelli and Tushman [1994] defined a revolutionary transformation as one that occurred when they found changes in three major organizational conditions, strategy, structure and power, within any two-year time period. A more recent study [Dehning, et al. 2003] of excess stock market returns related to news of company investments in transformational technologies defined technology transformations as events that:

- Fundamentally alter traditional ways of doing business by redefining business capabilities and/or (internal or external) business processes and relationships;
- Potentially involve strategic acquisitions to acquire new capabilities or to enter a new marketplace;
- Exemplify the use of IT to dramatically change how tasks are carried out...is the move recognized as being important in enabling a firm to operate in different markets, serve different customers...gain considerable competitive advantage by doing things differently.

Change is a continuum ranging from incremental advances on one end to radical transformation on the other. One important research task is to define what constitutes a transformation: How do we map change to the various points on the continuum? What kind of major changes are required for observers to agree that a transformation has taken place? What kind of indicators measure change? Can we define change generically, or does each domain and proposed transformation require its own measures?

Contents of the Documentary

Robert X. Cringely, the host of a number of PBS documentaries about technology, is the host of *The Transformation Age*. He leads the viewer on a trip around the U.S., encountering examples of how the technology transforms business and lives. The major vignettes include:

The Office

- Anina, a fashion model and entrepreneur who models and runs a fashion Web site
- Point B, a consulting firm with no offices; it takes on assignments where employees live
- Telepresence at HP: the Halo system—will this life-like video conferencing system replace air travel? Will it let us conduct remote classes that are like being there?
- Google and Google apps; trying to change the dominant computing model

Markets

- Storereport.com, technology levels the playing field and lets the convenience store compete with Wal-Mart
- RFID: a segment that points to the future
- *Second Life*, exploring the potential of virtual worlds
- Electronic Sheep, a company that lives within virtual worlds
- Kodak: a company that missed the revolution

Media and Money

- Newspapers: the impact of Craigslist; will the industry survive, and if so, in what form?
- Newspapers: the promise of e-ink—will the future newspaper involve no paper?
- Lime Brokerage and Limewire, high speed algorithmic trading meets file sharing

Life

- Electronic health records at the Mayo Clinic; an application with tremendous challenges and a potentially gigantic payoff
- MyLifeBits: the Memex: are we headed for digital immortality?

Concluding Thoughts

- Conclusions: Carly Fiorina and others—the adaptable survive

Please see Figure 2 for some screen shots from the program. The program includes interviews with a variety of people associated with technology transformations, some of whom are working like Anina, a fashion model whose office is a cell phone and laptop, to Carly Fiorina, former CEO of HP, who comments on the technology revolution. Maryland Public Television will sell a DVD of the documentary, and the Smith School will host a Web site described below. It is hard to do justice to a one-hour television program in print, a program that took over a year to write and tape, and that was put together from 40 reels of original taping and another 5-10 reels of archive material. I encourage you to watch the program when it airs on your local public television station and to consider buying the DVD for ongoing use in class.

The Book

A lot goes into a one-hour television program. We might tape a 90-minute interview and end up using 3 or 4 minutes of it in the final program. In order to provide material to supplement the program, I have written a short book, *Inside the Future: Surviving the Technology Revolution* which Praeger is publishing in late March of 2008. Please see Figure 3. The book contains both material that is not in the program—for example, a chapter on e-government—and additional quotations from the transcripts of all the interviews.

The table of contents follows.

INTRODUCTION TO A REVOLUTION

1. Rules of the Revolution
2. A Framework for Transformation

EVIDENCE FOR TRANSFORMATIONS

3. Transforming Every Day Events
4. The Power of Online Communities
5. Transforming Services
6. E-Government

7. Transformations in Manufacturing
8. The Digital Pipeline to your Home
9. Healthcare Has a Desperate Need for a Transformation
10. Can Education be Transformed?
11. The Tragedy of Resistance
12. The Magnitude of the Transformation

HOW TO SURVIVE

13. Barriers to Change
14. How to Flourish





Figure 2. Still Shots from the Documentary

(Top Two Photos (previous page): Bob looks at screens for MyLifeBits at Microsoft and visits the Mayo Clinic. Bottom Two Photos: Bob at work in an office of the 1920s as he introduces the idea of working without an office.)

The book offers a series of rules for the technology revolution and illustrates them in each chapter. Public television seeks to educate and inform its viewers, but it does not encourage them to take action or offer solutions. Chapters 13 and 14 attempt to provide these guidelines: What should the reader do to take advantage of the technology revolution, to survive and flourish in the Transformation Age?

The Web Site

The Smith School is hosting a Web site on the project offering free content (www.rhsmith.umd.edu/transformation). The Web site contains the following:

An introduction to the DVD

A Guide to Teaching, which integrates vignettes from the DVD with the book and offers interviews with Smith School experts on its various topics

An index to each vignette in the program

Each individual vignette, which can be downloaded to play in class

Links to supplemental material on the Smith and MPT Web sites

The companion MPT Website may be found at: www.mpt.org/

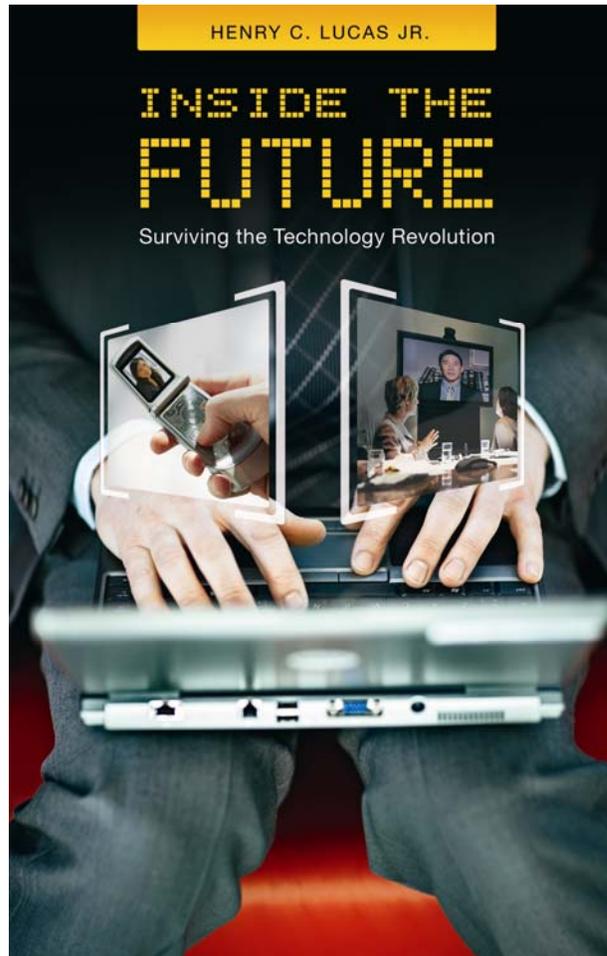


Figure 3. The Book

III. THOUGHTS ON INTEGRATING TRANSFORMATION WITH CURRICULA³

While IT-enabled transformations are pervasive, they are difficult to teach—because they are largely devoid of a consistent framework, lens or theory through which we can explain their manifestations. Therefore, the diversity in teaching a course or a module on this topic would be quite high.

To examine this proposition, I compiled syllabi for courses or modules with titles that reflected IT-enabled transformation or modules of courses. While most were at the graduate level, there were some at the undergraduate level. Of the syllabi I collected (based on accessibility over the Web), there were two approaches. Both were largely descriptive in nature—but one focused on instances of innovative companies or industries that had undertaken transformation, and provided copious readings on diverse representation of these transformations. The other approach was also descriptive but organized in modules. These could be broad (e.g., digital economics) or based on an application (e.g., supply chain), a system (e.g., enterprise), management (e.g., IT valuation), or the

³ This part of the panel was presented by Varun Grover.

environment (e.g., legal), among others. Within the modules, illustrations and cases seem to be the primary tools for discussion.

In considering these approaches, I feel that something is missing. From a pedagogical standpoint, we need to clearly communicate the following message to our students:

Information Technology alone is rarely the key to economic value. Companies create real value when they combine technology with new ways of doing business.

So, if from these largely descriptive approaches we can extract *fundamentals*—that give us a clearer sense of what drives the transformation and how successful companies manage it—we can impart better sense-making to our students. They can appreciate fundamental drivers of change and the role of IT in facilitating this (e.g., What are these new ways of doing business? How does IT facilitate them? Can we derive prescriptions from these new business models? Are these prescriptions applicable to other industries? Under what conditions?). By creating a link between description and prescription through fundamentals, we can impart meaningful learning—the mental scaffolding needed for students to learn and apply lessons from business transformation. This is not easy, because it requires creation of a *logic of linkages* between the descriptive world (all the IT-enabled transformations) that are easy to observe, and the prescriptions (where we can take lessons that work and apply them elsewhere). It is made even tougher when we consider that transformations are often facilitated by new technologies...and new types of transformations might be driven by new types of technologies. So, any prescriptions are necessarily bounded to the world we currently know.

Student Learning

In teaching IT-enabled business transformation, we need to enable various aspects of student learning: Students should *observe* and *broaden* their awareness that transformation is happening, that it takes many forms and is pervasive. Current pedagogical tools include articles, books, anecdotes, Web site links and cases. The video described earlier and Web site vignettes can form a powerful complementary approach to raising awareness, as the observation is rich and directed to a particular type of transformation.

Students should go beyond awareness and feel *engaged* and *involved* in the transformation. They should feel like it is relevant to them and their world. Current pedagogical approaches include case analysis, software applications, industry analysis, putting together business plans, and so on. The Web site associated with the video could allow students to engage with the companies they observed and perhaps even interact with personnel from those companies or follow through with formal cases or business analyses.

Students should *understand* the basis for transformation and take away *prescriptions* that could form part of a useful conceptual toolkit. This requires an understanding of fundamental drivers of change, new ways of doing business, the role of IT in these new ways, and formulations of ways to manage these changes successfully. While, it is not clear whether this is the weak link in current courses, I suspect that it is, and an effort needs to be made to create the logic of linkages here. A well designed book (complementing the Web site and video), along with effective lecture and discussion sessions, could impart the meaningful learning that is so important here. Failure to do to provide prescriptive guidelines relegates the course to a level of description, which is of somewhat limited use.

Finally, students should be able to take prescriptions and observe (*illustrate*) their *application* to other companies. By applying prescriptions to new contexts, a richer understanding of when, where and how these prescriptions work is created. Again, the book, Web site and effective class fora could facilitate these aspects of student learning.

An Illustration

To illustrate how the application of such an approach might unfold, consider a simple illustration. The starting point could be a successful company, a social transformation, or even a new technology. The *Motley Fool* offers financial advice to individual investors in an informative but quirky way. They leverage the power of the Web to distribute their products. The company has been very successful in doing this.

In the “observe and broaden” stage, a five-minute video module at the beginning of a class session can expose students to the company. Students can appreciate that this is a successful business, has an alliance with a publisher, numerous Web sites, and it empowers its customers (investors) to make better financial decisions.

Then, in order to “engage and involve” students, students can be given mini-assignments that include exploring the company Web site, they can read articles on the company, they can respond to questions, and so on. The focus is on the business model and value-added issues.

The “understand and prescribe” stage involves asking the question: What is fundamental about the way this company does business? The *syndication* model can be described as the basic concept (this draws from Werbach 2000]. Through class discussion, students come to understand that syndication can occur when information is reusable, has multiple distributors, and is modular, so it can be seamlessly packaged with other products. Motley Fool leverages e-syndication by drawing products and financial software from other companies (e.g., Reuters), bundling it in different ways with its own original content (through its group of savvy financial pundits) and selling it to other distributors (e.g., Yahoo!, newspapers, radio, and so on). So, moving to prescription, the recommendation is that companies should consider an *e-syndication strategy* by asking how they can enhance the value of their products and services by bundling with external sources.

The “illustrate and apply” stage closes the deal by stimulating discussion on how companies other than Motley Fool might use e-syndication. When would it be successful? When would it not? So, under what conditions can e-Syndication work? What kinds of companies can benefit from it? How is it transforming industries? (e.g., Are we seeing broader separation of content from distribution).

By moving through the stages from description (exemplar) to fundamental drivers to prescription to application, we are facilitating the logic of linkages that is necessary to help students truly understand IT-enabled business transformation. Through this understanding, they are not only more informed about the real drivers of business transformation, but they are also in a position to provide prescriptions to practice, based on this fundamental understanding.

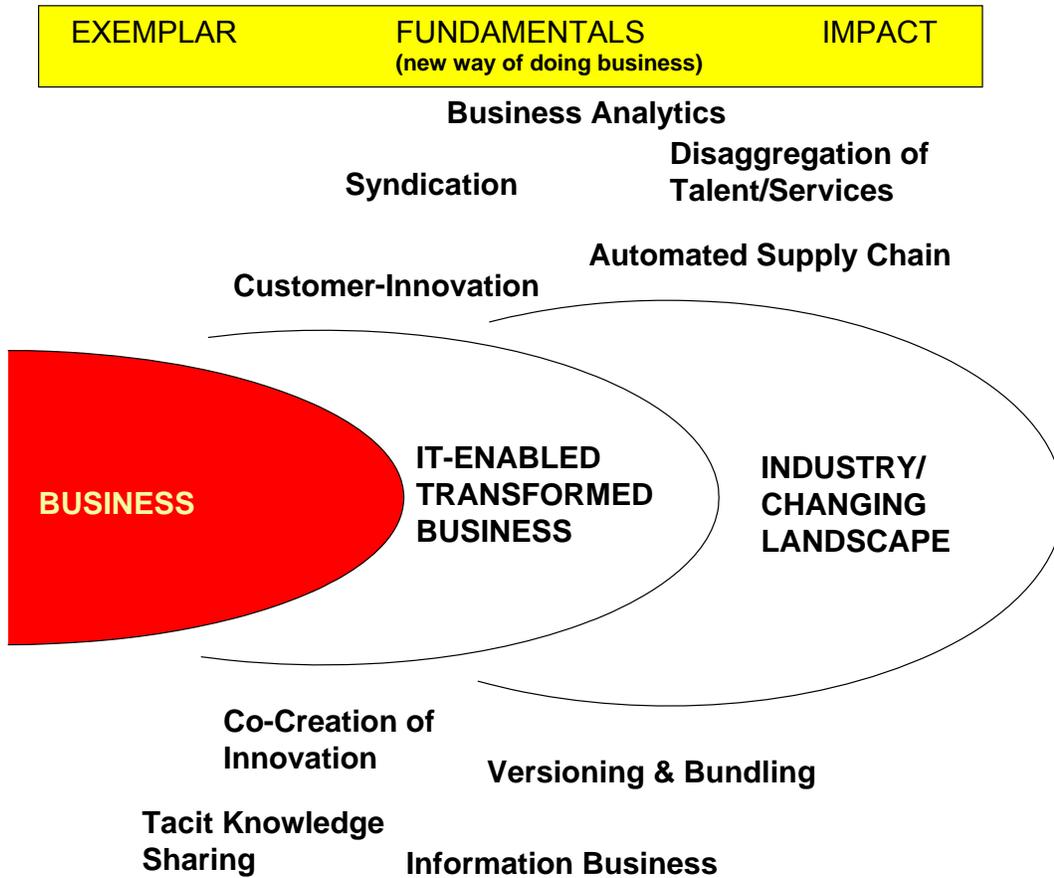


Figure 4. The Evolution of New Ways of Doing Business

Figure 4 illustrates the evolving impact from the firm to the industry level and the numerous “fundamental” concepts that describe “new ways of doing business.” A carefully designed course and well-prepared instructor could weave video modules, a Web site, and a book very effectively into the logical schema needed for imparting deeper knowledge on IT-enabled business transformations.

IV. CONCLUSIONS

One goal of the panel and this project is to encourage academics to think about IT-enabled transformations as a theme in our field. Will a new focus on the exciting changes going on around us halt declining enrollments in IS and motivate our students? We hope the materials described here and presented as a television documentary, as a book, and on a Web site, help answer this question in the affirmative.

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