ABSTRACT

Multiple studies in the information systems (IS) literature recognize that information technology (IT) investments may not yield immediate returns. Nevertheless, there has been a lack of theoretical and empirical research to understand and explain this value latency phenomenon. We propose a new theoretical perspective on the latency of IT value and argue that IT value flows occur in three phases: the value dormancy phase, the value triggering phase and the value transformation phase. We validate our theory by mapping the prior IT value literature onto its theoretical dimensions. To provide a preliminary validation of this theory, we use it to explain differences in the IT investment value lags experienced by two organizations.

KEYWORDS: Business value, economic analysis, IT investments, IT value, lagged effects, latent value, organizational performance, theory-building research
1. INTRODUCTION

The existing literature on the business value of IT recognizes that returns from IT investments are not instantaneous [1, 7, 10, 24, 25, 29]. Bharadwaj, et al. [7] used firm market value to measure returns on IT investments and reveal their contribution to long-term performance. “Investments in IT systems may take years to add value to a firm and are therefore more likely to be reflected in future profit streams” (p. 1011). Similarly, Brynjolfsson and Hitt’s [10] econometric analysis of firm-level IT returns reveals that long-term returns are two to eight times greater than short-term returns. Devaraj and Kohli [19] note how the magnitude of lagged effects of IT investments is contingent upon the business context. Brynjolfsson and Hitt [10] examined the productivity paradox of IT, noting that returns to IT investments are inconsistent over time, with a lag between initial investment and final payoff. Hitt, et al. [27] affirm this for enterprise systems, and conclude that value accrual is subject to significant lags.

The observed lags in returns on IT investments—the **IT value latency problem**—is an area that clearly calls for more research [20]. **IT value latency** is the inherent lag in business value returns after the implementation of a new IT investment. We must understand the factors and circumstances that influence IT value latency and result in differential lag lengths. When managers understand how IT investments reach their full potential value, they will be prepared to anticipate and respond to changes that impact projects. Having a theory-based or empirical analysis-based understanding of the **value trajectory over time** for different kinds of IT investments will lead to appropriate managerial expectations for the benefits the firm can obtain. This will also enable senior managers to track the progress of IT returns, and help overcome myopic views about IT project investment opportunities. Also, recognizing that there will be peaks and troughs in the value flows over time will provide a basis for bench-marks for IT project performance. This will have the collateral benefit of helping managers
to “right size” their IT payoff expectations and focus attention on ways to unlock more value sooner from their investments.

We seek to answer several research questions:

• What are the relevant bases for a theory of IT value latency that explains and predicts IT value flows over time? What will be its explanatory theoretical components?

• What evidence can we provide to show the robustness of the theory’s interpretive capabilities? What are its advantages and shortcomings? Can it be leveraged to make strategies for enhancing the managerial control and predictability of lagged IT value flows?

To provide answers, we will specify a variance theory that appropriately captures the antecedents and the situational controls which lead to the observation of different lag patterns for IT value flows. Our theory should be useful to understand more about why lags in IT investments occur. Though it is hard to manage aspects of a business that are poorly defined and measured, we hope to initiate a dialogue that will lead to greater awareness of the issues and new opportunities to formulate managerial policies that will speed the value flows and returns on IT investments.

We review the IT value literature to determine the theoretical premises for which ideas our theory will be built on. We next propose a new theory of IT value latency from an intra-firm perspective. We sketch the theory by mapping the past IT value literature onto the various dimensions of our proposed theory. We also identify and analyze the antecedents of IT value latency with the proposed theory, and display the preliminary robustness of this theory by utilizing it to explain the value lags experienced in two case studies.
2. LITERATURE REVIEW

Our value latency theory is based on the IT value literature. It enables us to understand the overall value creation process of IT investments. Though the literature does not provide all the answers for the formulation of our theory, it provides an initial structure for our theory-building process. We will highlight only the key conclusions that facilitate the reader’s understanding of the proposed theory.

The IT value latency problem has been studied in the past largely in the context of the productivity paradox. Diffusion delay, the time required for IT to attain its maximum payoff [2], is one of the key explanations for the productivity paradox [9, 2]. Economists believe that this delay is inevitable as existing industry structures will have to be reconfigured to provide the necessary support for the technology to yield economic rents [17].

The impacts of firm structure and practices on IT value have been widely researched. Studies have indicated that business practices such as workforce composition, management commitment, decision making policies, and employee empowerment establish the initial set of conditions that make or break the value creation process [18, 24, 53]. Extending these ideas, firms with the desirable set of initial practices will observe shorter value flow lags. The literature suggests that IT investment performance and business processes are linked. To maximize value, firms have to align their business processes with IT investments alongside their implementation [27]. Alignment requires substantial effort from stakeholders of the system [28, 32]. Numerous studies have looked at IT investments in conjunction with business process reengineering efforts [4, 6, 8, 27]. They suggest that intra-firm coordination after system implementation is imperative for value flows. IT investments accompanied by complementary changes to business processes facilitate coordination, yielding earlier returns.

Based on our synthesis of the literature, we conclude that value flows for IT investments are impacted by the initial set of firm conditions present prior to the investment, and efforts to enhance the
conditions for value creation. We will build on this conclusion to develop a theory of IT value latency.

3. A THEORY OF IT VALUE LATENCY

A theory sets forth a collection of statements that are systematically related. Together they imply something about reality and provide an explanation for some observed phenomenon [16]. Our proposed theory explains the manifestation of lags in IT value by taking an intra-firm perspective. The theory focuses on the dynamics within the boundaries of the firm and does not incorporate external factors (e.g. business environment) that might impact the value flows. The reasons are as follows: (1) External factors tend to be less managerially controllable, so they provide limited leverage for actions by IT practitioners. (2) To achieve parsimony, testability and logical coherence—the tenets of a good theory according to Pfeffer [43]—we concentrate on what matters most. Setting boundaries around the firm filters out a set of manageable factors and relationships from which knowledge can be drawn.

Returns on IT investment occur in three key phases for value: dormancy, triggering and transformation. Phase 1, value dormancy, occurs after an IT investment is made, when a firm experiences inertia in value creation. This may come from existing firm structures and routines. For value flows to occur within the firm in Phase 2, a primary set of value triggers needs to be in place. After the current impediments are overcome, the value creation process will undergo a period of extensive change in Phase 3: value transformation. In each phase, technology, people (stakeholders of the firm) and firm processes shape the outcome and impact the value flows.

We recognize the flow of value as a continuous process and represent IT value flows in three phases. But this doesn’t indicate that these phases are occurring in isolation or without some observable overlaps. We characterize their distinctive features across time into phases to highlight the key milestones, issues and relationships in the value trajectory.

3.1. Phase 1: Value Dormancy
After an IT investment has been made by the firm, the associated value flows take time to appear. Their timing will be influenced by technology, people and processes (a set of firm activities) of the organization. This period is characterized by *value dormancy*.

**Technology.** The existing installed base of technology affects the value dormancy for new IT investments. Barua, et al. [4] echo these views by suggesting that incumbent technologies within the organization create inertia in value creation for the new IT investment. They single out the Connecticut-based health insurance firm, Aetna, to illustrate why existing structures within the firm inhibit value flows from a new IT investment. Aetna’s investment in PC-based software and hardware was influenced by the firm’s original investment in fifteen mainframe computers. The costly existing investment was an obstacle in gaining support from management to switch to the new platform.

At the macro-level, David [17] claims that the productivity paradox is caused by lags in IT value, which are in turn caused by firm’s reluctance to abandon existing systems and migrate processes to newer systems. Sunk costs also have confounding impacts on managerial decisions to accept new technological initiatives.

**People.** IT investments create socio-technical systems that have social impacts on system stakeholders [40]. Technologies that change work routines may exhibit value dormancy due to resistance from users, and may cause conflict in work cultures. For example, prior to implementing changes to the IT processes of British Petroleum (BP), some senior executives informally recognized that they would lead to firm-wide resistance. This was due to the clash between the existing work culture and the changes that are incidental to the introduction of the system [42]. BP nevertheless proceeded with the implementation, but was hit with incapacitating resistance.

**Processes.** Friction in IT value creation also originates from non-IT related business processes. IT investments that rely on complementary operational activities face potential inertia from these
processes when sub-optimal implementation strategies are applied [38]. For example, U.S. healthcare providers’ computerization of medical records has been thwarted by day-to-day medical processes and the practices of medical professionals, which appear to be resistant to effective computerization. In anticipation of the lack of computerized records, these providers should proceed with digitizing medical records months before implementation. Acknowledging the lack of digitized records as a huge initial impediment eases the value creation process.

Our view of how these business process considerations impact IT value creation is echoed by Dedrick, et al. [18], who survey empirical research on IT value. They state that value flows are significantly impacted by structure and business practices of the firms. Weill [53] and Francalanci and Galal [24] and others conclude that different organizational routines seem to be crucial in the creation of limits to value for IT investments.

3.2. Phase 2: Value Triggering

The second phase of the value creation process involves the triggering of value flows that result in changes in organizational routines and structures that permit the flow of IT value. We call this value triggering. In this phase, firms have to focus on setting off a series of timely value triggers. For effective value creation with constraining organizational structures and routines, strong catalysts are necessary to support the changes. These catalysts stem from the technology, people and processes within the organization.

**Technology.** Proper design of technology motivates the end-users of new IT investments and this can be achieved by empowering end users during the investment decision making and design stages. Bashein, et al. [6] and Brynjolfsson, et al. [11] concluded that empowerment of end-users diminishes the inertia within an organization and promotes acceptance of change. User-centric technologies eliminate cognitive hurdles experienced by individuals, catalyzing increased usage of the artifact.
People. Opportunities for success and threats, and concerns about the ineffective use of invested funds often serve as triggers that prompt managers to focus their efforts on the implementation of new IT projects so that significant organizational changes occur to make IT value flow to the firm.

Barua and Lee [3] model the value of an electronic data interchange (EDI) implementation, and conclude that positive motivation and threats result in more efficient utilization of IT. Misapplied threats, however, bring about losses of surplus by the parties that are involved in implementing EDI. The use of threats as a catalyst for change has not been explored in prior IS research. Studies that we surveyed suggest using motivational mechanisms to initiate value creation. These mechanisms include managerial involvement, senior management support, employee empowerment and voluntary use of the resulting system. Martinez [37] concludes that IS managers who are less involved in business process reengineering will be less motivated to ensure that new IT investments generate the appropriate value flows. They will set less demanding goals for their operations, opting for status quo. Without other countervailing efforts, this will result in lower payoffs.

Processes. Management of change process during IT implementation guides value creation by driving organizational activities in a direction aligned with firm goals. Senior managers championing change efforts lead to new IT value flows by providing effective stimuli for organizational changes [53]. By developing a right set of change management processes, IT investments can deliver value once value triggering has occurred.

3.3. Phase 3: Value Transformation

Identifying the right set of value triggers during implementation is essential to jump-starting Phase 3, value transformation, when value flows begin to occur. During value transformation, changes in existing structures in a firm go beyond existing routines to provide a better fit with the new IT investment, and support value creation [15]. Similarly, Barua, et al. [4] propose that radical change in
multiple aspects of an organization’s routines is the key to extracting value from IT investments. This view parallels value transformation in our proposed theory of IT value latency. Although the transformation phase has the potential to deliver significant value for the firm, it nevertheless may be plagued with high coordination costs, and the resulting lack of coordination, which is inevitable in the process of implementation.

Higher coordination costs may be a result of various technological, organizational and process factors, including differences in technological standards [5], differences in workflow practices, users’ lack of familiarity with an application’s interface [25], and system learning complexities [29]. They lengthen value transformation and have confounding impacts on IT value. One way to reduce the lag is to manage the coordination costs.

**Technology.** During the value transformation phase, having proper data definitions, compatible data formats and well-accepted technological standards is crucial in reducing coordination problems within the firm and among its business partners. Introducing standards and definitions that match existing systems will facilitate work processes for both system builders and end-users alike. In particular, having compatible technical standards will ensure that system users will be able to integrate their existing work processes with new processes in light of changes in the firm that are caused by the IT investment [5]. For example, the introduction of Microsoft-compatible accounting software from well-known vendors (e.g., Great Plains Software) reduces the coordination cost that accountants face when they need to modify accounting systems outputs and report using Excel spreadsheets. A simultaneous concern exists across organizations which places somewhat greater importance on the use of market standards for various technologies to achieve effective compatibility.

**People.** Coordination costs exist when different systems are used, and will be present in the interaction of different workgroups [5]. This is especially true for IT investments that span various
parts of the value chain in the organization. An example is enterprise systems investment. Initial implementation of enterprise systems typically causes disruption to various business processes in the firm [27]. When close communications between workgroups across different business processes or strategic business units are needed, new policies to establish the necessary cross-functional or inter-group communication are likely to reduce the costs of the system investment. Communication policies that can be used include regularly-scheduled meetings between business process unit staff members throughout the system implementation process.

The introduction of new technology leads to learning disruption in the organization [51]. The learning complexities which stem from IT investments often result in high coordination costs among key stakeholders to an IT investment. For example, users who are unfamiliar with new systems and applications will have trouble communicating the learning problems they face. This learning adversity is a result of high coordination costs, and it will lead to longer lags before business value begins to accrue.

**Processes.** High coordination costs can be managed by compartmentalizing the complexities of the IT investment. Workflow segmentation is one mechanism that can help to decompose the larger problem of coordination into divisible parts. Beyond the implementation of a new IT system, firms can also reorganize workflow processes into smaller standardized routines so that users experience more workflows, only with a narrower scope [29]. The increase in volume and decrease in scope of work processes may help to reduce the necessary coordination between stakeholders, as well as diminish the learning complexities within the organization.

In addition to workflow segmentation, labor and personnel specialization can help to reduce coordination costs. The specialization of labor involves designating individuals to work in a particular area of the business process that is affected by the IT investment for some time when early efforts are
made to implement the new system [29]. Changes in the staffing and the duties of these individuals (e.g., due to job rotation or turnover) should be minimized, even after the implementation, for a period of time. The early involvement and specialization of individuals in the new IT investments ensure familiarity with system use, and serve to control the coordination costs that arise from learning difficulties.

Figure 1 summarizes the key tenets of this theory.

4. VALIDATING THE THEORY

To preliminarily validate our theory, we surveyed the literature on IT value to map the dimensions of our proposed theory onto some of the leading explanations for lagged value. We covered articles published in academic and practitioner journals from 1990 to 2003, including *MIS Quarterly*, *Information Systems Research*, *Journal of Management Information Systems*, *Management Science*, *Strategic Management Journal*, *Communications of the ACM*, various *IEEE Transactions* and others. This mapping is accomplished in Table 1 by matching the primary and secondary findings of the papers against the value dormancy, triggers and transformation phases associated with our theory. (See Table 1 on next page.)

Table 1 shows evidence for a rich body of knowledge pertaining to this issue. Our mapping of prior works on IT value to our proposed theory of IT value latency suggests that the conceptual dimensions of the theory are already present in prior work. We explore this issues through additional discussion and application of the theory to real world mini-cases.
Figure 1. Key Tenets of IT Value Latency Theory

Table 1. Validation: Mapping IT Value Latency Theory to Prior IT Value Literature

<table>
<thead>
<tr>
<th>PHASES</th>
<th>FINDINGS FROM THE PRIOR LITERATURE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phase 1:</td>
<td>• Higher incongruence among existing structural arrangements reduces IT value [45].</td>
</tr>
<tr>
<td>Value Dormancy</td>
<td>• Four theories describe how IT reacts with org structures, impacts institutional inertia [49].</td>
</tr>
<tr>
<td></td>
<td>• Installed base of IT may generate inertia for new investments [4].</td>
</tr>
<tr>
<td></td>
<td>• Existing firm structures, business practices crucial in initial stages of IT implementation. [18].</td>
</tr>
<tr>
<td></td>
<td>• Existing practices, employee skills impact IT productivity [24].</td>
</tr>
<tr>
<td>Phase 2:</td>
<td>• Support is crucial early on. Project leader solicits management support for returns [44].</td>
</tr>
<tr>
<td>Value Triggering</td>
<td>• Benchmarking drives stakeholders, ensures creation of sustainable advantage [47].</td>
</tr>
<tr>
<td></td>
<td>• Weak CEO-CIO relationship limits IT performance; less monitoring and management of value [35].</td>
</tr>
<tr>
<td></td>
<td>• Stakeholders set investment goals; users partner on investments, ensure success [44].</td>
</tr>
<tr>
<td></td>
<td>• Managers less motivated in IT implementation set less demanding goals; result: lower payoffs [37].</td>
</tr>
<tr>
<td></td>
<td>• Management commitment and motivation on IT investment impact payoff [53].</td>
</tr>
<tr>
<td></td>
<td>• User empowerment reduces resistance; speeds value flows [6, 11].</td>
</tr>
<tr>
<td>Phase 3:</td>
<td><strong>General Findings</strong></td>
</tr>
<tr>
<td>Value Transformation</td>
<td>• IT-business-mgmt process alignment enhance IT returns and business performance [48].</td>
</tr>
<tr>
<td></td>
<td>• Mgrl. inefficiencies diminish value; corrective mechanisms ensure stable value creation [33].</td>
</tr>
<tr>
<td></td>
<td>• Changing firm processes/structure in implementation aligns incentives for better returns [39].</td>
</tr>
<tr>
<td></td>
<td>• Radical organizational change: positive association with IT investment success [46].</td>
</tr>
<tr>
<td></td>
<td>• Reordering routines: complementary resource to IT investments for high value [47].</td>
</tr>
<tr>
<td></td>
<td><strong>Coordination Cost-Related Findings</strong></td>
</tr>
<tr>
<td></td>
<td>• IOS investments in vertical integration: facilitate information flows, reduces coordination costs [34].</td>
</tr>
<tr>
<td></td>
<td>• Employee training improves org performance with IT by lowering coordination costs [36].</td>
</tr>
<tr>
<td></td>
<td>• Tech standards for IT and infrastructure result in lower coordination costs and higher payoffs [5].</td>
</tr>
<tr>
<td></td>
<td>• Workflow standards after IT implementation facilitate coordination and lead to higher payoffs [29].</td>
</tr>
</tbody>
</table>
5. APPLYING THE THEORY
We next examine two cases of IT investments and their associated lags in value. The first case refers to the implementation of electronic medical records (EMR) at the University of Illinois Medical Center (UIMC) in Chicago, IL [52]. The second refers to a problem-ridden enterprise system at Hershey Foods Corp., Hershey, PA [13]. These cases were selected to reflect the breadth of our theory in explaining diverse latency outcomes [23]. For both cases, we will apply our theory of IT value latency to understand the dynamics of value flows and attempt to provide explanations of the different degrees of latency they experienced. Bringing together the literature in the previous section with the case findings here improves the generalizability and increases our understanding of the applicability of our theory [23].

5.1. University of Illinois Medical Center
The top management of UIMC recognized the long-run benefits of an EMR system and decided to implement it hospital-wide in 1997 [30]. EMR technology was relatively new then, present in only about 10% of U.S. hospitals. Implementing the system revolutionized the way data are recorded, stored and utilized, and required UIMC to digitize patients’ records.

Phase 1: Value Dormancy. Existing routines within UIMC posed a great challenge to the implementation of the EMR system. The duration of an average medical consultation was about twenty minutes, and doctors had to assess, interpret and update medical records within minutes. The culture of medical practitioners was highly results-oriented and doctors would not tolerate delays as a result of digitizing medical records. For instance, an incident of hardware failure in UIMC brought about numerous angry calls by physicians to the IS department, demanding the problem to be solved immediately [30].
Prior to implementation, the IS department singled out three key conditions within the hospital that were likely to lead to dormant value: the time constraints physicians face during medical consultation; physicians’ results-orientation and unwillingness to tolerate delays; and the extent of integration of hospital departments, making it difficult to isolate just one to run a pilot test for an EMR system. The IS department chose the “big-bang approach,” implementing the systems changes hospital-wide all at once. Implementing the system in stages would have required concurrent maintenance of both digital and physical medical records, which created the possibility of confusion in records retrieval across multiple data sources. Delays were inevitable in updating the data, as users had to update both physical and electronic records. Dr. Patrick Tranmer, head of the Department of Family Medicine, commented, “Doctors would have said, ‘Now this is twice as hard. Forget it’” [30]. The IS department foresaw that the project would be abandoned if it were implemented in stages due to resistance. A “cold turkey” cutover compelled employees to use the EMR system without an option to use physical records.

Phase 2: Value Triggering. EMR implementations revolutionize hospital processes. Impediments in the dormancy phase of value flows for IT investments have to be overcome by the appropriate value triggers to release IT value. In UIMC’s context, a key value trigger was support from the hospital’s top management. The IS department attributed the EMR project’s success to the support of the newly-appointed vice-chancellor for health affairs, Dr. Charles Rice, who successfully prevented the termination of the project at an early stage. In addition, the project, with an initial investment of $11.2 million and a maintenance cost of $1 million annually, had total support from the Chief Medical Officer, CIO and other top management team members [30].

Another value trigger here is user empowerment. To overcome the inertia in IT value flows, project leaders focused on empowering users. They asked nurses and doctors to manage the system. By empowering the nurses early in implementation, they ensured that the entire organization would be
motivated to overcome the barriers to value creation. To facilitate the value triggering process, the hospital appointed some nurses as “power users” to motivate co-workers and influence doctors. The latter were important; doctors had no time for training.

The direct cutover approach to implementation constituted a direct threat. It removed the fallback options with respect to the physical records. As the project leader, Joy Keeler, pointed out, “We have burned the bridge. No paper” [30]. Appropriate use of a threat coerced users to embrace the changes that EMR brought.

**Phase 3: Value Transformation.** The UIMC EMR system consisted of numerous applications. This is confusing to a user if the applications are not properly integrated. Initial designs of the applications interface were rejected by the project manager for this reason. The IS department eventually decided to organize all the applications to mimic the flow of an email/scheduling program to enhance familiarity and learning, hence reducing coordination costs [30]. In the value transformation phase, UIMC introduced various means that aided learning and information acquisition among stakeholders. These mechanisms were crucial in managing the increased coordination costs.

To facilitate coordination among medical groups, data and technology in system were standardized to ensure compatibility across all medical departments. This enhanced communication between users within and across medical groups. The EMR system allowed physicians to type or dictate medical information into the system. It does not restrict records updates with fixed forms. This made it easier for physicians to learn and minimized coordination costs in medical consultation.

**Outcomes.** UIMC’s EMR investment reduced the average length of patient stays, increased patient capacity per day and reduced prescription errors. The IS leaders understood the lagged value of such systems in general, and were pleased with the rapid returns. UIMC won a *CIO Magazine*-sponsored “Enterprise Value Award” in 2003 [14]. The value creation process and the strategies that
were undertaken by UIMC can be understood in terms of the three phases associated with our theory of IT value latency. Our theory helps identify strategies that IS managers can implement to minimize the IT value lags. As Joy Keeler, the EMR System conversion leader, pointed out: "This isn't a project; this is a culture change. Transformation has to be the goal of the organization—not just of the chief medical officer or the CIO" [30].

5.2. The Hershey Foods Corporation

Hershey Foods Corp. is a relatively low-end IT user with an annual IT budget of only 1% of total revenue [26]. In early 1996, Hershey began an “Enterprise 21 Initiative,” a $112 million enterprise systems investment to improve inventory management and ensure Y2K compliance [31]. The investment initially created a large drag on firm profitability. Only some time later did the firm begin to see signs of a payoff.

Phase 1: Value Dormancy. Prior to its Enterprise 21 Initiative, Hershey’s last major IT project was a barcode scanning system in the 1980s. As a result, upon initiation of the new project, its technological infrastructure was below industry standards. Its IT infrastructure consisted of mainly mainframe-based hardware. The existing inventory management system lacked the business functionality to support a seamless supply chain process. But, in spite of its low IT capabilities, Hershey still made ambitious plans to implement major IT systems concurrently: an enterprise system from SAP, a customer relationship management system from Siebel Systems, and an inventory management system from Manugistics [50]. In addition, Hershey opted for a direct cutover strategy, so that all of its systems would go live enterprise-wide simultaneously to speed up the implementation process [31]

The preconditions in Hershey (low IT capability, low-tech business processes, and mainframe-based systems) suggest that problems might occur right from the start. Successful implementation of
the three advanced IT systems was likely to be held up by existing firm routines and structures. Hershey failed to analyze the preconditions prior to making the major investments, and chose a risky IT investment plan. The chosen strategy of building and deploying multiple new and complex systems over a short period of time resulted in extensive resistance within the firm, creating the basis for inertia in the creation of IT value. Containing the negative effects of the resistance would require major changes to the firm’s business processes [13]. The failure to manage these problems was acknowledged by Kenneth Wolfe, Hershey’s CEO, who admitted that the project was a failed implementation of new business processes [31].

**Phase 2: Value Triggering.** Resistance to the IT implementation at Hershey Foods led to an extended period of value dormancy. Compounding this problem was a shortage of appropriate value triggers to initiate IT value flows. Throughout the investment, Hershey did not have a CIO among the senior managers in its organizational structure to provide the necessary support and decisions required for the project [21]. The lack of a champion for the project made it difficult to effectively move the initiative forward against all the obstacles blocking its way.

Hershey’s ambitious plan to implement a four-year ERP project within thirty months omitted taking time to educate potential users about the merits that the various systems associated with Enterprise 21 would bring. Unfortunately though, educating users is essential for motivating organization-wide acceptance of the major changes in the firm’s business process that will occur as a result of IT investments, and as a means to nip any resistance in the bud.

Although the entire system went online in July 1999, the lack of appropriate triggers made the value transformation process less effective. The IT systems implementers experienced numerous obstacles that prevented them from integrating the new solutions into the daily operations of the firm. It was months later that Hershey was able to begin modifying its business processes to effectively
leveraging and obtaining value from the new systems.

**Phase 3: Value Transformation.** In the value transformation phase, the business processes and routines at Hershey were reengineered to better align the Enterprise 21 systems with the other IT systems that were still in place. The high coordination costs as a result of the complexity of changes caused many users to be unable to use the software in the new business environment. One consultant from vendor IBM Global Services pointed out that “the business process transformation underway at Hershey is an enormously complex undertaking. [The consultants] are making sure they [Hershey’s employees] are using the business process/software correctly” [31].

Hershey employed various strategies that upset the value transformation process. The training users received for the new system apparently was insufficient and inappropriate. Without proper user training, the complexity of the IT system hindered coordination among processes within the organization. In addition, its primary integration vendor, IBM Global Services, had not previously done systems integration involving the SAP platform and the Manugistics inventory system.

Moreover, the rollout of Enterprise 21 systems was poorly timed. Its value transformation phase coincided with the busiest period of the year, when 40% of the firm’s demand occurs: the Halloween to Christmas seasons [41]. The high transaction volume during this period made it difficult for Hershey to iron out some of the problems that occurred during this phase, leading to delivery backlogs of nearly two weeks, though the firm had about eight days of inventory on hand. The poor timing also created excessive strain on the users, who were required to handle an unfamiliar and increased workload.

Implementing three major IT systems at once created inappropriate complexity in the value transformation phase. This made the implementation of the Enterprise 21 Initiative more challenging and prone to failure than it should have been for Hershey. The coordination difficulties between the systems and the processes related to them retarded the value flows.
**Outcomes.** The poor choice of strategies in the three phases of value flow caused the lags in IT value. Due to the extended period of value dormancy and value transformation, Hershey’s profits declined by 19%, resulting in lost sales of about $150 million for the year [13] The desired value flows only appeared after one year in 2000, when profits increased by 23% [31]. Similar to the case of UIMC, we applied our theory of IT value latency to explain the IT value flows. However, in this instance, we learned how an investment plagued by extensive value lags could be understood through this new theoretical lens.

6. CONCLUSION

We proposed a new theory of IT value latency based on a synthesis of existing knowledge on IT value. Our view is that IT value flows occur in three phases: a value dormancy phase, a value triggering phase and a value transformation phase. Lagged flows of IT value occur as a result of drivers of internal organizational inertia and external environmental inertia that management faces after the investment is made. Only the drivers of internal organizational inertia are typically controllable by management to break through the value dormancy phase. To overcome the inertia, value triggers are required that will drive the investment into the value transformation phase. In the value transformation phase, stakeholders of the system will experience uncertainty, significant changes and increases in coordination costs among one another. The sometimes radical changes that occur are a necessary evil that ultimately help to ensure that a valuable IT payoff will occur with an acceptable lag time. The dynamics influencing each phase stem from the technology, people and processes within the firm.

To establish theoretical validity and consistency for our theoretical perspective, we mapped prior research on the business value of IT onto the proposed dimensions of our theory. To evaluate the generalizability of the theory, we applied the proposed theory in mini-case studies of two firms, UIMC
and Hershey Foods Corporation, that had different experiences with IT value creation. We successfully explained the differences in the lagged IT value experienced by these two organizations.

Although IT value latency is well recognized as an important research problem in Information Systems research [9, 18, 20, 24, 29], no dedicated efforts have been made to fully understand it. We hope that our theory will be the first step towards establishing a more complete understanding of IT value latency.
REFERENCES


