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REVEALING YOUR HAND: CAVEATS IN IMPLEMENTING DIGITAL BUSINESS STRATEGY[1]

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Digital business strategies (DBS) offer significant opportunities for firms to enhance competitiveness. Unlike the large proprietary systems of the 1980s, today's "micro-applications" allow firms to create and reconfigure digital capabilities to appropriate short-term competitive advantage. In the quest to provide value to customers through digitization, such applications can be efficiently deployed. However, we propose that in the long-term not all digitization is desirable. Indiscriminate digital initiatives through the use of micro-applications by a firm could "reveal its hand" to competitors and erode competitiveness. We propose that a firm's DBS must balance its system—software, process, and information—visibility with the ability to appropriate value from such systems. Through a visibility-value framework, and examples drawn from practice, this article illustrates the tradeoffs involved in making these choices as the firm traverses a dynamic business environment. In doing so, it raises sensitivity to an important caveat in digital environments epitomized by hyper-competition and transparency.

Keywords: Digital business strategy, competitiveness, flexibility, phasing, design, digitization

Introduction

The declining cost of replicating, processing, storing and distributing digits gives firms the ability to digitize products and services, conduct analytics, and ultimately implement business strategies that take advantage of digital economics (Porter 2001).[2] Digital economics enable digital business strategies (DBS) that leverage a firm's ability to rapidly deploy systems on developmental platforms. However, in doing so, firms incur the risk of exposing their systems to competitors. Our focus in this article is to raise a note of caution with respect to such DBS implementation.

Many traditional DBS frameworks in the IS literature have a static undertone to discover or influence product–market positions through IT initiatives (e.g., Porter 1996). These initiatives often involved significant in-house development of large-scale information systems (e.g., Merrill Lynch's CMA; American Airlines' SABRE) that were hidden from competitors and difficult to replicate. Today's digital environments differ in two fundamental ways that have profound implications for DBS. First, the digital environment has greater interconnectedness and interdependencies catalyzed by IT that make static analysis difficult and strategic positioning short-lived. Second, the source of competitive advantage is shifting

[1]Anandhi Bharadwaj, Omar A. El Sawy, Paul A. Pavlou, and N. Venkatraman served as the senior editors for this special issue and were responsible for accepting this paper.

[2]Porter argues that the Internet provides a better technological platform than previous generations of IT and that it can enhance traditional strategies.

away from large, proprietary systems and toward "micro-applications" that reside on digitally interconnected platforms.

Micro-applications, also referred to as enterprise mash-ups or composite applications, are applications that perform functions ranging from data retrieval (e.g., UPS's package tracking) to data integration from disparate services (e.g., Kayak's air-fare comparison) to more complex applications that create a business process (e.g., AutoSlash, a car rental monitoring application that rebooks a rental when cheaper options become available). Pahlke and Beck (2010, p. 311) define traditional strategic systems as developed through centralized developmental processes, involving a large number of developers, and with full firm control over the quality and processes of innovation (Gawer and Cusumano 2002). By contrast, micro-application development involves new approaches based on orchestration principles, typically on existing platforms (e.g., the Internet or smart phones). Individual software components that are reusable and interoperable can be mixed and matched to meet the demand for larger, more complex applications within days by an individual, a team, an outsourcer or the open source community, to provide agility and competitive advantage.[3]

Three principal components that comprise the micro-application *system* yield independent or collective sources of competitive value. These are referred to as software, processes, and information (SPI):

Software (S): the application, which could be a product (e.g., an airline checked baggage tracking) or an enabler in the provision of information or services;

Processes (P): defined steps that interact with the software to create a capability (e.g., compile data for mining software);

Information (I): adds value to the firm or to the customer. Information could be an input or output of the software or could be independently provided to the consumer (e.g., customer location to advertisers, or customer tickler when an item becomes available at a sale price).

In contrast with prior work on DBS, our thesis is: *should* the value from SPI be created rather than *can* the value be created? Firms can get carried away by the efficiency and low cost of modular and flexible building blocks of digitization.[4] By digitizing processes just because they *can* be digitized, a firm risks "revealing its hand" to competitors who can imitate faster, better, and cheaper (Vitale 1986). Open architectures, web services, and modular technologies, combined with reverse engineering and rapid deployment of applications, especially on the Internet, make it increasingly difficult to protect innovative information systems. This is in sharp contrast to the environment in the 1980s when proprietary strategic systems required thousands of human-hours of in-house application development and remained hidden from competitors.

In today's hyper-competitive conditions, firms should be sensitive to the transparency that make applications susceptible to imitation. Visibility of systems' SPI *is a choice variable*, often underemphasized in research and practice, and should be evaluated for its ability to appropriate value. A firm can appropriate greater value by strategically hiding some and making visible other components of the micro-application's SPI. We present a framework that illustrates considerations for both visibility and appropriability. Our objective is to bring this important aspect of DBS into corporate consciousness.

Tradeoffs in System Visibility and Value

If the system from which the focal firm successfully appropriates value is visible to external entities, then there is incentive for competitors to imitate and appropriate that value. Of course, value appropriation by competitors depends on the system's degree of embeddedness within complementary assets (Pavlou and El Sawy 2006). The focal firm can, however, shield the system to extract supranormal rents but this comes at a cost. This entails costs of protecting the information, customizing the design, and opportunities lost that might otherwise emerge from "openness" in sharing software, processes, and information. Lack of openness is also likely to inconvenience customers' interaction with the firm. Therefore, firms must assess the tradeoff between managing system *visibility* and *value* of micro-applications when formulating DBS.

[3]We use the term *micro* to represent the typically smaller applications than large-scale strategic systems. Our focus, however, is more on rapid development and not scale. Therefore, Google's search algorithm and other large systems fall well within our thesis.

[4]During the dot com boom there was an implicit bias in favor of greater digitization as business models were handsomely rewarded by venture capitalists and equity markets until traditional concepts of business value caught up with many digital firms.

Managing System Visibility

System visibility indicates the revelatory aspects of the three components—software, processes and information (SPI)—that a competitor can observe, replicate, or improve upon. Thus a key element of system visibility is *what can be discerned* from the visible SPI that makes each vulnerable to imitation. For instance, how an insurance company mines (software) proprietary data to gain insights into customer behavior (information) and then provides a micro-application for customers to customize insurance coverage (process) is less vulnerable to imitation because of its low system visibility. Further, a DBS that leverages unique attributes of the firm, such as a distribution channel, or develops and exploits processes that are hidden from competitors such as Google's search algorithm, are less vulnerable to imitation.

We offer two approaches for firms to manage system visibility: *phasing* (temporal revelation of SPI) and *design* (modular revelation of SPI). Drawing upon real options thinking (Fichman 2004), *phasing* uses the option of planned sporadic releases of the digital application without making the entire digital initiative visible. In doing so, a firm can manage uncertainty and observe competitors' response before exercising its options in the next phase. When uncertainty is high, the pioneer firm can phase its system in such a way that the complete orchestrated plan remains ambiguous to its competitors. It can increase visibility by opening its hidden software, processes, or information, or commoditize the application when the uncertainty is resolved. Consider Medical Health System (MHS)[5] that followed a phased approach to digital application visibility through a comprehensive tracking application. It monitored treatment and outcomes at various points during the patient's hospital visit, yielding valuable performance metrics. MHS' DBS leveraged this information through a phased approach. By exploiting a portion of process level data, it now broadcasts hospitals' real-time emergency room (ER) patient wait times on roadside billboards or via text messages. This is a low visibility DBS phase because MHS does not reveal how it tracks specific processes behind ER wait times, yet it has enhanced competitive value by appealing to patients who need immediate care. While MHS awaits competitors' response, it continues to analyze patient data, for example, from social media including an application that engages parents by providing information regarding nutrition, how-to videos, and available hospital services. This information can be exploited in future DBS phases if MHS feels that it can generate competitive value. It can accelerate or modify phasing depending on competitors' response.

A second approach to managing system visibility is through *design*. Drawing upon the system design perspective (Ramachandran and Krishnan 2008), modular design of a system can be the basis for extracting value by controlling visible and the invisible parts of the SPI. In a modular design, a part of the system can be made visible to competitors while another invisible module remains the real source of value. Consider Netflix that uses Cinematch, a strategically designed movie-ratings system, to make movie recommendations to its customers. The visible part of the system allows users to provide inputs at various points during the online transaction. Although competitors can replicate the interface, the real value lies in the hidden module that comprises vast amounts of data and algorithms that Netflix has refined over the years.

Managing Value

Along with system visibility (low versus high), firms can identify and control the source of value from the system. With low visibility, the value appropriation (low versus high) depends on whether the firm can generate value from proprietary SPI. With high visibility, competitors may imitate SPI but still not appropriate value if the real source of value is in the way SPI leverages the unique complementary assets of the firm. This allows the focal firm to be more flexible in opening up its system. For instance, Goodyear's retail business uses micro-applications for "Search-and-Comparison" and a "Request-for-Quote" on its website to help price-conscious customers choose the right tires and then direct them to an online "Dealer Locator" tool. Although the search tools are common micro-applications, they help Goodyear appropriate value through integration with its distribution and retail outlets. By using digital applications to leverage the physical assets of its distribution systems, Goodyear can be far more flexible in opening up its system and still appropriating value. Similarly, some major investment services firms reveal their system and processes by putting a plethora of micro-applications on their websites but draw synergistic value through their national network of physical offices. Their high-end clients set up online portfolios and then meet investment counselors for advice. While competitors can appropriate some value by imitating the online system, investment services firms gain significant value in provision of high-end services by leveraging the synergy between their micro-applications and physical assets.

System Value–Visibility Framework

The two facets discussed above are presented as a value–visibility framework in Figure 1 to illustrate how a firm can manage visibility and appropriate value. It is important to

[5] Name disguised.

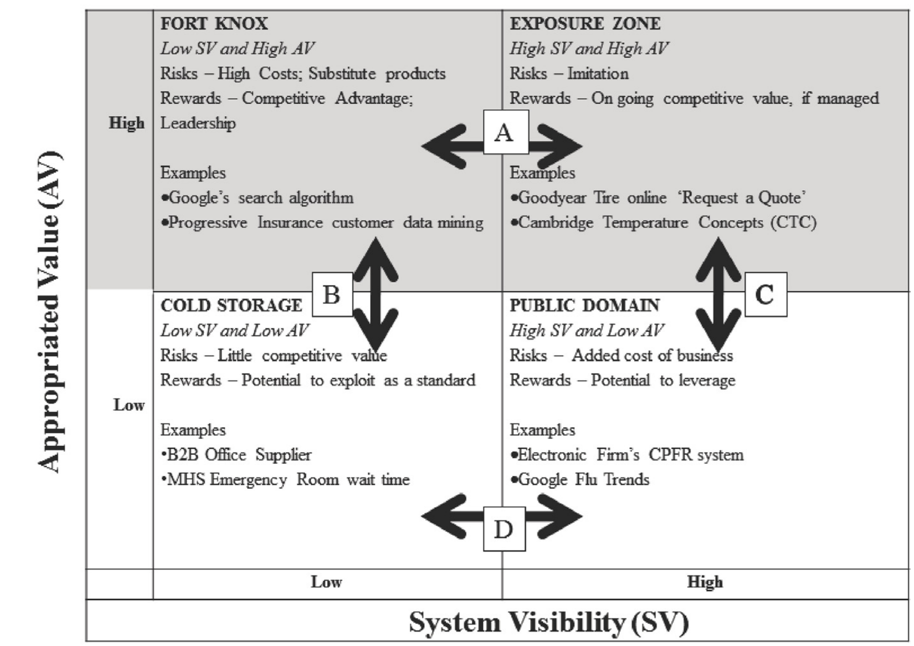

Figure 1. Value–Visibility Framework

note that the unit of analysis is a *system* and its SPI components. Given that firms manage a portfolio of macro- and micro-applications, a firm could have multiple application systems that can be mapped onto the framework's grid. The x-axis, System Visibility (SV), represents the extent to which SPI is visible to customers and competitors. The y-axis, Appropriated Value (AV), represents the extent to which the focal firm can appropriate value.

In Figure 1, the top left cell, *Fort Knox* (low SV, high AV), is a desirable position as the firm appropriates value from a "hidden" system, such as Google's search algorithm, which it zealously guards, or Progressive Insurance, which mines customer data to develop new insurance products. If the system fails to yield value, the application system slips into *Cold Storage* (low SV, low AV), where investments to protect system visibility may not yield commensurate returns. In the top-right *Exposure Zone* (high SV, high AV), firms reveal parts of the system to appropriate "return on visibility" openness benefits also proposed as open innovation (Chesbrough 2007). If the system does not create value, it could slide into *Public Domain* (high SV, low AV), where appropriated value goes to the consumer (not the firm) and the system becomes a part of standard business practice.

In a dynamic environment, however, it is more appropriate for firms to think of how systems move vertically and horizontally within the grid. Firms can orchestrate movement in the grid but in many cases systems "drift" into other cells of the grid due to competitors' action or technological changes. The extent to which a firm's movements are "managed" will cause greater value to be realized from the DBS. In summary, when *managing system visibility,* firms facilitate horizontal movement across the grid (i.e., sustain increased appropriated value through phasing and design). When *managing value,* firms facilitate vertical movement through the grid (i.e., high appropriation through proprietary value and complementary assets). By managing the four movements—marked as A, B, C and D in Figure 1—firms can appropriate higher value as articulated in the following questions for each movement.

Movement A

Key Question: *Can the focal firm generate a return on its system visibility?*

Movement: In the left part of the grid, a firm can appropriate value by hiding its system. In the right part of the grid, the firm increases the visibility of the system's SPI. When competitors get around patent protections or reverse engineer the application, the *Exposure Zone* usually yields short-lived value followed by a slide to *Public Domain*. However, a firm could also manage this movement by phasing or design. The firm could appropriate higher value by increasing visibility of the system than by hiding the system. In some cases, increased visibility has little downside because the system is part of a broader system of complementary assets that is difficult to replicate by competitors.

Illustration: Cambridge Temperature Concepts (CTC) developed a technology for high precision temperature measurement (*Fort Knox*). Building upon this technology, it developed a noninvasive micro-application body patch human fertility monitor. CTC exposed its temperature measurement technology (*Exposure Zone*), which captures and transmits changes in a woman's body temperature. Yet, it created value from this visibility by analyzing a woman's temperature patterns and by informing her of an optimal time for conception. Further, the database, which CTC keeps protected, remains an increasingly rich repository to build future instrumentation products.

Movement B

Key Question: *Can the focal firm appropriate value in the future from low application visibility?*

Movement: The upper half of the grid represents appropriated value from proprietary SPI or a capability. In the lower half, value appropriation deteriorates or fails to ensue. Firms usually don't voluntarily transition an application to the lower half; market forces or insufficient investments lead it there either because the SPI has limited or no proprietary value or competitors have created better value through other substitutable means. Firms with systems embedded in complementary assets are likely to hold their position in the upper grid.

Illustration: A large office supplies company invested in a neural pattern-based data mining software application. The software, coupled with carefully conceived data collection from customers, allowed the company to compile granular cost reports across product lines. The firm was able to appropriate significant value from its business-to-business system, while guarding its external visibility. However, a competitor partnered with another analytics company with superior information and built a better B2B business. The focal firm's application slid into *Cold Storage* because it was no longer viable to protect system value.

Movement C

Key Question: *Can the focal firm appropriate value from high system visibility?*

Movement: In the top-right part of the grid, firms can generate a return (e.g., in the form of innovation) on carefully managed system visibility. In the bottom-right part of the grid the system is visible, making it difficult for an individual firm to appropriate value. In some cases, this downward movement is beyond the firm's control as competitors may be in a position to appropriate higher value from the application. Some firms with capabilities beyond the SPI might have an easier time staying in the upper grid. However, movement C could also be a part of a strategy where the focal firm fosters imitation of the application for public use because it benefits from its broader use, for instance, by expanding its *Fort Knox* applications or by taking advantage of network effects.

Illustration: Having exposed its precision temperature monitoring micro-application (discussed in Movement A), CTC faces a risk of sliding the application into the *Public Domain* if competitors replicate its functionality. CTC may strategically choose a point in time and expose the temperature monitoring application to let it become an industry standard. CTC is in a position to leverage its database and the knowledge of expectant mothers' use of monitoring apps residing in *Fort Knox* to extract value from future applications for prenatal diet, maternity supplements and mitigating pregnancy risks.

Movement D

Key Question: *Is it worthwhile to protect SPI when limited value can be appropriated?*

Movement: In *Cold Storage* firms protect system visibility but with little or no immediate appropriated value, ostensibly for future returns. In *Public Domain* firms open the system, possibly for industry-wide adoption. In both quadrants the firm does not appropriate significant value because the cost of protecting SPI might not be favorable. Given that path D is a lateral transition into continued low appropriated value, it is unlikely to be a firm's priority. However, under certain conditions this path can benefit the firm's DBS if it helps to exploit its other, less visible valuable applications within *Fort Knox*. Reversing course is another actionable way out of *Cold Storage* (path B) but this entails bearing the costs of rebuilding the system and must be balanced against the potential for new value appropriation.

Illustration: A leading electronics firm developed proprietary data exchange and process standards for Collaborative Planning Forecasting and Replenishment (CPFR), a digital application to synchronize its production with retail sales at sellers. Despite protecting its proprietary system, its competitors were able to recreate their own versions of CPFR and the electronics firm's application slid into *Cold Storage*. To avoid the backlash from retailers having to deal with disparate CPFR systems, the electronics firm chose to move its CPFR to *Public Domain* by opening its data exchange and process standards. The electronics firm will leverage the learning from CPFR to further refine its processes and exploit its vendor-managed inventory applications currently residing in *Fort Knox*.

It should be noted that while we have assumed that the *software, process*, and *information* (SPI) have low or high visibility together, in practice each of the SPI components could be managed independently. This is tantamount to representing the value–visibility framework with three separate grids, one each for S, P, and I. For instance, Netflix holds its in-house algorithm-driven software, Cinematch, in *Fort Knox* and extracts value by recommending movies to customers. To thwart competitors' attempt to imitate or to improve the predictive ability of Cinematch, Netflix increased information visibility by exposing a dataset of 100 million movie ratings in *Exposure Zone* as part of a US$1millon contest. By carefully managing its *information* visibility, Netflix is able to appropriate value from open innovation by customers—which has resulted in a significant improvement in its algorithm. (See the Appendix for illustrations of inter-grid movement.)

Implications

Today's competitive advantage is based on a succession of short-term advantages through digital initiatives that are a part of broader DBS. The ease of implementing DBS through Lego®-like micro-application systems allows firms to construct powerful digital initiatives. There is an inclination on the part of business strategists to pioneer high digital content products and services in the hope that their firm can gain first mover advantage. While such moves have indeed benefitted some firms, it is important to be sensitive to "revealing your hand" and the signal that these application systems, and their SPI, sends to competitors. A short-term advantage may come at the cost of long-term value.

Our value–visibility framework has several implications. First, we sensitize firms to the use of system visibility as a tool that covers a gamut of value appropriation tradeoffs ranging from proprietary value to open innovation. We propose that managers should raise questions in their strategic IT planning forums about how to selectively expand system visibility such that it extends current sources of value or create new ones. Second, firms should examine their system components for return on visibility. In doing so, the risk of "imitability" of components can be assessed through embeddedness within the firm's complementary assets. Firms can strategically identify SPI components of their key digital applications and manage visibility such that their actions can expand overall value. Third, using our value-visibility framework, firms can aggressively seek to disrupt competitors' value (D'Aveni 1999) by regulating SPI visibility of their applications on their own terms, for example, by phasing and modular design. Finally, firms should not hesitate to let the SPI of an application slide into *Public Domain* if they are in a position to leverage complementarities, such as physical assets, technical know-how, joint ventures, and patents, particularly if such an action also erodes competitors' positions.

There are several research opportunities for further exploration. First, our thesis that all digitization is not necessarily advantageous needs to be further examined through contemporary cases in the context of emerging theories of competitiveness. Second, our conclusion that digitization can expose a firm to unwanted risks by signaling its high value processes or information needs to be further validated, for example, by modeling risk components of software, processes, and information. Finally, our proposed framework suggests that the ratio of value appropriation to system visibility can serve as a useful construct both at the firm and the industry level in the study of strategic IT systems. Future research can test conditions of high or low system visibility and how firms can maximize value.

Conclusion

Although IS research has dealt with topics of sustainability (Mata et al. 1995) and commoditization (Carr 2003), the importance of system visibility in the context of DBS requires greater consideration. We believe that this is an increasingly important message for forward-looking firms in environments where digital technologies make it easier to piece together business applications, hypercompetition reigns and competitors can capitalize on product-market gaps, and open architectures and sourcing, thus making it easier to imitate. In deploying digital initiatives, firms should evaluate tradeoffs between information content and competitive content, otherwise they risk destroying profits and stifling innovation.

The framework described in this essay offers an approach for firms to examine and evaluate issues of system visibility and appropriation of value. In that sense our goal is modest but, in our opinion, critically important. We aim to sensitize firms to the visibility caveat as a consideration in digitization. Appropriating value through visibility versus proprietary system is a fundamental tradeoff that needs to be carefully evaluated. Our framework provides a tool to begin such an assessment.

References

Carr, N. G. 2003. "IT Doesn't Matter," *Harvard Business Review* (81:5), pp. 41-49.

Chesbrough, H. W. 2007. "Why Companies Should Have Open Business Models," *MIT Sloan Management Review* (48:2), pp. 22-28.

D'Aveni, R. A. 1999. "Strategic Supremacy Through Disruption and Dominance," *Sloan Management Review* (40:3), pp. 127-135.

Fichman, R. G. 2004. "Real Options and IT Platform Adoption: Implications for Theory and Practice," *Information Systems Research* (15:2), pp. 132-154.

Gawer, A., and Cusumano, M. A. 2002. *Platform Leadership: How Intel, Microsoft, and Cisco Drive Industry Innovation*, Boston: Harvard Business School Press.

Mata, F. J., Fuerst, W. L., and Barney, J. B. 1995. "Information Technology and Sustained Competitive Advantage: A Resource-Based Analysis," *MIS Quarterly* (19:4), pp. 487-505.

Pahlke, I., Wolf, M., and Beck, R. 2010. "Enterprise Mashup Systems as Platform for Situational Applications," *Business & Information Systems Engineering* (2:5), pp. 305-315.

Pavlou, P. A., and El Sawy, O. A. 2006. "From IT Leveraging Competence to Competitive Advantage in Turbulent Environments: The Case of New Product Development," *Information Systems Research* (17:3), pp. 198-227.

Porter, M. E. 1996. "What Is Strategy?," *Harvard Business Review* (74:6), pp. 61-78.

Porter, M. E. 2001. "Strategy and the Internet," *Harvard Business Review* (79:3), pp. 63-78.

Ramachandran, K., and Krishnan, V. 2008. "Design Architecture and Introduction Timing for Rapidly Improving Industrial Products," *M&SOM-Manufacturing & Service Operations Management* (10:1), pp. 149-171.

Vitale, M. R. 1986. "The Growing Risks of Information systems Success," *MIS Quarterly* (10:4), pp. 327-334.

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Appendix

Inter-Grid Movement with Software, Process, and Information in Separate Grids ■

We present three scenarios of inter-grid movements. For simplicity, we present one such movement in a graphical illustration (Figure A1).

Scenario 1: Software in Fort Knox and Information in Exposure Zone

In this scenario, companies protect their software assets, but use information judiciously to increase their value. Figure A1 illustrates online movie rental provider Netflix's movement between *software* and *information* components. The in-house algorithm-driven software, Cinematch, is a treasured tool that resides in *Fort Knox* and recommends movies to Netflix customers. To thwart competitors' attempts to imitate, and to improve the predictive ability of Cinematch, Netflix increased *information* visibility by exposing a dataset of 100 million movie ratings (in *Exposure Zone*) as part of a US$1millon contest.[6] The winning team improved the predictive ability of the Cinematch algorithm by 10 percent thus offering significant value appropriation to Netflix. By carefully managing visibility, Netflix appropriated greater value from data that

[6]The contest was called Netflix Prize. More information is available at http://www.netflixprize.com/.

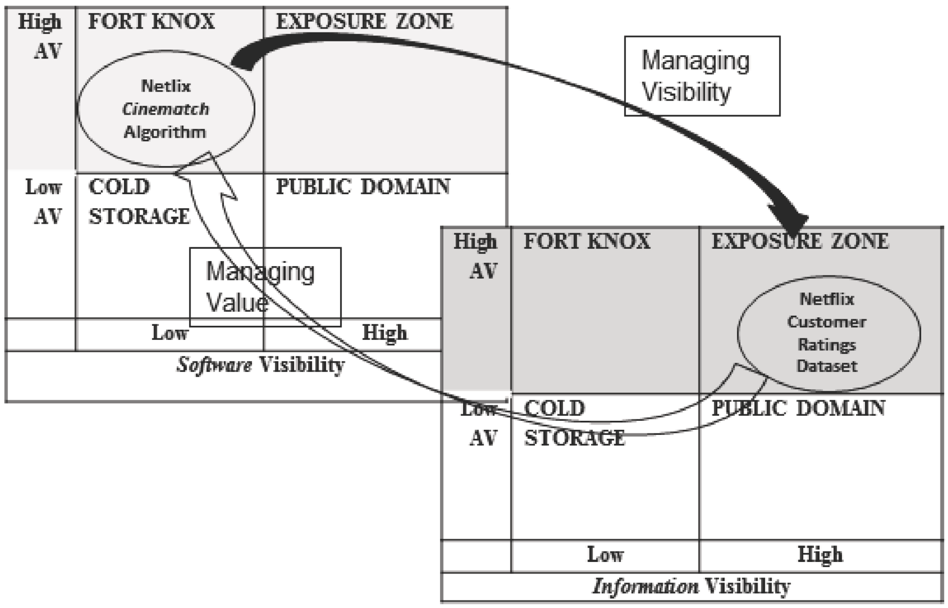

Figure A1. Movement Across Software and Information Grids Shown in Scenario 1

would have otherwise remained hidden in *Fort Knox*. Although by exposing the data Netflix bore some risk of competitor imitation, it managed value by improving the algorithm that was deemed to yield higher net returns.

Scenario 2: Information in Fort Knox and Software in Exposure Zone

In a reverse of Scenario 1, in this scenario a firm opens up its software in order to capture better information. In the case of a fertility monitor micro-application, called Duo-Fertility, CTC increased the visibility of its hidden precision measurement software, thus exposing it to competitor imitation. But it managed the value from information in its database resulting in analytics that remain protected in *Fort Knox*. CTC's future value may emerge from building superior products by refining instrumentation, understanding differences in human physiology, and expanding into other clinical and health maintenance domains.

Scenario 3: Software in Public Domain but Process in Exposure Zone

In this scenario, firms capitalize on the complementarities between applications and physical assets to manage value. Due to inimitability of assets, such firms are less concerned about managing visibility. Therefore, firms can focus upon managing value by configuring SPI components in high visibility quadrants (*Exposure Zone* and *Public Domain*). The Goodyear Tires' micro-application software "Search and Compare" (mentioned in the paper) uses automobile models, driving and performance conditions, and other specifications and is built on commonly used e-commerce tools that reside in the *Public Domain*. This micro-application links customers to "Request a Quote" and "Dealer Locator" applications that can expose Goodyear's process of supply and distribution to customers as well as to competitors. However, Goodyear Tires manages value by leveraging its warehouses, dealerships, and tire replacement facilities through managing higher software and process visibility.