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Chen Zhang
University of Memphis

Qizhi Dai
Drexel University

Deepti Agrawal
University of Memphis

William Kettinger

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IMPACT OF IT PRODUCT COMPATIBILITY INITIATIVES ON THE MARKET VALUE OF FIRMS

Zhang, Chen, University of Memphis, Memphis, TN, USA, czhang12@memphis.edu

Dai, Qizhi, Drexel University, Philadelphia, PA, USA, qd24@drexel.edu

Agrawal, Deepti, University of Memphis, Memphis, TN, USA, dagrawal@memphis.edu

Kettinger, William, University of Memphis, Memphis, TN, USA, wjkttngr@memphis.edu

Abstract

Product compatibility is becoming increasingly important especially in the IT industry due to a high level of network effect in this industry. This study empirically examines the business value of IT product compatibility initiatives with respect to the nature of the compatibility achieved (i.e., horizontal compatibility, vertical compatibility) and the type of focal product (i.e., software, hardware) for which compatibility is achieved. Using event study methodology, this paper investigates the market reaction to announcements of compatibility initiatives over a three-year period. The results show that business announcements associated with horizontal compatibility yield higher abnormal returns than the ones with vertical compatibility. Also compatibility initiatives for software products tend to be associated with a more positive stock market reaction than those for hardware products. Our findings reveal the nuances in IT product compatibilities and the need to develop a richer theory to enhance our understanding of the various IT compatibilities. Our findings also provide business insights to strategic planners and help them understand how and when to invest in IT product compatibilities to obtain positive reactions from investors.

Keywords: Product Compatibility, Horizontal compatibility, Vertical Compatibility, Software, Hardware, Event study.

1 Introduction

The dynamics of the IT industry is very different from many other industries. In the presence of strong network effect, the user value of a product is treated as a function of stand-alone benefits and network externalities. Thus, the value to the consumer increases as the installed base (number of users in the network) of the product expands (e.g., Farrell and Saloner, 1985; Gallaughner and Wang, 2002). Due to a high level of network effect in the IT industry, product compatibility is becoming increasingly important. For example, since the launch of Mac OS X Lion, many incompatibility issues have surfaced, resulting in a wave of compatibility initiatives by a number of firms. Furthermore, as the complexity level and the variety of IT products increase, firms as well as individuals are becoming more concerned with product compatibility issues when evaluating and adopting new products. At the industry level, IT firms' strategic decisions about their products' compatibilities often influence the competitive dynamics in the industry.

Many prior studies have studied the effects of compatibility with respect to value addition to the customers (Katz and Shapiro, 1983) and how it can be seen as a strategic move of a firm to make its products compatible with other company's product or the de facto standards. These studies have been primarily theoretical, often focusing on a specific type of products (e.g., Brynjolfsson and Kremer, 1996) or a specific type of compatibility (e.g., Einhorn, 1992). Recognizing that there exists a great variety of IT products and previous research often identifies different types of compatibility (e.g., Chen and Forman, 2006; Katz and Shapiro, 1994), we conduct a study of compatibility initiatives associated with both horizontal compatibility and vertical compatibility as well as a range of IT products.

Furthermore, we adopt a business value perspective in this research by examining the stock market's reaction to IT firms' compatibility initiatives. Given that firms make significant strategic investments in order to achieve compatibility with other products on the market, we are yet to understand the business value of these strategic moves toward compatibility.

This study attempts to answer two research questions. First, what impact do firms' strategic initiatives that strive to achieve compatibility with other products in the IT industry have on the stock market? Second, under what conditions do initiatives that strive to achieve compatibility with other products in the IT industry pay off in terms of abnormal stock returns? The results of this study not only provide a richer understanding of the nuances associated with IT product compatibility and the business value of IT compatibility initiatives but also offer practical implications to strategic planners who are making product compatibility decisions.

2 Literature Review and Research Model

2.1 Product compatibility

Product compatibility refers to interoperability or the extent to which two or more products can work with one another. For example, Katz and Shapiro (1986) consider two units of hardware that can work with identical units of software to be compatible. Compatibility is made possible by coordinated product design and can be categorized into physical compatibility, communications compatibility, and compatibility by convention (Farrell and Saloner, 1987). The degree of compatibility between products is considered not only the result of a technological decision but also the result of a strategic decision by the firm (Besen and Farrell, 1994).

Compatibility can be achieved in several ways. For products where the competing technologies are inherently incompatible, compatibility may be achieved through de facto standardization where all consumers adopt the same technology used by the market leader (Katz and Shapiro, 1986). Alternatively, products using different technologies may be designed in such a way that they have a

standardized interface agreed upon by manufacturers and can work with one another, achieving technical compatibility (Farrell and Saloner, 1987; Katz and Shapiro, 1986). In addition, manufacturers may adopt open standards that are not set by any firm (Chen and Forman, 2006). Conversion technologies can also be used as an alternative mechanism to achieve compatibility (Liu et al., 2011).

There has been a significant amount of research in economics and IS that examines incentives for achieving compatibility in an industry with network effects as well as the implications of achieving compatibility. One consumer obtains more value from a product when another consumer has a compatible product. In addition, compatibility among products may intensify price competition among vendors, leading to greater value obtained by consumers (Farrell and Saloner, 1985). Hence, when two firms' products are compatible, the compatibility creates more value for consumers and draws more consumers into the market, increasing network size and further enhancing the value of firms' products (Chen, Doraszelski, and Harrington 2009). Other benefits of compatibility include ease of communication and cost savings due to mass production of standardized parts when standards are adopted to achieve compatibility (Farrell and Saloner, 1986). Furthermore, firms with small user bases have strong incentives to make their products compatible with products of firms with larger user bases in a duopoly as well as markets with multiple firms and components (Katz and Shapiro, 1985; Economides 1989). However, some studies have argued that achieving compatibility with other firms' products may not be desirable to firms with a large installed base because it may lose market share to other firms and be unable to demand higher prices for its products (Gandal, 1994; Brynjolfsson and Kemerer, 1996; Gallagher and Wang, 2002).

However, the studies summarized above are primarily theoretical with limited empirical support. In the recent years, a few empirical studies have been conducted to examine the impact of product compatibility. For example, Aggarwal et al. (2006) examine the financial market's response to announcements of XML standardization initiatives and find that the market responds positively to announcements of proprietary standardization but not to those of open standardization. Aggarwal et al. (2011) study how the number of firms in standard-setting initiatives influences the participating firm's return and risk including market risk and idiosyncratic risk. In the US cable modem market, Cohen-Meidan (2007) investigates the influences of two standardization processes – one involving a commercial consortium and the other involving an official standardization organization – on both within standardization group competition and competition between standards.

Based on the empirical findings of these studies, we hypothesize a positive impact of compatibility announcement on the firm's abnormal stock returns. In the financial market, when a firm makes an announcement about its product compatibility with another firm's product(s) or standards, rational and informed investors are likely to expect that this compatibility information will increase consumers' welfare and positively influence the future revenues of the firm and its present value. Hence, under the efficient market hypothesis, such favorable expectations of the change in the firm's value will likely lead to the firm's positive abnormal stock returns. We hypothesize that

Hypothesis 1: Involvement in product compatibility initiative results in positive abnormal stock returns for firms and its stock holders.

2.2 Horizontal compatibility and vertical compatibility

Depending on the relationship between two products that are compatible, previous research distinguishes between vertical compatibility and horizontal compatibility (e.g., Besen and Farrell, 1994, Chen and Forman, 2006).

Vertical compatibility refers to compatibility with complementary products from different manufacturers (e.g., Einhorn, 1992; Katz and Shapiro, 1994). An example of vertical compatibility is the support of the desktop PC operating system DOS and associated hardware platform IBM PC for

complementary applications and peripheral devices, that was critical to the dominance of Win-Tel systems in the early PC market (Gandal, Greenstein and Salant, 1999).

Given two firms produce two complementary components of a system, when these components are compatible, consumers can mix and match the firms' components. In other words, they can obtain components from different firms and assemble their own systems. Thus, the number of different systems available to consumers is greater with vertical compatibility than without it. As a result, some consumers can obtain a system that better satisfies their need, shifting the industry demand curve upwards and increasing the market profitability (Matutes and Regibeau, 1988). A firm's strategy with regard to its vertically related firms often focuses on increasing the supply of complementary products compatible with its own product while trying to discourage such a supply to its competitors (Besen and Farrell, 1994). In addition, vertical compatibility between two firms' components increases the components' prices and the firms' profits (Einhorn, 1992). Furthermore, a virtual network effect arises when an increasing number of adopters of a focal product increase the demand for compatible complementary products and the variety of such products. Such an increase in the availability of the variety of complementary products increases the benefit of all adopters of the focal product (Gandal, 2002). The consumers who purchase the focal product and the compatible complementary products form a virtual network. When the focal product is compatible with a greater number of complementary products, the virtual network size and virtual network benefit increase.

Horizontal compatibility refers to compatibility with competitors' comparable products (Katz and Shapiro, 1994) that are functionally equivalent. An example of horizontal compatibility is the interoperability between two routers (Chen and Forman, 2006).

Given two firms producing comparable products in a market with network externalities, making their products compatible has several implications. First, the network size will likely increase because additional consumers who do not want to be locked in to a single product may be attracted to the network due to the compatibility between the two products. Secondly, the increase in the market size may also lead to the investor's favorable assessment of the firms' future value due to indirect network effect, which arises when a bigger market increases the demand for and the supply of complementary products (Gandal, 2002). Thirdly, as pointed out by Besen and Farrell (1994), in the long run, the co-existence of incompatible products on the market may be unstable and eventually a single winning standard will dominate the market. When the investor perceives the increased market size as a result of the horizontal compatibility announcement, the investor may also perceive an increased likelihood that these products will emerge as the de facto standard in the future, leading to favorable expectations about the impact of the announcement on the firm's value.

However, horizontal compatibility may intensify the competition between the comparable products. When horizontal compatibility with rivals' products is present, competition between the products may be channeled into other dimensions such as price, service, and product features (Besen and Farrell, 1994). In other words, vendors may need to make strategic enhancement to their products to increase product differentiation, improve product functionality, or to improve customer service in order to acquire new customers and retain existing customers (Chen and Forman, 2006). Hence, when competitors' products are made compatible, the competition may intensify but the specific impact of such competition on each firm may not be clear to investors. If the firm is able to successfully distinguish its product in price, service, or features, the impact of horizontal compatibility may be positive. But if the firm is unable to do so, it may suffer from achieving horizontal compatibility with its rivals' products.

In summary, on one hand, both horizontal compatibility and vertical compatibility tend to increase the market size but in different ways. The additional consumers attracted by compatible complementary products tend to be those who would like to mix and match the components produced by different firms. The additional customers attracted by compatible comparable products tend to be those who

perceive the products to be more valuable because of the anticipated larger user base, the perceived increased availability of complementary products, and the perceived emergence of de facto standard from these products. Hence, we hypothesize the positive effect of horizontal compatibility as

Hypothesis 2a : Companies obtain higher abnormal stock returns from a horizontal product compatibility announcement in comparison to a vertical product compatibility announcement.

On the other hand, horizontal compatibility may intensify the competition between the comparable products because firms may need to increase product differentiation, improve product functionality, and provide value to customers in such a way that helps acquire and retain customers (Shapiro and Varian, 1999). In contrast, vertical compatibility is unlikely to alter the intensity of the competition between the firms. When horizontal compatibility intensifies the market competition to such an extent that a firm's customer base decreases despite the increase in the overall market size for all firms producing comparable products, this firm may be perceived less favorably by the investors than a firm announcing a vertical product compatibility. Therefore, we propose the following competing hypothesis:

Hypothesis 2b: Companies obtain higher abnormal stock returns from a vertical product compatibility announcement in comparison to horizontal product compatibility announcement.

2.3 Software compatibility and hardware compatibility

In addition, we argue that the impact of product compatibility announcements is different for software products and hardware products. The cost of achieving software compatibility is likely lower than that of achieving hardware compatibility. As information goods, software is costly to produce but can be reproduced with low marginal cost. To make existing software compatible with other products, the firm needs to invest resources in modifying the existing code but does not need to invest in additional equipment and materials. And the existing customers can install software patches to obtain the newly implemented compatibility benefits. In contrast, to make existing hardware products compatible with other products, the firm incurs greater cost (both fixed cost and marginal cost) in modifying the design, manufacturing, and assembling the modified products. In addition, hardware producers face the possibility that the earlier models of the product may become obsolete once the newer, compatible model is made available to customers, leading to lost revenue and additional inventory cost. From the customer's perspective, unlike software upgrade that can be achieved by patch installations, hardware upgrade often requires the customer to replace the existing product with the new one. Consequently, we posit that achieving software compatibility for existing software products is less costly and risky than achieving hardware compatibility and that shareholders may perceive achieving software compatibility more favorably than hardware compatibility. Therefore, we hypothesize that:

Hypothesis H3: Companies obtain higher abnormal stock returns from announcing software product compatibility than from announcing hardware product compatibility.

3 Research Method

A common method to estimate the stock market reaction to news announcements is through event studies which evaluates the signs and significance of the abnormal returns following the news announcements.

Event studies are based on the assumptions that capital markets operate efficiently and that all information available to the market can be incorporated into the stock price. Consequently, as new information is provided to the market in the form of a firm's announcements about its strategies, operations, and performances, the market should quickly incorporate the new information into the firm's stock price. The event study method has been widely adopted to examine the impact of business events on shareholder value and risks. IS researchers have also examined abnormal returns on stock

prices and short-term changes in market value caused by IT related events such as e-commerce announcements (e.g., Subramani and Walden, 2001; Dewan and Ren, 2007), announcements of transformational IT investments (Dehning, et al., 2003), announcements of CIO positions and hires (Chatterjee, Richardson and Zmud, 2001), BPO announcements (Duan et al., 2009) etc. Konchitchki and O'Leary (2011) provide a review of event studies in information systems discipline.

The event of interest in this study is the announcement of a product compatibility initiative of a firm. An important assumption of the event-study methodology assumes that the information contained in the compatibility initiative announcements is not anticipated by the market beforehand. We expect the market to revalue the firm based on the information conveyed in the news announcement (e.g., Dos Santosh et al., 1993; MacKinley, 1997; Aggarwal et al. 2006). Abnormal return is defined as the difference between actual return of the stock and the expected "normal" return based on the so-called market model, which relates stock returns R_{it} to the returns on the market portfolio R_{mt} as follows:

$$r_{it} = \alpha_i + \beta_i r_{mt} + \varepsilon_{it} \quad (1)$$

where i and t index the firm and date of returns relative to event respectively. This model is estimated over an estimation window usually 120 days or more prior to the event. The abnormal return on stock for the firm i for each day in the event window ($T1, T2$) is given by the difference between the actual ex post return and the predicted return from the market model,

$$AR_{it} = r_{it} - (\alpha_i + \beta_i r_{mt}) \text{ for } t \in [T1, T2] \quad (2)$$

where α_i and β_i are the parameter estimates from model 1. The daily excess return over the event window was cumulated to get Cumulative abnormal return (CAR). Using the variance of CAR, the cumulative returns over the event window can be standardized to obtain Standardized Cumulative Abnormal Returns (SCAR) to smooth out any stock specific variations in the cumulative abnormal returns.

3.1 Data collection

Adopting the method that is used in past event studies (e.g. Dehning et al., 2003; Aggarwal et al. 2006; Dewan and Ren, 2007; Aggarwal et al. 2011), we collected news releases or public announcements about product compatibility by searching LexisNexis Academic Universe database. Our search used the combination of the following keywords: enhance or obtain or achieve or improve or gain or increase, product, and compatible or interoperable. For the period from year 2001 to year 2003, we identified 233 announcements that were made by publicly traded companies containing the specified key words. The period is suitable for study as it is the period after the software boom and avoids confounding effects from that period. In addition, new product announcements where compatibility is one of the several features were excluded from the sample to avoid potential confounding effects. Announcements that did not mention a specific product including announcements involving development of a new standard were excluded. To avoid confounding effects due to other events like mergers and acquisitions, earning announcements or changes in the board of directors in the period of 2 days before the focal event to the event day we removed such announcements. We included only the publicly traded US firms and excluded private firms in the analysis due lack of availability of required data. The returns data was collected from CRSP (Center for Research in Security Prices) database In accordance with prior studies (Aggarwal et al., 2011; Dewan and Ren, 2007). We collected the data for 180 calendar days before and after the event, which would be equivalent to about 120 trading days. We also excluded firms with an average trading price of less than \$1 or with less than 60 trading days of data before or after the event date. After removing duplicates and observations that have missing stock or financial data, we obtained 184 observations.

For these observations, two authors performed a content analysis to identify the type of compatibility (horizontal vs. vertical) and the type of product in the announcement (software vs. hardware). 14 observations were dropped because the announcements either did not clearly specify the type of compatibility or the type of product, or contained more than one type of compatibility. Table 1 shows an example of news announcement in our sample.

Business Wire

April 5, 2001, Thursday

Quantum|ATL Certifies the Emulex LP8000S SBus HBA With its Fibre Channel-Based Network Storage Solutions

DATELINE: IRVINE & COSTA MESA, Calif., April 5, 2001

BODY: Certification Assures Complete Interoperability of Best-in-Class Network Storage Products for Increased Availability and Manageability of Open SAN Systems

Quantum|ATL, a unit of Quantum's DLT and Storage Systems Group (NYSE:DSS) and a leading supplier of intelligent DLTape(TM) automation products for networked computers, and Emulex Corporation (Nasdaq:EMLX), the world's leading supplier of storage networking host bus adapters (HBAs), today announced that the Emulex LightPulse(R) LP8000S SBus Fibre Channel (FC) HBA has been awarded certification of interoperability with Quantum|ATL's SAN solution offerings for Sun Solaris environments. Certification of the Emulex LP8000S provides customers with the assurance that this product is not only compatible with Quantum|ATL's P1000, P2000 and P3000 Series FC tape libraries, but also will perform with Quantum|ATL-certified solutions in a SAN environment.

"Our certification process consists of rigorous laboratory testing of the product in a Quantum|ATL SAN environment. The Emulex LP8000S SBus host bus adapter demonstrated the performance and reliability demanded by our mutual customers," said Richard Toomey, technical marketing SAN engineer, Quantum|ATL. "With this announcement, our SAN customers can now choose both PCI and SBus host bus adapters from Emulex with full confidence of interoperability with our SAN solutions."

Among the powerful benefits provided by the Emulex LP8000S is the HBA's support of device scanning at boot prompt and firmware updated with the driver load during system start-up. Additionally, the card supports BINDINGS, which enables it to maintain system level operation through SAN channels. The LP8000S is certified for use in Solaris 2.6 and 2.8 environments.

"Our LP8000S leverages the feature rich architecture of our market-leading LP8000 PCI products, so customers may now enjoy the same robust performance and reliability in both PCI and Sun SBus environments running Solaris. Our LightPulse family of HBAs provide a unique combination of features required for mission-critical enterprise applications, including full fabric support, high data integrity, full-duplex operation, data buffering for up to 100km of cabling, and support for all Fibre Channel topologies," stated Mike Smith, executive vice president of Worldwide Marketing at Emulex. "Quantum|ATL's certification of our new SBus HBA provides significant benefits to our mutual customers who require robust, interoperable solutions."

Emulex host bus adapters are also supported by a rich suite of software for storage protocol (SCSI), network protocol (IP), as well as multi-protocol (SCSI and IP) operation, which makes them a perfect solution for Quantum|ATL's advanced SAN and network applications. Emulex also provides a wide range of operating system support, including Windows NT and 2000, Solaris, AIX, Linux, HP-UX, and NetWare.

Table 1. *An Example of Compatibility Announcement*

3.2 Analysis

Hypothesis testing was carried out using the typical event study model following previous studies (MacKinlay, 1997; Subramani and Walden, 2001; Duan et. al., 2009). We used three day event window in accordance with prior event studies (Aggarwal et. al. 2011, Dewan and Ren, 2007). We used CRSP equally weighted index for market returns and obtained individual firms' market adjusted returns. We aggregated the ARs over the three day event window to get the CAR for 3 days and as suggested by prior studies, standardized the CAR to get the standardized cumulative abnormal returns (SCAR), over the 3- day window as suggested by Campbell, Lo and MacKinlay (1997). To test H1, we calculated the z-statistic for the standardized cumulative abnormal returns (SCAR) of the portfolio of N=170 observations.

To test the hypotheses H2 and H3, we conducted independent sample t-test with SCAR as the test variable and Horizontal (=1 for horizontal compatibility; =0 for vertical compatibility) or Software (= 1 for software product; =1 for hardware product). The parametric tests indicated above are limited by the assumptions about the distribution of the abnormal returns. To overcome these limitations and ensure robustness of results, prior research (McWilliams and Siegel, 1997) has suggested using non-parametric tests. To supplement our results we run Wilcoxon-Rank-sum test and regression with additional control variables.

4 Results

The distribution of the observations is summarized in Table 2. The descriptive statistics including mean, standard deviation, median and the quartile ranges of abnormal returns viz. AR (-1), AR (0), AR (+1) for each day in the event window, cumulative abnormal returns (CAR) over the event window and, standardized cumulative abnormal returns (SCAR) over the 3-day event window are shown in Table 3. As indicated, a firm receives 0.77% abnormal return over a 3-day window by announcing a compatibility initiative, while average event day abnormal return is 1.08%.

		2001	2002	2003	Total
Compatibility Type	Horizontal compatibility	26	6	8	40 (23.53%)
	Vertical Compatibility	68	26	36	130 (76.47%)
	Total	94	32	44	170 (100%)
Product Type	Software	50	18	24	92 (54.12%)
	Hardware	44	14	20	78 (45.88%)
	Total	94	48	66	170 (100%)

Table 2. *Distribution of Event Sample*

Variable	Mean	Std. Dev.	Minimum	1st Quartile	Median	3rd Quartile	Maximum
AR (-1)	-0.0041	0.0409	-0.1055	-0.0318	-0.0045	0.0173	0.1679
AR (0)	0.0108	0.0519	-0.1207	-0.0190	0.0040	0.0355	0.2264
AR (+1)	0.0010	0.0494	-0.1937	-0.0245	0.0003	0.0199	0.1925
CAR	0.0077	0.0808	-0.2557	-0.0425	-0.0029	0.0476	0.3034
SCAR	0.0739	0.9106	-2.3119	-0.5102	-0.0353	0.6539	3.5509

Table 3. *Descriptive Statistics for Abnormal Returns*

Table 4 shows that, out of 170 announcements, 40 are related to horizontal compatibility and 130 are related to vertical compatibility while 92 are related to software products and 78 are related to hardware products. Table 4 also summarizes the results of hypothesis testing as discussed below.

Hypothesis	Sample Size		SCAR Mean	Parametric tests (one-tailed t-tests)		Non-parametric tests (Wilcoxon rank sum test)	
				Statistics	Significance	Statistics	Significance
H1	Total	170	0.0739	0.9629	0.1678 (z-test)		
H2	Horizontal	40	0.3700	2.3848	0.0091	1.99	0.0233
	Vertical	130	-0.0173				
H3	Software	92	0.1691	1.4858	0.0696	1.52	0.0643
	Hardware	78	-0.0384				

Table 4. Standardized Cumulative Abnormal Returns and Hypothesis Testing Results

The first hypothesis H1 relates to the overall effect of compatibility announcements to yield positive abnormal returns. The z-statistic in Table 3 is not significant. Thus we found no support for overall positive impact of a product compatibility announcement on the firm's valuation as suggested by H1.

Mean value of SCAR for horizontal compatibility is 0.3700 while the mean SCAR for vertical compatibility is -0.0173. The difference of mean yields a t-statistic of 2.3848, which is significant with one-tailed test at 95 % confidence level ($p=0.009$). Multiple regression analysis controlling for size of the firm and year of the announcement, yields a standardized coefficient of 0.181 for the dummy variable horizontal, which is significant at 95% confidence level ($p=0.019$). Non-parametric test Wilcoxon rank sum test yields a z-score of 1.99, which is significant at 95% confidence level ($p=0.023$). As a result, we find support for H2a. Thus firms obtain higher positive abnormal stock returns from a horizontal product compatibility announcement in comparison to comparison product compatibility announcement.

Similarly to test H3, we conducted an independent sample t-test on SCAR as test variable by regrouping it by dummy variable software. Mean value of SCAR for software announcements was 0.1691 and mean SCAR for hardware announcements was -0.0384. The t-statistic of the mean difference is 1.4858, which is significant at 90% confidence level ($p=0.0696$). Regression analysis controlling for the size of the firm and year of announcement yielded a standard coefficient of 0.130 which is significant at 90% confidence level ($p=0.090$). Wilcoxon rank sum test Z-score was 1.52, significant at 90% confidence ($p=0.0696$). This gives a weak support to H3.

5 Discussion and Conclusion

Overall, the results suggest that the chances of getting a positive or negative abnormal return from the stock market as a reaction to a product compatibility announcement depends upon the type of the compatibility achieved and the type of products involved. We find that investors tend to respond positively to a horizontal compatibility initiative rather than a vertical compatibility initiative. In addition, the financial market seems to respond to software product compatibility announcements more positively than hardware product compatibility initiatives.

Although a rich body of theoretical research on network effects identifies and analyzes the incentives for achieving product compatibility and the impacts of product compatibility on market competition, firm value, and social welfare, there has been a scarcity of empirical studies on the business value of strategic decisions related to product compatibility. Different from two event studies (Aggarwal et al. 2006 and Aggarwal et al. 2011) that focus on stock market's reaction to standardization initiatives,

which represent one of several means to achieve product compatibility, we investigate the business value of IT product compatibility initiatives in general. Theoretically, through comparing the effects of product compatibility initiatives across types of compatibility and across product types, we extend the network externality research by contextualizing it to the IT industry. Our findings reveal the nuances in this context that have been largely ignored in the existing theoretical research on network effects. We identify the need to further develop richer theories that emphasizes the differential impact of different types of IT product compatibility on different IT products.

From a managerial perspective, the findings provide some insights that can help firms' strategic planners identify how and when to invest in IT product compatibility in order to obtain a positive market reaction to their compatibility strategies.

As it is with most of the event studies, this study considers only the publicly traded firms in the United States because of the constraints on availability of the data. Another limitation is associated with our sampling time period. Although the authors feel that the announcements were comparable over the years, future research may look into the issue with more recent data and compare and contrast the findings over the years. In addition, future research may examine the possible interaction effects between compatibility types and firm size or compare them across different industries. Overall, this study has the potential to contribute to the literature on compatibility and network effects by expanding our examination of the effects of different compatibility types and developing a richer theory about product compatibility.

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