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Abstract

Facing uncertainty about whether to adopt a new technology, firms rely on both external and internal sources of information. Firms may learn vicariously about the desirability of adoption; a large body of research has demonstrated a tendency for firms to imitate rival adopters. Organizations with multiple units may also learn from their own experience once an initial unit of the firm has adopted. This article uses data on the establishment of websites by consumer magazines during the early internet era to test the hypothesis that multi-unit firms pay less attention to rivals after an initial unit of the firm has adopted. Consistent with this hypothesis, it is found that the influence of rivals drops sharply following the initial adoption. One explanation for the shift is that vicarious learning becomes less valuable once richer information becomes available from internal sources.

Keywords

consumer magazines, internet, multi-unit firms, organizational learning, technology adoption, vicarious learning

When a new technology is developed, firms must choose whether and when to adopt it. This decision is similar to a range of other decisions that managers make, such as whether to diversify (Haveman, 1993), whether to adopt a new market position (Greve, 1998) and whether to enter a new geographic market (Greve, 2000). Managers often make these decisions under great uncertainty, where the decisions of rivals can convey information about the desirability of adoption. While all firms can learn from these external adoptions, multi-unit firms can also learn from their own prior internal adoptions. As multi-unit firms gain experience, they may pay less attention to external sources.

In this study we examine this transition from external to internal learning. Our empirical context is the adoption of websites by consumer magazine publishers during the early years of the world wide web. We focus primarily on multi-title publishers and the change in their response to adoptions by rivals. We find that after one of the publisher's magazines has established a

website, the influence of rival adopters on the publisher's subsequent website adoption decisions declines sharply.

Our analysis lies at the nexus of several streams of literature on learning and technology adoption. Within the learning literature, studies of inter-organizational learning (Ingram, 2002) have focused on learning from others, whereas studies of intra-organizational learning (Argote and Ophir, 2002) have focused on how firms learn from their own experiences. Most investigations have considered one type of learning or the other, although a growing number of studies have addressed them jointly (e.g. Baum and Dahlin, 2007; Baum and Ingram, 1998; Baum et al., 2005; Beckman and Haunschild, 2002; Menon and Pfeffer, 2003). In this article, we consider both forms of learning, and whether they are substitutes or complements, in the context of multi-unit firms. Thus, we help to bring together these different strands of literature on organizational learning.

The literature on technology adoption provides extensive evidence of vicarious learning. Numerous studies have found that adoption by rivals increases a firm's propensity to adopt a new technology or practice. This pattern has been observed across a variety of organizational settings, from hospitals (Burns and Wholey, 1993) and municipal governments (Tolbert and Zucker, 1983), to radio stations (Greve, 1998) and savings and loan associations (Haveman, 1993). Moreover, imitative behavior of this sort has been found in a broad range of decisions involving corporate strategy and structure (Fligstein, 1985, 1991), market entry (Gimeno et al., 2005; Greve, 1998, 2000; Haveman, 1993) and new technologies (Hannan and McDowell, 1987; Levin et al., 1992).

In contrast to this large body of research on vicarious learning, relatively few studies have examined experiential learning in multi-unit firms, where information may be transmitted across business units. For example, Baum et al. (2000: 766) found that experiential learning leads chains to acquire firms 'geographically and organizationally similar to their own most recent and most similar prior acquisitions and their own current components'. Similarly, Darr et al. (1995) showed that greater unit and chain experience is associated with declining production costs in pizza stores, while Ingram and Baum (1998) found that chain affiliation and higher levels of operating experience tend to decrease the failure rates of Manhattan hotels. Most relevant to our study is research by Greve (1995, 1996, 1998), which showed that in multi-unit firms, sibling adopters – business units owned by the same firm that have already adopted – increase a business unit's propensity to adopt a new technology.

A growing number of studies have examined the relationship between vicarious and experiential learning. For example, Baum and Dahlin (2007) examined how performance pressures may lead firms to learn more directly from others than from their own experience, and Menon and Pfeffer (2003) considered factors such as status and information scarcity that may lead managers to value external over internal knowledge. Baum and Ingram (1998) found that hotel organizations benefit from population-level experience that occurred prior to their founding, but after founding hotels benefit more from their own experience – i.e. the founding date of the firm demarcates a shift in information sources. Nevertheless, no published study has considered how, in an established firm, internal experience with a new technology may alter the importance of vicarious learning. Perhaps the study that comes closest to addressing this question is Guillen's (2002) analysis of foreign market entry, which finds that the influence of home-country rivals entering a foreign market diminishes once a firm has entered that market. Guillen suggests that 'the information and legitimacy value of the actions of other firms from the same home country industry decrease as the firm gains first-hand knowledge and experience in a foreign country' (Guillen, 2002: 520).

Building on and combining these research streams, we consider the following question: In a multi-unit firm, how does the influence of rival adopters change once a unit of the firm has adopted the new technology? We posit that in multi-unit firms, prior adoption experience provides information that weakens the influence of rival adopters on the subsequent adoption decisions of the remaining business units. This would arise, for example, if internal and external information are substitutes for each other.

Using a unique dataset of magazine website adoptions, we estimated a discrete-time hazard model to compare the influence of rival adopters on a publisher's initial and subsequent decisions to adopt websites for its magazines. The results provide strong evidence that firms learn from rival adopters and also from their own experience. Both rival and internal adoptions had a positive effect on a magazine's hazard rate of adoption. Furthermore, we find that in multi-title publishers, prior adoption experience weakens the influence that rival adopters exert on the firm's adoption decisions. In particular, the influence of external adopters falls sharply once a multi-title publisher has established a website for one or more of its magazines.

By distinguishing the learning processes of firms with and without adoption experience, our findings suggest some boundary conditions for theories of imitation and learning. Theories that predict organizational adaptation through vicarious learning may not apply equally to all firms. Our findings suggest that multi-unit firms may enjoy advantages in their ability to share and develop knowledge internally.

More broadly, this study contributes to our understanding of imitation and the diffusion of new technologies. Imitative behavior can have both positive and negative implications for firms and society, and a deeper understanding of such behavior may help managers and policy-makers to avoid negative outcomes (Lieberman and Asaba, 2006).

Theoretical development

Vicarious learning from rival adopters

When choosing to adopt a new technology or practice, firms are generally uncertain about the effect that adoption will have on profits. Boundedly rational managers do not know all the benefits and costs of the new technology. Because of this uncertainty, rival adoption may provide useful information. There are three ways in which a firm can vicariously learn from rival adopters.

First, a firm may be able to learn by observing how the technology or practice is implemented by rival adopters. Such knowledge 'spillovers' may allow later adopters to adopt the new technology at a lower cost than previous adopters (Reinganum, 1981, 1982). In this case, rival adopters increase a focal firm's incentive to adopt by reducing the cost of adoption. For example, in the context of magazines and the world wide web, publishers were able to observe the websites of rivals and could often copy the format of rivals' sites relatively easily.

Second, a firm can learn from the experiences of rivals that have adopted the new technology or practice (Abrahamson and Rosenkopf, 1993). By observing rivals, a firm may be able to learn something about the costs and/or benefits of adoption. This can drive outcome-based imitation (Haunschild and Miner, 1997), where firms base their adoption decisions on the outcomes that rival adopters experience. If a firm observes rival adopters enjoying positive effects from adoption, then this will increase its own likelihood of adoption.

These two modes of learning require strong assumptions about information flows (Abrahamson and Rosenkopf, 1993). In the case of technology spillovers, non-adopters must have access to information about adopters' technology, while in the case of outcome-based imitation, they must

be able to observe adopters' payoffs. Adopters have strong incentives to protect this information from rivals (Abrahamson and Rosenkopf, 1993). Moreover, this information must be available in a timely manner to be useful. If information about the benefits of adoption is available only with a lag, non-adopters may not be able to wait, as they would risk letting early adopters gain first-mover advantages (Abrahamson and Rosenkopf, 1993).

The third way in which firms can learn from rival adoption requires only that adoption decisions be visible. Here, a non-adopter does not observe adopters' payoffs, but the decision to adopt may signal that a firm has private information about the value of adoption (Bikhchandani et al., 1992; Greve, 1998). By adopting the new technology, adopters indicate that they believe that the benefits exceed the costs. Other managers may determine that if rivals deem adoption beneficial, then their own firm, too, is likely to benefit from adoption. Such managers may rationally disregard their own prior beliefs and imitate others. This is because the adoption decisions of others convey private information about the benefits of adoption, which can trump prior beliefs that adoption may not be profitable. When managers make decisions in this way, following the behavior of rivals while ignoring their own assessments, this process is known as an information cascade (Bikhchandani et al., 1992).

Because of these opportunities to learn vicariously from rival adopters, we offer the following baseline hypothesis (which we include for theoretical completeness rather than for its original contribution):

HYPOTHESIS 1 The number of rival adopters reduces the time until a firm adopts a new technology.

Experiential learning from prior adoption

While all firms can learn from rival adopters, multi-unit firms can also learn from their own prior adoption experience. This experience of units within the firm provides another source of information that can influence the firm's subsequent adoption decisions. Internal adopters can provide information about performance, and most importantly, about implementation (Greve, 1998). Recent work on inter-organizational learning posits that 'a relationship between organizations greatly facilitates learning between them' (Ingram, 2002). Sibling units typically have incentives to share information, and there are established channels for knowledge transfer within the corporation (Darr et al., 1995; Greve, 1995, 1996). For example, regular corporate meetings between heads of different business units provide an opportunity for managers to discuss problems and potential solutions (Darr et al., 1995). Moreover, personal relationships between managers of different units enhance familiarity and trust, which further facilitate information sharing (Darr et al., 1995). Therefore, internal adopters are likely to provide more information about adoption than rivals. Similarly, the marginal cost of adoption declines if there are fixed costs that can be shared by adopters in the same company. In the case of technology adoption, there may be development and operating costs that later adopters can avoid or share. Finally, information and cost sharing may also yield centralized decision making (Greve, 1995). In this case, the initial adoption may indicate that the firm has already decided to implement a company-wide process of adoption for all units within the firm, in order to exploit information and cost sharing among the firm's units.

Because of information and cost sharing, as well as centralized decision making, a multi-unit firm's prior adoption experience should facilitate subsequent adoptions by allowing sibling units to adopt the new technology much more quickly. Therefore, we offer the following hypothesis (again, for theoretical completeness rather than for its original contribution):

HYPOTHESIS 2 In multi-unit firms, the firm's prior adoption experience reduces the time to subsequent adoption.

We do not suggest that learning is the only explanation for why rival and internal adopters reduce a focal firm's time to adopt a new technology. As noted above, internal adoption may provide cost-sharing opportunities that reduce the cost of subsequent adoption. Moreover, research on imitation suggests other explanations: rival adoption may create a competitive threat (Gimeno et al., 2005; Hannan and McDowell, 1987) or create social pressures to conform and maintain legitimacy with stakeholders (Abrahamson and Rosenkopf, 1993; Greve, 1998; Haveman, 1993). These alternative explanations are not mutually exclusive (Lieberman and Asaba, 2006). However, given our emphasis on organizational learning, and because we only include H1 and H2 for theoretical completeness, we do not discuss these explanations further (although we do return to the role of social pressures, below).

The moderating influence of prior adoption experience on the effect of rival adoption

Prior adoption experience may also reduce the extent to which multi-unit firms monitor and consider the adoption decisions of rivals. Such experience may weaken the influence of rival adopters for two main reasons. Firms may substitute internal information for the information provided by external adopters. Similarly, firms may give less attention to social pressures to conform when they have access to internal sources of information.

Information substitution. The information that internal adoption provides should reduce the value of information provided by rival adopters in all three modes of vicarious learning described earlier. First, technology spillovers from rival adopters likely provide less new information for subsequent adopters, since they can use the technology that internal adopters have already developed, rather than developing it from scratch. Second, although firms may observe customer response to rival adoption, internal adopters can offer more detailed data on customer response and other performance measures. Therefore, internal adoption is much more likely than rival adoption to drive outcome-based imitation. Third, while firms may sometimes ignore their own valuation and imitate rival adopters because they assume that rival adopters have some private information about the value of adoption, multi-unit firms are much less likely to do so when they have access to detailed data from internal adopters pertaining to the costs and benefits of adoption. Therefore, multi-unit firms with prior adoption experience are likely to substitute information from internal adopters for information provided by rival adopters.

Weaker influence of social pressures. Proponents of bandwagon effects argue that firms may adopt an innovation 'because of a pressure caused by the sheer number of adopters' (Abrahamson and Rosenkopf, 1993: 488). When many organizations adopt a practice, it becomes taken for granted or institutionalized, so that other organizations adopt the same practice without thinking (Haunschild and Miner, 1997; Haveman, 1993; March, 1981). In other words, firms imitate each other solely for the sake of conformity, without any updated assessment of the value of the new technology or practice (Abrahamson and Rosenkopf, 1993).

Social pressures to imitate rivals should be greater when uncertainty or ambiguity is high (Abrahamson and Rosenkopf, 1993; Haunschild and Miner, 1997), as firms may give greater weight to social factors or institutional rules rather than technical rules (Haunschild and Miner, 1997; Haveman, 1993; Meyer et al., 1983). Lacking internal sources of information, firms with no adoption experience may give greater importance to social considerations in their decision making, and therefore they may imitate rival adopters, at least in part, as a way to conform to social pressures. By contrast, prior adoption experience reduces uncertainty. Therefore, having access to

internal sources of information, subsequent adopters are likely to pay less attention to social pressures.

For these reasons, we hypothesize that:

HYPOTHESIS 3 In multi-unit firms, internal adoption experience weakens the effect of rival adoption on subsequent adoption decisions.

This is the primary hypothesis that we examine in the study. Note that the alternative hypothesis is also plausible. That is, while H3 flows from the argument that internal and external information are substitutes, we also recognize the possibility that they serve as complements. For example, internal adoption may allow the firm to better understand the details of implementation by rivals. Vicarious learning may shift from simple observation of whether rivals have adopted, to more complex assessments of how they have adopted. In essence, initial adoption may increase the firm's absorptive capacity (Cohen and Levinthal, 1990), enabling the firm to learn more quickly and effectively from rivals. Similarly, firms that have already made investments in website development are likely to be able to respond more quickly to rival adoption. Although we are unable to observe such complementarities in any detail, we can test a basic form of the alternative hypothesis empirically. If internal adoption experience strengthens the effect of rival adoption on subsequent adoption decisions, this would lend support to the idea that internal adoption experience complements information from external adopters.

Methods and data

Empirical setting

The adoption of websites by consumer magazines is a good setting for studying imitation for several reasons. One is that entry onto the web was a major decision for the publishing firms involved. Launching a website is costly (Kaiser, 2002). The development cost for a basic site was about US\$1 million in the late 1990s, while the cost for a more elaborate site was about US\$4.6 million (Barsh et al., 2001). This does not include maintenance and operating costs, which averaged about US\$270,000 annually for a basic site, and more than US\$4 million for a more elaborate site (Barsh et al., 2001). In total, these costs were quite substantial for consumer magazines, whose median annual revenues were less than US\$40 million during the late 1990s.

Not only is website adoption costly, but it also comes with considerable risk. For example, a magazine can reduce the cost of adoption by creating a very basic site, but if it does a poor job of designing its website, not only will it not attract many readers to its site, but 'the magazine risks losing valuable print subscribers' (Barsh et al., 2001). Moreover, a magazine's website threatens to cannibalize its print analog if readers choose to simply read free content at the magazine's website (Kaiser, 2002; Simon and Kadiyali, 2007). There was widespread fear of this cannibalizing effect in the magazine (and newspaper) industries (Porter, 2001). On the other hand, there was also great fear that doing nothing might be an even worse choice, as rivals with websites, as well as internet-only content providers, would steal readers from those titles that chose to stay offline.

As a result of the costs and risks, magazines faced substantial uncertainty regarding whether to adopt a website (Barsh et al., 2001; Bughin et al., 2001), as well as what type of website to create: 'The environment is filled with uncertainty as firms plunge forward into an unknown where business models and revenue streams are unclear and, profitability is questionable' (Gallaughner et al., 2001: 473). This kind of uncertainty creates pressures for imitation (Haunschild and Miner, 1997).

Lieberman and Asaba (2006) suggest that learning-based explanations for imitation are most likely in environments characterized by high uncertainty and ambiguity. Others have argued that social pressures to imitate rivals should be greater when uncertainty or ambiguity is high (Abrahamson and Rosenkopf, 1993; Haunschild and Miner, 1997).

In this uncertain context, the consumer magazine industry's adoption of websites provides a good setting because rival adoption appears likely to convey information. Websites are easily observable, even by geographically separated rivals. Moreover, websites can be reverse engineered relatively easily; in many cases, rivals can access the source code of earlier adopters. Furthermore, many websites are developed and operated by third parties who can transmit information from early adopters to late adopters.

Similarly, with the growth of the web as a new medium for information and entertainment, magazines faced intense social pressure to establish a digital presence. In the popular and industry press, there has been a continuous call for magazines to move online and exploit the internet's wondrous possibilities (Barsh et al., 1999). In the late 1990s, magazines that were slow to establish a web presence risked being labeled technological laggards, 'as fast-movers obtain[ed] financing, attract[ed] talent, establish[ed] brand, and cement[ed] customer loyalty' (Gallaughier et al., 2001: 473).

The consumer magazine industry also provides a good setting because it contains numerous multi-title publishers. This enables us to examine the direct and indirect influence of prior adoption experience on subsequent adoption decisions within the same firm, and for the adoption of the same technology. Moreover, multi-title publishers face numerous opportunities to share information and costs across adopters.

Multi-title publishers enjoy substantial economies of scope in the adoption and operation of magazine websites (Goldfarb, 2004). Most of the costs of adoption and operation should be fixed in nature, and therefore may be shared across magazines. These opportunities for information and cost sharing can be found both in back-office and in front-end operations (Barsh et al., 2001). For example, two of the largest publishers of consumer magazines, Hachette Fillipacchi and Conde Nast, used the same subscription-service software for all of their magazines' websites (Barsh et al., 2001). Similarly, titles owned by the same publisher can use a common template for their websites. Later adopters can simply add content to a sibling magazine's existing website, reducing set-up and operating costs. Reflecting these benefits, many publishers offer content for multiple titles at the same website.

Sample and data sources

The sample of magazines used in this study was drawn from the Audit Bureau of Circulation's (ABC's) annual Magazine Trend Reports. These reports provide operating data for US consumer magazines. ABC classifies the magazines into categories according to the magazines' readership. Categories range from hunting and fishing, to art and antiques. For example, *Cat Fancy* competes in the 'pets' category; *Field and Stream* competes in the 'fishing and hunting' category.

To gather data on magazine websites, we searched for each magazine's website using a variety of internet search engines (primarily Google), and a search engine devoted exclusively to magazines and newspapers on the internet (www.newsdirectory.com). When we found a website, we collected data on the year in which the magazine began offering digital content. To do so, we used the Internet Archive, which allows users to examine websites as they appeared on various dates from 1996 to the present. Using this archive, for most magazines we defined the time at which the magazine first created a website as the earliest year in which the site appears in the Internet Archive.

Because the Internet Archive only extends back to 1996, we were unable to use it to identify website adoptions in earlier years. Published reports indicate that a very small number of

magazines first offered digital content in 1993, with the numbers increasing slowly in 1994 and 1995 (Kelley, 1994, 1995). To identify magazines that adopted websites prior to the advent of the archive in 1996, we contacted publishers and we examined popular and trade press articles, as well as data on domain name registrations. Using these data, we identified 31 magazines that are likely to have had a website prior to 1996, when we are first able to observe websites in the Internet Archive. However, because we have less detailed information on these pre-1996 website adoptions, we took a conservative approach and omitted these magazines from our main sample, thereby restricting our primary analysis to adoptions beginning in 1996. Nonetheless, we show that our results are robust to a variety of approaches for dealing with this potential measurement error.

Analyses and dependent variable

This study employed an event history analysis to assess the influence of prior adoption on a magazine's decision to offer digital content. Specifically, we used Prentice and Gloeckler's (1978) discrete-time hazard model, which is appropriate when a continuous process generates the data, but events are only observed at discrete times (Jenkins, 1995). In this case we only measured the year in which a magazine begins to offer digital content. No distinction was made between a magazine that adopts a website on 1 January 1997 and a magazine that adopts a website on 31 December 1997.

We did not define the time of adoption more precisely for two reasons. First, the archive does not provide access to the website at regular intervals (e.g. every week or every month), but instead provides links to the website as it appeared on various dates throughout the year. Second, all of the control variables are measured annually.

In the discrete-time model, the hazard of adoption by magazine i during the j^{th} interval takes the following form (Jenkins, 1995):

$$h_{ij} = 1 - \exp[-\exp(X_{ij}B)]$$

where the dependent variable, h_{ij} , is the hazard rate of website adoption by magazine i during spell j , and X_{ij} comprises a set of time-varying covariates. Coefficients in this model indicate the effect that the independent variables exert on the hazard rate of adopting a website.

Independent variables

In the empirical analysis that follows, we distinguish two types of rivals: direct and indirect. To clarify these concepts, along with that of siblings, consider a publisher A that offers magazines in three different categories: arts and antiques, sports and computers. For publisher A's magazine(s) in the sports category, the other magazines owned by publisher A are its siblings. Its direct rivals are other sports magazines owned by publishers other than A, and its indirect rivals are arts and antiques titles and computer titles owned by publishers other than A. In other words, indirect rivals are rivals of sibling magazines in other categories. Because these indirect rivals are in different categories, competing for different segments of customers and advertisers, they do not pose a competitive threat (Greve, 1998; Lieberman and Asaba, 2006), but they are more likely than an average magazine to be within the firm's reference set.

Many studies have found that attention to external information varies based on characteristics of the external organizations (e.g. Beckman and Haunschild, 2002; Haveman, 1993). We expect that during the rise of the world wide web, managers in the magazine industry were keenly aware of direct rivals and would have tracked their adoption of websites. In addition, we expect that

managers were likely to have followed a broader set of magazines. Although these magazines are harder to identify, we used the category of ‘indirect rival adopters’ as a proxy for this broader set, recognizing that these more distant rivals would likely exert a weaker influence on a focal magazine’s adoption decisions.

Using these definitions, we considered two different measures of rival adoption. *Direct rival adopters* is a count of the direct rival magazines (rival titles in the focal magazine’s category) that established websites prior to the beginning of the current year. *Indirect rival adopters* is a count of the rival magazines in the other categories in which the publisher competes that established websites prior to the beginning of the current year.

To distinguish subsequent adoption from the initial adoption in firms with multiple magazines, *internal adoption* is a dummy variable that takes a value of 1 if at least one other magazine, owned by the same publisher, has already established a website, prior to the beginning of the current year. In most models, we also included a count of the number of prior *internal adopters*. Including both measures allowed us to determine if the impact of internal adoption was discontinuous, with a shift following the initial adoption and further impact for each incremental adoption. Furthermore, to assess the moderating influence of prior adoption experience on the effect of rival adopters, we interacted the rival adoption measures with the *internal adoption* dummy. This allowed us to test whether rival adoption had a differential effect once a unit of the firm had adopted a website. We interacted the *internal adoption* dummy variable, rather than the continuous measure of *internal adopters*, with the rival adoption variables because we believe that the moderating effect of internal adoption experience is likely to be highly discontinuous. The initial internal adoption is likely to provide more information than subsequent adoptions, thereby reducing the value of information provided by rival adopters by more than subsequent internal adoptions.

Control variables

We controlled for several factors that may influence a magazine’s decision to adopt a website. For example, due to cannibalization concerns, or concerns about the visual quality of web pages, magazines with higher prices may have less incentive to adopt. To control for this effect, *price* is the print magazine’s annual subscription price. On the other hand, magazines with high advertising rates may have a stronger incentive to establish a website, in order to garner additional online advertising revenues. Therefore, we included *ad rate*, which is the magazine’s advertising rate per 1000 readers. Similarly, magazines with access to greater resources, including financial, physical, human and social capital, may also have greater incentives to establish a website, in order to better exploit these resources. To control for the magazine’s access to resources, we included several measures of size and scope. *Magazine circulation* is the title’s average per-issue circulation, while *publisher circulation* is the aggregated circulation of the publisher’s other magazines. *Multi-title* is a dummy variable indicating that the publisher owns more than one magazine, *publisher titles* is a count of the magazines owned by the publisher, and *publisher categories* is a count of the number of different categories in which the publisher competes. In addition, because titles that are published more frequently may have a greater incentive to establish a website, *issues* is the number of times per year that a title is published.

To control for competition that may affect all magazines’ (focal and rival) adoption decisions, *rivals* is a count of the number of rival magazines in the same category as the focal magazine. We lagged all of the control variables one year to ensure that they precede the magazine’s decision to establish a website. Moreover, we took the natural log of several of these variables, because they have skewed distributions and are likely to exert diminishing marginal effects on the adoption

decision. Finally, to control for the possibility that magazines 'respond independently but identically to a common environmental shock' (Lieberman and Asaba, 2006: 19), such as a change in web technology or the diffusion of e-commerce, we included year dummies in all models.

Results

The sample includes 450 magazines in 46 different markets, spans six years, 1996–2001, and comprises 1174 annual spells. This includes 31 magazines that likely adopted prior to 1996. Because we have less detailed information on these pre-1996 website adoptions, we excluded them from our primary analyses, yielding a sample of 1143 annual spells. However, we included these magazines in the sample as a robustness check (in which we assumed that they adopted in 1996), and they were included in all counts of direct and indirect rival adopters. Table 1 provides descriptive statistics including a correlation matrix. As can be seen, several of the independent variables are highly correlated with each other. Of particular concern are the high correlations between the component adopter variables and the interaction terms. We address this issue in our empirical analysis below.

Figure 1 illustrates the diffusion of new websites. The number of magazines adopting websites increased from 31 prior to 1996, to 78 in 1996, then declined slightly to 65 in 1997, before rising to a peak of 106 in 1998. The number of adopters then fell off steadily to 15 new adopters in 2001, as the number of remaining non-adopters got smaller. By the end of 2001, there were only 13 titles that had not adopted a website.

We report our results in Tables 2 and 3, where the coefficients are hazard ratios. For any variable x , the hazard ratio is the hazard rate when an additional unit of x is added, divided by the hazard rate without the additional unit of x . Because the hazard rate indicates the likelihood of adoption in the current year, conditional on having not already adopted, a hazard ratio greater than 1 indicates an increase in the conditional likelihood of adoption (and a reduction in the time to adoption); a hazard ratio less than 1 indicates a decrease in the conditional likelihood of adoption (and an increase in the time to adoption). We refer to hazard ratios below 1 as negative coefficients.

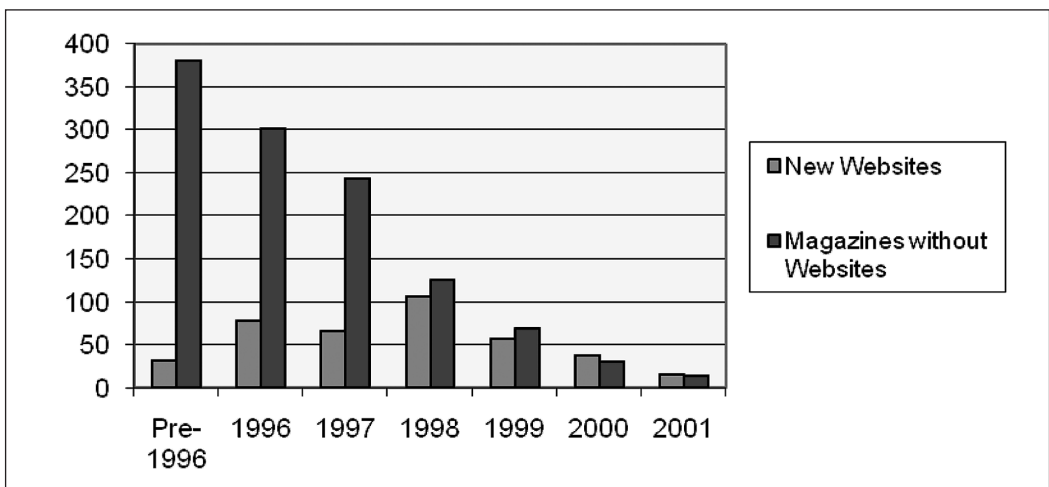


Figure 1. The diffusion of websites in consumer magazines

Table 1. Descriptive statistics

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.
Mean (SD)															
1. New website	0.31 (0.46)														
2. Direct rival adopters	.14 (7.36)														
3. Indirect rival adopters	.15 (28.01)	.20													
4. Internal adoption (dummy)	.20 (0.48)	.16	.62												
5. Internal adopters	.22 (2.97)	.26	.80	.59											
6. Internal adoption* Direct rival adopters	.17 (6.50)	.59	.57	.68	.58										
7. Internal adoption* Indirect rival adopters	.16 (28.82)	.23	.98	.67	.82	.60									
8. Ad rate	.04 (0.56)	.09	.08	.01	.05	.01	.08								
9. Price	.03 (0.43)	-.03	-.12	-.09	-.04	-.12	-.08	-.10	.17						
10. Rival titles	22.29 (13.92)	-.06	.59	-.03	.03	.03	.30	.00	-.13	-.08					
11. Circulation	5.42 (1.27)	.06	-.13	.18	.21	.12	.10	.16	-.52	-.23	.03				
12. Issues	2.39 (0.51)	.03	.05	-.04	.06	.00	.06	-.02	-.09	-.62	-.19				
13. Multi-title publisher	0.73 (0.44)	.06	-.10	.38	.47	.28	.32	.32	-.12	-.04	-.02	.09			
14. Publisher titles	8.31 (8.96)	.02	.06	.79	.60	.58	.48	.76	-.02	-.11	.03	.28	.49		
15. Publisher categories	3.90 (3.52)	.06	-.06	.72	.57	.47	.35	.68	.06	-.07	-.03	.35	-.02	.50	.84
16. Publisher circulation	5.63 (3.77)	.07	-.09	.56	.59	.42	.39	.49	-.11	-.09	.00	.48	.10	.91	.73

All correlations greater than or equal to .05 are significant at .10.
N = 1143.

Table 2 reports the results for the basic models, which exclude the interaction terms. Models 2.1 and 2.2 are based on the full sample of all publishers, whereas models 2.3 and 2.4 are limited to multi-title publishers. The results for model 2.1 show that, consistent with H1, direct and indirect rival adopters had a positive and (marginally) statistically significant effect on the hazard rate of website adoption. Each additional direct rival adopter increased the conditional likelihood that a magazine adopts a website during the current year by about 2.7 percent, while each indirect rival adopter increased the hazard of adoption by less than 1 percent. The larger hazard ratio for direct rivals likely reflects the fact that direct rivals are likely to be central within the magazine's reference set, whereas indirect rivals are more peripheral.

The results also show that for multi-title publishers, prior adoption experience greatly increased the conditional likelihood of subsequent adoptions. The coefficient of the internal adoption dummy in model 2.1 implies that a magazine was more than twice as likely to establish a website during the year if at least one sibling title had already done so. This result provides strong support for H2 and suggests the importance of experiential learning and cost sharing in website adoption.

Table 2. Hazard analysis of adoption with main effects only

	Model 2.1	Model 2.2	Model 2.3	Model 2.4
	Full sample	Full sample	Multi-title publishers	Multi-title publishers
Variable	Hazard ratio	Hazard ratio	Hazard ratio	Hazard ratio
Direct rival adopters	1.027 ⁺	1.022	1.030 ⁺	1.022
Indirect rival adopters	1.007 ⁺	0.993	1.010*	0.996
Internal adoption (dummy)	2.286**	1.984**	2.435**	2.118**
Internal adopters		1.129**		1.121**
Ln(ad rate)	1.024	1.003	0.919	0.879
Ln(subscription price)	0.953	0.995	0.667 ⁺	0.720
Rival magazines	0.983**	0.982**	0.983*	0.981**
Ln(circulation)	1.117 ⁺	1.126 ⁺	1.100	1.108
Ln(issues)	0.989	1.045	0.785	0.848
Multi-title publisher	0.827	1.211		
Publisher titles	0.925**	0.932**	0.918**	0.926**
Publisher categories	1.061 ⁺	1.123**	1.057	1.117**
Ln(publisher circulation)	1.038	0.972	1.021	0.964
N	1143	1143	836	836
Log likelihood	-623.271	-614.082	-460.852	-453.772

⁺p < .10; *p < .05; **p < .01. Hazard ratios for year dummy variables are omitted to save space.

In model 2.2, we added the number of prior internal adoptions as a measure of adoption experience. This allowed us to estimate the impact of the initial adoption, as well as any further effects of additional adoptions within the firm. The internal adoption coefficients in model 2.2 imply that the conditional likelihood that a magazine adopts a website during the current year increased by 124 percent with the first adoption,¹ and by a further 13 percent after each additional adoption. These results provide strong additional support for H2. However, the results for both of the rival adoption variables are statistically insignificant in model 2.2. One possibility is that the correlation between internal adoption and rival adoption makes it difficult to distinguish their independent effects.

Moreover, the impact of rival adoption may weaken once the firm has begun to adopt internally (as predicted by H3), making it difficult to identify a uniform rival adoption effect.

Because this article focuses on the influence of adoption experience, which is only possible in multi-title publishers, models 2.3 and 2.4 repeat the first two regressions, including only multi-title publishers. Doing so yields very similar results. The pattern for both the binary and continuous measure of prior internal adoption is very similar to that reported in models 2.1 and 2.2, as are the results for rival adopters. Taken together, these results provide strong support for H2, but only mixed results for H1. Specifically, the positive effects of rival adoption are eliminated when controls are included for the number of internal adopters.

The models in Table 3 include interactions or split-sample analyses that allow us to distinguish between the period prior to the initial internal adoption and the period after. This enabled us to test our primary hypothesis, H3, which posits that, in multi-title firms, internal adoption experience weakens the influence of rival adopters. The estimates in Table 3 are based only on observations for multi-title publishers.² Exclusion of single-title publishers creates a more homogeneous group, enabling us to better identify the direct and indirect influence of internal adoption experience.

In models 3.1 and 3.2, the main effects of direct and indirect rival adopters, which indicate the effects of rival adoption on multi-title publishers without prior adoption experience, are

Table 3. Hazard analysis of adoption with interaction effects (multi-title publishers only)

Variable	Model 3.1	Model 3.2	Model 3.3	Model 3.4	Model 3.5	Model 3.6
	Hazard ratio	Hazard ratio	Hazard ratio	Hazard ratio	Hazard ratio	Hazard ratio
			Publishers without prior adoption experience	Publishers with prior adoption experience	Assuming all magazines with websites in 1996 adopted in 1996	Excluding all observations from 1996
Direct rival adopters	1.066**	1.056*	1.072*	1.016	1.062**	1.083**
Indirect rival adopters	1.035*	1.028*	1.025	1.000	1.033*	1.046**
Internal adoption (dummy)	3.957**	3.614**			4.637**	5.290**
Internal adopters		1.133**		1.161**	1.166**	1.128**
Internal adoption*	0.962*	0.963*			0.947*	0.947*
Direct rival adopters Internal adoption*	0.976 ⁺	0.968*			0.956**	0.964*
Indirect rival adopters						
Ln(ad rate)	0.940	0.903	1.803 ⁺	0.633*	1.074	1.107
Ln(subscription price)	0.651 ⁺	0.718	0.448*	1.044	0.801	1.071
Rival magazines	0.983*	0.981**	0.979 ⁺	0.982 ⁺	0.985	0.982 ⁺
Ln(circulation)	1.106	1.120	1.753**	0.978	1.156	1.305**
Ln(issues)	0.792	0.875	0.427**	1.321	1.022	1.001
Publisher titles	0.922**	0.932**	1.027	0.909**	0.943	0.905**
Publisher categories	1.049	1.111**	0.836 ⁺	1.189**	1.117	1.053
Ln(publisher circulation)	1.006	0.936	0.945	0.839**	0.951	0.887
N	836	836	408	428	867	555
Log likelihood	-457.633	-448.990	-181.203	-247.741	-494.249	-295.784

⁺ $p < .10$; * $p < .05$; ** $p < .01$. Hazard ratios for year dummy variables are omitted to save space.

both positive and statistically significant. The main effects in model 3.1 indicate that for publishers without prior adoptions, each additional direct rival adopter increased the hazard rate of adoption by 6.6 percent, and each additional indirect rival adopter increased the hazard rate by 3.5 percent. The main effects are similar, though a little weaker, in model 3.2. Thus, these results suggest that titles without prior adoption experience tended to imitate both direct and indirect rivals.

Models 3.1 and 3.2 also show interaction effects that are negative and statistically significant (in model 3.1, the indirect rival adopters interaction term is significant at .10). These results provide support for H3, indicating that internal adoption experience weakened the influence of rival adopters on subsequent adoptions. In terms of magnitude, the negative interaction effects almost completely offset the positive direct effects; i.e. the influence of rival adoption fell virtually to zero once the firm began to adopt.

These estimates, showing positive main effects of rival adoption and negative interaction effects, help to explain the inconsistent findings for the rival adoption variables in Table 2. The results in Table 3 suggest that the positive effect of rival adoption for magazines without access to internal adopters is offset by the non-effect for magazines with access to internal adopters.

Split-sample analyses

As already noted, many of the independent variables are highly correlated. Of particular concern are correlations between the interaction terms and the component adoption variables. To assess the impact of these correlations, we conducted a split-sample analysis. The first sample included only those publishers with no prior adoption experience (again excluding single-title publishers), while the second included only those publishers with adoption experience. By comparing the effects of rival adoption in these two samples, we were able to assess the influence of adoption experience on the effect of rival adoption without the interaction terms, hence alleviating concern about collinearity.

Models 3.3 and 3.4 in Table 3 report the results of the split-sample analysis. Model 3.3 includes only observations for publishers with no prior adoption experience, whereas model 3.4 is limited to observations for publishers following their initial adoption. In model 3.3, the effects of both rival adoption variables are positive, with the effect of direct rival adopters achieving statistical significance despite the smaller sample size. This provides additional evidence that, prior to initial internal adoption, firms imitated rival adopters (H1). By comparison, in model 3.4, the effects of both rival adoption variables are much smaller and statistically insignificant. These results provide additional support for H3, indicating that rival adopters increased the hazard of adoption by publishers without prior adoption experience, while exerting no influence on the decisions of publishers with adoption experience. Moreover, the magnitudes of the hazard ratios in the split-sample models are fairly consistent with the other estimates in Table 3 (although the significance levels are lower, due to the smaller sample sizes). These results provide no evidence that multicollinearity between the components of the interaction terms in the preceding models is a problem.

Several control variables in model 3.3 are also of interest, as they suggest that publishers selected magazines with specific features to serve as initial adopters. Two characteristics stand out: initial adopters tended to be magazines with high circulation, and they were published relatively infrequently. More specifically, for their initial positioning on the web most multi-title publishers chose popular titles that were issued monthly (rather than weekly), potentially attracting a sizable

advertising base while avoiding the burden of continually updating the website. Model 3.3 provides weaker evidence that initial adopters had relatively high advertising rates and low subscription prices.

Robustness checks

As noted earlier, one concern is potential error in our magazine website adoption dates. In particular, some magazines that we classified as adopting websites in 1996 may have adopted websites earlier. And, some websites that we classified as adopting prior to 1996 may have actually adopted in 1996. Both types of error could lead to measurement problems. In either case, inaccurate classification would result in mismeasurement of the rival and internal adoption variables. Although it is not obvious how such errors would bias our results, they are a potential concern.

To address this issue, we considered two different approaches. First, we assumed that all magazines with websites in 1996 adopted in 1996; i.e. we assumed that no magazines established websites prior to 1996. Thus, we included all of the magazines with websites in 1996 in the hazard analysis. Second, we dropped all observations from 1996, allowing the sample to start in 1997. In this way, we eliminated all cases of potentially mismeasured adoption dates, as well as any mismeasured rival and publisher adoption variables.

Estimates based on these two approaches are shown in the last two columns of Table 3. The results of these analyses are very consistent with those reported in model 3.2, using the primary sample. In fact, the results are stronger than those for our primary sample. These results provide reassurance that our findings are not being driven by measurement error in our data.

As noted earlier, another concern is multicollinearity among the adoption variables. To further address this, we first excluded indirect rival adopters (and the indirect rival adopters interaction term) from our model and found that the main effect of direct rival adopters and the interaction effect (along with the main effect of prior internal adoption) both remain similar in magnitude, while retaining their statistical significance. We then tried the same approach, excluding the direct rival adopter variable (as well as its interaction term). In both cases, the results for the main adoption effects (and interaction term) remained statistically significant.

A final concern is magazine acquisitions. (In our sample, there were 74 acquisitions.) Acquisitions are a potential concern because they raise the question of whether to use the acquiring publisher's data or the selling publisher's data to create the lagged publisher-level variables. Because all of our independent variables are lagged one year, we used the values corresponding to the magazine's publisher in year $t-1$ to create publisher-level variables (i.e. we use the values corresponding to the publisher that sold the magazine). For example, if magazine 1 is sold by publisher A to publisher B in year 1, then in year 2 we would use publisher A's adoptions to create the internal adoption variables. Similarly, the categories variable would indicate the number of categories in which publisher A competed during the previous year. To assess whether this approach was improperly influencing our results, we tried using the acquiring publisher's data to create the publisher-level variables. We found the results of this analysis to be quite consistent with the baseline results in Table 3, suggesting that the manner in which we handled acquisitions in our data did not drive our results.

Centralized decision making

One limitation of our study is that we lack specific information on the internal processes that underlie firms' adoption decisions. Although we have emphasized the role of learning-based

mechanisms, other processes could be of equal or greater importance, particularly after the initial adoption in a multi-unit firm. Centralized decision making and cost sharing are likely to have influenced the timing of website adoption decisions by multi-title publishers. Even so, these factors are unlikely to provide full explanations of firms' adoption behavior.

We have argued that multi-unit firms pay less attention to rivals once they have made their first adoption because learning shifts from an external to an internal focus. An alternative explanation is that the corporate parent has already decided which units will adopt the technology, so these decisions are unaffected by rival adopters. Such centralized decision making undoubtedly plays a role in our sample, but it is unlikely to provide the dominant explanation for our findings.

The limits of centralized decision making in the magazine industry are corroborated by survey data. In 2003, a survey of US magazine publishers with websites indicated that only about one-quarter (26 percent) of publishers had implemented a centralized strategy, in which 'online activities [are] handled centrally for the whole company, by a single business unit' (Consterdine, 2003: 8). Another quarter of the publishers responded that 'websites (23 percent) [are] developed and managed by each particular publication' (Consterdine, 2003: 8). The remaining half of publishers used a mix of centralized and decentralized adoption and management of websites (Consterdine, 2003). Similarly, in a survey of German women's magazines, Kaiser (2002) found that:

Even if magazines have the same publisher, such as 'Elle' and 'Freundin' (both Burda Media), their websites appear to be quite dissimilar with respect to website organization and design, suggesting that publishing houses do not aim at providing lookalike websites based on a joint platform for their magazines. The decision to launch a website hence appears not mainly be driven by the publishing house. (Kaiser, 2002: 4-5)

While providing some evidence of centralized decision making, these survey results suggest that in most cases publishers influence, but do not solely determine, magazine website adoption. This seems quite consistent with the arguments presented earlier, that publishers may help to coordinate the sharing of information, technology and other resources across titles, but typically they do not dictate the timing of adoption decisions.

Nonetheless, it is important to note that centralized decision making does not necessarily conflict with our hypotheses about organizational learning. A publisher could make adoption decisions centrally, but use information from rival adopters to choose how quickly to implement the adoption process for each magazine. In such cases, vicarious learning would still influence the timing of adoption decisions. Furthermore, centralized decision making shifts the locus of learning within the organization, but it does not eliminate learning. The degree to which learning about the web took place in a centralized vs decentralized manner undoubtedly varied among the magazine publishers in our sample. But either way, the process of organizational learning is unlikely to have come to a stop.

One exception would be the case where all adoption decisions were made centrally by the publisher at the time of the initial adoption. In particular, if we observe that most titles owned by the publisher adopted at the same time, this would be evidence of a centralized decision made by fiat, or alternatively, a shift in the economics of adoption (e.g. as the result of procurement of common software or servers for web hosting). To examine this issue, Table 4 reports the likelihood of adoption in year t , conditional on the first internal adoption occurring during year $t-i$ (t ranges from 1 to 6, and i ranges from 0 to 5). In other words, Table 4 reports how the likelihood of adoption varies over time since the publisher's initial adoption.

The results of Table 4 provide little evidence that siblings are disproportionately likely to adopt simultaneously. Rather, it indicates a gradual, intra-publisher diffusion of websites. For example,

only 40 percent of magazines adopted websites in the year that the publisher made its initial adoption. By comparison, among titles that had not yet adopted, just over half (54 percent) adopted websites two years after their first sibling(s) did so. Similarly, 90 percent of those titles that had not yet done so adopted websites three or more years after their first sibling(s) did so. These results show that the hazard of adopting a website actually increases with the time since the publisher's initial adoption. This is not suggestive of centralized decision making. Under centralized decision making, we would expect that titles would be much more likely to adopt in the year of initial adoption than in later years. After the initial adoptions, the hazard of adoption should decline, as those titles that did not adopt initially would then be very unlikely to adopt in later years (because if they were going to adopt websites, it would have happened at the time of the publisher's initial adoption[s], or shortly thereafter). Together with the survey results, these results provide little evidence that centralized decision making explains why the effect of rival adoption is weaker for publishers with internal adoption experience.

Table 4. Assessing centralized decision making: intra-publisher diffusion of websites

Year in which first sibling adopted	Percentage of magazines adopting in current year (N) ^a
Current year	40% (82/204)
One year earlier	29% (38/129)
Two years earlier	54% (34/63)
Three or more years earlier	90% (26/29)

^a Magazine counts fail to add up due to entry and exit from the sample.

Website heterogeneity

Throughout this article, we assume that magazines faced uncertainty regarding whether and when to adopt a website, as well as regarding what type of website to establish. To provide some evidence for this uncertainty, and to examine the heterogeneity of magazine websites, we gathered data on the content that magazines offered on their websites. Specifically, we focused on the extent to which the content available for free on the website overlapped with the content available in the current issue of the print magazine. The findings of this analysis are summarized in Table 5.

Table 5 shows that more than half (56 percent) of all magazines' websites offered at least some content from the current print magazine. In some cases, this was simply a table of contents (108 websites, or 30 percent) or abstracts (excerpts from current articles) (8 percent). In other cases, it included full articles from the current print magazine (15 percent), and in a few cases, even access to the entire contents of the current print magazine (3 percent). Moreover, even among those titles that did not offer any content from the current magazine issue (44 percent), the majority offered the opportunity to subscribe to the print issue online, as well as other kinds of related content. For example, for several years *Sailing World Magazine's* website offered stories about boats, equipment, races and other sailing-related topics, but none of the content came from the current print magazine. Other websites also offered related stories, photographs and other images, multimedia content, interactive tools, games, etc.

To examine how this heterogeneity in websites affected adoption decisions, we incorporate a basic measure of website heterogeneity into our models. Specifically, we consider two different

Table 5. Heterogeneity in magazine websites

Type of content offered on the website	Classification of website content ^a	Number of websites
Related content only; no information from the current print issue	Complementary	156
Table of contents for the current print issue PLUS related content	Complementary	108
Article excerpts from the current print issue (plus table of contents and related content)	Complementary	28
Full-length articles from the current print issue (plus table of contents and related content)	Substitute	55
Entire contents of current print issue (plus related content)	Substitute	12

^a For analysis in Table 6.

types of websites: (1) those that only offer *complementary* content (related content that does not appear in the current print magazine, a table of contents for the print magazine, or excerpts of articles from the current print issue), and (2) those that offer *substitutable* content (full-length articles from the current print magazine).³ We examine the influence of rival adoptions of these types of websites, as well as the publisher's internal experience with the two types of sites, on a magazine's hazard of adoption of each type of site. We report the results of these analyses in Table 6.

In the first column of Table 6 we examine the hazard of adopting a complementary website (a website with complementary content). The results show that direct rivals' adoption of both complementary and substitutable websites (websites with substitutable content) increased the hazard of adoption, as did indirect rivals' adoption of substitutable websites. Moreover, internal adoption experience with complementary websites had a strong positive effect on the hazard of adopting a complementary website, while internal adoption experience with substitutable websites did not. In the second column, we examine the hazard of adopting a substitutable website. As in the first column, direct and indirect rivals' adoption of websites with substitutable content has a positive effect on the hazard of adoption. However, direct and indirect rivals' adoption of websites with complementary content has negative, but statistically insignificant effects. Internal adoption experience with both complementary and substitutable websites has a positive, but statistically insignificant effect. In columns 3 and 4, we repeat our analysis for multi-title publishers. We obtain similar results, though the smaller sample size reduces the statistical significance of some estimates.

Comparing across models, we see that magazines appear to be more influenced by rival adoption of websites with substitutable content. This may reflect the greater competitive threat that such sites pose. Although in both models the effects of rival adoption of substitutable sites are greater than the effects of rival adoption of complementary sites, rival adoption of substitutable sites has much larger effects on the hazard of adopting substitutable sites. Similarly, direct rival adoption of complementary sites positively affected the hazard of adopting a complementary site, but had no effect on the hazard of adopting a substitutable site. These results provide more fine-grained evidence that magazines did learn from rivals. Magazines not only imitated rivals' adoption of websites, they also responded by introducing a website of the same general type. Table 6 also provides similar evidence of internal learning. The results show that internal adoption experience with complementary websites only affected the hazard of adopting a complementary website; it had no

Table 6. Hazard analysis of adoption: complementary vs substitute websites

Type of website (dependent variable)	Complementary	Substitute	Complementary	Substitute
	Full sample	Full sample	Multi-title publishers	Multi-title publishers
	Hazard ratio	Hazard ratio	Hazard ratio	Hazard ratio
Direct rival adopters: complementary websites	1.030 ⁺	0.960	1.032	0.973
Direct rival adopters: substitute websites	1.060 ⁺	1.147 ⁺	1.081 ⁺	1.305 ^{**}
Indirect rival adopters: complementary websites	1.005	0.984	1.009	0.986
Indirect rival adopters: substitute websites	1.036 [*]	1.075 ⁺	1.037 [*]	1.061
Internal adoption: complementary websites	1.999 ^{**}	1.529	2.152	1.365
Internal adoption: substitute websites	0.907	1.773	0.943 ^{**}	1.543
Ln(ad rate)	0.770 ⁺	1.393	0.603 ^{**}	2.329 [*]
Ln(subscription price)	0.963	1.988 ⁺	0.738	1.420
Rival magazines	0.984 [*]	0.987	0.982 [*]	0.990
Ln(circulation)	0.960	1.422 [*]	0.925	1.644 [*]
Ln(issues)	0.789	3.436 ^{**}	0.739	2.283 [*]
Multi-title publisher	0.655	8.426 [*]		
Publisher titles	0.896 ^{**}	1.015	0.888 ^{**}	1.024
Publisher categories	1.104 ^{**}	1.000	1.111 ^{**}	0.959
Ln(publisher circulation)	1.141 ⁺	0.624 ^{**}	1.122	0.653 ^{**}
N	1143	1143	836	836
Log likelihood	-558.501	-207.994	-422.022	-131.872

⁺ $p < .10$; ^{*} $p < .05$; ^{**} $p < .01$. Hazard ratios for year dummy variables are omitted to save space.

significant effect on the adoption of a substitutable site. (The evidence for internal adoption experience with substitutable sites is mixed.)

Discussion and conclusion

This article contributes to our understanding of organizational learning by drawing a link between inter- and intra-organizational learning processes in multi-unit firms. The results for our sample of consumer magazine publishers adopting websites provide evidence that multi-unit firms learned vicariously from rivals that adopted the new technology (H1), as well as from prior adoptions within the firm (H2). Most importantly, we found that in multi-unit firms, prior adoption experience diminished the influence of rival adopters (H3). This influence may have weakened for a number of reasons: because multi-unit firms substituted internal knowledge for more imperfect information gleaned from rival adopters; because greater internal knowledge reduced pressures to conform; or because economies of scope and planning processes within a multi-unit firm shifted the managerial focus away from external sources.

These findings are consistent with the idea that experiential and vicarious learning are substitutes. Moreover, the results for our sample suggest that experiential learning, when available, may be more valuable. For multi-title publishers, internal adoptions had a much stronger influence than rival adoptions on the rate of subsequent adoption within the firm. Indeed, our estimates imply that the influence of rivals fell virtually to zero once the adoption process began within the firm. These results highlight the importance of experiential learning, suggesting that firms gain richer, more detailed information from internal adopters, which reduces the value of information from rival adopters.

Given the limitations of the magazine publisher data, our analysis does not shed light on the details of underlying learning processes, whether external or internal. Nevertheless, by suggesting boundary conditions for the widely observed phenomenon of imitative adoption, the findings of this study extend our understanding of how new technology diffuses. Our results demonstrate that multi-unit firms with prior adoption experience were less influenced by rival adopters, and were less likely to engage in imitative adoption. In contrast, firms without prior adoption experience – regardless whether they are single- or multi-unit enterprises – were more influenced by the adoption decisions of rivals.

The results of this study are also consistent with the argument that social pressures to imitate have a greater influence when uncertainty is high (Haunschild and Miner, 1997), as firms may give greater weight to social factors or institutional rules rather than technical rules (Haunschild and Miner, 1997; Haveman, 1993; Meyer et al., 1983). Lacking internal sources of information, publishers without prior adoption experience may have given greater importance to social considerations in their decision making, and therefore they imitated rival adopters, at least in part, because of pressures to maintain legitimacy. By contrast, prior adoption experience reduced uncertainty, and thus publishers with access to information from prior adoptions paid less attention to social pressures.

Although we have emphasized learning-based explanations for our results, we cannot rule out other explanations. Processes of centralized decision making, as well as economies of scope, are likely to have contributed to the drop in imitative behavior following the firm's initial adoption. Nevertheless, our findings demonstrate a shift away from imitation of rival firms, regardless of the exact mix of reasons.

An interesting implication of our findings is that industries with multi-unit firms may be less prone to information cascades, social pressures to imitate, or management fads. Multi-unit firms have the ability to adopt new technologies incrementally, initially committing only a small portion of the enterprise. Experiential learning within such firms may serve as a brake on mimetic processes that can sometimes veer out of control. Therefore, industries where multi-unit firms are prevalent may be able to avoid counterproductive bandwagons in the adoption of new technologies. In addition, within a given industry, multi-unit firms may have potential advantages over their single-unit rivals in the ability to pursue experiential learning. Nevertheless, to achieve such advantages, multi-unit firms must follow a careful approach in which they engage in experimentation, assess newly acquired information and avoid the possibility of adoption cascades among internal units of the firm. Otherwise, multi-unit firms risk escalation of commitment after they make initial sunk investments (e.g. in website design).

A further, more strategic implication is that multi-unit firms may dominate many industries, at least in part, because they have the ability to pursue internal learning more effectively. Multi-unit firms can take a measured approach when faced with adoption cascades, committing the bulk of their units only when internal information is supportive. Such learning-based advantages may be greatest during periods of rapid technological change and high uncertainty, and are supplementary

to more standard economies of scope that are likely to be the primary drivers of multi-unit organization.

This research exploited certain characteristics of the magazine industry, in particular the existence of multi-title publishers competing across categories. But, like any single-industry study, generalizability of the results is limited. A natural extension of this research would be to extend it to other industries. The newspaper industry may provide a good first step in this line of research, given the similarities between newspapers and magazines. However, there are many other products – digital and non-digital – that may be studied in this way.

Notes

1. This effect of the first internal adopter was obtained by multiplying the hazard ratio for the internal adopter dummy times the hazard ratio for the number of internal adopters.
2. Although we dropped the single-title publisher observations from the sample, we still included these publishers in the construction of our internal and rival adoption variables.
3. The substitutable content is in addition to any related content that these websites offer. All websites offer some related content, starting with a brief description of the print magazine's general editorial content.

References

- Abrahamson, E. and Rosenkopf, L. (1993) 'Institutional and Competitive Bandwagons: Using Mathematical Modeling as a Tool to Explore Innovation Diffusion', *Academy of Management Review* 18: 487–517.
- Argote, A. and Ophir, R. (2002) 'Intra-Organizational Learning'. in J. A. C. Baum (ed.) *The Blackwell Companion to Organizations*. Malden, MA: Blackwell.
- Barsh, J., Lee, G. and Miles, A. (1999) 'Beyond Print: A Future for Magazines', *The McKinsey Quarterly* 3: 122–30.
- Barsh, J., Kramer, E., Maue, D. and Zuckerman, N. (2001) 'Magazines' Home Companion', *The McKinsey Quarterly* 2: 83–91.
- Baum, J. and Dahlin, K. (2007) 'Aspiration Performance and Railroads' Patterns of Learning from Train Wrecks and Crashes', *Organization Science* 18: 368–85.
- Baum, J. and Ingram, P. (1998) 'Survival-Enhancing Learning in the Manhattan Hotel Industry, 1898–1980', *Management Science* 44(7): 996–1016.
- Baum, J., Li, S. and Usher, J. (2000) 'Making the Next Move: How Experiential and Vicarious Learning Shape the Locations of Chains' Acquisitions', *Administrative Science Quarterly* 45: 766–801.
- Baum, J., Rowley, T., Shipilov, A. and Chuang, Y. (2005) 'Dancing with Strangers: Aspiration Performance and the Search for Underwriting Syndicate Partners', *Administrative Science Quarterly* 50: 536–75.
- Beckman, C. and Haunschild, P. (2002) 'Network Learning: The Effects of Partners' Heterogeneity of Experience on Corporate Acquisitions', *Administrative Science Quarterly* 47(1): 92–124.
- Bikhchandani, S., Hirshleifer, D. and Welch, I. (1992) 'A Theory of Fads, Fashion, Custom, and Cultural Change as Informational Cascades', *Journal of Political Economy* 100: 992–1026.
- Bughin, J., Hasker, S., Segel, E. and Zeisser, M. (2001) 'Reversing the Digital Slide', *The McKinsey Quarterly* 4: 58–69.
- Burns, L. and Wholey, D. (1993) 'Adoption and Abandonment of Matrix Management Programs: Effects of Organizational Characteristics and Interorganizational Networks', *Academy of Management Journal* 36: 106–38.
- Cohen, W. and Levinthal, D. (1990) 'Absorptive Capacity: A New Perspective on Learning and Innovation', *Administrative Science Quarterly* 35: 128–52.
- Consterdine, G. (2003) *Routes to Success for Consumer Magazine Websites*. London: International Federation of the Periodical Press.

- Darr, E., Argote, L. and Epple, D. (1995) 'The Acquisition, Transfer and Depreciation of Knowledge in Service Organizations: Productivity in Franchises', *Management Science* 41: 147–60.
- Fligstein, P. (1985) 'The Spread of the Multidivisional Form among Large Firms, 1919–1979', *American Sociological Review* 59: 377–91.
- Fligstein, P. (1991) 'The Structural Transformation of American Industry: The Causes of Diversification in the Largest Firms, 1919–1979', in W. Powell and P. DiMaggio (eds) *The New Institutionalism in Organizational Analysis*, pp. 311–36. Chicago, IL: University of Chicago Press.
- Gallaughier, J., Auger, P. and BarNir, A. (2001) 'Revenue Streams and Digital Content Providers: An Empirical Investigation', *Information and Management* 38: 473–85.
- Gimeno, J., Hoskisson, R., Beal, B. and Wan, W. (2005) 'Explaining the Clustering of International Expansion Moves: A Critical Test in the US Telecommunications Industry', *Academy of Management Journal* 48: 297–319.
- Goldfarb, A. (2004) 'Concentration in Advertising-Supported Online Markets: An Empirical Approach', *Economics of Innovation and New Technology* 13: 581–94.
- Greve, H. (1995) 'Jumping Ship: The Diffusion of Strategy Abandonment', *Administrative Science Quarterly* 40: 444–73.
- Greve, H. (1996) 'Patterns of Competition: The Diffusion of a Market Position in Radio Broadcasting', *Administrative Science Quarterly* 41: 29–60.
- Greve, H. (1998) 'Managerial Cognition and the Mimetic Adoption of Market Positions: What You See is What You Do', *Strategic Management Journal* 19: 967–88.
- Greve, H. (2000) 'Market Niche Entry Decisions: Competition, Learning, and Strategy in Tokyo Banking, 1894–1936', *Academy of Management Journal* 43: 816–36.
- Guillen, M. (2002) 'Structural Inertia, Imitation, and Foreign Expansion: South Korean Firms and Business Groups in China, 1987–95', *Academy of Management Journal* 45: 509–25.
- Hannan, T. and McDowell, J. (1987) 'Rival Precedence and the Dynamics of Technology Adoption: An Empirical Analysis', *Economica* 54: 155–71.
- Haunschild, P. and Miner, A. (1997) 'Modes of Interorganizational Relationships: The Effects of Outcome Salience and Uncertainty', *Administrative Science Quarterly* 42: 472–500.
- Haveman, H. (1993) 'Follow the Leader: Mimetic Isomorphism and Entry into New Markets', *Administrative Science Quarterly* 38: 593–627.
- Ingram, P. (2002) 'Inter-Organizational Learning', in J. A. C. Baum (ed.) *The Blackwell Companion to Organizations*. Malden, MA: Blackwell.
- Ingram, P. and Baum, J. (1998) 'Chain Affiliation and the Failure of Manhattan Hotels, 1898–1980', *Administrative Science Quarterly* 42: 68–102.
- Jenkins, S. (1995) 'Easy Estimation Methods for Discrete-Time Duration Models', *Oxford Bulletin of Economics and Statistics* 57: 129–38.
- Kaiser, U. (2002) 'The Effects of Website Provision on the Demand for German Women's Magazines', National Bureau of Economic Research Working Paper 8806.
- Kelley, K. (1994) 'Time Warner Opens on the Internet', *Advertising Age* 65: 40.
- Kelley, K. (1995) 'Hearst Opens a Cyberspace Newsstand', *Advertising Age* 66: 14.
- Levin, S. G., Levin, S. L. and Meisel, J. (1992) 'Market Structure, Uncertainty, and Intrafirm Diffusion: The Case of Optical Scanners in Grocery Stores', *Review of Economics and Statistics* 74: 345–50.
- Lieberman, M. and Asaba, S. (2006) 'Why Do Firms Imitate Each Other?', *Academy of Management Review* 31: 366–85.
- March, J. (1981) 'Decision in Organizations and Theories of Choice', in A. H. van de Ven and W. F. Joyce (eds) *Perspectives on Organization Design and Behavior*, pp. 205–44. New York: Wiley.

- Menon, T. and Pfeffer, J. (2003) 'Valuing Internal Versus External Knowledge: Explaining the Preference for Outsiders', *Management Science* 49(4): 497–513.
- Meyer, J., Scott, W. and Deal, T. (1983) 'Institutional and Technical Sources of Organizational Structure: Exploiting the Structure of Education Organizations', in J. Meyer and R. Scott (eds) *Organizational Environments: Ritual and Rationality*, pp. 45–67. Beverly Hills, CA: Sage.
- Porter, M. (2001) 'Strategy and the Internet', *Harvard Business Review* 79: 62–79.
- Prentice, R. and Gloeckler, L. (1978) 'Regression Analysis of Grouped Survival Data with Application to Breast Cancer Data', *Biometrics* 34: 57–67.
- Reinganum, J. (1981) 'On the Diffusion of New Technology: A Game Theoretical Approach', *Review of Economic Studies* 158: 395–405.
- Reinganum, J. (1982) 'Market Structure and the Diffusion of New Technology', *Bell Journal of Economics* 12(2): 618–24.
- Simon, D. and Kadiyali, V. (2007) 'The Effect of a Magazine's Free Digital Content on its Print Circulation: Cannibalization or Complementarity?', *Information and Economic Policy* 19: 344–61.
- Tolbert, P. and Zucker, L. (1983) 'Institutional Sources of Change in Organizational Structure: The Diffusion of Civil Service Reform, 1880–1930', *Administrative Science Quarterly* 23: 22–39.

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