http://ansinet.com/itj

ITJ

ISSN 1812-5638

INFORMATION TECHNOLOGY JOURNAL

ANSInet
Asian Network for Scientific Information
308 Lasani Town, Sargodha Road, Faisalabad - Pakistan

Information Technology Journal 12 (10): 1932-1940, 2013
ISSN 1812-5638 / DOI: 10.3923/itj.2013.1932.1940

Similar Technology, Complementary Technology and Long-term Shareholder Value of Acquiring Firm in Technology Acquisitions: Evidence from High-tech Industries in China

Ren He and Tienan Wang
School of Management, Harbin Institute of Technology, 13 Fayuan Street, Harbin, 150001, China

Abstract: Technology acquisitions have become a much researched phenomenon in recent years. The relationship between technology acquisitions and innovative performance of acquiring firms attracted the interests of many scholars. The previous empirical research did not give evidence on the effect of technology acquisitions on shareholder value of acquiring firms. The difference between similar technology and complementary technology was overlooked in most previous research on technology relatedness in technology acquisitions. In this article, we explored event study to examine the effect of technology acquisitions on long-term shareholder value of acquiring firms. For a sample of 100 technology acquisitions in high-tech industries in China from 2004 to 2008, we found that technology acquisitions had negative effect on long-term shareholder value of acquiring firms on average. We also found that acquiring a target firm occupied by similar technology compared with the technology of acquiring firm had no effect on long-term shareholder value of acquiring firm. Acquisition of a target firm occupied by complementary technology had negative effect on long-term shareholder value of acquiring firm. And the negative effects appeared around one year and a half to the 28th month following the technology acquisitions.

Key words: Similarity, complimentarity, shareholder value, technology acquisition

INTRODUCTION

Mergers and acquisitions (M&A) has been and will still be a popular development strategy for firms. Investments in M&A have reached a worldwide higher level in recent years (Barkema and Schijven, 2008). The global value of mergers and acquisitions set a new record in 2006 with $3.79 trillion-a 38% increase over 2005 (King *et al*., 2008), exceeding the GDP of several large countries. In most previous research, frequently mentioned motives for M&A are: synergy, market share, firm growth, risk reduction and access to a specific asset (Cooke, 1986; Trautwein, 1990; DePamphilis, 2005). Technology is rarely mentioned as a motive for acquisition before late 1980s. Nowadays, competitive advantages of firms have increasingly been based on innovation, which can be improved through M&A activities. Both M&A and innovation are centerpieces of today's competitive strategy development (Cassiman *et al*., 2005).

The fast change of technological environment and increasing complexity of technology, in addition to the shortening product life cycle, bring great challenges for firms in high-tech industries (Bannert and Tschirky, 2004). Due to the companies' limited resources in terms of time and skills, they cannot develop their competencies fully on their own but need to externally source knowledge and capabilities (Jones *et al*., 2001; Chesbrough, 2003). Technology acquisition is one way to enable an industry to keep in touch with the latest trends of an accelerated technology and has continued to be a popular strategy for firm growth (Hagedoorn and Schakenraad, 1994). This is well supported by the increasing number of acquisitions in high-tech industries (Jansen, 2002) and the growing importance of technologically motivated acquisitions (Granstrand *et al*., 1992; Goodman and Lawless, 1994). Paralleling this practical importance, technology acquisitions have recently become a much researched phenomenon among management scholars (for a review see Graebner *et al*., 2010).

From industry level, Guo (2008) investigated the relationship between technology acquisition channels and performance of manufacturing industry. From organizational level, Puranam *et al*. (2006) studied the integration issue after technology acquisitions related to the coordination-autonomy dilemma. Huang and Tang (2008) studied influential factors that can affect the acquisition mode of firms involved in technology acquisitions. The relationship between technology acquisition and the innovative performance of acquiring

Corresponding Author: Tienan Wang, School of Management, Harbin Institute of Technology, 13 Fayuan Street, Harbin, 150001, China

firm has attracted substantial interest of scholars in the last ten years. Scholars tended to explore the regression model to examine the effect of technology acquisition on the innovative performance of acquiring firm. And the innovative performance of the acquiring firm was often measured by the number of patents granted to acquiring firm one to five years after the acquisition (Ahuja and Katila, 2001; Hagedoorn and Duysters, 2002; Cloodt *et al.*, 2006; Makri *et al.*, 2010).

Although some research has been done in this area, limitations have been found. The innovative performance of technology acquisitions reflects long-term effects of acquisitions (Hagedoorn and Duysters, 2002). The research on the relationship between M&A and shareholder value are fruitful, but there is much fewer evidence on the relationship between technology acquisitions and long-term shareholder value of acquiring firms. Many technology acquisitions fail to create value (King *et al.*, 2008). The high-risk and high-return characteristics of high-tech industry attract our attention to the value creation in technology acquisitions (Kohers and Kohers, 2000). When exploring the effects of technological relatedness of the acquired firm on the post-M&A innovative performance of acquiring firm, the research sample was often divided into technologically related and technologically unrelated M&A based on the patent information (Hagedoorn and Duysters, 2002; Cloodt *et al.*, 2006), which overlooked the difference between technology similarity and complimentarity within the technologically related M&A. Makri *et al.* (2010) proposed measures of technology similarity and technology complementarity using three-digit patent classification code provided by USPTO. But the two value can not be compared with each other, which makes them can not be used as the benchmark of judging the acquired firm is occupied by similar technology or complementary technology by analyzing the patent information of acquiring and acquired firms. And in the majority of previous literature, the data were collected from advanced markets such as the USA and Europe. There is very few research on technology acquisition based on the firms in emerging markets.

In this study, we try to provide evidence regarding the effects of technology acquisitions on long-term shareholder value of acquiring firm in high-tech industries in China, where little evidence is available. We first examine the change of shareholder value by event study to test all sample of acquisition announcements of the firms listed in Shanghai Stock Exchange and Shenzhen Stock Exchange in high-tech industries in China. Subsequently, we disaggregate the sample into two subsamples to examine the effects of technology acquisitions on long-term shareholder value of acquiring firms, which composed of target firms occupied by similar technology and complementary technology compared with the technology of acquiring firms. All samples were collected from 5 years period between 2004 and 2008, which ensured the technology acquisition happened in recent years and that we could test the change of shareholder value three years after the technology acquisitions. A number of insights emerge from this study. First, an analysis of long-term abnormal returns after announcement month raises questions about the time lag of the effects of technology acquisitions on shareholder value. Second, we redefined the measure of technology similarity and complementarity using the IPC code, the value of which can be used as the benchmark to judge the target firm is occupied by similar technology or complementary technology compared with the technology of acquiring firm. Third, an analysis of the effects of target firm with similar technology or complementary technology on long-term shareholder value of acquiring firm shed light on the decision making for shareholders or strategic investors confronted with technology acquisition opportunities.

MATERIALS AND METHODS

Method: The event study method, estimating a market model for each firm and then calculating abnormal returns as the standard approach (McWilliams and Siegel, 1997), now a conventional approach in management (Lubatkin, 1987; Anand and Singh, 1997; Arnold and Parker, 2007; Chang *et al.*, 2010; Papadakis and Thanos, 2010), is employed to assess the market impact of technology acquisitions. According to Kothari and Warner (1997), using an equally-weighted index leads to more powerful tests than using a value-weighted index, we choose to use equally-weighted index as scholars did in previous research (Lubatkin, 1987; Kothari and Warner, 1997; Kuipers *et al.*, 2009). Considering strategic events cannot be dated precisely because they represent the outcome of a series of related event, the short time horizon employed when using daily returns data may not capture the full series of strategic event-related returns (Lubatkin and Shrieves, 1986). The monthly returns are popular used in the long-term event studies for M&A (Lubatkin, 1987; Gregory 1997; Gregory and McCorriston, 2005). The market model was estimated as:

$$R_{it} = \alpha_i+\beta_i R_{mt}+\varepsilon_{it} \tag{1}$$

Where:

R_{it} = The monthly rate of return on the shares of firm i in month t
R_{mt} = The monthly rate of return on a market portfolio of stocks in month t (the equally weighted index)
α_i = The intercept term
β_i = The systematic risk of stock i
ε_{it} = The error term, with $E(\varepsilon_{it}) = 0$

From estimation of Eq. 1, we used the following equation to estimate the monthly abnormal returns (AR) for the ith firm:

$$AR_{it} = R_{it}-(a_i+b_iR_{mt}) \tag{2}$$

where, a_i and b_i are the Ordinary Least Squares (OLS) parameter estimates obtained from the regression of R_{it} on R_{mt} over an estimation period of 36 months (-40, -5) beginning 40 months prior to the acquisition announcement month. AR_{it} was calculated over 36 months event window (+3, +38) after the acquisition announcement month.

The Cumulative Abnormal Returns (CAR) for event windows were calculated by summing the monthly abnormal returns:

$$CAR_{iT} = \sum_{0}^{T} AR_{it} \tag{3}$$

where, CAR_{iT} is the cumulative abnormal returns on the shares of firm i over event window T.

Average Cumulative Abnormal Returns (ACAR) across N acquisitions is:

$$ACAR_T = \frac{\sum_{i=1}^{N} CAR_{iT}}{N} \tag{4}$$

When analyzing technology similarity and complementarity between acquiring and target firms through patent information of them, Makri *et al*. (2010) proposed the measures of technology similarity and technology complementarity based on the three-digit patent classification code in 1996 provided by USPTO. But the measures can not be compared with each other, the value of technology complementarity will always be much greater than the value of technology similarity when the target firm has both patents in the same patent class and in the same patent subcategory but in different patent class comparing with the acquiring firms' patents, which makes them can not be used as the benchmark of judging the target firm is occupied by similar technology or complementary technology only by calculating technology similarity and complementarity between acquiring and target firms. And the measure can only be used to analyze the patent information in the USA. Here, we use International Patent Classification (IPC) code to define the measures of technology similarity and complementarity. The measure of technology similarity is calculated as degree of patent overlap between the target and acquirer, weighted by the importance of each patent subclass for the acquirer:

$$\frac{\text{Overlap all patent subclasses}}{\text{Total patent A\&T}} \times \frac{\text{Total acquirer patent in common subclasses}}{\text{Total acquirer patents}}$$

Technology complementarity is operationalized as the overlap in patents in the same class but in a different subclass. For comparing technology similarity and complementarity of the target firm to judge the target firm is occupied by similar or complementary technology compared with the technology of acquiring firm, we calculated technology complementarity as follows:

$$\frac{\text{Overlap all patent classes}}{\text{Total patent A\&T}} \times \frac{\text{Total acquirer patent in common classes}}{\text{Total acquirer patents}} - \frac{\text{Overlap all patent subclasses}}{\text{Total patents A\&T}} \times \frac{\text{Total acquirer patent in common subclasses}}{\text{Total acquirer patents}}$$

For example, two firms' patents build on class 'Electric communication technique' (H04) in the section 'Electricity' (H), but on different subclasses 'Digital information transmission' (H04L) and 'Telephone communication' (H04M), the technologies they occupy have complementarity.

Data: We examined the effects of technology acquisitions on long-term shareholder value of acquiring firm using a sample of 100 technology acquisitions in high-tech industries in China from 2004 to 2008. All the information on mergers and acquisitions was collected from China Securities Journal, Shanghai Securities News, Securities Times, the official websites of Shanghai Stock Exchange and Shenzhen Stock Exchange, RESSET Financial Research Database provided by Beijing Gildata RESSET Data Tech Co., Ltd. The monthly rate of return of acquiring firm and equally weighted index in the stock market are collected from RESSET Financial Research Database. All the information on patents of acquiring and target firms was collected from The China Patent Inquiry System provide by State Intellectual Property Office of P. R. China. Our sample was constructed in the following steps:

- We collected 642 (excluding related-party transactions) acquisition transactions between 2004 and 2008 from RESSET Financial Database in four industries in China: electronics (SIC-code C5), pharmaceuticals and biotechnology (SIC-code C8), machinery, equipment and instrument (SIC-code C7) and information technology (SIC-code G). The four industries above cover the majority of high-tech industries listed in the High-tech Industries Statistical Classification Directory issued by the National Bureau of Statistics of China, which includes pharmaceuticals, biotechnology, medical and other general and special equipment and instrument, aerospace, telecommunication, computer and office machine, electronics
- We distinguished technology acquisition from all other acquisitions. In keeping with prior literature, the criteria used in this paper were the same as Ahuja and Katila (2001) did which was cited broadly in research on technology acquisitions (Cloodt *et al*., 2006; Puranam *et al*., 2006; Puranam and Srikanth, 2007). First, we examined the news stories to establish if the acquiring firm reported technology as a motive factor for the acquisition or if technology was a part of the transferred assets. Second, we classified the acquisition as technology acquisition if the target firm had been granted any patent or had applied any patent which was granted later in the 5 years preceding the acquisition. Of the 642 acquisitions on which we had information, 206 met at least one of the two above criteria and were classified as technology acquisition
- Considering the usability of the sample for our research, we cut off the acquisitions as follows. We excluded the acquisitions missing the information of transaction date. Acquiring firm was listed on the Shanghai/Shenzhen Stock Exchange less than 40 months prior to the technology acquisition. The acquiring firm is bidding for less than 5% of the target firm and can not take control of the target firm at the mean time. The acquisition is terminated before its completion or the acquiring firm is acquired by another firm within three years after the technology acquisition. We only keep the largest transaction sum acquisition if acquiring firm is bidding for the target firm from its different shareholders within one month. For avoiding confounding effects, we excluded acquisitions following or followed by another acquisition or other events having significant effects on the acquiring firm within three months such as restructuring, investment, sale of assets, etc. These procedures can make a relative clean data sampling ensure that the technology acquisition is isolated event and the parameters estimated for the model reflect only the influence of a single acquisition (Elgers and Clark, 1980; Choi and Philippatos, 1983). Finally, we got 100 technology acquisitions consists of 67 acquiring firms of which 9 (13.43%) operate in the electronics industry, 27 (40.30%) are found in machinery, equipment and instrument industry, 17 (25.37%) are active in pharmaceutical and biotechnological industry and 14 (20.90%) operate in information technology industry
- We disaggregated the sample into two subsamples: firms occupied by similar technology and complementary technology compared with the technology of acquiring firms through analyzing the information on acquisitions and using the measures of technology similarity and complementarity mentioned above. For example, if the news stories such as acquisition announcement reported the motive of the acquisition was enhancing the current technology, improving current products of acquiring firm, or the value of technology similarity was greater than technology complementarity between acquiring and target firms, we divided the sample into subsample in which target firm was occupied by similar technology. If the motive of the acquisition was reported for accessing the technology of target firm to develop a complementary product or business, or the value of technology complementarity was greater than technology similarity between acquiring and target firms, we divided the sample into subsample in which target firm was occupied by complementary technology. The similar technology subsample consists of 63 acquisitions and the complementary subsample consists of 32 acquisitions. The technologies acquired in the other 5 acquisitions are unrelated to the technologies of acquiring firms. The value of technology similarity and complementary between acquiring and target firms was zero or the motives were reported for access to an unrelated industry in the 5 acquisitions

RESULTS AND DISCUSSION

For all sample, we found that the sample experienced positive Average Cumulative Abnormal Returns (ACAR) the 3rd and 4th month following the acquisition announcement and experienced negative ACAR for the period from the 5th month to the 38th month following the acquisition announcement. But significantly negative ACAR only appeared for the period from the 12th month

Table 1: ACAR for the sample of technology acquisitions from 2004 to 2008

		Type of technology occupying the target firm	
		Similar technology	Complementary technology
Number	100	63	32
ACAR(+3, +3)	0.008	0.012	-0.002
	(0.62)	(0.77)	(-0.09)
ACAR(+3, +4)	0.005	0.007	0.004
	(0.30)	(0.33)	(0.13)
ACAR(+3, +5)	-0.003	-0.015	0.029
	(-1.61)	(-0.63)	(0.72)
ACAR(+3, +6)	-0.007	-0.021	0.031
	(-0.34)	(-0.73)	(0.78)
ACAR(+3, +7)	-0.021	-0.031	0.003
	(-0.86)	(-0.96)	(0.08)
ACAR(+3, +8)	-0.021	-0.036	0.018
	(-0.79)	(-1.07)	(0.38)
ACAR(+3, +9)	-0.017	-0.024	-0.001
	(-0.60)	(-0.66)	(-0.02)
ACAR(+3, +10)	-0.037	-0.038	-0.026
	(-1.29)	(-1.02)	(-0.55)
ACAR(+3, +11)	-0.050	-0.058	-0.029
	(-1.63)	(-1.38)	(-0.60)
ACAR(+3, +12)	-0.057*	-0.066	-0.029
	(-1.81)	(-1.55)	(-0.58)
ACAR(+3, +13)	-0.072**	-0.077	-0.051
	(-2.09)	(-1.60)	(-1.05)
ACAR(+3, +14)	-0.071*	-0.069	-0.061
	(-1.94)	(-1.33)	(-1.23)
ACAR(+3, +15)	-0.072*	-0.061	-0.082
	(-1.81)	(-1.09)	(-1.46)
ACAR(+3, +16)	-0.078*	-0.058	-0.101*
	(-1.88)	(-1.00)	(-1.75)
ACAR(+3, +17)	-0.081*	-0.057	-0.118*
	(-1.85)	(-0.95)	(-1.95)
ACAR(+3, +18)	-0.073	-0.060	-0.094
	(-1.60)	(-0.93)	(-1.49)
ACAR(+3, +19)	-0.073	-0.055	-0.095
	(-1.55)	(-0.85)	(-1.38)
ACAR(+3, +20)	-0.085*	-0.055	-0.133
	(-1.69)	(-0.81)	(-1.67)
ACAR(+3, +21)	-0.097*	-0.057	-0.165*
	(-1.93)	(-0.84)	(-2.04)
ACAR(+3, +22)	-0.086	-0.052	-0.141
	(-1.59)	(-0.73)	(-1.61)
ACAR(+3, +23)	-0.088	-0.053	-0.147*
	(-1.64)	(-0.72)	(-1.74)
ACAR(+3, +24)	-0.084	-0.051	-0.161*
	(-1.57)	(-0.70)	(-1.90)
ACAR(+3, +25)	-0.085	-0.038	-0.184*
	(-1.47)	(-0.49)	(-1.97)
ACAR(+3, +26)	-0.097	-0.053	-0.187*
	(-1.64)	(-0.67)	(-1.84)
ACAR(+3, +27)	-0.094	-0.045	-0.210*
	(-1.54)	(-0.56)	(-2.01)
ACAR(+3, +28)	-0.066	-0.021	-0.174*
	(-1.07)	(-0.25)	(-1.72)
ACAR(+3, +29)	-0.051	-0.012	-0.151
	(-0.81)	(-0.15)	(-1.47)
ACAR(+3, +30)	-0.047	-0.015	-0.145
	(-0.72)	(-0.17)	(-1.28)
ACAR(+3, +31)	-0.042	0.003	-0.161
	(-0.63)	(0.03)	(-1.44)
ACAR(+3, +32)	-0.041	0.013	-0.182
	(-0.61)	(0.14)	(-1.55)
ACAR(+3, +33)	-0.038	0.032	-0.195
	(-0.54)	(0.35)	(-1.57)
ACAR(+3, +34)	-0.029	0.022	-0.155
	(-0.40)	(0.24)	(-1.22)
ACAR(+3, +35)	-0.043	0.013	-0.183
	(-0.59)	(0.14)	(-1.41)
ACAR(+3, +36)	-0.045	0	-0.155
	(-0.61)	(0)	(-1.22)
ACAR(+3, +37)	-0.051	-0.005	-0.157
	(-0.70)	(-0.05)	(-1.22)
ACAR(+3, +38)	-0.048	-0.01	-0.144
	(-0.67)	(-0.10)	(-1.14)

*,**Represent significance at 10% and 5% levels for two tailed t-statistic test

to the 21st month following the acquisition announcement. The results for all sample were reported in Table 1 and Fig. 1. The results above showed M&A could lead a negative effect on shareholder value of acquiring firm in the long term, which was consistent to some previous empirical studies (Gregory 1997; Rau and Vermaelen, 1998; Sudarsanam and Mahate, 2006). What's the result for acquiring the target firm occupied by similar technology or complementary technology compared with the technology of acquiring firms?

From Table 1 and Fig. 1 we found that the ACAR of the subsample, in which the target firms were occupied by similar technologies compared with the technologies of acquiring firms, were positive for the period the 3rd, 4th and from the 31st to 36th month following the acquisition announcement. And the ACAR were negative for the period from the 5th month to the 30th month, the 37th and the 38th month following the acquisition announcements. But none of the ACAR in this subsample was significant at 0.1 statistical level, which meant acquiring a target firm occupied by similar technology compared with the technology of acquiring firm had no effect on the shareholder value of acquiring firm. Although the positive effect of relatedness in technological knowledge on the success of M&A was found by several studies that emphasized the effects of economies of scale and scope of R&D, such as a shorter innovation lead-time and the possibility to engage in larger combined projects (Gerpott, 1995; Hagedoorn and Duysters, 2002). The previous empirical research also found that technological knowledge similarity had no effect on invention quantity or quality, which suggested that high level of technology similarity created path dependency, thereby harming the development of novel inventions (Makri *et al*., 2010). The explanation for our empirical result might be that, a too similar acquired technological knowledge contributed little to the post-acquisition innovation performance (Ahuja and Katila, 2001; Cloodt *et al*., 2006), thereby contributing none to long-term shareholder value of acquiring firm. From an absorptive capacity perspective acquired

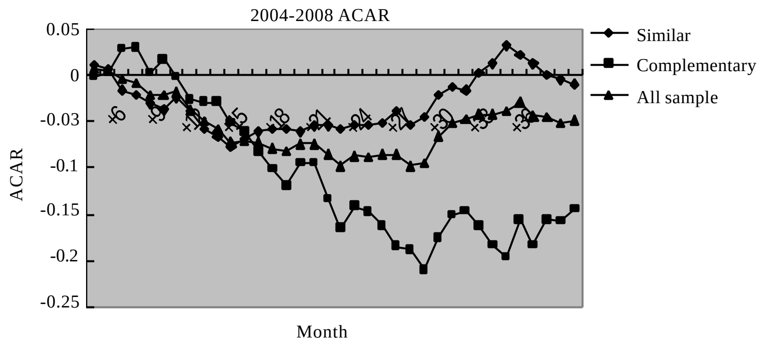

Fig. 1: ACAR for the sample of technology acquisitions from 2004 to 2008

knowledge can help improve performance through two effects. Firstly, acquired knowledge can provide a cross-fertilization effect as old problems can be addressed through new approaches (Cohen and Levinthal, 1990). Secondly, new acquired knowledge can serve as the basis for absorbing additional stimuli and information from the external environment. If acquisitions bring in knowledge that is too closely related to the existing knowledge base of the acquiring firm, both these benefits might be limited (Ahuja and Katila, 2001).

From Table 1 and Fig. 1 we also found that the ACAR of the subsample, in which the target firms were occupied by complementary technologies compared with the technologies of acquiring firms, were positive for the period from the 4th to the 8th month following the acquisition announcement. The ACAR were negative for the period the 3rd month, from the 9th month to the 38th month, following the acquisition announcements. And the negative ACAR of the 16th, the 17th, the 21st, from the 23rd to the 28th month following the acquisition announcements were significant at 0.1 statistical level. The results above were unexpected considering the positive effect of complementary technology on innovation performance of acquiring firm supported by prior empirical research (Makri *et al*., 2010). One explanation for the results might be the difficulty of knowledge integration. The ability to use new information to solve problems is enhanced when the new knowledge is related to what is already known, according to the absorptive capacity argument (Cohen and Levinthal, 1990). Elements of similar knowledge facilitate the integration of the acquired and acquiring knowledge bases (Kogut and Zander, 1992; Grant, 1996). Whereas, the recipes for conducting research, or the innovation routines of the target and acquiring firms, are likely to be different (Kogut and Zander, 1992). Under such circumstances, the integration of knowledge can be resource consuming, or even counterproductive as routines inappropriate to either or both knowledge bases can be adopted (Haspeslagh and Jemison, 1991; Zollo and Singh, 2004). A second possibility may be that it's more difficult to achieve synergy in acquiring a target firm occupied by complementary technology than similar technology compared with the technology of acquiring firm. Synergies in scale and scope are the main reasons for technologically related acquisitions (Hagedoorn and Duysters, 2002). But synergy through the creation or combination of capabilities can sometimes prove to be extremely difficult which has been emphasized by some case studies (James, 2002).

CONCLUSION

The objective of the research was to investigate the effect of technology acquisition on long-term shareholder value of acquiring firm, especially the effects of similar technology and complementary technology on shareholder value of acquiring firm. We examined the effects of 100 technology acquisitions on shareholder value of acquiring firms in high-tech industries in China using data from 2004 to 2008. Employing standard event study, with market model benchmark, the results showed that technology acquisitions had negative effects on shareholder value of acquiring firms in the long term at 0.1 and 0.05 statistical levels. The significantly negative ACAR appeared in the period of one year to one year and a half following the technology acquisitions. Even acquiring a firm with complementary technology, which usually leads to positive innovation performance of acquiring firm in previous research, still had negative effects on long-term shareholder value of acquiring firms at 0.1 statistical level. The significantly negative ACAR appeared in the period of around one year and a half to the 28th month following the technology acquisitions. And we found acquiring a firm with similar technology had no effect on long-term shareholder value of acquiring firms at 0.1 statistical level.

Our results have important implications for shareholders and investors in the stock market. For shareholders of acquiring firms, they need to think the proposal of technology acquisition carefully before making the decision. Although almost all motives of M&A stated by managers are finally for increasing the shareholder value in China. The effects of technology acquisition on shareholder value of acquiring firm may be unpredictable and uncontrollable by managers even with true value-maximizing motives. For example, synergy is usually hard to achieve between acquiring and target firms with complementary technology compared with the technology of acquiring firm in practice. For investors in stock markets, especially strategic investors, they can decide when sell their shares of a firm intending to begin a technology acquisition before the value of the target firm was destroyed if they know the time lag of the effect of technology acquisitions on shareholder value of acquiring firms by analyzing the information on technology similarity and complementarity between acquiring and target firms.

The contribution of this paper has been to bring new evidence on the effects of technology acquisition on shareholder value of acquiring firms in emerging markets such as China. The paper also adds to the evidence that mergers and acquisitions do not increase long-term shareholder value of acquiring firms. The effects of acquiring a firm with complementary technology compared with the technology of acquiring firm on shareholder value of acquiring firm in China are on average negative in the long term. The negative relationship between complementary technology acquisition and shareholder value of acquiring firm in our research is inconsistent to the positive relationship between complementary technology acquisition and innovative performance of acquiring firm in previous research based on firms in the USA, which may means a weak technological integration capability of firms in China or that improved innovative performance will not certainly increase shareholder value of acquiring firm. And we found how long the time lag of the effect of technology acquisition on shareholder value of acquiring firm was. To our knowledge, this study is the first empirical study on the effects of technology acquisition on shareholder value of acquiring firms through analyzing information on the technology similarity and complementarity between acquiring and target firms, which provide a new perspective for investors to make investment decision.

ACKNOWLEDGMENT

The authors gratefully acknowledge the funding from the National Natural Science Foundation of China (Grant No. 71031003).

REFERENCES

Ahuja, G. and R. Katila, 2001. Technological acquisitions and the innovation performance of acquiring firms: A longitudinal study. Strategic Manage. J., 22: 197-220.

Anand, J. and H. Singh, 1997. Asset redeployment, acquisitions and corporate strategy in declining industries. Strategic Manage. J., 18: 99-118.

Arnold, M. and D. Parker, 2007. UK competition policy and shareholder value: The impact of merger inquiries. Br. J. Manage., 18: 27-43.

Bannert, V. and H. Tschirky, 2004. Integration planning for technology intensive acquisitions. R&D Manage., 34: 481-494.

Barkema, H.G. and M. Schijven, 2008. How do firms learn to make acquisitions? A review of past research and an agenda for the future. J. Manage., 34: 594-634.

Cassiman, B., M.G. Colombo, P. Garrone and R. Veugelers, 2005. The impact of M&A on the R&D process: An empirical analysis of the role of technological- and market-relatedness. Res. Policy, 34: 195-220.

Chang, S.C., W.Y. Wu and Y.J. Wong, 2010. Family control and stock market reactions to innovation announcements. Br. J. Manage., 21: 152-170.

Chesbrough, H.W., 2003. The era of open innovation. Sloan Manage. Rev., 44: 35-41.

Choi, D. and G.C. Philippatos, 1983. An examination of merger synergism. J. Financial Res., 6: 239-256.

Cloodt, M., J. Hagedoorn and H. Van Kranenburg, 2006. Mergers and acquisitions: Their effect on the innovative performance of companies in high-tech industries. Res. Policy, 35: 642-654.

Cohen, W.M. and D.A. Levinthal, 1990. Absorptive capacity: A new perspective on learning and innovation. Administ. Sci. Quart., 35: 128-152.

Cooke, T.E., 1986. Mergers and Acquisitions. Blackwell, Oxford, UK., ISBN-13: 9780631147473, pp: 26-37.

DePamphilis, D., 2005. Mergers, Acquisitions and other Restructuring Activities. 3rd Edn., Academic Press, Waltham, MA., USA., ISBN-13: 9780080511436, pp: 6-13.

Elgers, P.T. and J.J. Clark, 1980. Merger types and shareholder returns: Additional evidence. Financial Manage., 9: 66-72.

Gerpott, T.J., 1995. Successful integration of R&D functions after acquisitions: An exploratory empirical study. R&D Manage., 25: 161-178.

Goodman, R.A. and M.W. Lawless, 1994. Technology and Strategy: Conceptual Models and Diagnostics. Oxford University Press,New York, USA., ISBN-13: 9780195079494, pp: 35-36.

Graebner, M.E., K.M. Eisenhardt and P.T. Roundy, 2010. Success and failure in technology acquisitions: Lessons for buyers and sellers. Acad. Manage. Perspect., 24: 73-92.

Granstrand, O., E. Bohlin, C. Oskarsson and N. Sjoberg, 1992. External technology acquisition in large multi-technology corporations. R&D Manage., 22: 111-133.

Grant, R.M., 1996. Prospering in dynamically-competitive environments: Organizational capability as knowledge creation. Organ. Sci., 7: 375-387.

Gregory, A., 1997. An examination of the long run performance of UK acquiring firms. J. Bus. Finance Accounting, 24: 971-1002.

Gregory, A. and S. McCorriston, 2005. Foreign acquisitions by UK limited companies: Short- and long-run performance. J. Empirical Finance, 12: 99-125.

Guo, B., 2008. Technology acquisition channels and industry performance: An industry-level analysis of Chinese large- and medium-size manufacturing enterprises. Res. Policy, 37: 194-209.

Hagedoorn, J. and J. Schakenraad, 1994. The effect of strategic technology alliances on company performance. Strategic Manage. J., 15: 291-309.

Hagedoorn, J. and G. Duysters, 2002. The effect of mergers and acquisitions on the technological performance of companies in a high-tech environment. Technol. Anal. Strategic Manage., 14: 67-85.

Haspeslagh, P.C. and D.B. Jemison, 1991. Managing Acquisitions: Creating Value through Corporate Renewal. Free Press, New York, USA., ISBN-13: 9780029141656, pp: 6-12.

Huang, S.W. and R.H. Tang, 2008. Factors affecting the choice of technology a cquisition mode: An empirical analysis of the electronic firms of Japan, Korea and Taiwan. Technovation, 28: 551-563.

James, A.D., 2002. The strategic management of mergers and acquisitions in the pharmaceutical industry: Developing a resource-based perspective. Technol. Anal. Strategic Manage., 14: 299-313.

Jansen, S.A., 2002. Pre- and Post Merger-Integration in Cross Border Transactions: Trends, Tools, Themes and Empirical Tests of Old and New Economy Deals. In: International Handbook of Mergers and Acquisitions, Picot, G. (Eds.). Palgrave, London, UK., ISBN-13: 9780333968673, pp: 371-398.

Jones, G.K., A. Lanctot Jr. and H.J. Teegen, 2001. Determinants and performance impacts of external technology acquisition. J. Bus. Venturing, 16: 255-283.

King, D.R., R.J. Slotegraaf and I. Kesner, 2008. Performance implications of firm resource interactions in the acquisition of R&D-intensive firms. Organiz. Sci., 19: 327-340.

Kogut, B. and U. Zander, 1992. Knowledge of the firm, combinative capabilities and the replication of technology. Organization Sci., 3: 383-397.

Kohers, N. and T. Kohers, 2000. The value creation potential of high-tech mergers. Financial Anal. J., 56: 40-50.

Kothari, S.P. and J.B. Warner, 1997. Measuring long-horizon security price performance. J. Financial Econ., 43: 301-339.

Kuipers, D., D. Miller and A. Patel, 2009. The legal environment and corporate valuation: Evidence from cross-border takeovers. Int. Rev. Econ. Finance, 18: 552-567.

Lubatkin, M.H., 1987. Merger strategies and stockholder value. Strategic Manage. J., 8: 39-53.

Lubatkin, M. and R.E. Shrieves, 1986. Towards reconciliation of market performance measures to strategic management research. Acad. Manage. Rev., 11: 497-512.

Makri, M., M.A. Hitt and P.J. Lane, 2010. Complementary technologies, knowledge relatedness and invention outcomes in high technology mergers and acquisitions. Strategic Manage. J., 31: 602-628.

McWilliams, A. and D. Siegel, 1997. Event studies in management research: Theoretical and empirical issues. Acad. Manage. J., 40: 626-657.

Papadakis, V.M. and I.C. Thanos, 2010. Measuring the performance of acquisitions: An empirical investigation using multiple criteria. Br. J. Manage., 21: 859-873.

Puranam P. and K. Srikanth, 2007. What they know vs. what they do: How acquirers leverage technology acquisitions. Strategic Manage. J., 28: 805-825.

Puranam, P., H. Singh and M. Zollo, 2006. Organizing for innovation: Managing the coordination-autonomy dilemma in technology acquisitions. Acad. Manage. J., 49: 263-280.

Rau, P.R. and T. Vermaelen, 1998. Glamour, value and the post-acquisition performance of acquiring firms. J. Financial Econ., 49: 223-253.

Sudarsanam, S. and A.A. Mahate, 2006. Are friendly acquisitions too bad for shareholders and managers? Long-term value creation and top management turnover in hostile and friendly acquirers. Br. J. Manage., 17: S7-S30.

Trautwein, F., 1990. Merger motives and merger prescriptions. Strategic Manage. J., 11: 283-295.

Zollo, M. and H. Singh, 2004. Deliberate learning in corporate acquisitions: Post-acquisition strategies and integration capability in U.S. bank mergers. Strategic Manage. J., 25: 1233-1256.