Does it pay to align a firm's competitive strategy with its industry IT strategic role?

Jinmei Yin [a], Shaobo Wei [b,*], Xiayu Chen [c], Jiuchang Wei [d,e]

[a] School of Management, University of Science and Technology of China, University of Science and Technology of China, Jinzhai Road 96, Hefei, Anhui, China
[b] International Institute of Finance, School of Management, University of Science and Technology of China, Hefei, Anhui 230026, China
[c] School of Management, Hefei University of Technology, Hefei, Anhui 230009, China
[d] School of Management, University of Science and Technology of China, China
[e] Center for Crisis Management Research (Sponsored by Beijing Planning Office of Philosophy & Social Science), School of Public Policy & Management, Tsinghua University, China

A R T I C L E I N F O

A B S T R A C T

While researchers have increasingly recognized the importance of information technology (IT) in leveraging a firm's competitive strategy for achieving superior firm performance, our understanding of the nature of how a firm's competitive strategy aligns with its industry IT strategic role and how such alignment influences firm performance remains limited. Drawing upon strategic alignment perspective, this study aims to theorize and empirically test how the firm's competitive strategy (i.e., cost leadership, differentiation, and dual strategy) aligns with its industry IT strategic role to improve firm performance. Based on the data of Chinese publicly listed firms during 2009–2015, our results indicate that different competitive strategy aligns with different industry IT strategic roles for achieving superior performance. Specifically, cost leadership strategy aligns with automate IT strategic role, dual strategy aligns with informate IT strategic role, and differentiation strategy aligns with transform IT strategic role in generating superior firm performance. We also discuss the theoretical and practical implications of the current study.

1. Introduction

In response to the unique challenges of rapid changes and institutional voids, firms operating in emerging economies need to make appropriate competitive strategy choices so as to generate superior firm performance (Li & Li, 2008; [1,2]). Within the dominant competitive strategy paradigm, cost leadership and differentiation have become the two fundamental strategies that firms can adopt to achieve a competitive advantage [3,4]. Specifically, cost leadership refers to the strategy that firms create a low-cost advantage relative to their peers to improve market share and achieve operational efficiency; differentiation refers to the strategy that firms differentiate their products/services that can satisfy a customer's changeable demand and thus help achieve a competitive advantage that is not easy to be imitated by competitors [3, 5–7]. However, controversy remains regarding the effectiveness of pure versus dual strategies, and the existing findings, particularly those derived from emerging economies, provide only limited and mixed understanding [8]. Increasingly, scholars have begun to shift their focus

from trade-off (either/or) to paradoxical (both/and) thinking and have argued that a dual strategy that combines cost leadership and differentiation can lead to better performance [9–11]. In particular, Gabrielsson et al. [8] indicate that "almost three decades of debate have not conclusively determined the conditions under which a firm can realize a combined 'hybrid' competitive strategy instead of a 'single' (or pure) generic competitive strategy of either differentiation or cost leadership." It is thus of great significance and interest to examine the specific conditions under which pure or dual strategy can contribute better performance [12,13].

To resolve this debate, researchers have suggested that the effectiveness of cost-leadership, differentiation, or dual strategy depends on the industry conditions in which they are implemented (Li et.al., 2008a). In particular, a group of scholars have recognized the importance of information technology (IT) when implementing their competitive strategy for superior performance [14–16], and IT-enabled initiatives are required to be considered in the context of other competitors' IT-enabled actions in the same industry because it is not an isolated

event [17,18]. Under this condition, information systems researchers have proposed the conceptualization of industry IT strategic role, which refers to IT that may play a different role in different industry contexts [19,20]. Specifically, based on the different purpose of IT across industries, industry IT strategic role can be classified into three categories: automate, informate up/down, and transform [20]. This kind of industry classification determines the various types of IT required, the way of its application, and the extent of value produced and retained [21]. The strategic role of IT in certain industries reflects the main function that IT plays for firms' competition across industries [22]. Prior research have highlighted the importance of alignment among different facets during firm operation, such as industry and business strategy [23,24]. Therefore, the industry IT strategic role that brings structural changes across different industries might affect firms' value capturing from specific competitive strategy [25,26]. Although industry IT strategic role has been applied to evaluate the role that IT serves in a firm, there is a dearth of research that explores how a firm chooses competitive strategy to improve firm performance in a different industry IT strategic role [27, 19,8,20]. It is thus necessary to investigate whether and how a firm aligns its competitive strategy with its industry IT strategic role to achieve superior firm performance.

Drawing upon the strategic alignment perspective (Henderson et al., 1993), this study aims to explore how the alignment between a firm's competitive strategy and industry IT strategic role affects firm performance in an emerging economy, such as China. As China is the largest emerging economy in the world and its stunning rate of economic growth has made it become one of the most important markets in the world (Li et.al., 2008a); we thus used data from Chinese publicly listed firms during 2009–2015 to test the research model. Specifically, strategic alignment perspective suggests that a firm's competitive strategy is only suitable in particular external conditions, and the well-aligned organization will acquire peak effectiveness [28]. Specifically, we propose and empirical test that a different competitive strategy type will have differential impact on firm performance under a different IT industry role. In doing so, our research contributes to the existing literature in two main ways. First, by integrating industry IT strategic role with the firms' competitive strategy and further exploring their joint effects on firm performance, our study crystalizes the perspective of IT strategic role and competitive strategy and confirms the importance of the alignment of industry IT strategic role and competitive strategy in shaping superior firm performance. Although industry IT strategic role has been well documented in existing literature on a variety of topics such as IT investment (Banker, Feng, & Pavlou, 2011; [12,19,20]), previous research has not integrated industry IT strategic role with the firm's competitive strategy to examine whether and how such alignment influences firm performance. Second, our research also enriches the existing research on how to configure appropriate competitive strategy from the perspective of industry IT strategic role. Generally, the empirical results of our study present a more nuanced understanding of the link between firm competitive strategy and firm performance under different industry IT strategic role in an emerging economy (i.e., China). In particular, our study shifts focus from which competitive strategy is effective to the context under which competitive strategy is effective, providing a comprehensive understanding of the effectiveness of different competitive strategies.

The remainder of this paper is planned as follows. In the next section, we put forward our research model and develop our hypotheses. Next, we describe our data collection process and empirically test our hypotheses. Finally, we conclude our findings and discuss the contributions and limitations, as well as show some potential avenues for future research.

2. Theoretical framework and literature review

2.1. Competitive strategy

Competitive strategy is one of the most important business strategies. The researchers who advocated Porter's view have argued that firms are supposed to focus on pure strategy (either low cost or differentiation) to generate superior performance ([29]; Porter, 1985; [30]). Specifically, cost leadership strategy represents that firms need to create a low-cost advantage relative to their peers, whereas differentiation strategy represents that firms need to exploit products/services that can offer the firm to obtain a price premium, which is not easy to be imitated by competitors [5–7,31].

Prior studies have verified that competitive strategy has an important impact on performance. However, it remains unknown which strategy firms can contribute to firm performance among differentiation, cost leadership, and dual strategy ([4]; Li et al., 2008a; [32]). Aulakh et al. [29] put forward that firms implementing a dual strategy is negatively related to firm export performance. However, using a sample of firms in Greece, Spanos et al. [11] find that a dual strategy is preferable to pure strategies and pure differentiation strategies are less profitable. As such, it is still confusing for firms to select which kind of competitive strategy for achieving superior firm performance. In addition, the studies on dual strategy have mainly focused on the developed countries, such as the US [11]. Recently, the attention of dual strategy has gradually shifted to emerging markets with the increasing importance of developing countries in the world economy, such as China. Scholars have argued that the emerging economy (China) provides an interesting research background that explores both conventional research questions and distinct phenomenon to advance the literature [33]. On the one hand, China is the biggest emerging economy with the fastest speed of growing. The Chinese market is getting more and more competitive and firms need to take on an appropriate competitive strategy ([33]; Li, Poppo, & Zhou, 2008). On the other hand, China is in a transitional period with technological transformation and this phenomenon posits a suitable research context to explore across different industries [34]. Moreover, scholars are also constantly exploring the boundary conditions of firm competitive strategy to enrich existing research, such as firm size, IT capability, and industry environment, and thus it is interesting to examine which competitive strategy in China can help achieve the goal of optimal performance [8,32].

2.2. Industry IT strategic role

Chatterjee et al. [20] first proposed that industries can be divided into three categories based on the different strategic role that IT plays in the industry clearly: automate, informate, and transform. The industry IT strategic role describes the real function of IT in the industry (Armstrong et al., 1999). Specifically, in an automate industry, IT is used to replace expensive and unreliable human labor by automating business processes (e.g., metal manufacturing) (Armstrong et al., 1999). In the informate industry, IT can be used to provide and distribute data/information to empower management and employees more efficiently and easily (e.g., food services). IT not only helps firms improve operational efficiency, but also promotes the introduction and development of new products/services (Armstrong et al., 1999; Henderson et al., 1993). While in the transform industry, IT can fundamentally alter traditional ways of doing business and competition of the industry by redefining business processes and relationships (e.g., airlines) [20]. IT is viewed as a key driver and critical organizational resources of the firms' development (Armstrong et al., 1999). Indeed, quite a lot of researchers have agreed with this kind of category and have applied the industry IT strategic role to investigate how IT investment's effect varies under a different industry IT strategy role [12,19]. As the strategic role of IT varies across different industries, it might also have an important role in shaping the firm's business activities and competitive strategies (Chae

et al., 2018). However, our knowledge regarding how the effectiveness of different competitive strategies varies under different industry IT strategic role remains limited.

2.3. Strategic alignment perspective

The strategic alignment perspective outlines four topics of strategy decision for management: business strategy (including competitive strategy), IT strategy, organizational infrastructure and process, and information systems [35]. Given that IT has become a key tool for implementing business strategy [36], firms can adjust their strategies that can align with IT strategy and operate business with minimum fuss and maximum efficiency [37]. As such, the alignment of IT and business strategy has been a top concern for organizations to execute business [37,38]. IT-business strategic alignment can be defined as the level of integration and harmony between IT and business strategy when firms apply IT strategy in a proper and timely manner [39]. Researchers have paid increasing attention to the alignment between business strategy and IT strategy and have explored its impact on firm performance ([40]; Schniederjans et al., 2009).

It is a critical issue to explore whether there is an alignment between the strategic application of IT and firm competitive strategy to attain an optimal organizational performance [37]. In this regard, most studies have investigated the performance effects of the strategic alignment ([41–43]; Schniederjans et al., 2009; [13]). For example, Chan et al. [41] find that the strategic alignment positively affects firm innovation and market growth, but negatively affects firm reputation and financial performance. Yayla and Hu [13] analyze the impact of the strategic alignment on organizational performance, and they further suggest that strategic alignment has a positive impact on organizational performance in both developed and developing countries. Schniederjans and Cao [35] also find that IT-business alignment has a positive impact on firm performance. Although there is a body of literature investigating the alignment between business strategy and IT strategy, it remains to be resolved whether and how competitive strategy aligns with industry IT strategic role as well as how such alignment influences firm performance. ([2,36]; Yayla et al., 2012).

2.4. Hypothesis development

Drawing upon strategic alignment perspective, firms with alignment between IT and business strategies can generate a sustainable competitive advantage [44]. According to this, we argue that a firm's competitive strategy needs to align with its industry IT strategic role and such alignment can help the firm achieve superior firm performance. Specifically, we propose that cost leadership is the most important competitive strategy that the firm can adopt for achieving superior firm performance in the IT automate industry; dual strategy is the most important strategy that the firm is able to adopt for achieving superior firm performance in the IT informate industry; and differentiation is the most important competitive strategy that the firm in the IT transform industry can adopt for achieving superior firm performance.

Specifically, in the automate industry, the role of IT is mainly used to replace expensive and unreliable human labor with automating business processes and improve the existing business activities' efficiency (Armstrong et al., 1999; [19]). In particular, some routinized organizational functions are substituted by automating processes enabled by IT [45]. The prevalent IT in automate industry is to support common standards, reduce cost, and promote operational efficiency (Armstrong et al., 1999; [46]). Meanwhile, such a kind of IT in the automate industry is standardized and easily accessible with spending minor cost [19]. Firms adopting a cost leadership strategy aim to provide customers with standard and a high-volume product at the most competitive prices. In contrast, firms pursuing a differentiation strategy strive to attract customers by means of innovative products, good experience, advanced technology, and so on [47]. A dual strategy is a kind of compromise

strategy, which means that firms pay attention to the cost of products while pursuing product differentiation, and firms want to form the advantages of high quality and low cost. Therefore, the IT function in the automate industry mismatches the goals of differentiation and dual strategy.

Compared to differentiation and dual strategy, the prevalent IT in automate industry can help firms leverage the advantages of cost leadership, which focuses on reducing costs through a simplified operation process and scale economies [31]. For example, the firms belonging to heavy construction need to accurately record and control costs in every step of the operations, and develop IT systems to simplify the operational process and save time. Meanwhile, the low price helps firms attract more customers. From the perspective of strategic alignment, the IT orientation in automate industry fits with the orientation of cost leadership strategy at the business level. Thus, for firms in the IT automate industry, cost leadership might be better aligned with the IT strategic role of the automate industry. As such, we hypothesize:

Hypothesis 1. In the automate industry, cost leadership has a stronger impact on firm performance when compared with differentiation and dual strategy.

In the IT informate industry, the main role of IT is to facilitate information flows to enhance decision-making and decision-taking activities, which involve both internal and external functions [20,17,24]. For the internal communication, IT helps distribute critical information across the internal functions more easily and efficiently. In the IT Informate industry, IT is regarded as a way to obtain information about firms' operations, so that the timely communication will help firms achieve organizational cost control and coordination (Armstrong et al., 1999). From the aspect of external business partnerships, the role of IT can help firms obtain timely market response to pinpoint problems and initiate corrective measures rapidly (Wade et al., 2004). In particular, effectively obtaining customers' changeable requirements through IT can facilitate firms to develop new products continually (Armstrong et al., 1999; [45]). As such, IT in the informate industry can not only improve the internal production process to reduce costs, but also help firms differentiate their products to their competitors [48,49]. A cost leadership strategy pays attention to reduce cost and improve operational efficiencies internally while a differentiation strategy focuses on differentiating products to satisfy customers, and the two kinds of strategies do not match the function of IT in the informate industry (Li et al., 2008a; [50]).

Compared to firms with either pursuing cost leadership or differentiation strategy, firms with dual strategy can exert more effectively due to facilitating information flow both within and across organizational boundaries supported by IT in the informate industry. For example, in the retail industry, Walmart stores which belong to the informate industry, have used IT to redesign key business processes that affect their capability to manage the North American distribution channels of products. As a result, Walmart stores obtain significant improvements in operating costs and increased the speed to respond to market requirements (Henderson et al., 1993). Meanwhile, with the help of IT, efficient distribution information channels can help timely collect and analyze customer information and feedback, which facilitates the Walmart to more effectively provide customers with various personalized products/services. For example, based on customer and market feedback, Walmart stores distinguish between different customer groups for targeted sales. Based on the strategic alignment perspective, the IT orientation in the informate industry, which is aligned with the business orientation of dual strategy (focus on both cost and product differentiation) can create superior performance. Thus, for firms in the IT informate industry, firms which adopt a dual strategy combing cost leadership and differentiation might better align with the IT strategic role of informate industry for achieving superior performance. Therefore, we expect:

Hypothesis 2. In the informate industry, dual strategy has a stronger impact on firm performance when compared with cost leadership and differentiation.

In the IT transform industry, the implementation of IT is imperative and proactive (Henderson et al., 1993). Generally, the role of IT in the transform industry is to introduce radically different technologies that can make firms abandon obsolete business processes. Under this industry, IT enables major innovations in products, services, and business models due to fundamentally changing the relationship between business and market (Armstrong et al., 1999). In particular, the use of IT can redefine existing organizational activities and create a new business that can change industry standards. In addition, the role of IT in the transform industry can help firms continually better develop various new products/services that can evenly exceed the customers' expectations. A growing slice of expenditure in IT is devoted to product development rather than making existing production more efficient in the transform industry [49]. The purposes of cost leadership and dual strategy is not aligned with the prevalent IT in transform industry. Firms implementing a dual or cost leadership strategy are unable to take advantage of the IT resources provided by the transform industry and will result in a waste of resources and inefficiency.

Compared to cost leadership and dual strategy, differentiation strategy focus more on innovation and superior customer service, which need more advanced IT for better research and development which cannot be imitated by competitors (Wade et al., 2004). The advanced IT in the transform industry can support firms to differentiate products and develop new technologies more easily (Li et al., 2008a). For instance, in the financial banking industry, IT leads to substantial structural changes of the industry and plays a critical role. Banks, thus, have been developing a website or an online application to provide customers with information and financial services that help the banks to differentiate their products/services to their competitors [51]. According to the strategic alignment perspective, the fit between the IT orientation of transform industry and the business orientation of differentiation strategy can generate the competitive advantage. Thus, for firms in the transform industry, differentiation strategy is aligned with the IT strategic role of transform industry so as to generate superior firm performance. Hence, we propose:

Hypothesis 3. In the transform industry, differentiation has a stronger impact on firm performance when compared with cost leadership and dual strategy.

3. Methodology

3.1. Sample and data collection

We conducted our research against the background of the largest developing economy, namely, China. Meanwhile, small and medium-sized and growth firms need to pay more attention to their decision-making under intense competition in the emerging economy, because they need to allocate their limited resources appropriately. Therefore, we collected archival data that can represent our independent and dependent variables from the China Stock Market and Accounting Research Database (CSMAR) from 2009 to 2015 on Small and Medium-sized Enterprises Market and Growth Enterprises Market to test our hypotheses. CSMAR provides structured financial reports, trading quotations, unstructured news, research reports, firms' announcement information and so on for academic research in China. CSMAR is one of the most influential financial database in China and contains all financial information of listed firms in China, and have been recognized in previous research [52,53]. To reduce the risks of reverse causality, we measured firm performance after firms had conducted a competitive strategy, and measured the impact of competitive strategy using one-year lags [54]. At first, during 2009–2015, we acquired the financial information of 1279 publicly listed firms and 6696 observations from

CSMAR database. In the process of data processing, we eliminated the missing observations because firms do not report financial information that we need. At the same time, we also excluded missing matching samples due to one-year lags of independent and control variables. Then, we need to clarify these firms according to its role of IT and excluded the observations, which do not belong to this classification [19, 20]. Finally, we obtained 926 firms and 4044 observations from 2009 to 2015. Because the purpose of this paper is to find how a firm's competitive strategy aligns with its industry IT strategic role to improve firm performance, we divided the total sample into three subsamples: automate, informate, and transform industry. Then, we conducted a comparative analysis among subsamples to find the best alignment between competitive strategy and industry IT strategy role. Furthermore, we viewed industry IT strategic role as dummy variables to do a hierarchical regression analysis, which examined the moderating effect of industry IT strategic role. Chatterjee et al. [20] developed a method to classify IT strategic role and then Chae et al. [19] used the same way to access the strategic role of IT. Accordingly, we used the latest classification results to obtain our three subsamples. Table 1 shows the distribution of the industry IT strategic role in the sample.

3.2. Measurements

3.2.1. Differentiation strategy

Differentiation strategy refers to firms that provide products with unique or superior features that appeal to customers. Differentiation strategy focuses on the development of new designs, innovative research and development, customer satisfaction, and brand image [55]. Firms adopting the differentiation strategy are able to show a high profit margin, because differentiation can help firms fulfill a price premium for their superior products/service or greater customer value [31]. Thus, we used profit margin ratio of firms to measure the differentiation strategy [31,56].

3.2.2. Cost leadership strategy

Cost leadership aims at selling the cheapest unit price product in their industry [55,57], p. 35) indicated that "cost leadership requires aggressive construction of efficient-scale facilities, vigorous pursuit of cost reduction from experience, tight cost and overhead control and cost minimization in areas like R&D, service, sales force, advertising, and so on." Therefore, firms require to utilize their assets efficiently and main lean operations to achieve cost leadership and maintain their competitive advantages as cost leaders [3]. Thus, we used the asset turnover ratio of firms to capture this strategy [31].

3.2.3. Dual strategy

Dual strategy refers to firms that not only focus on cost control and save, but also consider how to develop a new product/service to create customer demand. These firms usually adopt differentiation and cost leadership simultaneously in the process of operation [58]. According to the definition, we used the product of asset turnover ratio and profit margin ratio as the operationalization of dual strategy.

3.2.4. Industry IT strategic role

Industry IT strategic role was divided into three categories based on the different roles that IT plays in the industry. Chae et al. (2018, p. 8) put forward that "the construct of the strategic role of IT for an industry has been used to understand the impact of IT on a firm's business

Table 1
Industry Types (N = 4044).

	Frequency	Percentage (%)
Automate industry	245	6.11
Informate industry	3252	80.41
Transform industry	547	13.48

activities and competitive strategies." Accordingly, this study describes the industry classification using the industry information developed from Chae et al. [19]. Thus, we used the result to divide our samples into automate, informate, and transform industry as shown in Table 2.

3.2.5. Firm performance

The measures of firm performance require to show the effectiveness of the firm's action to achieve the firm's goals [59]. Firm financial performance indicators based on accounting reflect the final results of the managers' strategy decisions, thus, this kind of measures are preferable to market-based performance measures, which are more susceptible to uncontrollable factors when exploring the impact of competitive strategy on firm performance [60]. Following prior studies (Stoel et al., 2009; Palmer et al., 2000), we utilized return on assets (ROA) information from archival data to capture firm financial performance. ROA is a useful indicator of measuring firm profitability relative to its total assets [58]. Meanwhile, to demonstrate the robustness of our results using different measurements of firm performance, we utilized return on equity (ROE) measurement as the ratio of profit to equity as the performance measure for robustness check [61].

3.2.6. Control variables

To exclude the impact of other factors, we controlled the firm and industry level variables, which may affect firm performance: (1) firm size: the natural logarithm of total assets [62,63]; (2) firm capital expenditure: the natural logarithm of the cash paid by the firm for the purchase and construction of fixed assets, intangible assets, and other long-term assets [64]; (3) fixed asset: the ratio of fixed assets to total assets at the end of the year [65]; and (4) firm leverage: the ratio of total liabilities to total assets at the end of the year [64]; (5) industry concentration: the Herfindahl index, which equals the sum of the squared market share of each firm in the same industry [66].

4. Analysis and results

Table 3 reports the descriptive statistics and correlation matrix for variables applied in this paper. The variance inflation factor (VIF) test shows that all VIF values are below 2.1 with an average of 1.57. The results indicate that multicollinearity is not a concern in the regression analysis. We minimized possible collinearity by centering all pertinent independent variables and creating the interaction terms by multiplying them [67]. Before we performed a regression analysis to test the hypotheses, we confirmed whether we should use a fixed-effect or a random regression model. Our study has three subsamples, period "T" of seven years and the number of three subsamples are 245, 3252, and 547 (N), respectively. We performed the Hausman test in the total sample and every subsample (Total sample: chi^2 = 357.51, p < 0.001; Automate: chi^2 = 16.01, p < 0.05; Informate: chi^2 = 368.46, p < 0.001; and Transform: chi^2 = 30.67, p < 0.001) and the results show that we should

Table 2
Industry IT Strategic Role.

Role of IT	Industries Classified
Automate	Coal Mining; Heavy Construction and Lumber & Wood Prods – except Furniture Manufacturing
Informate	Agricultural Machinery Manufacturing; Apparel & Other Finished Products –Manufacturing; Automotive Manufacturing; Computer Manufacturing; Diversified Chemicals Manufacturer; Diversified Foods Manufacturing; Electrical Equipment, Electronic/Scientific Test & Measurement Instruments Manufacturer; Fabricated Metal Products Manufacturing; Food Services; Furniture & Fixtures Manufacturing; Holding & Other Investment Offices; Miscellaneous Retail; Motor Freight; Transportation/Warehouse; Petroleum Refining; Pharmaceuticals Manufacturer; Retail; and Rubber Manufacturing
Transform	Airlines; Advertising; Banking; Computer Software Products & Services; Financial Services; Media-Diversified; and Printing, Photocopying & Graphics Design

adopt the fixed-effect estimation model [68]. Next, because the fixed-effect estimation model may include not only an individual fixed effect, but also time fixed effect, we examined the joint salience of annual dummy variables to determine whether time effects should be controlled in the model and the results show that the model should contain year effects. Therefore, we used annual dummy variables as control variables in our model. We then estimated the following model:

$$
\begin{aligned}
(\textbf{\textit{Firm\_performance}})_{i,t+1} = {} & \alpha_{i,t} + \beta_1 firm\_size_{i,t} + \beta_2 capital\_expenditure_{i,t} \\
& + \beta_3 fixed\_asset_{i,t} + \beta_4 firm\_leverage_{i,t} \\
& + \beta_5 industry\_concentration_{i,t} \\
& + \beta_6 differentiation_{i,t} + \beta_7 cost\_leadership_{i,t} \\
& + \beta_8 dual\_strategy_{i,t} + YearEffects_{i,t} + \varepsilon_{i,t}
\end{aligned}
$$

Where i stands for the firm and varies from 1 to N in every subsample;
t is the year and varies from 2009 to 2015;
$\alpha_{i,t}$ is the constant;
β_1 - β_8 are the coefficients in the regression;
$\varepsilon_{i,t}$ is the residual variable that varies with time.

Using the model, we tested our hypothesis, and the results of three subsamples are presented in Table 4. To test which competitive strategy has the strongest positive impact on firm performance under different industry IT strategic role, we compared the significant coefficients between specific competitive strategy and firm performance.

In the automate industry, we hypothesized that cost leadership strategy has a stronger positive impact on firm performance, and the result of Model 1a shown in Table 4 and the results supported this hypothesis. In Model 1a, the results showed that cost leadership significantly positively affects firm performance ($\beta7 = 0.091$ and p < 0.05), while differentiation was insignificantly related to firm performance ($\beta6 = -0.121$ and p > 0.10). Moreover, dual strategy was found to be significantly negatively related to firm performance ($\beta8 = -1.384$ and p < 0.01). Then, we conducted the comparison analysis, and the results indicated that cost leadership has a stronger impact on firm performance in the automate industry as compared to differentiation and dual strategy ($\Delta T1 = 43.343$). This result suggested that the alignment between cost leadership strategy and automate IT strategic role has a stronger impact on firm performance.

For the informate industry, we hypothesized that dual strategy has a stronger positive impact on firm performance and the result of Model 2a displayed in Table 4. In Model 2a, the results presented that dual strategy positively affects firm performance significantly ($\beta8 = 0.834$ and p < 0.01), whereas differentiation strategy does not significantly affect firm performance ($\beta6 = -0.002$ and p > 0.10) and cost leadership is positively related to firm performance at the significant level of 0.1 ($\beta7 = 0.012$ and p < 0.10). The results of the comparison analysis further showed that dual strategy in the informate industry has a stronger impact on firm performance as compared to cost leadership and differentiation ($\Delta T2 = 171.926$). This result suggests that dual strategy was aligned with informate IT strategy role to generate superior firm performance and supported hypothesis 2.

For the transform industry, we hypothesized that the differentiation strategy has a stronger positive impact on firm performance and the result of Model 3a shown in Table 4. In Model 3a, the results showed that only differentiation has a significant positive impact on firm performance ($\beta6 = 0.259$ and p < 0.05), while the coefficients of cost leadership and dual strategy is insignificant ($\beta7 = 0.008$, p > 0.10 and $\beta8 = 0.520$, p > 0.10). This result suggested that the differentiation strategy is better aligned with transform IT strategy role to improve firm performance and supported hypothesis 3.

Table 3
Descriptive Statistics.

	Mean	Median	SD	1	2	3	4	5	6	7	8	9	10
1. Firm size	21.17	21.09	0.81	1									
2. Capital	18.22	18.29	1.25	0.65**	1								
3. Fixed asset	0.20	0.17	0.13	0.13**	0.346**	1							
4. Leverage	0.30	0.28	0.19	0.45**	0.326**	0.315**	1						
5. Industry concentration	0.09	0.052	0.11	−0.03	−0.010	0.035*	0.04**	1					
6. Differentiation	1.01	1.00	0.05	−0.02	−.051**	0.010	0.13**	−0.015	1				
7. Cost leadership	0.64	0.55	0.43	0.15**	0.111**	0.090**	0.29**	0.023	−0.10**	1			
8. Dual strategy	0.64	0.56	0.43	−0.01	0.005	0.026	0.028	0.010	−0.61**	−0.06**	1		
9. ROA	0.045	0.043	0.066	−0.06**	−0.07**	−0.10**	−0.23**	−0.03	−0.21**	0.021	0.17**	1	
10. ROE	0.071	0.067	0.291	0.019	0.02	−0.01	0.02	0.038*	−0.05**	−0.01	0.16**	0.18**	1

Table 4
Results for Three Subsamples.

	Automate		Informate		Transform	
	Model 1a	Model 1b	Model 2a	Model 2b	Model 3a	Model 3b
Variables	ROA	ROE	ROA	ROE	ROA	ROE
Firm size	−0.018†	−0.027	−0.016***	−0.024*	−0.012*	−0.008
Firm capital	−0.006	−0.016	−0.004*	−0.004	−0.003	−0.002
Firm fixed asset	−0.065	−0.119	−0.001	0.186	−0.013	−0.133
Firm leverage	0.060	0.030	0.037	0.223	0.037	0.031
Industry concentration	−0.001	0.063	0.006	0.582	0.014	0.018
Differentiation	−0.121	−0.418	−0.002	−0.696	0.259*	0.233
Cost leadership	0.091*	0.173*	0.012†	−0.129	0.008	0.001
Dual strategy	−1.384*	−3.256†	0.834**	1.212	0.520	0.197
Constant	0.003	−0.007	−0.003***	−0.005***	0.002	0.001
Year	YES	YES	YES	YES	YES	YES
Observations	245	245	3252	3252	547	547
R-squared	0.125	0.076	0.097	0.040	0.061	0.020

Note: †p<0.1, *p < 0.05, **p < 0.01, and ***p < 0.001.

5. Post hoc analysis

5.1. Robustness check

To further confirm the results, we also conducted three additional robustness checks. First, we used ROE as an alternative dependent variable to do a robust check and the results were also displayed in Table 4. In Models 1b, 2b, and 3b, the relationship between competitive strategy and industry IT strategic role are the same as the relationship in Models 1a, 2a and 3a (Model 1b: $\beta6$=-0.418, p > 0.10; $\beta7$ = 0.173, p < 0.05; $\beta8$=-3.256, p < 0.10; Model 2b: $\beta6$=-0.696, p > 0.10; $\beta7$=-0.129, p > 0.10; $\beta8$ = 1.212, p > 0.10; Model 3b: $\beta6$ = 0.233, p > 0.10; $\beta7$ = 0.001, p < 0.10; and $\beta8$ = 0.197, p > 0.10). Although the coefficients in Model 2b and Model 3b is insignificant, the relationship is still positive as the main results.

Second, to confirm the robustness of our results, we also used industry dummy variables as moderators to examine the interactions between three types of industry IT strategic role and three types of competitive strategies. Then, the results were consistent with the main results. We presented this result in Table 5. The results in Table 5 revealed that the direct effect of differentiation and cost leadership strategy on firm performance is absent, while the direct effect of dual strategy is significantly positive (β = 0.717 and p < 0.01). Then, we added interaction terms in Model 2, Model 3, and Model 4 gradually. In Model 2, the results provided evidence to support the moderating effect of automate industry proposed under H1. Specifically, the interaction of automate IT industry strategic role and cost leadership strategy is positively related to firm performance (β = 0.090 and p < 0.01). The results shown in Model 3 and Model 4 also provided evidence to support the moderating effect of informate and transform IT industry strategic role proposed under H2 and H3. The alignment of informate industry and dual strategy had a positive impact on firm performance (β = 1.138 and p < 0.05) and the alignment of transform industry and

Table 5
Hierarchical Regression Analysis.

Variables	Model 1	Model 2	Model 3	Model 4
	Firm Performance			
Firm size	−0.017**	−0.015**	−0.017**	−0.017**
Firm capital	−0.002†	−0.002*	−0.002†	−0.002*
Firm fixed asset	−0.006	−0.009	−0.006	−0.006
Firm leverage	0.035†	0.033†	0.034†	0.036†
Industry concentration	−0.002	−0.001	−0.013	0.006
Differentiation	−0.007	−0.005	0.001	−0.033
Cost leadership	0.009	0.008	0.001	0.019*
Dual strategy	0.717**	0.754**	−0.331	0.767*
Automate		0.006		
Auto*Diff		−0.325†		
Auto*Cost		0.090**		
Auto*Dual		−2.311***		
Informate			−0.009	
Informate*Diff			−0.019	
Informate*Cost			0.015	
Informate*Dual			1.138*	
Transform				0.008
Transform*Diff				0.303†
Transform*Cost				−0.017†
Transform*Dual				−0.339
Constant	0.019***	0.020***	0.024**	0.017***
Year	YES	YES	YES	YES
Observations	4044	4044	4044	4044
R-squared	0.087	0.095	0.102	0.099

Note: †p<0.1, *p < 0.05, **p < 0.01, and ***p < 0.001.

differentiation strategy also exists (β = 0.303 and p < 0.10).

Finally, considering the financial halo effect, we controlled the current year's ROA (ROE for robust check) to eliminate the potential bias due to prior firm performance. Because of this dynamic panel model, we applied a generalized method of moments (GMM) to obtain our results

[69]. The results are shown in Table 6. In Model 1a, Model 2a, and Model 3a, the results totally supported our hypothesis. The coefficients are significant only when the competitive strategy is aligned with the specific industry IT strategic role. Specifically, cost leadership is positively related to firm performance in the automate industry (Model 1a: $\beta7 = 0.159$ and $p < 0.10$) and dual strategy is positively significant in the informate industry (Model 2a: $\beta8 = 1.365$ and $p < 0.05$), and the differentiation has a significantly positive impact on firm performance in the transform industry (Model 3a: $\beta6 = 0.814$ and $p < 0.01$). Then, we also used ROE as the alternative measurement of the dependent variable, the results of Model 1b and Model 3b are consistent (Model 1b: $\beta7 = 0.451$, $p < 0.05$; and Model 3b: $\beta6 = 1.895$, $p < 0.05$), while the coefficient of dual strategy is insignificant in Model 2b (Model 2b: $\beta8 = -9.698$ and $p > 0.10$). These generally consistent results further demonstrate the robustness of our conclusions. Based on the empirical analysis, the hypotheses of our study were generally confirmed and the results suggested that the alignment between firms' competitive strategy and the industry IT strategy role could significantly improve firm performance.

5.2. Endogeneity test

Omitted, correlated variables or reverse causality may cause a wrong observed association between competitive strategic and firm performance. To examine the possibility that competitive strategy is determined exogenously, we conduct the standard Durbin-Wu-Hausman method to verify that endogeneity is not a matter of concern in our study [70]. Specifically, because firm size, firm capital expenditure, firm fixed asset, firm leverage, industry concentration, and industry IT strategic role are not directly related to firm performance in our empirical results, we adopted these variables as instrumental variables to do the endogeneity test. Therefore, we regress cost leadership and differentiation strategy on firm size, firm capital expenditure, firm fixed asset, firm leverage, industry concentration, and industry IT strategic role, respectively. Then, we compute the residual, η_1 and η_2 of the two regressions. Finally, we add η_1 and η_2 as variables in the main regressive equation and reran the research model. The parameter estimate for the two residuals were insignificant ($\beta = 0.634$, $p > 0.30$ and $\beta = 0.159$, $p > 0.50$), and the results suggested that competitive strategy is exogenous in our context.

6. Discussion

Drawing upon strategic alignment perspective, this study aims to investigate whether and how a firm's competitive strategy aligns with its industry IT strategic role and how such alignment influences firm financial performance. By collecting archival data from 2009 to 2015 in China, we classified the total sample into three subsamples (automate/ informate/transform) according to the industry IT strategic role [19,20]. In each subsample, we conduct an empirical analysis and the results generally support our hypotheses. In addition, we examine the moderating effect of industry IT strategic role and these results confirm our findings. First, we proposed hypothesis 1 that IT in automate industry helps firms to save costs, which is consistent with the purposes of cost leadership. Our results confirm that there is an alignment between cost leadership strategy and IT strategic role in the IT automate industry. Meanwhile, we also find that dual strategy has a significantly negative association with firm performance in the automate industry. A possible explanation is that the prevalent main function of IT in the automate industry cannot help firms achieve the goals of both cost leadership and differentiation strategy (i.e., dual strategy) [22]. Moreover, the mismatching of competitive strategy with industry IT strategic role will require the firm to invest more resources; however, this kind of investment in the automate industry may not bring corresponding profits. In automate industry, such as coal mining, product differentiation does not increase consumer demand effectively. As such, it is not worthy for firms in the automate industry to adopt both cost leadership and differentiation strategy through improving IT capabilities. This finding further confirms that it is important for firms to align their competitive strategy with its industry IT strategic role.

Second, we put forward hypothesis 2 that IT in informate industry can not only help firms differentiate products, but also improve operational efficiency, and the results indicate that the dual strategy is aligned with the main purpose of IT in the informate industry. These kinds of firms can use IT appropriately to simplify the production process and constantly introduce a new product [48]. For instance, more and more young people prefer to customize their own furniture to display their personality, but they do not have too much consumption capacity because of the too high housing price and low salary in China as compared to the developed country [71]. They prefer to buy a good looking and affordable product. Therefore, furniture manufacturers need to commit to providing customers with affordable and distinctive furniture.

Finally, the empirical results also confirm our hypothesis 3 that differentiation strategy aligns with the role of IT in the transform industry. IT in the transform industry is to change the firm's fundamental relationships with external partnerships and alter the markets, products, organizational structures, inter-organizational relationships, and so on. Firms in the IT transform industry face intense competition and some advanced IT have also fundamentally transformed the industry. Under

Table 6
Results of dynamic panel model.

Variables	Automate		Informate		Transform	
	Model 1a	Model 1b	Model 2a	Model 2b	Model 3a	Model 3b
	ROA	ROE	ROA	ROE	ROA	ROE
Firm size	−0.042	−0.069	−0.007	0.038	−0.015	−0.015
Firm capital	−0.014†	−0.029	−0.003	−0.006	0.001	−0.004
Firm fixed asset	−0.098	−0.414	0.001	0.237	0.031	0.022
Firm leverage	0.136	0.094	−0.007	0.363	0.041	0.112
Industry concentration	−0.137	−0.251	0.083	−0.212	−0.004	−0.023
Current ROA	−0.167		−0.129		0.412*	
Current ROE		−0.402		1.094		−0.433
Differentiation	−0.261	0.866	−0.178	−9.227**	0.814**	1.895**
Cost leadership	0.159†	0.451*	0.076	−0.557	0.010	−0.012
Dual strategy	−0.677	−0.765	1.365*	−9.698	−0.210	0.058
Constant	−0.010	0.034	−0.001	−0.091	0.007	0.042
Year	YES	YES	YES	YES	YES	YES
Observations	245	245	3252	3252	547	547
Wald chi^2	31.80	51.92	21.73	39.15	76.62	57.80
Sargen chi^2	33.302	30.906	39.293	45.344	40.518	31.852

Note: †$p<0.1$, *$p < 0.05$, **$p < 0.01$, and ***$p < 0.001$.

this condition, firms in the transform industry can develop differentiation strategy to better utilize the advanced IT in the transform industry to better meet the customers changing requirements.

6.1. Theoretical contributions and practical implications

This study provides two main theoretical contributions to the existing literature. First, this study points to the critical function of industry IT strategic role as an important conditional factor in developing and examining the impact of competitive strategies. This contingency model adds knowledge to the relationship between competitive strategy and firm performance. More importantly, industry IT strategic role provides a new perspective to explore the impact of pure/dual competitive strategy on firm performance [28,14]. Second, our study demonstrates that the link between competitive strategy and firm performance are more complex than previously theorized [12,19,20,31]. Particularly, the impact of dual strategy on firm performance appear to be significantly positive, while differentiation and cost leadership strategy are insignificant in the full sample. These results suggest that we need to consider the other conditional factor to unveil the mechanism of competitive strategy. This study extends strategy management literature by further substantiating the relationship between both pure/dual strategies and firm performance. By adopting the strategic alignment perspective, our study argues and empirically tests whether and how a firm's competitive strategy aligns with its industry IT strategic role. Our results provide the empirical support for the existence and nature of the alignment between competitive strategy and industry IT strategy role. In addition to the findings of the alignment between competitive strategy and industry IT strategic role, we also find that the effect of dual strategy in automate industry appear to be significantly negative. This result demonstrates that the mismatch between the firm's competitive strategy and its industry IT strategic role can indeed undermine firm performance.

From the view of practical implications, our findings remind managers that they need to recognize the strategic importance of industry IT strategic role when developing an appropriate competitive strategy for achieving superior firm performance. Managers might use our research results as a guideline to utilize the alignment tactics between industry IT strategic role and competitive strategy to achieve superior firm performance. Different industry IT strategic roles enable firms achieve goals of different competitive strategies. Managers need to consider the impact of industry IT strategic role and try their best to exploit the possibilities offered by the specific industry IT strategic role to align with competitive strategy. Specifically, with the help of prevalent IT function in the automate industry, firms can more easily achieve the strategic goal of cost leadership to improve firm performance because of the alignment between industry IT strategic role and competitive strategy. Moreover, dual strategy in the automate industry can result in the decrease of firm performance because of the misalignment. In IT transform industry, managers can develop new products by leveraging advanced IT in the industry to keep up with industry transformation. When a firm belongs to informate industry, it indicates that the firm can more easily establish competitive advantages of dual strategy under this the kind of industry IT strategic role. For example, the IKEA group, the world's largest home products retailer, not only shows their furniture's information online and collect customers' preference through internet to differentiate their products, but also reduces inventory costs and facilitates transportation by using flat packaging. This helps IKEA form competitive advantages and attract more customers who want to purchase favorite products at affordable prices [72].

Moreover, our findings not only help managers recognize that alignment between competitive strategy and industry IT strategic role could help generate better performance, but also remind managers to realize that the misalignment between competitive strategy and industry IT strategic role may deteriorate firm performance, such as developing the dual strategy in the automate industry. For instance, the Ford Motor Company used to only focus on achieving the lowest costs and ignored

customers' demand; however, this type of competitive strategy makes it bear heavy losses by competitors [73]. Besides, some firms may confront the challenges of the transformation period because of the industry environment with intense competition [19]. Thus, they need to obtain some information of the industry in which they are ready to participate, such as industry IT strategic role, and adjust their competitive strategy timely to adapt to new industry environment. Another example is the music and media industry, which has become more and more digitalized to differentiate products/service rather than reducing costs. Providing diversified products/service online is at the heart of firms in this industry to improve customer experience and command premium prices [49].

6.2. Limitations and future research

There are several limitations in our study, which provide some directions for future research. One limitation of our study is the classification of automate, informate, and transform industry. We can only obtain the classification based on Chae et al. [19] and the year of 2007 is the latest criteria for this classification. Therefore, one direction for future research is to develop a finer measure of this important variable (Dehning et al., 2003). Another limitation is that we only integrate IT strategic role of industry with competitive strategy because of the data limitation. Industry IT strategic role is a coarse metric to measure the IT usage in the industry. This variable can reflect the IT status of the industry, but each firm's ability to utilize IT is different. Moreover, although we argue that in certain industry, if specific IT is imperative for the industry, the firms in the industry need to also develop their IT aggressively to compete in the industry (Chae et al., 2018). However, firms may choose a different IT strategy such as IT innovator and IT conservative, even they are in the same industry IT strategic role. Therefore, future research can investigate the IT-business alignment deeply and consider how a firm's competitive strategies align with its specific IT strategies and industry IT strategic role [19]. In addition, this study can be extended by containing additional contingency factors, including external and internal factors. For example, future research can consider the impact of firm characteristics at the internal level, such as firm size and the quality of IT governance [12]. The external environment such as industry dynamism can also be considered in future research.

7. Conclusion

By echoing the perspective from strategic alignment, our study provides insights into the alignment between the firms' competitive strategy and their industry IT strategic role and how such alignment influences firm performance. Our findings show that the three competitive strategies can play different roles under various IT strategic roles. Specifically, we find that cost leadership strategy has a significantly stronger positive association with firm performance in the automate industry. For the informate industry, firms can choose a dual strategy to improve firm performance. Finally, firms that belong to the transform industry can use the differentiation strategy to improve firm performance. Our findings provide a more nuanced understanding of the existence and nature of the alignment between competitive strategy and industry IT strategic role and call for more research to explore the interaction between industry IT strategic role and other firm strategic decisions, such as innovation orientation and IT governance strategies.

CRediT authorship contribution statement

Jinmei Yin: Conceptualization, Methodology, Formal analysis, Investigation, Data curation, Writing - original draft. **Shaobo Wei:** Conceptualization, Methodology, Investigation, Data curation, Writing - original draft, Supervision, Project administration, Funding acquisition. **Xiayu Chen:** Conceptualization, Methodology, Writing - review &

editing. **Jiuchang Wei:** Resources, Supervision.

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Jinmei Yin, PhD student, School of Management, University of Science and Technology of China. Her research focuses on strategic management, supply chain management, and social network. She has published papers in journals such as Decision Sciences.

Shaobo Wei, Associate professor, International Institute of Finance, School of Management, University of Science and Technology of China. He obtained his Ph.D. from USTC and City University of Hong Kong. His research focuses on digital supply chain management and IT business value creation. He has published papers in journals such as Journal of Operations Management, Journal of Business Ethics, Decision Sciences, Journal of Information Technology, and International Journal of Logistics Management, as well as in conference proceedings, including those of the International Conference on Information Systems. Shaobo Wei is the corresponding author.

Xiayu Chen, Associate professor, School of Management, Hefei University of Technology. She received the Ph.D. degree in Information Systems from the University of Science and Technology of China and the City University of Hong Kong. Her research interests include electronic commerce and social media. She has published papers in journals such as Information Systems Journal, International Journal of Electronic Commerce, Journal of Information Technology, Decision Sciences, International Journal of Information Management, Information Technology & People, Computers in Human Behavior, IEEE Transactions on Professional Communication and International Journal of Hospitality Management. Xiayu Chen currently serves as an Associate Editor for Information Systems Journal and International Editorial Review Board of International Journal of Information Management.

JiuChang Wei, Ph.D. Professor, School of Management, University of Science and Technology of China. His research interest includes strategic management, financial risk management and organizational reputation management. He has published papers in journals such as Strategic Management Journal, Journal of Business Research, Risk Analysis, Journal of the American Society for Information Science and Technology, Journal of Environmental Management and other well-known international journals.