



# THE PERFORMANCE IMPLICATIONS OF THE EVOLUTION OF MANAGERIAL CAPABILITIES IN THE CONTEXT OF INDUSTRY EVOLUTION

## ABSTRACT

This dissertation integrates research in the areas of entrepreneurship, top management teams (TMT), firm evolution, and industry evolution to address the following question: how does the evolution of TMT capabilities affect firm performance? Specifically, I propose to examine the conditions under which these capabilities result not in competitive competencies, but in core rigidities, as the industry evolves. Departing from existing studies, this dissertation focuses on the impact that the *group of key people* organizing resources within the firm has on its evolution and performance. Post-entry learning and re-configuration of the team helps capitalize on initial experience of the top managers and entrepreneurs, and also fills in identified gaps that are caused due to technological transformation and industry evolution. The proposed hypotheses are empirically tested on firms who entered the cellular phone service industry from 1983 to 1998.

## EXECUTIVE SUMMARY

The success of entrepreneurial firms rests on the expertise and leadership offered by their founding/top management teams (TMTs), particularly when these firms are competing in a rapidly evolving and highly technologically intensive industry (Rosenbloom 2000; Tripsas and Gavetti 2000; Holbrook et al. 2003; Agarwal et al.2004). However, the entrepreneurship and industry evolution literature has typically examined the performance consequences of firm or founder heterogeneity in resources/capabilities *at the time of entry in the focal industry* (Burton et al.2002; Helfat and Lieberman 2002; Agarwal et al.2004). Less attention has been focused on the evolution of these resources/capabilities and particularly how founder and initial TMT capabilities evolve due to the dynamics of fit with the evolving industry environment.

This dissertation integrates research in entrepreneurship, top management team (TMT), firm evolution, and industry evolution to address the questions: how the evolution of TMT capabilities affects firm performance and under what conditions these capabilities result not in competitive competencies, but into core rigidities, as the industry evolves. Specifically, at the individual level, I study managerial capabilities acquired through working in the top management team across firms- focal firms and competitors- and across industries- focal and related industries.

This dissertation further makes the following predictions. When evolutions in the industry are not considered, I expect that (1) the more the TMT's focal-industry experience, the higher the firm's performance in the focal industry, (2) the ratio of a firm's externally acquired to its internally developed focal-industry experience is curvilinearly (inverted U) related to a firm's performance in the focal market,(3) the

longer the TMT's team tenure, the more that the TMT's focal-industry experience increases firm performance in the focal industry, (4) the more heterogeneous the TMT's team tenure, the more that the TMT's focal-industry experience increases firm performance in the focal industry,(5) the more external links the TMT has, the more that the TMT's focal-industry experience increases firm performance in the focal industry, and (6) the more the TMT's related-industry experience that fits to the focal industry, the higher the firm's performance in the focal industry. However, as the industry evolves overtime, I expect all the predicted effects in (2), (4), (5) and (6) to decrease.

These predictions are tested on entrants to the cellular phone service industry from 1983 to 1998. The cellular phone service in the United States initiated in 1983 when Ameritech Mobile Communications launched the first commercial cellular service in Chicago. Due to the use of lottery and auction in issuing cellular licenses by the FCC, entrants to the industry range from firms that are already established in other industries such as TV and radio broadcasting, paging and landline telephone, to start-ups, such as the firm that is formed by former FCC staff members, representing a great diversity in entrants' initial endowments and managerial talents.

In addition, the industry has evolved rapidly along technology, demand and competition among entrants, representing a high level of management challenges to founding/top management teams. According to a 10-year review report on the cellular communications service industry from 1983 to 1992: (1) technology went from analog to digital in 1991 and from narrowband to broadband in 1996, (2) several standards emerged competing to be the dominant digital standard: NAMPS, IS-45 TDMA, IS-136 TDMA, GSM, to IS-95 CDMA, (3) the typical cellular customers move from primarily 35-

50 year-old professional, managerial, entrepreneurial males to mass markets usage, (4) the average monthly cellular bill has dropped from \$170 to \$40, and the price of cellular phones also dropped from \$3027 to \$1-\$800 (Wickham 1993).

Information for firm performance and executives' career paths for cellular operators in the United States in each year from 1983 to 1998 is mainly obtained from a series of Phillips Publishing's publications. Other information sources for the data include LexisNexis, company annual reports and 10Ks, industry reports, the FCC's Universal Licensing System (ULS), and industrial magazines and publications such as Cellular Business, Mobile Phone News, Cellular Radio: Birth of an Industry (1983), Cellular Marketplace (1984), and Donaldson, Lufkin & Jenrette's Cellular Communications Industry Report (1985).

A final sample of 45 cellular service operators, covering 89 to 100 percent of the market share from 1983 to 1998, reveals the following findings. For TMT's focal-industry experience, the empirical results first suggest that the more the TMT's focal-industry experience, the higher the firm's performance. However, this positive effect increases at a decreasing rate. Moreover, an inverted "U" shaped relationship between the ratio of a firm's externally acquired to its internally developed focal-industry experience and firm performance. In addition, a higher level of externally acquired focal-industry experience is needed as the industry ages. A possible explanation from the data for this phenomenon might be that sales take off faster (eight years since introduction) than people in the cellular service industry expect, and internal middle-level managers are not ready for the big challenge yet; hence, to catch the market growth opportunity, firms need to quickly obtain managerial talents from competitors to serve the growing market.

For the TMT's shared-team experience, the empirical results suggest the following findings. For average team tenure, in the early stage of an industry, the longer the team tenure, the lower the positive impact of the firm's focal-industry experience on firm performance, and the importance of long team tenure increases with the age of an industry. For heterogeneity of team tenure, the more heterogeneous the team tenure in prior year, the more the TMT's focal-industry experience increases firm performance in the focal year. In addition, the positive moderating effect of heterogeneity of team tenure reduces over the industry age. Moreover, heterogeneity of team tenure imposes different moderating effects on the effects of externally acquired and internally developed focal-industry experience on firm performance. The more heterogeneous the TMT's team tenure in the prior year, the lower that the TMT's internally developed focal-industry experience increases firm performance in the focal year. Yet, the more heterogeneous the TMT's team tenure in the prior year, the more that the TMT's externally acquired focal-industry experience increases firm performance in the focal year.

In addition, the more the TMT's links with the Cellular Telecommunications Industry Association, the more the TMT's focal-industry experience increases firm performance in the focal year. However, the positive effect of the links with the CTIA significantly reduces as the industry ages. This finding is consistent with one historical development: "TDMA", a digital standard endorsed by CTIA, has died out in the standard war of digital communications.

Finally, for TMT's related-industry experience, the empirical results suggest that for a given firm, (1) the more the TMT possesses experience in distant industry, the

lower the total number of subscribers the firm has, (2) the TMT's experience in the related-industry, communications services, only has a transient benefit to firm performance in the cellular service industry, and (3) the TMT's experience in the electronics manufacturing industry exhibits significant negative effects on firm performance in the cellular service industry initially, but later becomes increasingly important to firm performance as the industry ages. The increasing importance of managerial talents with experience in the electronics manufacturing industry could be a result of the technology shift from analog to digital for the underlying technology in the cellular service communications industry, and firms need to have those talents to understand what the digital technology can do in the focal industry and which digital standard to choose.

A few implications can be drawn from this study. First, firms with few endowments (existing routines) can grow if they hire top managers with more focal-industry experience and cautiously acquire managers from competitors to obtain new knowledge. In addition, the more is not always the better since a TMT's experience in the focal industry beyond six years does not give firms additional benefits. Moreover, firms need to acquire more managerial talent from outside the firm boundary as the industry becomes more mature.

Second, for firms who are early entrants, they do not need to get all TMT members at the outset since the environment favors firms with high heterogeneity of team tenure and low average team tenure. However, for firms who enter the industry late, the firms want to get the whole team ready and running since the environment favors firms with long team tenure and the importance of heterogeneity of team tenure

reduces. In addition, heterogeneity of team tenure facilitates the absorption of the externally acquired knowledge but hampers the deployment of internally developed knowledge. In addition, long shared-team experience is beneficial to the efficient implementation of focal-industry experience developed internally.

Third, being able to scan the environment through top managers' relationships with the industry association is important to firm performance in the focal industry. However, as industry structures become more developed over time, TMT members' ability to scan environments through the lens of industry associations become less important to firm performance. This finding suggests that for earlier entrants, active involvement in an industry association is very important to their performance.

Finally, the empirical results imply that in an emerging industry, managers' experience in a related industry can help a firm navigate the new industry. However, this benefit is quite transient and turns into a constraint as the industry evolves over time. In addition, top managers' experience in very distant industries from the focal industry does not render the firm any competitive advantages. Moreover, TMTs' experience in the upstream technology sector might help firms to manage technology changes in the focal industry since TMTs' experience in the electronic manufacturing sector becomes more important at the later stage of the industry, reflecting a period when technology is shifting from analog to digital in the cellular communications service industry.

The completion of this dissertation contributes to our understanding on the impact of the *group of key people* organizing resources within the firm on its evolution and performance. Moreover, this dissertation demonstrates that post-entry learning and re-configuration of the team helps capitalize on initial experience of the top managers



and entrepreneurs, and also fill in identified gaps that are caused due to technological transformation and industry evolution. However, some questions need to be answered to help us understand the successful entrepreneurial process. For example, it might be interesting to see whether entrepreneurial experience of top managers are important to firm performance in a new industry since I did not find experience of top managers in other industries beneficial to the firm performance and focal industry experience is more important. Entrepreneurial experience does not confine to setting up a new organization as an owner, and they can be experience related to expand new geographic and product markets as a manager or owner. Moreover, I wonder whether the positive effect of industry-specific capabilities on firm performance will be more prominent when managers have entrepreneurial experience.

In this dissertation, I make a direct connection between managerial capabilities and firm performance, and ignore the heterogeneity of firm strategies managers make. The same set of managerial capabilities might come up with a different strategy since there are more than one ways to the same end. The second direction worth examination is to investigate whether strategies differ among firms within each stage of industry life cycle or firms just follow whatever other firms do. If heterogeneity in strategies among firms is observed, does heterogeneity of managerial capabilities contributes to the phenomenon?

Finally, it is important to see how the design of corporate governance structure moderates the effect of managerial capabilities on firm performance and whether the structure should be adjusted according to the industry. To alleviate agency problem, monitoring and incentives are both necessary. There are two sub-questions can be

examined: (1) what combinations of board of directors will be more effective in terms of monitoring, and (2) whether there is a systematic relationship where in some business environments it is optimal to have more monitoring and less incentives, while in other business environments it is optimal to have less monitoring and more incentives to minimize the agency costs.

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