Leveraging board talent for innovation strategy

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Introduction

Why are people appointed to corporate boards of directors? In some cases, it may be a result of "who you know," whether a membership in the same country club as the CEO or having gone to the same university as another board member. This was especially true when boards were viewed as rubber stamps of management decisions. However, more recent and accepted wisdom is that board members should make strategic contributions to the firm and provide valuable advice. Thus, the resources that board members bring to the firm, referred to here as human capital, are a critical contribution that must be considered when determining the composition of the board. Human capital is defined as the knowledge, skills, abilities and other characteristics embodied in people which are derived from education, training and experience and contribute to individual performance and ultimately to organizational performance. However, the human capital of board members should not be considered as merely a collection of individual capabilities and knowledge that is assembled in a haphazard manner. Rather there exist complementarities among individual members which can make a more significant impact on corporate strategy. This paper uses human capital resources theory to discover how complementarities might predict innovation in the pharmaceutical industry.

Human capital resources

Human capital has been an important theory both in economics and the social sciences. In an organizational context, people with high levels of human capital have an advantage over other employees or applicants. For example, the presence of human capital, including differences in education, skills and experience, and the investment in acquiring these assets enhance a person's value to the firm and correspondingly result in rewards such as higher pay levels and promotions (Singh *et al.*, 2008). Human capital in the form of education and experience may also be treated as a surrogate for a manager's general ability, and thus age and tenure may also be proxies for abilities and skills leading to higher levels of compensation. Distinctions are also made between general and firm-specific human capital, with firm-specific human capital more valuable for advancement within an organization and more broad-based human capital more likely to provide opportunities outside the firm.

A second area of interest to organizational scholars is the effect of human capital on firm strategy and outcomes. This approach argues that human capital is a critical resource for the firm. The human capital of its members, particularly the top management team, has a profound impact on strategy development and ultimate firm performance (Hambrick and Mason (1984).

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Recently, a paradigm shift has occurred in the field of human capital research, with increased interest in studying the concept as a macro level construct (Nyberg *et al.*, 2014). This shift draws primarily from the literature on organizational strategy. Under the resource-based theory of the firm, an organization's competitive advantage is a function of its collection of unique resources that it both possesses and uses and that are not easily copied by competitors (Barney, 1992). To the extent that human capital is both above-average and difficult for other firms to replicate, human capital becomes a strategic asset permitting superior performance by the firm.

A consequence from the transition to a more macro level approach to human capital is a focus on the strategic nature of human capital and consideration of the effects of aggregate human capital. This concept has been called human capital resources and is defined as "individual- or unit-level capacities based on individual [knowledge, skill, abilities and other characteristics] that are accessible for unit-relevant purposes" (Ployhart *et al.*, 2014, p. 374). Thus, a distinction has been made between those human capital qualities that have a direct impact on unit-level outcomes from those that do not. Impact on unit-level outcomes means that "value is created [. . .] when the use of human capital increases a firm's revenues and/or decreases a firm's costs compared to what would have been if that human capital had not been used" (Molloy and Barney, 2015, p. 310). The convergence of strategy and human capital research provides a platform through which researchers can examine how the human element facilitates strategic outcomes of the firm.

One aspect of the human capital resources framework is that it can exist at any business level, suggesting its relevance for examining the impact of human capital on various aspects of the firm. For example, human capital is essential for a firm's top management team, which contributes positively to firm performance. Scholars have found that top management team human capital is a key asset to a firm because it is often tacit, context-specific and path-dependent (Le *et al.*, 2013). However, less research has focused on the human capital of corporate board members and whether their human capital resources can make a positive contribution to the firm. This study is intended to determine whether human capital resources at the board level can contribute positively to a firm's innovation strategy. In doing so, the paper also examines whether there might exist an optimal combination of human capital on corporate boards leading to superior firm outcomes.

Levels of human capital resources

While human capital resources are either at the individual or unit level, they have the capacity to produce competitive advantages at the unit level (Ployhart *et al.*, 2014). These may present a number of configurations, which Ployhart and colleagues call exemplars. One of these configurations, which they call complementary interactions, occurs in cases where one human capital resource augments another. The authors cite the positive performance effects of the personality traits of conscientiousness and agreeableness as an example of this interaction complementarity.

In a similar way, certain individual knowledge or capabilities among board members may complement the abilities of other board members that in combination create unit-level human capital resulting in enhanced outcomes of board processes. These are defined as cross-level combinations where human capital resources are combined across levels to

create a new collective human capital resource. While unit-level human capital resources emerge from individual human capital, it is not merely a combination of individual characteristics but can be higher level collective phenomena through frequent interactions and other contextual factors. Further, cross-level combinations can occur when people hold the same individual level abilities or when they have different capacities based on different sets of knowledge and experience.

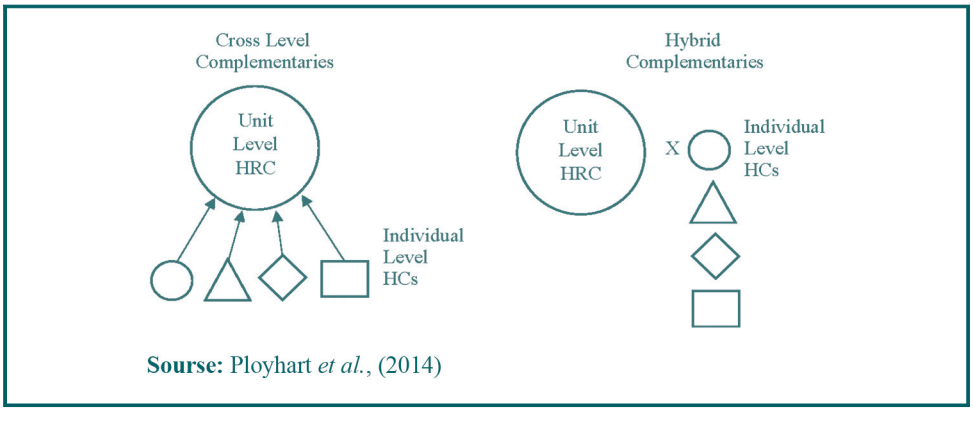
A third type of complementarity identified by Ployhart and his colleagues is a hybrid combination formed when an interactive complementarity exists between two different types of human capital resources at two different levels to create or augment human capital resources at the higher level. These combinations arise though frequent relations among unit members and characteristics of the unit. The number of human capital resources combinations in this model reflects the complexity of the theory, warranting the need to study the appropriate combination of resources and their antecedents and outcomes. In the next section of this article, we describe the attributes of a corporation's board of directors that constitute human capital resources (Figure 1).

Human capital resources as a function of the board of directors

The provision of human capital is a primary reason directors are appointed to a board. The board has the potential to influence a firm's strategic direction, and directors' human capital should match and enhance the firm's strategic objectives to maximize their effectiveness. The main role of directors' human capital resources should be to provide highly qualified and relevant advice to the managers of the firm, which then contributes to firm level outcomes. However, the human capital of outside board members may vary based on several dimensions, including education, knowledge and technical experience.

Each individual outside director brings specific human capital. For example, Hillman *et al.* (2000) suggested three types of directors who provide different contributions to the focal firm: business experts, such as CEOs or officers of other corporations; support specialists, such as lawyers or financial managers; and community influentials, such as politicians and university professors. Another model of board roles suggests that directors perform three essential responsibilities to the firm: governance, provision of resources and strategic advice (Zahra and Pearce, 1989). Table I summarizes these three functions, their origins and the activities involved. Extending this paradigm, modern theorists suggest that directors should take a more active leadership role in directing the affairs of the organization (Charan *et al.*, 2014). This research, therefore, examines how human capital resources affect the strategic role of the board.

Figure 1 Human resource capital combinations



Sourse: Ployhart *et al.*, (2014)

Table I Roles and functions of corporate boards

Board role	*Theoretical basis*	*Primary responsibilities*	*Specific duties*	*Director human capital*
Governance	Agency theory	Oversight monitoring control	Selection of CEO, TMT Compensation and Rewards Establishing Performance Goals Audit	Outsiders with board experience financial expertise governance experts
Resource provision	Resource dependency theory	Co-optation Establishing social networks Acting as boundary Spanners reducing Uncertainty	Bridging contacts with external stakeholders Facilitating mergers, acquisitions Providing outside financing	Industry leaders Community leaders Government experience University affiliation
Strategic advice	Strategic contingency	Providing strategic direction Identifying opportunities	Evaluating diversification, globalization, product and technology proposals	Current or Prior CEO Experience Technology Expertise Business/Management Consulting

Individual and unit levels of board human capital resources that contribute to innovation

For firms heavily focused on innovation and new product development, the relevant board human capital resources are the scientific and technological expertise that directors bring to the firm. This scientific expertise can be especially relevant to firms dependent on innovation for their long-term survival, such as firms in the pharmaceutical industry. However, prior research looking solely at the scientific and educational backgrounds of individual board members were somewhat equivocal in their findings of a relationship between board human capital and firm outcomes, including innovation. Instead, it is more likely that a combination of individual and unit-level human capital resources act as complementarities in fostering innovation. Individual level human capital resources relevant to a pharmaceutical company can be defined as scientific expertise derived from a medical or PhD degree in the sciences, experience working in the pharmaceutical industry, a university position in a department of science or some combination of these.

At the unit level, several sources of human capital may be predictive of firm innovation. This research examined several and ultimately two unit-level measures were included in the model: board tenure and the existence of a founder on the board. Board tenure is a unit-level characteristic that independently provides a source of human capital resources. The longer a director is on a company's board, the more familiar he or she becomes with the resources and capabilities of the firm and is thus better able to assess the feasibility of R&D proposals presented by management. Huang (2013) noted that the tenure of a firm's directors is an aggregate measure and is a proxy for both the level of the board's specific firm knowledge as well as the extent of its independence. The presence of the firm's founder on the board is also considered a unit-level characteristic, as studies have shown that founder-managers contribute to the entrepreneurial performance of the firm (Fischer and Pollock, 2004).

Research design and results

The pharmaceutical industry was chosen as the basis for this study because of the critical importance of innovation in the creation of patentable discoveries. Although the results obtained may not be generalizable to all other industries, some industries share several of the characteristics of this focal industry. The industry is well established (the American Pharmaceutical Association was formed in 1851), yet is subject to a number of environmental forces that call for collaboration between upstream and downstream partners, government agencies, universities and industry alliances, requiring a broad range

of knowledge and experience. Further, preliminary analysis shows a wide range in the size of pharmaceutical companies, potentially offering significant variation within the sample. As a result, pharmaceutical companies provide a rich framework in which human capital resources theory can be tested.

From the Corporate Library database, we selected US publicly traded corporations with SIC codes 2834, 2835 and 2836 representing the pharmaceutical and biotechnology industries. After removing companies with incomplete available data, the study included 154 companies. The research design incorporated financial and other data from 2012 through 2015 contained in annual reports and proxy statements filed with the Securities and Exchange Commission and patent data from the USA Patent Office.

Our dependent variable to measure innovation was the number of patent filings during the study period. Independent variables capturing the boards' scientific human capital resources included the percentage of directors of the total number of directors whose biographies listed them as medical doctors, PhDs in the sciences or members with a university affiliation. Board tenure was measured by the average number of years that directors served on the board, and the presence of a founder was represented by a dichotomous variable; both variables were determined from companies' proxy statements. Control variables included the size of the firm, measured by the log of assets, as larger firms would be more likely to have larger and more diverse boards. The percentage of insiders on the board was included in the model, as insiders are better able to assess the need and importance of R&D activity for their firms. Prior R&D expenses were also included as a control as patentable discoveries often build upon previous R&D spending.

Because the number of patent filings is a count variable, negative binomial regression in SPSS 25 was used. Further, as patents are considered an output measure of innovation, the variable was lagged by two years. In all models, the presence of the founder on the board was significantly and positively related to innovation. When the predictor variable measuring the combined effect of the founder and directors with scientific expertise was added to the model, the deviance and Pearson chi square statistics measuring the goodness of model fit increased. Board tenure standing alone negatively predicted the likelihood of patent filings, but when combined with the percentage of scientific directors the interaction variable was both positive and significant, meaning that the length of board membership by directors with scientific expertise is more likely to foster innovation. A third model was estimated to compare the inclusion of individual members with scientific backgrounds with a combined measure of scientific experience. As expected, the deviance and Pearson chi square statistics in the combined model increased. The results are summarized in Figure 2 which shows that the increase in the Pearson chi square statistic was greatest in the third model, suggesting that overall human capital is best examined at the aggregate level.

Discussion

At the outset, it should be noted that both measures at the unit level of human capital resources, the existence of a founder and board tenure were independently predictive

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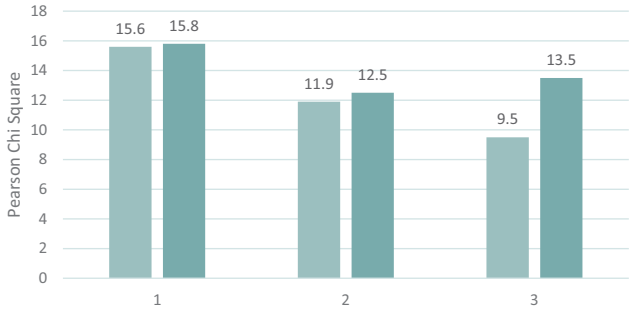
Figure 2 Change in Pearson chi square



Notes: Light shaded bar = Individual Variables; Dark shaded bar = Combined Variables; 1. Founder/Scientific Human Capital Resources; 2. Tenure/Scientific Human Capital Resources; 3. Individual/Combined Scientific HCR

of firm innovation. For a young firm, it might be advisable to retain its founder on the board even after he or she retires from management to encourage continued innovation resulting in patent applications. Longer board tenure as an independent variable was negatively associated with patent filings; however, when coupled with board scientific human capital, the variable was significant and positive. Thus, insuring longevity among board members with scientific human capital rather than making frequent changes may be a strategy for insuring innovation. Of course, management should be mindful that members who have worked together over a long period may become too cohesive and fall into a groupthink trap where ideas are not questioned or challenged. Further, longer-service members tend to be older and perhaps more conservative in evaluating new research proposals.

The results also suggest that human capital resource theory is relevant to boards insofar as directors with scientific experience coupled with board tenure and the presence of the firm's founder on the board are likely to influence strategy and are critical to firm innovation. While it may be argued that the findings are unique to the pharmaceutical industry, which depends on scientific expertise to drive innovation, it is plausible that in any industry there is an optimal combination of individual and unit-level board human capital that can create a strategic advantage.

The results may also be explained by upper echelons theory. As originally introduced, the upper echelons framework suggests that top management team characteristics have a direct impact on organizational strategy. More recent research has applied upper echelons theory to boards of directors by defining boards as "supra top management teams" (Finkelstein *et al.*, 2009, p. 11). While much research on upper echelons theory examines the demographic characteristics of management teams and directors, other qualities such as individual member firm and functional knowledge and skills and cohesion among directors are factors affecting board performance. This study confirms those conjectures and proposes that board members' individual characteristics can influence firm strategy.

A third basis for the results resides in critical mass theory. Although that concept has been applied largely in the context of women on boards of directors (Torchia *et al.*, 2010), it can be extended to any board member characteristic. In this case, while a lone physician, researcher or university professor may not be able to influence the board's decisions to any

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great extent, a sufficient number of such directors may be able to encourage innovation leading to more patent filings.

Conclusion

Managers and incumbent directors are the main sources of identifying new members of the board. The skill sets of potential directors are an important factor in selecting new members, but often the complementarities with existing directors and with the overall structure and make-up of the board are ignored. Managers should carefully consider the impact on the function of the entire board when making decisions on adding or replacing board members. When innovation is central to the firm's survival, how directors can both foster and initiate innovative ideas and strategies becomes an overriding consideration. Hundreds of configurations may be taken into account, and it is up to management to determine the mix of talent that will lead to optimal decision-making.

Keywords:
Human capital,
Innovation,
Governance,
Board of directors,
Pharmaceutical industry,
Upper echelons theory,
Board demographics,
Critical mass theory,
Human capital resource theory

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