

TRACING THE TRAJECTORY OF INDUSTRY LEADER'S DRUG INNOVATION CAPABILITY: THE AMGEN CORPORATION CASE

Victor Oladapo, Webster University, USA
Godwin Onyeaso, Shorter University, USA

ABSTRACT

The origin of organizational capabilities remains elusive to strategy managers and scholars. Because of this elusiveness, a scholar has questioned: "where [do] capabilities come from [and] what kinds of investment in money, time, and managerial efforts is required in building them" [Ethiraj, et al. 2005, Strategic Management Journal, 26, 25-45]. Using the lens of the upper echelon theory, this case provides evidence that Amgen's President hired "stair-scientists" who then developed the first drugs that launched Amgen as the global biopharmaceutical industry leader. This way, this case study contributes answers to the questions raised by Ethiraj and colleagues (2005). In sum, this real-world case discussion has practical significance to managers and academics alike.

JEL: MOO, M1, M2

KEYWORDS: Upper Echelon, Drug Innovation, Capabilities, Network Capabilities

INTRODUCTION

On one hand, copious literature suggests that non-imitable and non-substitutable organizational capabilities are the bedrock of inter-firm sustainable competitive advantage and performance (see, e.g., Barney, 1991; Wernerfelt, 1984; Rumelt, 1984; Dosi, Nelson & Winter, 2000; Nelson & Winter, 1982; Henderson & Cockburn, 1994). On the other hand, research suggests that the extant strategy literature is not clear where in the organization the answers to the following practical questions---can be found (Ethiraj, et al 2005): (1) Within the organization, where is the starting point of organizational capability? (2) Within the organization, what types of asset and resources are necessary to build organizational capabilities? (3) Outside the organizational boundary, what role does social capital (Granovetter, 1985; Coleman, 1988; Uslaner, 2003) play in organizational capability building strategy? (4) Are external ties and networks of top managers critical to the development of organizational capabilities? Our paper makes contributions by providing answers to the above questions in the framework of archival data on Amgen.

The reminder of this paper is organized as follows. The literature review section discusses works on the fusion of theory and managerial practice---pertinent to the research questions examined in this discussion case. Following this, data and methodology section presents the data sources and methodology used in the study. Next, the results of the study are articulated. Finally, a concluding section wraps up the discussion case study as it underscores the academic and managerial significance of the study.

LITERATURE REVIEW

To address the questions posed in this case discussion, a fusion of theory and managerial practice was used especially answers the questions posed by Ethiraj and colleagues (2005). Answers to these critical questions are important for a number of reasons. First, because the extant strategy literature is at best silent on the answers to these questions, they represent gaps in scholarly knowledge on the development of organizational capabilities. Second, it has been established that the development of theories that

managers can apply is among the major objectives of the strategic management discipline (Hofer & Schendel, 1978; Chandler, 1990; Leonard-Barton, 1995). To this end, scholars agree that sound knowledge of the theories of the origins of organizational competitive advantage rooted in capabilities---is critical (Cockburn, Henderson & Stern, 2000; Teece et al. 1997). In deed, Mahoney and Sanchez (2004:34) cautioned that “theory building in strategic management should also recognize that inquiry from the inside [of the firm] is vital in developing integrative capabilities and more integrated strategy theory.” That said, they also stressed that “researchers interested in developing useful strategy theory” should gain rich insights from the managerial actions of practitioners in the real business world, as discussed in the present case study. Of course, this is not an entirely new proposition because landmark works in strategic management grounded on practical insights of practitioners have long been documented (see for e.g., Penrose, 1959; Leonard-Barton, 1995; Chandler, 1990; Argyres, 1996; Williamson, 1975). These distinguished strategy and organization researchers agree that history matters, and called for more research for theory development in strategy grounded on the practical experience of managers in strategic management and organizational economics (Chandler, 1990).

Since three decade ago, there has been a growing consensus among strategy scholars that resources and capabilities are critical determinants of organizational innovations and differential performance (Penrose, 1959; Barney, 1991; Rumelt, 1984; Wernerfelt, 1984). Consequently, research on strategic leadership started to focus on executives who have the overall responsibility for organizational success especially under the rubrics of the upper echelon theory (Hambrick & Manson, 1984), and resource-based view (Barney, 1991; Wernerfelt, 1984). These perspectives suggest that superior leadership remains an intangible resource for crafting organizational strategies (Barney, 1991) as well as the implementation of those strategies (Schoenecker & Cooper, 1998). Even though conceptual definitions of resources and capabilities may differ among scholars (Makadok, 2001; Priem & Buttler, 2001; Amit & Shoemaker, 1993), there is a consensus that inter-firm differences in intangible managerial capabilities constitute the inimitable and non-substitutable organizational capabilities instrumental to inter-firm differences in performance (Dierickx & Cool, 1989). Consistent with this notion, the relationship between leadership and innovation has become the focus of empirical research (Halbesleben et al., 2003; Sharma & Rai, 2003; West et al., 2003; Elenkov, Judge & Wright, 2005), particularly---the strategic actions of the topmost organizational leader has attracted research attention (Halbesleben et al., 2003; Elenkov, Judge & Wright, 2005). However, the persistent empirical question still remains: where and when do organizational capabilities originate in the organization (Cockburn, Henderson & Stern, 2000)?

In this case study, we argue and then illustrate with examples, that the beginning of any meaningful attempt to trace the trajectory of the origin of organizational capabilities, should begin with the strategic roles played by the organization’s topmost executive---the CEO. Our rationale for this assertion is rooted in research suggesting that the CEO is the best informed person about the mission of the organization (Hambrick & Mason, 1984). That is why research suggests that organizations reflect the actions of their top executives (Hambrick & Mason, 1984; Cyert & March, 1963; Hambrick, 1989).

DATA AND METHODOLOGY

In this case study discussion, archival data were extracted from Amgen’s records (*10K and 10Q Annual Reports and Letters to Stockholders*) to analyze the strategic actions in asset deployments of Amgen’s managers cumulating in Amgen’s industry leadership. However, additional data were also extracted from the membership directory of the Biotech Industry Organization (BIO).

Methodologically, we now turn to the birth of Amgen as a legal person for practical illustrations of the preceding theoretical analyses. Amgen was organized as a company in April 1980 when *four venture capitalists* legally registered it as a corporate person, and then hired Dr. George B. Rathmann to be the President and CEO of Amgen Corporation (hereafter Amgen). As can be seen, the recruitment of Dr.

Rathmann by the four venture capitalists marks the beginning of the answer to “the kinds of investment in money, time and managerial efforts required in building [capabilities]” (Ethiraj et al, 2005).

Consequently, the first thing Dr. Rathmann (hereafter, the President) did was to craft a business strategy for Amgen. Keeping in mind that: “Strategy is a firm’s theory [assumption] of how it can gain superior performance in the markets within which it operates” (Drucker, 1994), Amgen’s business strategy at the time of its incorporation was unambiguously stated as follows:

Product development based on own advanced biotechnology [underlining is mine].

As can be seen, this corporate strategy is a three-part strategy subsumed in one: (a) develop biotechnology products, (b) the products must be developed using Amgen’s own proprietary technology (blueprint), and (c) the technology must be advanced technology. Then, the trajectory of strategic actions taken by the President had the following critical linkages: to acquire *advanced technology* demands the possession of hi-tech human resource (first-class research scientists) as the most competitive asset of the firm (Grant, 1996). In the innovation literature, the task of these scientists has been variously dubbed “radical innovation” (Henderson & Clark, 1990), “breakthrough” innovation (Tushman & Anderson, 1986), and “paradigmatic” innovation (Hara, 2003). In essence, these first class scientists invented the all-important *advanced technology* necessary to develop the biotech products that would make Amgen the leader of the biotech industry.

Further, a cursory reading of research on radical or breakthrough innovation (Henderson & Clark, 1990; Hara, 2003) allows the understanding that scientific knowledge embedded within the organization is typically insufficient to invent the type of new-to-the-world blueprint that would catapult Amgen to biopharmaceutical industry leadership envisioned by the President in Amgen’s corporate strategy. That is, scientific knowledge outside the boundaries of the organization must be accessed to implement the strategy entailed by *advanced technology*, as discussed next.

It is well established that the past and present experience of the organization’s CEO (Amgen President in this case) in external ties, is directly related to the CEO’s capability in tapping on available network capitals for strategy implementation. Stated unequivocally, within the purview of the boundary spanning activities of the CEO, the quality of the social and political ties available to the CEO is directly related to the degree the young organization will successfully draw legitimacy and identification from established organizations (D’Aveni & Kesner, 1993). Relating this theory to Amgen’s case, our archival research found that, between April and May, 1983, president Rathmann---was a former Vice President of R&D (Diagnostics Division) of Abbott Labs. Interestingly, Amgen’s President capitalized on his social epistemology and networking capability to get Abbott Labs to sign a *collaborative agreement* with Amgen for a five-year \$19 million R&D partnership deal. Accordingly, these deliberate conducts (strategy implementations) allows us to suggest the following proposition:

Proposition 1: External collaborative partnership for R&D is among the first strategic investment by a biotech organization to acquire drug innovation capabilities.

Because primary focus of this case study discussion is a focus on practical managerial application, the study must therefore underline the following encouraging observations about the importance of the *Collaborative Agreement* discussed above. First, industry observers said that the collaborative agreement would have been impossible without the prior experience of Amgen’s President with Abbot Labs where he (the President) served prior to joining Amgen. Hence, the President’s networking capability was instrumental in getting Abbott Labs and Amgen to sign this all-important collaborative R&D agreement. Stated another way, absent the President’s networking capabilities that associated him with Abbott Lab, the collaborative agreement would not have occurred in the first place.

Therefore, it is noteworthy that, the networking capabilities of Amgen's CEO is, per se an important leadership capability which cannot be ignored in Amgen's success history in the same sense that forecasting capability in the mutual funds industry (Makadok & Walker, 2000) is a source of competitive advantage. Another parallel support comes from previous research which corroborates the notion that a CEO with previous R&D management experience "is clearly beneficial to a biotechnology firm's productivity," (Deeds et al, 1999:225). Hence, superior leadership is indispensable for the genesis of organizational innovation capabilities. Accordingly, we propose as follows:

Proposition 2: Superior leadership is at the epicenter in tracing the origin of organization innovation capabilities, especially in the biotech industry.

Importantly, a lion share of the \$19 million collaborative agreement was deployed as monetary compensations to attract and retain the best research scientists in the biotech industry to work for Amgen. These best scientists were dubbed "star scientists" (Zucker et al, 1998). To see that this is a classic illustration of strategy implementation, it was these star scientists that developed (invented) "*the advanced technology*" blueprint stated in Amgen's strategic vision discussed above. In other words, strategic acquisition of the star scientists was a necessary precursor to building "*the advanced technology*" required to acquire the proprietary drug innovation capabilities envisioned in Amgen's business strategy. We believe that these practical chronologies of strategic events are practically informative to the practical manager grappling with similar practical strategic issues. The word *practical* is underscored because implementation is the most important aspect of strategy (Hofer & Schendel, 1978; Chandler, 1990). Finally, consistent with the question about the *kinds of investment in money, time, and managerial efforts required in building them* [capabilities] (Ethiraj et al, 2005), we now discuss further how this strategy translated into organizational innovation capabilities.

In a short time (May to December, 1983) the strategy behind the \$19 million R&D collaboration with Abbott Labs started to payoff. How? One of the star scientists hired via that Agreement---led a team that discovered *New Molecular Entities* called Epoetin alfa which later was commercialized as a product called EPOGEN. The team leader was Fu-Kuen Lin. Therefore, we propose as follows:

Proposition 3: The origin of organizational innovation capabilities begins with a team of scientists who discover the first new Molecular Entities commercialized as a product.

In fact, a confidential informant close to Amgen said that no one can challenge the fact that the discovery of EPOGEN by Lin's team launched Amgen's fame and fortune as a biopharmaceutical industry leader. This way, the hypotheses about the *kinds of investment in money, time, and managerial efforts required in building them* [capabilities] (Ethiraj et al, 2005), begins to be addressed in this case study. In addition, this inference is supported by previous research suggesting that human capital is a critical first resource for the implementation of a firm's strategy (Lee & Miller, 1999), because human resource (Penrose, 1959; Barney, 1991) is needed to build innovation capabilities. Evidently, this finding is in line with previous research in the biotechnology industry indicating that the quality of research teams is the backbone of new product innovation capabilities (Deeds et al, 1999). In addition to that, following Makadok (2001) theory of embeddedness of capabilities, innovation capabilities are embedded in the teams of research scientists working in unity for a common purpose---innovation. Hence, the following proposition is suggested:

Proposition 4: Drug innovation capabilities are embedded in teams of scientists.

Being an intangible strategic asset (Amit & Schoemaker, 1993), an organization's drug innovation capabilities should positively impact the overall economic performance of the organization, according to strategic assets theory (Barney, 1986). Consistent with this theory, previous research suggests that as much as 70 per cent of the market value of Fortune 500 companies is based on investors' assessment of

the intangible assets of these companies (Srivastava et al, 1998, a, b), which includes superior leadership (Cho & Puck, 2005; Barney, 1991), corporate reputation for quality (Shapiro, 1993), corporate culture Barney (1991), forecasting capability (Makadok & Walker, 2000), and innovativeness (Cho & Puck, 2005).

Then, the question could be raised: to a young biotech firm (Amgen), what mechanism would be used to send signals of drug innovation capabilities to potential investors during the initial public offering (IPO) stage? Briefly, IPO shares are not sold directly to the public. Instead, institutional investors (investment bankers), broker the IPO deal between the issuing firm (Amgen) and the public by selling to the latter (Benveniste & Spindt, 1989). Here again, the network capabilities (external ties) of the issuing firm's CEO is directly tied to the quality of investment banker the CEO is able to attract to handles the IPO process. If all is well done, then both the issuing firm's CEO and the investment banker must work closely together to provide information that will showcase the value potentials in the young firm---a critical part of this information is the leadership capabilities of the CEO of the young firm issuing the IPO. At this critical stage, the investment banker strives to overcome the "liability of market newness" (Certo, 2003) of the young firm.

To be exact, verifiable evidence clearly indicates that Amgen's president and CEO did a superb job during Amgen's IPO process stage. That is, investors perceived value in Amgen's drug innovation capability and believed in the quality of Amgen's leadership. Investors' risk aversion reduced to the extent that they were willing to pay \$18 per share for Amgen's IPO. Altogether, the IPO netted \$40 million for Amgen. Amgen's management called this event the "Ticker Event." that launched Amgen as biotech industry leader.

Two years later (1985) another team of star scientists led by Larry M. Souza discovered another New Molecular Entities called *Filgrastim* which was later produced and commercialized as a product called *NEUPOGEN*. These two products contribute more than a half of Amgen's \$5 billion sales yearly. EPOGEN and NEUPOGEN received *Fortune Magazine's product of the year awards* in 1989 and 1991, respectively. Currently, Amgen's R&D financing is generated internally from sales revenue from EPOGEN and NEUPOGEN, which in turn has made Amgen a biopharmaceutical company with global presence and industry leadership. We now turn to Amgen's resultant track records from the foregoing strategic implementations.

RESULTS

Amgen's archival data reveal that in December 1994, Amgen was awarded the *National Medal of Technology* (NMT) which is "the highest presidential tribute for extraordinary achievement in commercial application of technology and the equivalent of a Noble Prize." In addition, Amgen received *Fortune Magazine's Product of the Year Award* several times. To the extent that R&D spending leverages a firm's capability for radical innovation through organizational learning (cf: Cohen & Levinthal, 1990), Amgen records indicate that Amgen "invests heavily in research and development, having invested 22 per cent of total product sales in R&D in 2002."

Work by O'Brien (2003: 419) concludes that "The R&D intensity [ratio of R&D to sales] of a firm, relative to its industry rivals, indicates the strategic importance of innovation to a firm." Amgen realized this strategy because, to the extent that R&D spending reflects the level of importance a firm attaches to innovation (O'Brien, 2003; Hall & Bagchi-Sen, 2002), Amgen ranks first above all firms in the two industries--- biotechnology and pharmaceutical industries. Finally, in a profile of the top ten biotech firms in the US and Europe, Amgen ranked first in the following indices: unit sales, total revenue, R&D expenditure, and operating income (Dummet, 2003).

CONCLUDING COMMENTS

This study was an attempt to respond to calls for research on the origins of organizational innovation capabilities, and to do so by drawing practical illustrations and insights from the strategic actions taken by top managers. This way, the study drew practical illustrations from Amgen Corp. and tied it to the theoretical discussion of the origin of organizational innovation capabilities. Consequently, after elaborate discussion of the theory of the origin of innovation capabilities buttressed by practical insights drawn from Amgen Corp., the following striking results emerged. We found that it was President Rathmann who orchestrated and implemented an R&D collaborative agreement with Abbott Labs. Under this collaboration, Amgen was able to hire and finance the R&D drug innovation activities of the star scientists. In other words, absent the R&D collaborative agreement with Abbott Labs, Amgen's star scientists could not have been hired in the first place. In addition, we found that absent the leadership of President Rathmann, the R&D collaboration with Abbott Labs could not have taken place. Therefore, we found evidence that the role of Amgen's top leadership in supporting drug innovation activities resulted in the ability of the star scientists to acquire drug innovation capabilities that leapfrogged Amgen to the biotech industry leadership position. Hence, we concluded that leadership matters in the theory and practice of the origins of organizational innovation capabilities.

We also discussed the theory of embeddedness of organizational capabilities. We found evidence in support of the theory in the case of Amgen Corp. In particular, we found evidence that drug innovation capabilities were embedded in the teams of star scientists. This finding is consistent with Makadok's (2001) notion of embeddedness of capabilities in organizations. Finally, we found that absent the four venture capitalists that incorporated Amgen in 1980 and hired Dr. Rathmann as President, Amgen could not have come into existence at all. Hopefully, these findings will be insightful to entrepreneurs and academics grappling with the research questions addressed in this study especially the role of leadership in providing support to corporate innovation strategies, and the origin of capabilities.

Yet, another unique contribution of the study is that, even though the upper-echelon theory enriched our knowledge of strategic leadership, it has the caveat that it failed to study actual leadership behavior (Cannella & Monroe, 1997). In fact, the extant strategic leadership research underpinned in upper-echelon theory enlisted demographic proxies of leaders to draw inference about their leadership behavior---this point is underscored. In contrast, our case study used actual leadership strategic behaviors data to trace the trajectory the President's deployment of organizational strategic assets, which allowed us to glean answers to the research questions. Of course, the pattern of asset deployments of a firm is the x-ray of its corporate strategy and its implementation (Hofer, 1992; Hofer & Schendel, 1978).

To sum up, the key roles played by Amgen's top echelon in the initiation and implementation of the collaborative R&D agreement without which the star scientists would not have been hired, is worthy of emulation by entrepreneurial managers who wish to build innovation capabilities for new or existing organizations. Intrusive research methods such as in the present study hold the key to finding the origin of organizational innovation capabilities, not quantitative methods as some scholars would insist.

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BIOGRAPHY

Godwin Onyeaso is the President of Jesus Blood Spirit (JBS) Ministry, Inc, and Professor of Strategic Management and Research Methodology at Argosy and Shorter Universities, as time permits. Prior to that, Dr. Onyeaso was tenured on the faculty of Concordia College-University System, USA. His research interests focus on the use of time series econometric methods to investigate the dynamic trajectories of the impact of intangible strategic assets on firm performance. Professor Onyeaso has published in a number of peer-reviewed international journals including: *Journal of Services Marketing*, *Journal of the American Academy of Business*, *Journal of Business Strategies*, *International Journal of Management*, *Quarterly Journal of Business and Economics*, and *Management Decision*, among others. He has a forthcoming book on the impact of Spirituality and Religion (The Nine Gifts of the Holy Spirit) on Employee Productivity). He is a consultant to many organizations on the impact of Spirituality and Religion on Organizational Outcomes, among others. Dr. Onyeaso may be contacted at: gonyeaso@bellsouth.net

Victor Oladapo is on the faculty of Webster University (USA) where he teaches Human Resource Management and allied courses. Related to his teaching area, Dr. Oladapo's research interests focus on the use of latent factor and econometric methods to investigate the multivariate relationships between High Performance Work Systems (HPWS) and other strategic organizational outcome variables. His research articles have appeared in some academic and professional conference proceedings, and are being reviewed for journal outlets. Currently, he is a co-author of a forthcoming book on the impact of Spirituality and Religion on Employee Productivity in small business organizations, where he is a consultant. Dr. Oladapo may be contacted at: voladapo@aol.com