THE PERFORMANCE EFFECTS OF BALANCING EXPLORATION AND EXPLOITATION WITHIN AND ACROSS GOVERNANCE MODES

URIEL STETTNER
Faculty of Industrial Engineering and Management
Technion – Israel Institute of Technology
Haifa 32000, Israel

DOVEV LAVIE
Faculty of Industrial Engineering and Management
Technion – Israel Institute of Technology

INTRODUCTION

Exploration and exploitation entail distinctive organizational activities and skills, so firms make conscious decisions to support one activity at the expense of the other. March (1991) conjectured that pursuing both activities is essential for survival and prosperity, yet prior research has revealed mixed evidence in support of this balance hypothesis (He & Wong, 2004; Jansen, et al., 2006; Lin, et al., 2007). There is further disagreement concerning the means by which firms achieve balance. Some scholars suggest that firms can effectively balance exploration and exploitation by nurturing an appropriate organizational context (Gibson & Birkinshaw, 2004). Others call for temporal separation by which firms transition between exploration and exploitation over time (Eisenhardt & Brown, 1997), yet most scholars advocate simultaneous exploration and exploitation by means of organizational separation (Benner & Tushman, 2003; Tushman & O'Reilly, 1996), This approach, however, creates operational redundancy as the strategic trade-offs between exploration and exploitation give way to organizational trade-offs and increase the coordination burden imposed on top management (Lavie, et al., 2010). Prior research has underestimated these costs which may explain the inconsistent support for the balance hypothesis. Such research has also narrowly applied the notion of exploration-exploitation within particular governance modes, mostly focusing on innovation within firm boundaries (e.g., He & Wong, 2004; Katila & Ahuja, 2002; Rosenkopf & Nerkar, 2001), with few studies considering alliances (e.g., Lavie & Rosenkopf, 2006) or acquisitions (Hayward, 2002). Thus, prior research has ignored the possibility that firms concurrently pursue exploration and exploitation via multiple governance modes. Only a couple of studies (Hess & Rothaermel, 2009; Vermeulen & Barkema, 2001) have juxtaposed distinct governance modes when studying exploration and exploitation, and even they have not focused on balancing as the underlying theme. In turn, prior research on the choice of governance modes (e.g., Barkema & Vermeulen, 1998; Villalonga & McGahan, 2005) has not considered how these modes serve for exploration versus exploitation or which mode is best for pursuing each activity.

In an effort to account for interdependencies in a firm's exploration and exploitation activities across governance modes, we extend the domain separation approach which has advocated balancing exploration and exploitation across discrete fields of organizational activity (Lavie & Rosenkopf, 2006). We posit that this approach enables firms to avoid inherent trade-offs when balancing exploration and exploitation within governance modes and thus enhance firm performance. Unlike Lavie et al. (forthcoming) who limited their concern to a single mode, namely alliances, we seek to demonstrate how configuration of exploration and exploitation

activities across various governance modes can benefit the firm. Accordingly, we argue that resource allocation constraints, conflicting organizational routines and inability to specialize undermine a firm's ability to benefit from balance within each governance mode, namely internal development, acquisitions, or alliances. In turn, balancing exploration and exploitation across these modes relieves the firm from these impediments, so it can enjoy the benefits of balance and enhance its performance. We further suggest that the firm can maximize its performance by leveraging externally-oriented modes such as acquisitions or alliances for pursing exploration while engaging in exploitation via internally-oriented mode, i.e., internal development. We test these hypotheses with a unique data on all the product introductions, alliances and acquisitions of 190 publicly-traded, U.S.-based software firms during 1990-2001. Our study reconciles the mixed evidence in prior research which has limited its focus to particular governance modes.

THEORY AND HYPOTHESES

Prior research has underscored the merits of balancing exploration and exploitation with less regard to organizational impediments. Scholars have argued that balancing the discovery of new opportunities while leveraging prior experience can enhance firm performance (e.g., He & Wong, 2004; Hess & Rothaermel, 2009; Lin et al., 2007). Yet, they have underestimated the organizational challenges and costs of balancing exploration and exploitation (Abernathy, 1978; Benner & Tushman, 2003). We claim that the impediments associated with resource allocation constraints, lack of specialization, and conflicting organizational routines can outweigh the benefits of balance within particular governance modes and thus undermine firm performance. First, a firm that engages in both exploration and exploitation within a governance mode faces constraints arising from internal competition for resources (March, 1991). These constraints emerge since exploration and exploitation are fundamentally distinct activities that require resources that cannot be shared (i.e. used simultaneously) or transferred (i.e. used sequentially) across these conflicting activities (Cheng & Kesner, 1997). Their distinctive nature limits fungibility, divisibility, salvage, and redeployment of resources that are allocated to any one of these two conflicting activities (Anand & Singh, 1997; Mishina, et al., 2004) thereby accentuating internal competition for scarce resources and undermining the benefits of pursuing both activities in the same mode. Second, balancing within particular governance modes forgoes some of the benefits of specialization in either activity. It partially relinquishes the firm's ability to develop and assign specialized resources and streamline capabilities so as to foster core competencies in exploration or exploitation (Madhok, 1997). Consequently, it does not enjoy effectiveness and efficiency in carrying out specialized exploratory or exploitative activities (Schilling, et al., 2003) and fails to gain scale and scope economies otherwise attainable when concentrating efforts in either activity. Finally, exploration and exploitation rely on distinctive organizational capabilities that leverage resources through particular organizational routines (Dosi, et al., 2000). Organizational routines associated with exploitation focus on maintaining consistency, stability, and productivity by leveraging the firm's experience (Benner & Tushman, 2003) whereas routines associated with exploration encompass search and discovery of new opportunities by facilitating experimentation, flexibility, and risk taking (McGrath, 2001). Exploration and exploitation routines entail distinctive organizational structures and fundamentally different learning contexts. Hence, the simultaneous use of such routines increases organizational tension, complexity and coordination challenges that can undermine performance (Benner & Tushman, 2003). Moreover, bounded rationality may lead a firm that

balances exploration and exploitation within a certain governance mode to misapply knowledge or practices that are suitable for one activity when performing the other, exposing it to negative learning effects (Haleblian & Finkelstein, 1999; O'Grady & Lane, 1996). Overall, resource allocation constraints, limited specialization, and the need to reconcile conflicting routines undermine the firm's ability to benefit from balance within governance modes.

H1. Balancing exploration and exploitation within a governance mode will undermine firm performance relative to specializing in either exploration or exploration in that mode.

A firm can minimize or avoid the aforementioned impediments by balancing exploration and exploitation across distinct governance modes. The boundaries of these modes can serve as effective buffers between exploration and exploitation. By decoupling these activities, a firm can retain the benefits of balance and specialize while attenuating resource allocation constraints and mitigating the tension between conflicting routines. First, investing dedicated resources in exploration in one mode need not deprive the pursuit of exploitation via another. Moreover, resources that are deployed in a particular governance mode maintain fungibility, divisibility, transferability, salvage and redeployment in that mode (Vassolo, et al., 2004). These benefits prevail since the firm maintains a single type of activity within each mode. Therefore, avoiding the adverse consequences of resource allocation constraints typical of balance within modes and neutralizing some unfavorable resource characteristics enables the firm to minimize the adverse effects of resource allocation constraints while still benefiting from balance. Second, by balancing across governance modes a firm can develop and assign specialized resources and refine organizational processes within each mode. Consequently, the firm can specialize in each governance mode, thus enabling it to effectively develop skills, achieve efficiency, and obtain scale and scope economies in each mode. Finally, when balancing exploration and exploitation across governance modes, the firm can effectively buffer conflicting routines and circumvent the trade-offs thereby maintaining operational consistency within each mode. Engaging in one set of routines within each mode enables the firm to devise consistent procedures, thus attenuating tension, complexity and coordination challenges. For such a firm, the benefits of simultaneously leveraging its existing skills while uncovering new opportunities outweigh balancing costs.

H2: Balancing exploration and exploitation across governance modes will enhance firm performance relative to specializing in exploration and specializing in exploitation in both modes.

Which governance mode is most suitable for engaging in exploration and which is appropriate for exploitation? The underlying characteristics of distinct governance modes may offer differential performance benefits for exploration versus exploitation. We posit that internally-oriented governance modes are more suitable for exploitation whereas externally-oriented modes are more effective for exploration. Effective exploration entails organizational flexibility and ability to break from inertial pressures (Hannan & Freeman, 1984). Moving away from existing competencies by minimizing reliance on prior skills prevents core rigidities that undermine opportunity-seeking activities (Leonard-Barton, 1992). Hence, exploration becomes increasingly effective as the firm distances itself from the locus of its core competencies. Since resources and capabilities that are nurtured within the firm's boundaries are likely to be highly path dependent, those that span organizational boundaries have greater potential for generating

new opportunities (Rosenkopf & Nerkar, 2001). In turn, effective exploitation is associated with reliability and stability that emerge when a firm leverages prior skills (March, 1991). Leveraging established skills supports the development, refinement and application of distinctive competencies in familiar domains, which generates economies of scale and scope. Local search enhances efficiency and enables the firm to consistently apply skills and rely on compatible resources (Danneels, 2002). Exploitation thus becomes increasingly effective as the firm moves closer to the locus of its immediate field of expertise and remains within the boundaries of its learning context. Hence, internal development is most effective for exploitation relative to alliances and acquisitions, which in turn are expected to maximize the returns on exploration.

H3. When balancing exploration and exploitation across governance modes, exploration via an externally-oriented mode will enhance firm performance more than exploration via an internally-oriented mode.

METHODS

The hypotheses are tested with panel data on 190 U.S.-based publicly-traded firms in the pre-packaged software industry (SIC 7372) during 1990-2001. Data on product introductions, alliances, and acquisitions were gathered since 1985. Compustat offered firm-level data. Stock market data were extracted from CRSP. Information on new software products and product versions were gathered from press releases published in Lexis Nexus and Thompson's Dialog New Product Announcements databases. Each software product was classified to relevant function categories using a typology that was developed with the help of industry experts. The typology included 464 product functions in 54 market segments of 4 product classes: personal applications, system infrastructure, vertical applications, and business applications. These records were transformed to 1,952 firm-year observations by pooling each firm's data across all products introduced in a given year. Acquisition records were compiled from Thomson's SDC database which reports all acquisitions made by the sampled firms. Finally, alliance records were obtained from a previously used database (Lavie, 2007; Lavie &Rosenkopf, 2006) which compiles information from SDC, Factiva, corporate websites and Edgar SEC filings.

Firm performance was measured with a logarithmic growth function of market value (Stuart, 2000). All independent variables and controls were lagged by one year relative to the dependent variables. Exploration-exploitation was measured as a continuous variable in six domains associated with the three modes. In the internal development mode, product-market exploration was calculated by averaging an indicator that receives a value of "0" if the firm had prior products in that function, a value of "1" if prior products were introduced to the same market segment, a value of "2" for prior products in the same application class, or a value of "3" if the firm had no prior products in that class. Similarly, innovation exploration was based on an indicator receiving a value of "1" if the firm had not previously released a version of that product and a value of "0" if otherwise. Exploration in the alliance mode was assessed along the function and structure domains following prior research (e.g., Lavie & Rosenkopf, 2006). Finally, in the acquisition mode, international exploration was captured by institutional, cultural, geographical, and economic national differences between the firm's home country and the home country of its acquisition target (Ghemawat, 2001). In turn, industry exploration was based on an indicator receiving a value of "0" if the acquiring firm had offered a similar product function, a value of "1" if that function was not offered but the firm had prior products in the same market segment,

and a value of "2" if the firm had prior products in the same application class. For an acquisition target with a primary SIC code different from 7372, the indicator received a value of "3" if the first 3-digit SIC equaled 737, a value of "4" if the 2-digit SIC equaled 73, a value of "5" if only the first digit SIC equaled 7, and a value of "6" for all other unrelated industries. These six measures were transformed to range between 0 and 1, with high values indicating exploration.

By considering a single industry we controlled for inter-industry variation. Inter-temporal trends were controlled with year dummies. Other controls included a firm's size, R&D intensity, solvency, product life cycle, hardware experience, and governance mode experience. Remaining interfirm heterogeneity was controlled with firm fixed effects and a lagged measure of firm performance. Endogeneity in firms' tendencies to operate via particular governance modes was accounted for with two-stage analyses (Hamilton & Nickerson, 2003; Shaver, 1998). Following Heckman (1979), three Probit first-stage models estimated whether the firm used a particular mode. These predicted values were used to calculate the inverse mills ratios (λ) that were then incorporated in the second-stage models. The second-stage models were implemented using cross-section time-series regressions with firm fixed affects and an AR(1) process. Hypotheses were tested with partial models since VIF indexes in the full models exceed the critical value (Kleinbaum, et al., 2007). Model fit was evaluated with log likelihood ratio tests.

RESULTS

To test H1 we first introduced linear and quadratic terms of exploration in the internal development mode. In the innovation domain, the linear effect is negative and the quadratic effect is positive. In support of H1, t-tests show significant advantage of exploitation and exploration over balance. Similarly, in the product domain, the linear effect is negative while the quadratic effect is positive. There is a marginally significant advantage to exploration and exploitation relative to balance. In the international domain of the acquisition mode, the main effect is positive and the quadratic effect is negative, yet the infliction point falls outside the range. Within range, performance declines with exploration. Per H1, balance is undesirable given the benefit of exploitation. In the industry domain, the linear term of exploration is negative while the quadratic term in positive. Per H1, performance at either exploration or exploitation is better than at balance. No significant effects of exploration were found in the alliance mode.

When balancing across the internal development and acquisition modes, the main effects of exploration are positive and their interactions are negative. In support of H2, balance across furnishes better performance than either exploration or exploitation in both modes. When balancing across the internal development and alliance modes, the interaction effects of exploration are insignificant. Yet, when balancing across the internal development (product) and alliance (function) modes, in support of H2, balance is superior to specialization. Similarly, when balancing across the acquisition and alliance modes, exploring via acquisitions while exploiting via alliances offers superior performance relative to specialization in either exploration or exploitation in both modes. When balancing across the acquisition (international domain) and the alliance (structure domain) modes, no support is found for H2. Finally, the effects of exploration in the acquisition (industry domain) and alliance (function domain) modes are insignificant, yet the balance point is marginally superior to one of the specialization points, in support of H2.

In support of H3 a one-sided t-test for the performance difference between exploration via internal development (innovation domain) and exploration via acquisition (international domain) confirms that exploration via the externally-oriented mode generates better

performance. Marginal support is found when exploring in the acquisition mode (industry domain) relative to the internal development mode (innovation domain). However, while consistent with H3, insignificant results are obtained for balancing across the internal development (product domain) and acquisition modes (international domain). Finally, inconsistent yet marginally significant evidence is found when balancing across the internal development (product domain) and acquisition modes (industry domain). When balancing across the internal development (innovation domain) and the alliance modes (function domain), superior performance is observed when exploring via the externally-oriented mode, in support of H3. Other tests for the effect of balance across the internal development and the alliance modes generate consistent results. Finally, further evidence in support of H3 is found when balancing across the acquisition (international domain) and alliance modes (function domain) and across the acquisition (industry domain) and alliance modes (function domain).

DISCUSSION

We advance research on exploration and exploitation (Gupta, et al., 2006) by offering insight into the means by which firms benefit by exploring and exploiting across governance modes. Prior research has taken for granted that firms should independently balance exploration and exploitation within particular modes. Besides underestimating the challenges associated with such balance, prior research has ignored possible interdependence in a firm's exploration activities across governance modes. We extend the domain separation approach (Lavie et al., forthcoming; Lavie & Rosenkopf, 2006) by suggesting that internal development, alliances, and acquisitions serve as alternative modes for pursuing exploration and exploitation. We reveal that the traditional form of balance within modes is disadvantageous. Specifically, a firm does not benefit from balancing exploration and exploitation via internal development or acquisitions. We ascribe this performance decline to investments in divergent activities, inability to gain expertise, and reliance on inconsistent routines that generate tension and impair coordination. Eventually, operational inefficiency, hindrance of scale and scope economies, and ineffective learning weaken performance. Hence, counter to established research on balancing exploration and exploitation, we reveal negative performance consequences when balancing exploration and exploitation within governance modes. In turn, we show enhanced performance when a firm explores in one mode and exploits in another, especially when balancing these activities across the internal development and acquisition modes. The findings further demonstrate that exploring via externally-oriented modes while exploiting via internally-oriented modes enhances performance more than exploiting externally while exploring internally.

We advance the notion of balance across governance modes as a superior approach for balancing exploration and exploitation. We refute the latent assumption of independence in prior research by acknowledging interdependence across alternative governance modes. We offer concrete guidance for optimizing the configuration of exploratory versus exploitative activities by noting that exploration is better pursued via an externally-oriented mode such as acquisition. We conclude that a particular governance mode is not universally preferable (e.g., Villalonga & McGahan, 2005) since its value depends on the nature of organizational activity that the firm pursues in that mode. Our study advances research on exploration and exploitation by demonstrating the merits of coordinating exploration efforts across multiple governance modes.

REFERENCES AVAILABLE FROM THE AUTHORS