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ALL EXPERIENCE IS NOT CREATED EQUAL: LEARNING, ADAPTING, AND FOCUSING IN PRODUCT PORTFOLIO MANAGEMENT

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This study explores the contingencies relating firm experience to product development capabilities, focusing on experience type (breadth versus depth) and timing (prior versus concurrent). Results from empirical tests in the U.S. mutual fund industry offer two primary findings. First, firms increase proficiency at adapting their processes to address new opportunities as they accumulate experience in entering new niches, but face initial hurdles broadening their experience base. Second, concurrent learning is capacity constrained, as product quality increases in the number of products introduced simultaneously in one niche, but quality decreases as the firm's concurrent portfolio of new products broadens. Jointly, these findings highlight that dynamic capabilities are built through prior adaptation experience and that management of a product development portfolio is an important managerial capability. Copyright © 2011 John Wiley & Sons, Ltd.

INTRODUCTION

A firm's ability to create effective new products is central to both strategic renewal and long-term organizational growth (March, 1991; Nelson and Winter, 1982; Penrose, 1959). How firms can improve product development outcomes is therefore a key strategic question. Existing research has pursued two different paths by studying how to improve at the level of the project and at the level of the firm. The project level has received most of the attention, as most work on product development focuses on how to manage individual projects better—examining, for example, the importance of senior management sponsorship or cross-functional teams (see reviews from Brown and Eisenhardt, 1995; Shane and Ulrich, 2004). On the other hand, a firm-level perspective suggests that new products could be improved through organizational experience. However, while some research promotes learning from experience (Danneels, 2002; MacCormack, Verganti, and Iansiti, 2001), other research either finds no relationship between experience and product development outcomes or suggests that the link is complicated (Moorman and Miner, 1997; Nerkar and Roberts, 2004). This study seeks to explain these differing perspectives and explores the contingent potential for learning from experience in product development by focusing on two key characteristics of experience: *type* and *timing*.

Recent research suggests that the *type* of experience plays a role in understanding the nature of the capabilities created (e.g., Hoang and Rothaermel,

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2010; Zollo and Reuer, 2010). Two studies focusing on the role of experience type in the creation of new product development capabilities highlight this point. First, Salvato (2009) investigates how heterogeneity in experience affects product development performance. Second, Holmqvist (2004) investigates how different types of product development experience—namely broad versus focused experience—lead to different types of learning. The first approach this study takes toward unpacking the experience-outcomes relationship for product development builds on these studies (Holmqvist, 2004; Salvato, 2009) to investigate when firms benefit from broad versus focused product development experience.

In addition to experience *type*, this study also focuses on the effects of experience *timing* in product development because the timing of activities constrains learning. On the one hand, only recent experiences contribute as learning may dissipate (Argote, Beckman, and Epple, 1990), and concurrent projects offer opportunities for within-firm spillovers (Garcia-Vega, 2006; Henderson and Cockburn, 1996). On the other hand, utilizing a large volume of product development resources in a short period may create capacity constraints, limiting effectiveness (Levinthal and Wu, 2010; Penrose, 1959; Wu, 2007). Thus, organizations face an incentive both to accelerate and to restrain product development activities to maximize effectiveness. Given these important considerations about the timing of experience, the second approach this study takes to the experience-outcomes link for product development is to focus on experience *timing*.

The potential for building capabilities through experience and the temporal constraints on deploying those capabilities present interesting challenges for managers making product development decisions. The question becomes what type and timing of experience maximizes performance for the firm's new products. This study investigates the experience-product development link empirically in the U.S. mutual fund industry, a setting that provides excellent data, minimizes concerns about selection biases, and highlights the importance of knowledge and learning. The results offer two main findings. First, the greater the firm's experience with the adaptation of its product development process to different niches, the better the firm becomes at adapting that process for new niches in the future. In essence, the capability to adapt the firm's product development activities is governed by a learning-by-doing process. But achieving a broad experience base to facilitate adaptation comes with a short-term efficiency cost since focused firms initially are better equipped to exploit familiar niches and not explore new niches. Second, there are capacity constraints in product development, as firms benefit from executing concurrent projects in the same niche but suffer from spreading resources thinly across an array of niches.

This study's central contribution to the product development literature is to theoretically and empirically explore the role of different types and timings of experience from the perspective of organizational learning. In so doing, this study contributes to two additional literatures. First, the relationship between experience breadth and effectiveness in new niches is related to dynamic capabilities (Danneels, 2002). Winter (2003: 992) states that, '[n]ew product development, as practiced in many firms, is a prototypical example of a first order "dynamic capability"' in that it supports the creation of new resources and capabilities for the firm. The finding that the previous adaptation of product development processes for new niches facilitates subsequent adaptation efforts agrees with King and Tucci's (2002: 172) theorized (but not empirically supported) link between '*transformational experience*' and the creation of dynamic capabilities. Second, this study highlights the importance of considering the dynamic nature of the firm's product portfolio (Cooper, Edgett, and Kleinschmidt, 2001; Helfat and Raubitschek, 2000). The role of product portfolio management is investigated by considering the trade-off between short-term performance and long-term capability development (similar to the trade-off in March, 1991), as well as the timing-related challenges created by capacity constraints in the deployment of product development capabilities. The ability to manage that portfolio effectively may indeed be a dynamic managerial capability (Adner and Helfat, 2003; Eggers and Kaplan, 2009) that affects heterogeneity in firm performance over time.

The remainder of this paper is organized as follows. The next section identifies a key tension in the product development literature concerning learning from experience and new product outcomes and then uses the learning and capability literatures to frame the contingent effects of

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experience. Then, after the empirical setting is introduced and the results of the analysis are discussed, the themes of dynamic capabilities and product portfolio management are revisited in the Discussion section.

THEORY AND HYPOTHESES

Given the importance of product development to firms and the economy, a great deal of research across the management, innovation, and operations fields addresses the subject. These fields often use different levels of analysis, with management and innovation scholars focusing on firm-level drivers of performance and operations scholars focusing on project-level drivers. For example, research on innovation has highlighted firm characteristics such as firm size, diversification, and network position as key ingredients to innovation (for a summary see Ahuja, Lampert, and Tandon, 2008). The majority of firm-level research has, however, focused on the behavioral aspects of innovation—how likely firms are to search for and adopt different innovations.[1] These studies generally do not investigate the outcomes of product development, and these outcomes are central to investigating the link between experience and learning in new product development.

Conversely, the operations literature on product development often focuses on new product quality as a relevant outcome. However, most of this work focuses on characteristics of individual projects instead of on the organizational context for product development. For example, Thieme, Song, and Shin (2003) discuss a model for understanding new product survival based on the skills of the project manager, cross-functional composition, and planning proficiency. In Shane and Ulrich's (2004) literature review, the only concepts related more broadly to organizations are organizational design (specifically communication and decision processes) and knowledge transfer. Most studies control for organizational size, age, and/or profitability, but they are just that—controls.[2] While these project-level perspectives on product development effectiveness are important to product outcomes, they do not provide a useful lens for looking at the learning mechanisms that shape the firm's new product development effectiveness over time.

This study seeks to extend the cluster of studies looking at traditional performance measures of the new product development literature (product-level outcomes) through a firm-level lens on learning and capability development. Prior research in this tradition has shown mixed results. Fieldwork by Danneels (2002) shows that product innovation creates capabilities and does not simply utilize them, and fieldwork by Holmqvist (2004) identifies mechanisms by which firms capture learning from projects. Additionally, work in software development indicates that team members with greater experience in prior generations of the product produce higher quality outcomes (MacCormack *et al.*, 2001). These studies suggest learning via experience in product development. Large-scale work has shown inconsistent links between experience and product outcomes and suggests that differentiating between dispersion versus volume of experience (Moorman and Miner, 1997), market versus technical experience (Nerkar and Roberts, 2004), or breadth versus depth of experience (Mannor, 2009) is required to understand how experience affects product development. Thus, this study takes its first cue from this research and distinguishes between two different types of experience—the *breadth* of the firm's experience, in terms of how closely related the various products that the firm has created are to one another, and the *depth* of the firm's experience, in terms of the number of products the firm has created specifically for a focal niche.

To the extent that experience breadth and depth have effects on the product development process, the normative implications are straightforward. In the case of experience accumulation and capability deployment, however, timing poses an additional challenge. On the one hand, engaging in product development activities concurrently provides opportunities for cross-project spillovers

[1] For example, research claiming that more diversified (inter-industry) firms will be more innovative has focused on the role that basic science can play across divisions of the firm, thus increasing the incentives to invest in innovation (Nelson, 1959). Meanwhile, research suggesting the opposite has focused on the negative effects that potential cannibalization (Rotemberg and Saloner, 1994) and loss of managerial control (Hoskisson and Hitt, 1988) can have on innovation. In each case, the outcome of interest is innovation investment (often operationalized as R&D/Sales).

[2] The primary exceptions have looked at which opportunities to pursue and the sharing of (generally technical) resources across activities ('platforming').

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(Iansiti and Clark, 1994; Song and Parry, 1997) that can improve efficiency. On the other hand, deployment of product development capabilities will be affected by the same capacity constraints that affect other capabilities (Levinthal and Wu, 2010; Penrose, 1959). This study uses distinctions in the type of product development experience—breadth and depth—to disentangle these conflicting constraints on the timing of product development.

Though the focus of this study is on product development, the approach utilized draws on a learning and capability development perspective. Three elements drawn from these literatures are used to build each hypothesis. First, capabilities are built through experience, as has been investigated in countless learning-by-doing studies (Arrow, 1962). Second, the fungibility of capabilities—the ability to apply capabilities across a variety of tasks—is a central element to the resource-based view of the firm (Wernerfelt, 1984). However, not all capabilities are fungible since some are niche-specific while others may be deployed broadly (Danneels, 2007; Teece, 1982). This study looks at both fungible and specific capabilities. Third, there are limits on the deployment of capabilities based on capacity constraints (Levinthal and Wu, 2010; Penrose, 1959). Pushing capabilities past their limits reduces their effectiveness. These three elements form the core building blocks of the hypotheses offered below.

Key terms and their application to the mutual fund industry

This study is concerned with product development outcomes and utilizes a performance measure that is closely related to the product development process—new product quality. In line with work on product development, new product quality is defined as the superiority of a newly created product along dimensions that create value for customers (as opposed to the firm). Many studies of product outcomes use measures such as market share or initial sales, but such performance will depend in part on the presence of complementary assets (Teece, 1986). While some studies of product development have looked at new product quality as an outcome (e.g., Zirger and Maidique, 1990), most consider either a qualitative measure of success or commercialization outcomes (Montoya-Weiss and Calantone, 1994). This study focuses on new product quality as the output of the product development process itself. In order to study the learning effects of prior experience on new product quality over time, this study focuses on the within-firm effect of experience in line with prior studies of organizational learning. Thus, the hypotheses focus on changes in the type and timing of product development experience for any given firm.

It is helpful to ground the core concepts (quality, breadth versus focus, depth, and timing) in the study's empirical context, the U.S. mutual fund industry. Product quality is defined as a feature that benefits the customer—the financial return generated by the fund. The focus or breadth of experience refers to the similarity or dissimilarity of the existing funds in the firm's portfolio. Similarity in terms of the underlying knowledge (about types of investments) and processes (the process of valuing potential investments) needed to create a new fund are considered.[3] Depth refers to the volume of experience that the firm has within a particular niche. For timing, differences between all previous experience and concurrent (same year) experience (the most extreme comparisons of recent versus long-term) are focused upon.

In sum, this study develops theory about the effect of broad (versus focused) and deep (versus shallow) prior experience and looks at the effect of each type of experience along the temporal dimensions of prior versus concurrent. For this reason, the first hypotheses relate to experience breadth, both prior (Hypotheses 1 and 2) and concurrent (Hypothesis 3). The second set of hypotheses deals with experience depth, again both prior (Hypothesis 4) and concurrent (Hypothesis 5). Additionally, a mutual fund example is provided for each hypothesis.

Experience breadth and new product quality

Breadth and focus in prior experience have long been of interest in the organizational learning literature, with the implication that breadth is important for learning (Levitt and March, 1988). Huber (1991) outlines how exposure to a broader array

[3] Funds could theoretically be similar along other dimensions, most notably distribution and customer base. However, these similarities have less to do with product development processes.

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of experiences leads to a more substantial knowledge base. Empirical work on experience diversity in knowledge-intensive settings supports this claim in the contexts of acquisitions (Beckman and Haunschild, 2002) and international expansion (Luo and Peng, 1999). Implicitly supporting the value of breadth in knowledge, Levinthal and March (1993) highlight the dangers of overspecialization of knowledge. Research in innovation, as well, suggests that broad prior experiences are important for new product success (Katila and Ahuja, 2002; Nerkar and Roberts, 2004). However, while breadth of prior experience may be beneficial, it is not clear that breadth would be equally useful across all types of new products (Haas and Hansen, 2005; Zollo and Reuer, 2010). Indeed, focus may be especially beneficial for outcomes under specific circumstances (Siggelkow, 2003). The contingent effects of focus and breadth, therefore, require further investigation.

The first perspective is that focused prior experience—experience with only a single niche or a few closely related niches—allows firms to refine their product development processes and build highly efficient (though flexible) processes. Refinement enhances the quality of the firm's subsequent products in niches where it has direct experience. As found by Siggelkow (2003: 122), 'a high product focus may allow a firm to specialize on particular products, with resulting high product quality.' Thus, firms focusing on efficiency in existing routines will be effective in exploiting opportunities in familiar niches where these processes will be most useful (Benner and Tushman, 2002). Firms often target closely related niches to increase the applicability of existing processes (Breschi, Lissoni, and Malerba, 2003). This aligns with discussions of experience in the product development literature, that is, by focusing on niches in which the firm has prior experience or that exhibit important similarities with the firm's prior experiences, the effectiveness of the product development process can be increased because the firm already possesses efficient and useful processes (Kessler, Bierly, and Gopalakrishnan, 2000; Kim and Kogut, 1996; Smith, Collins, and Clark, 2005).

As an illustration, imagine a small and focused mutual fund company with two funds in categories that are closely related to one another (e.g., two U.S. domestic equity funds, one for blue chips and one for mid-caps). There are different fund managers for each fund, but there is a central research group that supports both managers. This research group is the most likely place where firm-level learning would accrue. This first hypothesis suggests that focused prior experience allows the research group to develop efficient processes that facilitate the creation of new products that are very similar to existing products (e.g., in the same category), as the research group already understands how to evaluate U.S. domestic equities and has a process to provide managers with information about potential investments.

Hypothesis 1: Increases in the focus of a firm's prior product development experiences will result in higher new product quality, but only for products in niches in which the firm has prior experience.

The logical corollary to the above argument is that adaptation in the past produces the necessary capabilities for adaptation in the future. Within the product development process, there are a number of microprocesses that vary from project to project. To introduce a new product in a niche that is new to the firm, some or all of these processes must be modified (Imai, Nonaka, and Takeuchi, 1984). The more experience the firm has in modifying its processes and the more significant those modifications have been, the more flexible and adaptable the processes become. King and Tucci (2002) argue that the ability to reconfigure processes at the organizational level is built through repeated reorganizations, a point echoed by Zollo and Winter (2002) and Danneels (2002) in their suggestions of how firms build dynamic capabilities. Thus, capabilities and processes developed through prior exploration of the product space (Katila and Ahuja, 2002; March, 1991) are more likely to be fungible ones that can be used to explore new product spaces in the future (Danneels, 2007; Teece, 1982), as opposed to the niche-specific processes discussed earlier for Hypothesis 1. This includes capabilities to learn new things (Cohen and Levinthal, 1990), a skill that would be inherently useful in the creation of new-to-the-firm products. Nerkar and Roberts (2004) investigate the benefits firms gain from having a diverse experience base, and find that firms with more diverse market experience produce higher quality new products. Broader experience means that

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the underlying product development processes are more modular and flexible, as they have been applied to disparate market niches.[4]

Again, considering our hypothetical company, if the firm's two funds were instead in domestic blue chip equities and international developing economy bonds, then the firm would have a broad scope. The central research group would already have created investment evaluation processes for very different types of funds and underlying assets, so the research group will be adept at creating new processes for a very different type of fund (e.g., creating a tax-free U.S. money market fund).

Hypothesis 2: Increases in the breadth of a firm's prior product development experiences will result in higher new product quality, but only for products that are in niches that are new to the firm.

While breadth of prior experience may benefit new product quality, there are temporal constraints in the deployment of that expertise and associated product development resources. Penrose (1959) notes that firms diversify to take advantage of excess resources under their control, and Wu (2007) and Levinthal and Wu (2010) build on this point to discuss how capacity-constrained capabilities limit the ability of firms to engage in too many activities simultaneously. This suggests that the more products the firm attempts to introduce at the same time, the lower the average quality of these products. In product development, knowledge and processes are theoretically unconstrained, but knowledge and processes are embodied in skilled human capital that is constrained (Cooper and Edgett, 2003). Tacit information is an important source of knowledge for innovation, especially tacit knowledge built through deep personal experience (Leonard and Sensiper, 1998). Experienced individuals will be less effective if their attention is spread across multiple concurrent projects, and projects will be less effective if each receives an insufficient allocation of skilled resources. Not all concurrent projects are likely to stretch resources, however. Given the statements earlier about the benefits of focus, it is likely that the costs of concurrent activity would be observed only in circumstances of concurrent breadth, where the firm is simultaneously producing new products in multiple different niches.

For our hypothetical company, it would be easier simultaneously to create two new domestic equity funds as opposed to one equity and one money market fund. In the former case, many of the assets being evaluated may be identical and the processes would be similar, while in the latter case the resources of the research group may be too thinly stretched across very different projects.

Hypothesis 3: Increases in the breadth of a firm's concurrent product development activities will result in lower new product quality.

Experience depth and new product quality

While the benefits of experience breadth primarily deal with processes created through experience, the benefits of experience depth center on the role of knowledge. Research in product development argues that products in niches in which the firm has direct experience will be aided by the knowledge that the firm has accumulated (Zirger and Maidique, 1990). This knowledge is likely to be niche-specific and not fungible across different categories. Kogut and Zander (1992) also argue for the relevance of direct knowledge, stating that organizations with greater depth of knowledge in a particular task will demonstrate higher performance at that task. The suggestion is that as a firm accumulates experience within a given product niche, its store of accumulated knowledge increases its ability to produce high quality new products within that niche.

Thinking about our hypothetical company, if they had previously created 10 domestic blue chip equity funds, then the firm should be very effective at creating another domestic blue chip equity fund. The research group understands the underlying assets and provides more effective assistance to the fund manager.

[4] By contrast, a firm that operates in multiple niches that are very similar to one another may have efficient but inflexible processes. Thus the amount of prior adaptation required by prior product development activities is not tied necessarily to the number of categories in which the firm operates, but to the distance between those categories. For this reason, this study focuses on the breadth of the firm's experience (as opposed to a simple count of categories), though a count measure is discussed in the Robustness section.

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Hypothesis 4: Increases in the depth of a firm's prior product development experiences in the focal niche will result in higher new product quality.

Concurrent depth of product development activity—the simultaneous creation of multiple new products in the same market niche—may also help firms. Work in product development has repeatedly identified senior management support as a component of success (Brown and Eisenhardt, 1995; Thieme *et al*., 2003). Given the multiple demands on the attention of senior managers (Ocasio, 1997), firms engaging in many unrelated projects will overburden managers, moving past Penrose's (1959: 42) 'managerial limit.' As a result, managers are likely to focus their limited attention on product development activities in a specific segment if there are multiple concurrent projects. Thus, depth of concurrent activity may increase new product quality by serving as a focusing mechanism for managerial attention. Additionally, while most work on knowledge spillovers has focused on cross-firm spillover activity (e.g., Henderson and Cockburn, 1996), there may be potential for cross-project spillover within the organization. A clear ingredient to spillovers has been relatedness of the knowledge of the two parties (Garcia-Vega, 2006), making the suggestion that learning spillovers between concurrent product development projects would be more beneficial if the projects were in the same niche. For these two reasons—managerial focusing and cross-project spillovers—greater concurrent depth (more projects in the same niche) should increase new product quality.

In the final reference to our hypothetical company, the new product quality of five new funds created in the same category should be higher than if the firm were only creating one in that category. With multiple funds being created, more resources are likely to be allocated and the processes created to support those funds will be more refined.

Hypothesis 5: Increases in the depth of a firm's concurrent product development activities in the focal niche will result in higher new product quality.

METHODS

Data

The setting for this study is the U.S. mutual fund industry, which was the largest financial intermediary in the country with more than $5.6 trillion in assets at the end of 2002. Individual mutual funds are offered by mutual fund providers, also called mutual fund families, such as Fidelity, Vanguard, and Merrill Lynch.[5] The data source is the *Survivor Bias Free U.S. Mutual Fund Data Base* maintained by the Center for Research in Security Prices (CRSP) at the University of Chicago. The CRSP data cover the history of virtually all open-end equity, bond, and money market funds that were available between 1962 and 2002.

This setting is attractive for several reasons. The primary reason is that the marginal cost to an existing company of opening a new fund is low. This leads to a large number of fund openings (the number of funds grew from 215 in 1962 to 15,524 in 2002), and minimal financial constraints for firms on their ability to create new funds. In other new products settings, firms may abandon low quality projects before introducing them, thus biasing the sample. When the costs of creating a product are low, one is likely to observe both high and low quality funds. The setting is also attractive for other reasons. For one, this is a knowledge-intensive industry with service products where product development is very important to firm success. Thus, the store of knowledge residing within the organization, fund managers, and central research group is vital to the success or failure of new products. Additionally, in the mutual fund industry, large volumes of relevant data are available to investigate these hypotheses, specifically the means to characterize the portfolios of companies and new product quality. Finally, while there is a great deal of research on mutual fund performance, there has been little consideration of the firm-level effects of mutual funds other than the suggestion from Jones and Shanken (2005) that there may be opportunities for learning across funds. Thus, this research fills an empirical gap as well.

[5] In this study, the terms 'fund provider,' 'fund family,' and 'firm' are used interchangeably.

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Strategic Insight, a mutual fund research firm, classifies funds into 83 categories.[6] This study considers these categories as the 83 niches available for product development. Probing the CRSP data revealed that the assignment of individual funds to mutual fund providers involved a number of problems. The primary problem revolved around faulty assignments of fund provider identification numbers (e.g., the same fund provider was listed with different identification numbers, or different fund providers had been assigned the same number). To correct for this problem, the study used publicly available data to document the entire history of each mutual fund company. This ensured that each fund was assigned to the correct parent company. The data are organized with one observation for each new fund created by an existing firm. In all, there were 18,364 new funds introduced between 1962 and 1999. Of those, 1,537 funds were created by mutual fund companies in their first year of existence. These funds perform no differently than the funds in the final sample, but as the firms have no experience these funds are excluded, leaving 16,827. Also excluded are funds that existed for less than four months, reducing the sample to 13,770 funds. Finally, new funds lacking sufficient data are excluded. The most common missing data were expense ratios and load information. Excluding funds with missing data leaves a final sample of 11,643 funds from 470 firms. Regressions including those funds either with the expense ratio and load information excluded or with dummies for missing data produced similar results. The only *firms* that are systematically excluded from the data are those that never create a new fund as an incumbent.

Dependent variable

The emphasis of this study is new product quality, specifically a measure of initial product quality during the 36 months after introduction. Herein, new product quality is defined as a feature enjoyed by consumers (as opposed to benefits reaped by the firm), and measured by the investment return of a fund. In the finance literature, there are numerous studies investigating mutual fund performance, with the question of the persistence of performance—and how much might be attributable to something other than luck—being of specific interest. After Jensen's (1969) initial suggestion that there should be no persistence in mutual fund performance from quarter to quarter or year to year, a number of studies identified some short-term persistence for periods of one to three years (Brown and Goetzmann, 1995; Grinblatt and Titman, 1992; Hendricks, Patel, and Zeckhauser, 1993).[7] These studies attribute persistence to the stock-picking abilities of fund managers (Wermers, 2000), such as Chevalier and Ellison's (1999) suggestion that managers from better schools had higher performing funds and the ability to access private information (Kacperczyk and Seru, 2007). Other research has demonstrated that persistence is very short-lived—lasting for as little as a few quarters to little more than a year (Bollen and Busse, 2005; Carhart, 1997). Some researchers suggest that prior measures of mutual fund performance are unreliable and argue for trading-based measures in order to be more precise (Kothari and Warner, 2001).

For reasons outlined below, this study relies on a comparative measure of performance. The specific measure is the percentage of the 36 months after launch in which the fund posted a better-than-median return versus the other funds (new and old) in its fund category (83 possible categories).[8] Most of the work on fund performance in the finance literature has measured either risk-adjusted returns or calculated *alphas*. However, there are six specific reasons to use this study's measure in place of traditional measures. First, *alphas* based on the traditional three- (Fama and French, 1993) or four-factor models (Carhart, 1997) are intended only for U.S. equity funds, not for foreign or fixed income

[6] Strategic Insight actually classifies funds into 181 categories, but 98 of those are for tax-free, intermediate maturity, or short maturity bond funds for individual states. These fund categories are very sparsely populated, so the study has combined them into three categories for Tax-Free State Bond Funds, Intermediate Maturity Tax-Free State Bond Funds, and Short Maturity Tax-Free State Bond Funds. The underlying assumption is that the type of analysis required to evaluate the bonds from a single state would be very similar to the analysis required for the bonds from another state, very akin to analyzing (for example) multiple companies involved a single industry. Omitting these categories and funds completely does not materially change the results of the reported regressions.

[7] Most finance studies of mutual fund persistence in performance find even shorter durations of persistence, but base their starting point by ranking funds by performance in the prior period (year, quarter, etc.). Thus, they are sacrificing one year of data to construct their panel. The true duration of high performance is, thus, slightly longer than may be suggested in some of these studies.

[8] To account for funds that closed before 36 months, the percentage of months the fund was active (up to a maximum of 36) in which the fund posted median-positive returns is used.

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funds. As this study looks at a broad array of mutual funds, such models are not suitable. Second, risk-adjusted returns rely on a calculated measure of *beta* (risk). A *beta* is calculated based on prior return data (ideally more than 36 months of data). Creating a fund-specific *beta* would require sacrificing early performance data on funds in the sample, which would prohibit analyzing the performance of new funds. As robustness checks, however, models based on risk-adjusted returns and *alphas* show similar results, as discussed later. Third, this study is not concerned with comparing the returns of funds across categories (e.g., aggressive growth versus bond funds), or with comparing the returns on mutual funds with other available alternatives (e.g., risk-free securities or individual stocks). Instead, the focus is fund performance within a given category—the quality of the fund versus its closest competitors. In this sense, it is like the finance literature on mutual fund tournaments (Brown, Harlow, and Starks, 1996). This measure provides for such comparisons and (since each month's performance is normalized versus the performance of other funds in the category) effectively provides category-month fixed effects. To the extent that funds in the same category carry similar risk profiles, this within-category comparison effectively controls for risk without sacrificing data. Fourth, sociological research suggests that social constructionism has a role in understanding the stock market's performance, especially in terms of the categorization of securities (Zuckerman, 2004). Relying on categorical comparisons is more in line with this perspective. Fifth, research suggests that the clearest differences are between the highest and lowest performing mutual funds (Bollen and Busse, 2005; Carhart, 1997). This measure captures these differences effectively, while permitting funds with less persistent performance to revert quickly to the mean. Sixth, and finally, research has shown that while fund families are well aware of risk-adjusted returns, most investors make their investment decisions on the basis of raw fund returns (Evans, 2006; Gruber, 1996). To measure the quality received by the customer, the raw return is the more appropriate measure on which to base the comparison. Thus, given the measurement concerns mentioned above, the simple measure proposed here that meets all of the required objectives may be preferable. Given that the dependent variable is a percentage (and thus bounded at 0 and 1), a logit transformation was used to create an unbounded dependent variable (DV) that could be tested with ordinary least squares (OLS).[9]

Independent variables

Experience breadth: The measure of breadth in the firm's product development experience is based on the concentric diversification index (Caves, Porter, and Spence, 1980). The concentric diversification index is computed as: $D = \sum_{i=1}^{N-1} \sum_{j=i+1}^{N} p_i p_j d_{ij}$ where p_i is a measure of activity for a particular fund provider in category i, and d_{ij} is a measure of distance between categories i and j. In this case, p_i represents the percent of all categories (of the 83 Strategic Insight fund categories noted above) in which a fund provider offers funds. For instance, if a provider offers funds in five categories, p_i would be 1/5 for these five categories, and 0 for all other categories. To assess the distance between categories, the 83 categories were organized into a four-tiered hierarchical branching structure similar to the Standard Industrial Classification code system. The actual structure, as well as its underlying logic and tests of its validity, is available from the author and by accessing his Web page. The basic logic is that the processes and analyses required to create an 'aggressive growth' fund, for example, have more in common with those supporting a 'small company growth' fund than with a 'tax-free bond' fund. To calculate the breadth measures, the distance between categories i and j, d_{ij}, was set to 0 for $i = j$; to 1 if i and j belong to the same level 3 category; to 2 if i and j belong to the same level 2 category (but not to the same level 3 category); to 3 if i and j belong to the same level 1 category (but not to the same level 2 category); and to 4 if i and j do not belong to the same level 1 category. Thus, the diversification measure d has a minimum of 0, when all the funds of a firm belong to the same category, and is increasing as the funds of a fund provider are in ever-distant categories. Two variables were constructed using this process. The first (*firm breadth*) looks at the breadth of all

[9] A small portion of the values of the original DV are 0 (2% of the sample) or 1 (1% of the sample), so the logit transformation of those values could not be taken. Instead, 0.0001 and 0.9999 were substituted for the two bounded endpoints before transforming them, though the exact values substituted in at those ends in no way impacted the outcomes of the models reported later. Using a two-sided Tobit on the untransformed dependent variable produced identical results.

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of the funds the firm controlled in the year prior to the launch of the focal new product. Hypotheses 1 and 2 are tested by interacting this variable with a dummy (*old category dummy*) noting whether the firm has ever created a new fund in the focal category.[10] The second variable (*breadth of new fund portfolio*) is similarly constructed using the formula above, but the set of funds considered is limited to funds introduced by the firm in the current year, concurrent with the focal new fund. This is used to test Hypothesis 3.

Experience depth: Both experience depth measures are counts of the firm's funds in the focal new category. The first (*firm's funds in category*) is a count of the funds the firm has created in the category over its history, excluding the focal year and logged to deal with overdispersion. This variable is used to test Hypothesis 4. The second (*firm's new funds in same category*) counts the number of funds created by the firm in the same year in the focal category, logged to deal with overdispersion. This variable is used to test Hypothesis 5.

Control variables

This study treats overall experience volume as a control. Much of the work in learning-by-doing suggests that the benefits of experience decay over time (Argote *et al*., 1990), especially in knowledge-intensive industries (Darr, Argote, and Epple, 1995; Ingram and Baum, 1997). Experience volume, *firm's stock of new funds*, is measured as a stock of all new funds the firm has created in its history (before the focal year), decaying at a rate of 15 percent per year (so, in the terms of prior work, a λ of 0.85). The choice of a depreciation rate is based on analysis (available from the author) identifying the optimal depreciation rate, though other structures (including zero depreciation and a stock based only on the most recent five years) show similar results.

Additional control variables were drawn from prior studies of mutual fund performance (Carhart, 1997; Gruber, 1996; Jensen, 1968; Siggelkow, 2003). These controls operate at the category, firm, and fund levels. At the category level, the lagged count of funds in that category (*total funds in category*) and two measures of category attractiveness are included. One measure (*total category size*) is a normalized ranking of the overall size (in assets) of the entire category, and the other is a measure of the growth rate of the category (*total category growth*). At the firm level, the most important control is the firm-level fixed effect. In terms of time-varying controls, a measure of the age of the firm (*firm age*, in years) and the assets under control by the firm in the focal category (*firm's assets in category*) are included. A measure of overall firm size (in assets) was too highly correlated with experience volume to include.

At the fund level, most of the potential controls used in prior studies are not relevant here as they do not exist for new funds. This includes fund age, fund market share, fund volatility, fund assets, and fund turnover. Three fund-level controls are included, however. First is the expense ratio charged by the fund (*expense ratio*) and a dummy noting whether the fund is load or no-load (*load dummy*), since prior research has indicated that these variables will have a significant impact on observed customer return (Carhart, 1997; Wermers, 2000).[11] Second, a control is included for the degree to which the product is in a 'core' area for the firm, where its objectives for the introduction of new funds may be to complement existing funds rather than achieve the highest possible performance (e.g., socially responsible or environmentally conscious funds). The specific variable (*in core*) is the percentage of the firm's funds that are in the most common level 3 category (the 'core') if that fund is within the core, and the inverse if it is outside the core. The *in core* measure takes on more extreme values (closer to 100 and -100) when the firm has a single dominant category, and more moderate values (closer to 0) when the firm has a balance between multiple categories.

Analysis procedures and descriptive statistics

The models used are OLS with fixed year and fixed firm effects, with one observation for each new

[10] Hypothesis 1 is actually about the level of focus in the firm's prior experience. Focus is, of course, the opposite of breadth. Therefore Hypothesis 1 can be restated as, '*Decreases* in the *breadth* of a firm's prior product development experiences will results in higher new product quality, but only for products in niches in which the firm has prior experience,' with the italicized words being reversed from the original hypothesis.

[11] Fund turnover has also been shown to be relevant, but the CRSP data were very inconsistent for turnover measures, especially in new and non-equity funds. Alternate models including turnover (not shown here) did not report significantly different results, though the sample size was dramatically reduced.

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fund created.[12] Firm fixed effects are important for two reasons. First, they control for suspected unobserved heterogeneity between organizations. Second, the use of fixed effects allows for the evaluation of changes over time within the firm based on the accumulation of experience. Thus, as stated in each hypothesis, the important variation is within the firm, meaning that the outcomes measure the effect of accumulated experience. The year fixed effects control for differences in quality for new funds (compared to old funds) that might be time sensitive. It is also important to note that, because the dependent variable is constructed by comparing the focal new product to other new products in the same category at the same time, category-specific effects are being effectively controlled for as well.

Table 1 contains the descriptive statistics for the data. The table shows that 66 percent of the new funds in the sample were created in categories in which the firm had prior direct experience, while 34 percent were in new categories. This shows balance in the sample, and the skew toward funds in existing categories suggests that firms generally grow through expansion in known spaces. The highest variance inflation factor (VIF) is for *firm's funds in category*, which clearly is connected to the *old category dummy*. Even so, the VIF is only 4.35, which is not high (10 being considered dangerous), and its exclusion does not materially affect the results. The other VIFs are all low (below 2.7), though a fair number of correlations are high (above 0.40). The best solution is to build the model slowly to make sure that coefficients or significance levels do not change greatly from one model to the next.

RESULTS

Results are reported in Table 2. Looking at the full model (Model 5), only four of the nine control variables are significant. The control for experience volume (*firm's stock of new funds*) is positive and significant ($p < 0.01$), as expected given work on learning-by-doing. The measure of *total funds in category* is positive and significant ($p < 0.001$), suggesting that new funds perform well in categories with many other funds (presumably older funds), which aligns with prior work on mutual fund performance. The coefficient on *expense ratio* is negative and significant ($p < 0.001$), which indicates that funds with higher expense ratios generally actually return a lower final return to investors. This is consistent with prior mutual fund research (e.g., Carhart, 1997), suggesting that funds with higher expense ratios return lower net performance. The final significant control variable is the measure of *in core*, whether the focal new product is in the firm's 'core' of its existing product portfolio. This variable is negative and significant ($p < 0.001$), lending support to the idea that additional new products within a broadly-defined 'core' are intended to compete on some basis other than new product quality, and thus exhibit lower returns. Controls for category attractiveness, firm age, firm assets in the category, and whether or not the fund carries a load fee are not related to new product quality.

Hypotheses 1 and 2 focus on the contingent effect of experience breadth, and predict that focused experience will help the fund in old categories (Hypothesis 1), while broad experience will help the firm establish funds in new categories (Hypothesis 2). The main effect of *firm breadth* tests the effect of breadth when the focal fund is in a new category for the firm (*old category dummy* $= 0$) and shows that product performance is an increasing function of experience breadth ($p < 0.05$). This shows support for Hypothesis 2. Meanwhile, the interaction term (*firm breadth* $\times$ *old category dummy*) is negative and significant ($p < 0.05$), demonstrating that the relationship between breadth and performance is significantly different for funds in old categories for the firm. However, while different from the effect in new categories, the observed negative effect in old categories is not significantly different from zero. Thus, Hypothesis 1 is not supported—experience breadth has no effect on new product quality in old categories. As shown in Figure 1, however, the two curves cross within the range of the data, so firms with focused experience are better at creating funds for old categories than for new ones. The essence of this trade-off and the conundrum that it presents to managers are discussed in greater detail in the Discussion section.

Hypothesis 3 addresses the projected negative relationship between concurrent breadth of product

[12] A Hausman test confirms that random effects are inconsistent with these data ($p < 0.001$) and thus the fixed effect model is more appropriate for its consistency, despite being less efficient (Greene, 1990/2003).

Table 1. Means, standard deviations, minimums, maximums, and correlations

	Mean	S.D.	Min	Max	VIF	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1 *Fund quality* (DV)	(15.55)	174.13	(921.0)	921.0		1.00													
2 *Firm breadth* (t-1)[a]	2.77	0.76	0.0	3.4	1.52	0.02	1.00												
3 *Old category dummy*	0.67	0.47	0.0	1.0	2.49	(0.01)	0.33	1.00											
4 *Breadth of new funds*	2.49	0.95	0.0	3.4	1.55	(0.01)	0.45	0.34	1.00										
5 *Firm's funds in category* (t-1)[b]	4.37	8.57	0.0	77.0	4.35	0.01	0.27	0.71	0.32	1.00									
6 *Firm's new funds in same category*[b]	2.50	5.60	0.0	45.0	1.72	0.02	0.14	0.29	0.24	0.56	1.00								
7 *Total funds in category* (t-1)	300.55	354.46	1.0	1,601.0	2.67	0.04	0.06	0.34	0.11	0.56	0.47	1.00							
8 *Total category size* (t-1)	0.7	0.2	0.0	1.0	1.78	0.02	(0.01)	0.29	0.03	0.37	0.25	0.59	1.00						
9 *Total category growth* (t-2 to t-1)	0.93	7.16	(0.9)	168.3	1.02	0.01	0.02	(0.07)	(0.03)	(0.07)	(0.05)	(0.07)	(0.12)	1.00					
10 *Firm's stock of new funds* (t-1)[c]	37.68	52.56	0.0	300.9	1.66	0.00	0.33	0.29	0.36	0.48	0.26	0.16	0.02	(0.04)	1.00				
11 *Firm age*	20.63	15.56	2.0	75.0	1.11	0.02	0.21	0.14	0.06	0.11	0.08	0.06	0.03	(0.01)	(0.01)	1.00			
12 *Firm's assets in category* (t-1)	1.25	6.48	0.0	203.7	1.11	0.01	0.09	0.14	0.08	0.28	0.15	0.21	0.14	(0.01)	0.15	0.10	1.00		
13 *Expense ratio*	1.20	0.77	0.0	15.1	1.64	(0.06)	0.08	0.15	0.13	0.10	0.16	0.21	(0.05)	0.00	0.08	0.10	0.04	1.00	
14 *Load dummy*	0.52	0.48	0.0	1.0	1.44	(0.02)	0.09	0.15	0.10	0.18	0.27	0.18	0.05	(0.01)	0.06	0.18	0.06	0.49	1.00
15 *In core*	(16.51)	31.99	(100.0)	100.0	1.38	(0.01)	0.27	0.37	0.04	0.41	0.27	0.19	0.10	(0.01)	0.06	0.10	0.10	0.03	0.08

[a:] Variable is mean-centered for regressions, but descriptives are reported on uncentered variable.
[b:] Variable descriptives (mean, SD, min, max) reported as normal, but VIF and correlations calculated with logged variable.
[c:] Total stock of prior new funds created by firm, depreciated at 15% per year.
N = 11,643.

Table 2. New product quality ramifications of portfolio management approaches
Fixed effect OLS regression model with families as focus; DV = % months with better-than-median return

	Model 1	Model 2	Model 3	Model 4	Model 5
Firm breadth (t-1)		11.336*	10.565*	11.150*	11.443*
		(4.661)	(4.662)	(4.738)	(4.738)
Old category dummy		−3.804	−2.545	−4.686	−1.841
		(4.640)	(4.658)	(5.543)	(5.669)
Firm breadth (t-1) × *old category dummy*		−13.835*	−13.766^	−14.796*	−15.579*
		(7.069)	(7.066)	(7.213)	(7.219)
Breadth of new fund portfolio			−8.311**	−8.345**	−8.383**
			(2.760)	(2.761)	(2.760)
Firm's funds in category (t-1)				2.439	0.320
				(3.424)	(3.536)
Firm's new funds in same category					6.651*
					(2.789)
Total funds in category (t-1)	0.039***	0.040***	0.040***	0.038***	0.034***
	(0.007)	(0.007)	(0.007)	(0.008)	(0.008)
Total category size (t-1)	−17.405^	−13.640	−12.863	−12.889	−12.859
	(9.146)	(9.396)	(9.397)	(9.397)	(9.395)
Total category growth (t-2 to t-1)	0.165	0.147	0.140	0.141	0.156
	(0.231)	(0.231)	(0.230)	(0.231)	(0.231)
Firm's stock of new funds (t-1)	0.241***	0.249***	0.229***	0.217**	0.235***
	(0.063)	(0.064)	(0.064)	(0.066)	(0.066)
Firm age	−0.355	−0.798	−0.299	−0.282	−0.329
	(3.668)	(3.676)	(3.678)	(3.678)	(3.677)
Firm's assets in category (t-1)	−0.429	−0.388	−0.415	−0.447	−0.450
	(0.273)	(0.273)	(0.273)	(0.277)	(0.277)
Expense ratio	−22.585***	−22.830***	−22.414***	−22.281***	−22.141***
	(3.087)	(3.090)	(3.092)	(3.098)	(3.098)
Load dummy	7.557^	7.488^	7.147	7.073	5.563
	(4.548)	(4.548)	(4.548)	(4.549)	(4.592)
In core	−0.169**	−0.237**	−0.248***	−0.266***	−0.289***
	(0.058)	(0.070)	(0.069)	(0.074)	(0.075)
Constant	−20.923	−10.269	−2.091	−2.193	−4.319
	(96.137)	(96.243)	(96.247)	(96.249)	(96.233)
Year effects	fixed	fixed	fixed	fixed	fixed
Firm effects	fixed	fixed	fixed	fixed	fixed
R-squared (within)	0.0123	0.0131	0.0139	0.0139	0.0144
N	11,643	11,643	11,643	11,643	11,643

Standard errors in parentheses beneath coefficients.
^ $p < 0.10$ * $p < 0.05$ ** $p < 0.01$ *** $p < 0.001$.

development activities and fund performance. The negative and significant ($p < 0.01$) coefficient on *breadth of new fund portfolio* shows that introducing new funds in a broad array of categories at the same time decreases overall new product quality for those new funds, in support of Hypothesis 3. Overall, two of the three hypotheses about the effect of experience breadth (Hypotheses 2 and 3) are supported by the data.

The last two hypotheses (Hypotheses 4 and 5) deal with the relationship between experience depth and new product quality. The measure of prior experience depth (*firm's funds in category*)

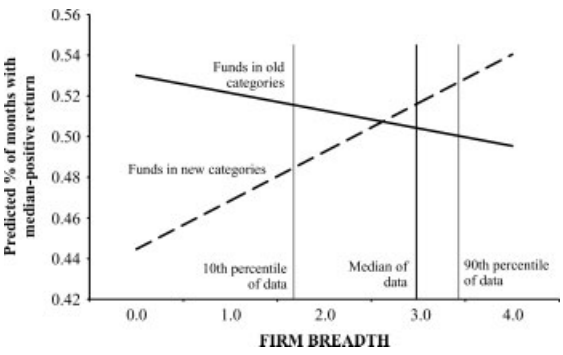

Figure 1. Interaction of family breadth and old category

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is not significant in any model, suggesting that there is no relationship between the depth of a firm's experience in a specific category and the quality of its new products in that category. This runs counter to Hypothesis 4. The measure of concurrent experience depth (*firm's new funds in same category*), however, is positive and significant ($p < 0.05$). Firms produce better products when they focus their development efforts in any given year. This finding supports Hypothesis 5, which suggested that the opportunities for spillover learning would be greater if the firm produced multiple products in the same category at the same time.

It is worth considering exactly how prior and concurrent experience may affect firm-level product development capabilities in the mutual fund industry. To uncover and validate the potential mechanisms behind the empirical findings, conversations were conducted with product managers (individuals responsible for creating new funds) at three very different mutual fund companies—one among the world's largest providers, one a medium-sized (15 fund) company, and one a small (two fund) company. Each discussion focused on whether these managers believed that learning across multiple product development projects was possible, and where that learning would be likely to accrue. The common thread across all discussions was the group of research analysts that supports fund managers. Product managers felt that firms built specialized knowledge resources (individual specialized analysts) that both performed better than generalized knowledge resources and were constrained in the breadth of their applicability. Firms with broader prior experiences were more likely to have embraced the specialization of these knowledge resources and have a process for the training of new specialists that would increase their effectiveness in addressing new market spaces. Firms with broader concurrent experience, on the other hand, were likely to stretch their existing research group too thin. Finally, increases in concurrent depth were seen as being related to an increased likelihood of dedicating an individual analyst with relevant specific knowledge to the creation of those new funds, thus increasing their performance. Thus, it seems likely that these specialized knowledge assets play a central role in facilitating the outcomes discussed in this research.

Robustness and economic significance

As discussed throughout the paper, multiple robustness checks were performed to ensure the validity of the results. The main checks are summarized here, and regression results are shown in Table 3. Model 0 repeats the full model from Table 2.

The first two are respecifications of the model, as Model 1 removes the year fixed effects and Model 2 uses a hierarchical model with funds nested within firms. Model 3 compares monthly fund performance versus only other young (less than five years old) funds, as prior research demonstrates that new funds outperform old funds, so this study's results might be capturing this difference (Carhart, 1997). Model 4 replaces the measures of breadth (*firm breadth* and *breadth of new funds*) with a count of the categories (out of 83) that the firm operated in or created new funds in, respectively. Model 5 uses a risk-adjusted return based on the capital asset pricing model (Sharpe, 1964) instead of the raw monthly returns in calculating the dependent variable (but still uses the same monthly within-category comparisons). The risk-adjustment is based on a 12-month calculation of fund *beta* that discards the first 12 months of data for each fund to create a usable *beta* measurement (and also discarding the approximately 8% of new funds that do not survive for at least 12 months). While most results are consistent across all models, two models produce a single noteworthy difference from Model 0. Model 4 (alternate measure of breadth) and Model 5 (risk-adjusted) show no benefit from experience breadth for the creation of new funds for new categories (Hypothesis 2), but show support for Hypothesis 1 that focus is better for the creation of products in old categories than breadth (the net effect of the interaction and main effect are significant at $p < 0.01$). In essence, the graphed results would look like Figure 1, except that the lines would be rotated slightly clockwise so that the upward curve is slightly flatter and the downward curve is significant. For Model 4, this suggests that the dissimilarity between categories is more important than the raw count of categories (i.e., that being in two very dissimilar categories is different from being in two very similar categories). For Model 5, note that this model has selection issues (since it drops the nearly 1,000 funds, about 8% of the sample, that close before the end of 12 months) suggesting that the very low performance of new funds in new categories

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Table 3. Robustness checks

	Model 0 Base	Model 1 No year FE	Model 2 Hierarchical	Model 3 v. New funds	Model 4 Alt breadth	Model 5 Risk-adjust
Firm breadth (t-1)	11.443*	13.033**	13.388***	10.886*	4.592	3.759
	(4.738)	(4.678)	(3.574)	(4.738)	(5.372)	(3.660)
Old category dummy	−1.841	−2.009	−3.347	−2.660	−4.362	5.249
	(5.669)	(5.602)	(5.482)	(5.650)	(5.805)	(4.360)
Firm breadth (t-1) × *old category dummy*	−15.579*	−16.015*	−16.970**	−15.162*	−16.087**	−22.270***
	(7.219)	(7.188)	(6.292)	(7.219)	(5.528)	(5.554)
Breadth of new fund portfolio	−8.383**	−6.671*	−7.545**	−8.577**	−10.338**	−3.602^
	(2.760)	(2.683)	(2.318)	(2.758)	(2.642)	(2.133)
Firm's funds in category (t-1)	0.320	1.113	0.418	0.506	2.305	−6.706*
	(3.536)	(3.533)	(3.447)	(3.548)	(3.709)	(2.703)
Firm's new funds in same category (t)	6.651*	8.174**	4.355^	6.337*	10.321***	9.936***
	(2.789)	(2.732)	(2.664)	(2.783)	(2.946)	(2.126)
Total funds in category (t-1)	0.034***	0.026**	0.037***	0.034***	0.030***	0.026***
Total category size (t-1)	−12.859	−8.105	−12.661	−12.722	−13.155	13.083^
Total category growth (t-2 to t-1)	0.156	−9.289^	0.149	0.157	0.139	0.284
Firm's stock of new funds (t-1)	0.235***	0.192**	0.180*	0.257**	0.229**	0.112^
Firm age	−0.329	0.219	0.063	−0.147	0.141	14.250***
Firm's assets in category (t-1)	−0.450	−0.469^	−0.366	−0.445	−0.460	0.142
Expense ratio	−22.141***	−21.717***	−20.402***	−22.161***	−22.036***	−12.410***
Load dummy	5.563	6.989	2.680	5.825	5.764	11.570**
In core	−0.289***	−0.299***	−0.284***	−0.286***	−0.284***	−0.168**
Constant	−4.319	7.215	−19.670	−3.434	−9.084***	−469.185***
Year effects	fixed		fixed	fixed	fixed	fixed
Firm effects	fixed	fixed	random	fixed	fixed	fixed
R-squared (within)	0.0144	0.0107		0.0142	0.0151	0.0483
N	11,643	11,463	11,643	11,643	11,643	10,693

Standard errors in parentheses beneath coefficients.
^ $p < 0.10$ * $p < 0.05$ ** $p < 0.01$ *** $p < 0.001$.

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from very focused firms drives the consistent result on breadth across other models (since these funds would be excluded from Model 4 if they closed before 12 months). But the consistent results for this variable across the other models suggest that the effect is likely obscured by the structure of this model.

There are additional robustness checks that are not included in Table 3. First, in addition to testing the models with the logit-transformed percentage as the dependent variable, the raw percentages with a two-sided Tobit model were tested that produced similar results. Second, multiple assumptions were tested for how to handle funds bounded at 0 and 1 before logit transformation (less than 3% of the overall sample). The core results do not change regardless of how these observations are treated. Third, a more traditional measure of *alpha* (Fama and French, 1993) was used as a dependent variable, without comparing the values within category-months. This model supports most of the findings reported here, but the interaction between *old category dummy* and *firm breadth* is not significant. It is important to remember, however, that the model for calculating *alpha* is not theoretically valid for non-equity funds and is intended to compare across categories and not within, two factors that are not an issue for the primary dependent variable used in this study. Calculating *alpha* also excludes funds with less than 12 months of data, introducing survivorship bias as noted above. Finally, most studies of mutual fund categories do not use as fine-grained categorization system as the one used here (with 83 categories). The study also performed the entire analysis on data constructed around the 39 level 3 categories with generally similar results.

Given the size of the overall sample (11,643 new products from 470 firms), it is a fair question to ask about the economic significance of the results. Admittedly, both the economic significance of the coefficients and the explanatory power of the model are small. For example, a one standard deviation increase in *firm's new funds in same category* produces an increase of nearly one month in the expected number of months of median-positive returns for the new fund. And, as shown in Table 2, the R-squared values for the overall model—even with firm fixed effects—are below two percent. However, it is important to remember two things. First, the dollar value of investments in these funds is significant, and the smallest change has immense financial impact. Second, mutual fund performance is subject to a high degree of external scrutiny. Any observed performance differences despite this scrutiny and transparency exist against significant odds, namely the suggestions of the Efficient Markets Hypothesis, as any potential firm-level advantage should be competed away with open information and strong competition. With these two points in mind, the findings in this study persist despite significant hurdles and, thus, represent the most stringent test of the theories offered here.

DISCUSSION

This study addresses how the type and timing of new product development experience is related to product quality, and does so drawing on the firm-level literatures on learning and capabilities. The two central findings offer implications for the product development literature, especially those studies looking at firm-level drivers of product development success (Danneels, 2002; Holmqvist, 2004; Salvato, 2009). First, the breadth of product development experience has a contingent effect on performance. Experience breadth increases the firm's ability to create high quality new products for niches that are new to the firm, but has no effect on new product quality in niches in which the firm already competes. Second, the timing of experience is also important, as managing concurrent product development activities is challenging. Concurrent breadth (introducing new products in multiple categories) leads to reduced performance while concurrent depth (introducing multiple new products in one category) increases performance. These findings have direct implications for studies looking at learning in product development activities (McKee, 1992), but also have broader links with the literatures on dynamic capabilities and product portfolio management, as discussed below.

Of these findings, the most interesting insight is the relationship between prior experience breadth and performance in new niches. This finding reaffirms and extends the importance of experience diversity (Schilling *et al*., 2003), and provides empirical evidence for the theorized effect of transformational experience offered by King and Tucci (2002) but not empirically supported in that study. Given the view that product development is a dynamic capability (Eisenhardt and Martin, 2000;

Winter, 2003), the finding that broad (transformational) experience facilitates future efforts to adapt the firm's product development processes is indicative of a higher order capability (Danneels, 2008). This dynamic capability is built the same way that other capabilities are built—through experience, in this case experience with adapting the product development process to new niches. The development of dynamic capabilities does come with a cost, however. When new firms are initially very focused, the expected quality of their new products in categories in which they have direct knowledge is higher than that in new categories. Thus, firms seeking to broaden their experience are faced with the trade-off between short-term efficiency and long-term efficacy. This trade-off is related to those suggested by March (1991) in terms of exploration and exploitation, and Salvato (2009: 397) in terms of firms knowingly underperforming on 'level n' capabilities to build 'level $n + 1$' capabilities.

Given the organizational imperative for growth, this trade-off between short-term efficiency and long-term efficacy raises an interesting conundrum for smaller, focused firms. This challenge is of particular interest to managers, as managerial choices to balance this trade-off have real implications for performance. How do companies with focused prior experience successfully broaden their experience base even though, in the short run, they would be better off creating new funds in the categories in which they have prior experience? If this study's findings on the contingent value of experience breadth present a challenge to managers, then the findings about concurrent depth offer a solution. This study shows that focusing concurrent development efforts in a single niche results in higher quality new products. Thus, firms can use timing and focus to increase experience breadth while benefiting from concurrent learning opportunities by introducing products in a single new niche in any given year. Following such a strategy would result in a discernable growth pattern—introduction of a set of new products in one niche this year, a set of new products in another niche next year. Multiple examples of companies implementing such a 'focused growth' strategy exist in the mutual fund industry, most notably Dreyfus Funds. Dreyfus started 17 new funds between 1969 and 1983, and while only two of them were in categories in which Dreyfus had prior experience, 14 of the 17 were either the only fund introduced by the firm that year or were accompanied only by other funds in the same niche. These 17 funds outperformed the other funds in their categories a robust 57 percent of the time.[13] Using this platform, Dreyfus greatly increased the diversity in its portfolio (*firm breadth* rose from one standard deviation below the mean in 1975 to one-half a standard deviation above after 1984) and by doing so increased its size (104 funds in 1993) and assets under management (from \$5 billion in 1969 to \$74 billion in 1993) before its acquisition by Mellon Bank in 1994.

More generally, there were 317 firms that were small at one point in the data (<11 funds) and had a *firm breadth* measure in the bottom quartile. In order to assess the portfolio strategy that these firms employed, the sample was limited to those firms that introduced at least 10 new products over their lifetimes, leaving 192 firms. Next, a comparison was made of the maximum family size (total assets under management) that these firms achieved based on the strategy they had followed when small—focused growth or broad growth.[14] As indicated by Table 4, the firms that employed a focused growth strategy grew larger than those using a less focused strategy when comparing means, medians, and seventy-fifth percentiles. While there are a few successful firms that utilize the less-focused growth strategy, the majority of successful firms pursued focused growth.[15] While not definitive, this analysis agrees with the earlier example of Dreyfus and suggests that smaller, narrower firms have more success basing their initial growth off of a focused product development pattern than a broader one.

These results—the empirical tables, the history of Dreyfus, and the results in Table 4—suggest the importance of different types of portfolio management strategies at different stages of the firm's existence. Echoing Penrose (1959) in her discussions of the limits on the growth abilities of

[13] $p < 0.05$ versus null that monthly fund performance is random.

[14] To assess whether the firm's strategy had been focused or not, normalized versions of the *firm's new funds in same category* were compared with *breadth of new fund portfolio* variables for the years in which the firm was small and focused. Firms with a higher ratio of the former to the latter were considered to have used a focused growth strategy, and otherwise they exhibited less of a focused growth strategy.

[15] Note, however, that the differences reported in Table 4 are not statistically significant, primarily due to the high variance within final asset size.

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Table 4. Comparison of maximum family size based on growth patterns
Maximum firm size (assets) based on average new product introduction choices when firms were small (total number of funds < median) and focused (*firm breadth* < 25th percentile) but add at least 10 funds over time

		Higher levels of focused growth	Lower levels of focused growth
Max firm size*	(mean)	$30,862	$19,273
	(median)	$5,498	$4,131
	(75th percentile)	$18,838	$13,050
# Obs (firms)		102	90

*: Values in millions of dollars in assets under management, in constant 1992 dollars.

firms, effective product portfolio managers may be able to identify multiple similar products to develop simultaneously, thus lowering the strain on resources that must be adapted to each market niche and increasing the potential for concurrent development learning across projects. Such decision making may be especially critical for young firms without much margin for error, and, as such, managers of some early-stage firms may maximize on experience breadth and development, building the organization's product development capabilities to better position the firm for later growth. Such a story suggests that portfolio management itself may be a dynamic capability. Helfat and Raubitschek (2000) discuss the importance of product sequencing in establishing competitive advantage, and work on product portfolio management demonstrates the importance of activities such as portfolio culling (Cottrell and Nault, 2004; Sorenson, 2000). The current study also agrees with practitioner-oriented literature on new product portfolio management (Cooper *et al*., 2001), and suggests that the product development choices that managers make may have far-reaching implications for long-run competitiveness. Indeed, while broader firms may have the luxury of building on a wider base of prior experiences to create excellent new products in different niches, they are still constrained in their ability to expand in multiple niches at the same time. This means that coordinating the creation of multiple new products at one time is not simply a matter of identifying potentially attractive market niches and independently allocating resources. This aligns with recent work highlighting the importance of managerial decision making for managing organizational adaptation (Adner and Helfat, 2003; Eggers and Kaplan, 2009) and offers clear implications for managers about the type of long-term growth strategy that is most effective at maximizing product development outcomes.

There are, of course, multiple limitations to this work. One potential issue is unobserved heterogeneity in the dataset that cannot be controlled for. Specifically, the concern is that the decision of where and when to open a new fund is not exogenous. The fact that managers may be aware of their firm's advantages and thus open more funds concurrently (related to Hypothesis 5) to profit from this advantage cannot be completely controlled for. Thus, this study may be seen as assessing when a firm may have advantage over others based on prior experiences. A second concern is that the mutual fund industry is subject to a high degree of external scrutiny on new product quality (fund performance). While it can be argued that such a setting offers the benefit of presenting a very stringent test of the hypotheses, it is possible that hypotheses not empirically supported would be validated in other contexts. Additionally, the external scrutiny of mutual funds returns suggests that economic magnitudes in other industries may be significantly larger.

There are also important boundary conditions to the findings that affect generalizability. Since prior research on product development in settings such as software (Holmqvist, 2004) and industrial product design (Salvato, 2009) have suggested that experience breadth may be helpful, the benefits of breadth—especially in market niches that are new to the firm—are likely to be found in many other settings. It may be true, however, that experience breadth might aid *all* product development activities in some settings, and not just those in new niches. For firms that are almost always looking for groundbreaking new products (e.g., the setting for Salvato's [2009] study above), breadth may always be helpful, though this is unlikely to be true of a large number of firms. In addition, the effect of experience breadth may depend in part on the organization of product development activities,

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similar to what Rulke and Galaskiewicz (2000) show with knowledge diversity. The benefits from focused and deep concurrent activity appear to be based largely on focusing managerial attention and organizational resources—conditions that are likely to be true across a variety of settings. The one primary caveat would be that if performance were measured in a way that self-cannibalization played a role, then developing a large number of new products in the same niche concurrently may be less effective. It is also worth noting that the mutual fund industry has not faced 'radical technical change' through the timing of this study, so the findings speak more to products on the same technological trajectory than ones on new trajectories. Future work could delve further into the breadth-performance relationship, as well as look at the mechanism behind the focus of product development activity.

In sum, this study set out to investigate the effects of different types and timings of experience on new product quality in the U.S. mutual fund industry. The results show that experience breadth benefits firms, but only in their ability to enter new-to-the-firm niches. Additionally, concurrent projects represent a trade-off, with concurrent projects in disparate categories overtaxing resources and reducing quality, while concurrent projects in the same category offer the opportunity for spillover learning. These findings offer important implications for the literature on firm-level drivers of product development success, as well as literatures on the development of dynamic capabilities (experience with adaptation) and product portfolio management (given the trade-offs that managers are forced to make in their new product planning). More work is needed to build out our understanding of these factors, but this study represents an attempt to extend our knowledge on these fronts.

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