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Experiential Learning in Joint Product Development Activities

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Abstract

We analyze the impact of different types of experience on sales of new products. We extend prior research on organizational learning in new product development projects by differentiating not only between experience depth and breadth but also between the sources of experience. As most products are created by more than one firm we distinguished between the experience that is gained within a dyad and the experience that the individual members of the dyad gathered with other partners. Following the literature on learning by doing we hypothesize that experience depth has a positive impact on the product development outcome. We further suggest that experience breadth may harm its success as a negative transfer might occur. Drawing on the relational view of the firm and the literature on alliance learning we suggest that both the positive impact of experience depth and the negative impact of experience breadth are reinforced through repeated interaction of the firms. Using a sample of 6,635 electronic games developed and published between 1995 and 2009 we find empirical evidence for all four hypotheses. The study contributes to the existing literature in several ways.

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Introduction

The importance of experiential learning for firm performance has long been recognized by researchers in both economics and management (Wright, 1936; Preston and Keachie, 1964; Baloff, 1971; Argote, 1993). Much of the literature, however, has concentrated on the narrow context of manufacturing settings (Argote et al., 1990) and the idea that organizations only learn if they are repeatedly exposed to similar situations (Yelle, 1979).

In recent years, research on organizational learning has branched out into different directions. First, strategy and organizational scholars have applied the concept to different strategic contexts like mergers and acquisitions (Lubatkin, 1983; Haleblan and Finkelstein, 1999; Hayward, 2002; Zollo, 2009), alliances (Anand and Khanna, 2000; Sampson, 2005; Kale and Singh, 2007; Zaheer et al., 2010) and new product development (Holmqvist, 2004; Nerkar and Roberts, 2004). Second, scholars have challenged the view that organizations can only learn from similar experiences and suggested that organizations may also benefit from “learning by doing something else” (Schilling et al., 2003). Both extensions propose that the relationship between organizational learning and performance in settings other than manufacturing may be more difficult to predict and that different types of experience may influence performance in different ways. This suggests that a contingency perspective may be more appropriate for studying the link between experience and performance (Haleblan and Finkelstein, 1999).

Research on organizational learning in new product development has adopted this view and suggested that differentiating between dispersion and volume of experience (Moorman and Miner, 1997), technical and product market experience (Nerkar and Roberts, 2004), or breadth and depth of experience (Mannor, 2010; Eggers, 2010) is required to understand the impact of experience on product development outcome. We follow this literature and ask how experience depth and breadth influence initial sales of new products. We define experience

depth by the number of products released in a specific product niche and experience breadth as the overall number of product niches served by the firm. While prior literature suggests that firms benefit from both experience depth and breadth, we take a different position and propose that breadth might have a negative impact on product development performance if a negative transfer occurs as suggested by Haleblan and Finkelstein (1999). A negative transfer describes the phenomenon that individuals inappropriately generalize from one situation to another that superficially appear similar but differ with regard to their structures.

We further depart from prior literature by adding a second dimension of contingency: the source of experience. Although most new product development is distributed among two partners and firms often collaborate with different partners in different projects (Powell et al., 1996), we know very little about the influence on a new product's success of experience that is created within a dyad of firms compared to firms' experience accumulated outside of the dyad. Put differently, it is not clear if a product development project of a firm dyad benefits more from the experience that the two firms made together or more from the experience that the two firms made with other partners. To answer this question we draw on the relational view of the firm and the literature on alliance learning that suggest that firms working together build up knowledge sharing routines so that they can easily transfer their knowledge (Dyer and Singh, 1998; Zollo et al., 2002; Hoang and Rothaermel, 2005).

We investigate these questions in the electronic game industry. It is an interesting setting for several reasons. First, the game industry is an intensely knowledge-based and creative industry in which the product development process is always undertaken by two firms: a developer and a publisher. While the developer creates and programs the game, the publisher has to finance and market the game. However, as the publisher bears the financial risk, he works closely with the developer and oversees the game development process to ensure that

the game meets his expectations. Second, as product life cycles are rather short, developers and publishers have to constantly engage in new product development.

We use a unique dataset compiled from two sources. MobyGames, the oldest, largest and most accurate database for electronic games, provides us with detailed information on the game, its developer and its publisher. We match this information with data on game revenues from the NPD group, a US market research firm. Using a sample of 6,635 games we find that product niche experience depth has a positive influence on game performance but product niche experience breadth has a negative impact. Both effects are stronger for the experience that is accumulated within the firm dyad.

Our study adds three important insights to prior literature on product development and interorganizational learning. First, we find empirical evidence for the idea that the positive effect of experience depth is strengthened by repeated interaction of a firm dyad within a specific niche as hypothesized by Zollo et al. (2002) but not empirically supported in their study. Second, we show that negative transfer might also occur in product development activities. Finally, we provide evidence that repeated interaction not only supports the transfer of useful knowledge but also of knowledge that may lead to misattribution.

The rest of the chapter is organized as follows. We first develop our hypotheses on the performance influence of experience depth and breadth in a product niche. We then describe the empirical setting, discuss our variables and present our results. We conclude by discussing the theoretical and managerial implications of our results, limitations, and ideas for further research.

Theory and Hypotheses

Since the early works of Rohrbach (1927) and Wright (1936), management scholars and economists have intensively researched the empirical validity of organizational learning curves (Preston and Keachie, 1964; Baloff 1971; Dutton and Thomas, 1984; Argote, 1993;

Darr et al., 1995). For many years the literature on organizational learning focused on the manufacturing sector studying the effects of cumulative production output on cost and productivity (Yelle, 1979). The basic idea is that the accumulation of similar experiences over time or put simply, “learning-by-doing” (Arrow, 1962) helps the organization to move along the learning curve and thus improve its performance. Although estimates of learning rates differ from industry to industry (Dutton and Thomas, 1984), the evidence that firms can improve efficiency in production through direct experience is overwhelming.

In recent years research on organizational learning has been applied to various strategic contexts like corporate acquisitions (Heleblian and Finkelstein, 1999; Hayward, 2002; Zollo and Singh, 2004; Zollo, 2009; Zollo and Reuer, 2010), alliances (Anand and Khanna, 2000; Zollo et al. 2002; Kale et al. 2002; Sampson, 2005; Kale and Singh, 2007) and new product development (Nerkar and Roberts, 2004; Eggers, 2010). As the relationship between experience and performance in these different contexts is more complex than in a manufacturing setting, researchers have challenged the traditional logic that all experience is valuable and suggested that a contingency perspective is more appropriate to study the phenomenon (Mannor, 2010). The idea is that different types of experience are valuable in some cases but have no value or are even disadvantageous in others (Haleblian and Finkelstein, 1999; Haunschild and Sullivan, 2002; Hoang and Rothaermel, 2005). Mannor (2010) for example shows that the success of a movie launched by a Hollywood studio does not depend on the overall number of movies produced by the studio but rather on the experience of the studio in the movies’ genre.

As noted above, one of the strategic contexts that have recently been researched through the organizational learning lens is new product development.¹ Case based research by Dannels (2002) shows that not only product innovation activities of high-tech firms rely on firm

¹ For reviews on the general success factors of new product development see Montoya-Weiss and Calantone (1994), Brown and Eisenhardt (1995), Shane and Ulrich (2004) or Edmondson and Nembhard (2009).

competences but that these activities also help to develop new firm competences. In his fieldwork Holmqvist (2004) examines how intra- and interorganizational exploitation and exploration activities in new product development are interlaced.

While case based research supports the view that firms benefit from experience in new product development, large-scale work has shown inconsistent results providing support for the contingency perspective mentioned above. Nerkar and Roberts (2004) thus differentiate between proximal and distal technology and product market experiences, Eggers (2010) distinguishes between experience depth and breadth and its timing, and Mannor (2010) discerns between experience volume, depth and breadth.

Following this stream of research, we distinguish between product niche experience depth and product niche experience breadth. While experience depth captures how many products a firm released in the same product niche prior to the focal product, experience breadth captures in how many product niches the firm has been active prior to the development of the new product. The first question we are interested in is thus how the different types of experience influence the performance of a new product.

While the type of experience is the first element of this study, the second component concerns the question about the partner with whom the firm accumulated the experience. Most innovations are conducted in a partnership of firms. Whether partners are inside or outside the firm, what really matters for the success of new product development is the repeated interaction of the partners (Dyer and Singh, 1998).² As firms often work with several partners across different product development projects, in a given situation a firm's experience can arise either from previous projects with the same partner or from projects with

² While it might be obvious that firms have to coordinate in alliances and that repeated interaction with a specific alliance partner helps firms to coordinate their product development activities (Hoang and Rothaermel, 2005), case based research of Dougherty (1992) also shows that technical, marketing, manufacturing, and sales departments contribute to the success of a new product. but that collaboration across the departments is quite rare.

other partners. The question, then, is whether new product development projects benefit equally from experience accumulated within and outside the current partnership.

To answer our questions we combine insights from the literature on organizational learning in new product development with the research on experiential learning in alliances and develop two sets of hypotheses. The first set relates to experience depth: we consider prior experience from work of the individual firms (Hypothesis 1a), and then joint experience of the dyad, i.e. the two firms working together on the focal product, (Hypothesis 1b). The second set of hypotheses deals with experience breadth, starting again with the individual firms' experience breadth (Hypothesis 2a) and then progressing to the experience breadth of the dyad (Hypothesis 2b).

Although we mainly draw on the literature on organizational learning to develop our hypotheses, we also consider insights from the literature on individual and group learning and from cognitive psychology. This is due to two reasons: first, organizations are typically a hierarchically nested system of smaller groups (Simon, 1962) and second, much of the learning in organizations arises from the group or individual level (Argote, 1999).

Product niche experience depth

The depth of experience has long been of interest in the organizational learning literature. While some authors argue that too much experience depth may lead to a competency trap (Levitt and March, 1988) or that core capabilities can turn into core rigidities (Leonard-Barton, 1992), others propose that organizations with greater depth of knowledge in a particular task will perform better at it (Kogut and Zander, 1992). Empirical research on new product development supports the view that experience depth improves a product's success. Zirger and Maidique (1990) show that new products perform better if they build upon the firm's existing market, technology and product competences. Eggers (2010) finds that the quality of newly released mutual funds increases in the number of concurrent funds released

in the same niche. In his study on Hollywood studios Mannor (2010) finds a positive relationship between the depth of experience in a specific genre and the commercial success of a movie released in the same genre. This finding is theoretically also supported by the literature on individual creativity. Sternberg and O'Hara (2000) state that creativity requires the application of deep knowledge as individuals must understand a knowledge domain to push its boundaries significantly. Following prior literature, we thus hypothesize that:

Hypothesis 1a: The success of a new product increases in the levels of product niche experience depths of the individual firms.

The arguments above do not reflect whether the product experience depths of the two firms stem from prior joint work of the firm dyad or whether they arise from prior work with other partners. In the following section we will argue that experience depth is to a greater extent a dyadic than a firm-level construct and that the experience depth accumulated within a firm dyad has a larger impact on the product's success than the experience depths that the firms accumulated with other partners.

The depth of product niche experience of the dyad reflects two different types of experience. First, it captures the experiences that the firms have in the specific product niche, and second it captures the experience of the firms in working together.

Following the arguments of Dyer and Singh (1998) repeated interactions between firms make them more inclined to invest in relation-specific assets that facilitate coordinating activities (Dyer, 1996). Moreover, repeated and intense interactions between two firms may lead to the development of dyadic knowledge-sharing routines (Zollo et al., 2002) which lay the foundation for a partner-specific absorptive capacity that enables the firms to recognize and assimilate valuable knowledge from the partner (Dyer and Singh, 1998).

We thus have two complementary arguments: first, that the accumulation of experience in a specific product niche increases the performance of a new product released in this niche,

and second that partner specific experience facilitates knowledge sharing. Combining them we propose that:

Hypothesis 1b: The success of a new product increases more in the level of the product niche experience depth of the dyad than in the levels of product niche experience depths that the individual firms accumulated with other partners.

Product niche experience breadth

It is widely accepted in the organizational learning literature that experience breadth is essential for firms to create a substantial knowledge base (Huber, 1991). Implicitly this view can also be found in the work of March (1991) and Levinthal and March (1993) who argue that firms have to strike a balance between the search for new knowledge and the refinement of existing knowledge to increase their performance. This view is echoed and strengthened in recent research that highlights the importance of experience breadth for the development of second-order competences (Danneels, 2002, 2008; King and Tucci, 2002). Contrary to a first order competence that is “a skill at performing a particular task” (Danneels, 2008: 520) a second-order competence is “a skill at learning new tasks” (Danneels, 2008: 520). While recent research on organizational learning in product development has devoted some effort to show how experience breadth leads to second-order competences (Danneels, 2002; King and Tucci, 2002; Eggers, 2010), little is known about the influence of experience breadth on the performance of first-order competences. Put simply, it is not clear how experience breadth influences the success of new products.

In their study on pharmaceutical firms Nerkar and Roberts (2004) show that a wider range of product market experience, i.e. the ability to market new products, has a positive influence on initial sales but that broader technological experience, i.e. the ability of an organization to make certain physical products, has no significant influence. This result indicates that it might

be difficult for firms to leverage complex technological experience and tacit knowledge from one product niche to another, as previously suggested by Kogut and Zander (1992).

Research in cognitive psychology has pointed to the fact that exposure to a wide variety of learning contexts can lead to negative knowledge transfer (Gick and Holyoak, 1987). Negative knowledge transfer occurs when experience gained in a prior activity is transferred to a new activity that looks superficially similar but differs with regard to its structure. In their seminal paper on organizational routines, Cohen and Bacdayan (1994) show in an experiment that novices perform better at a card game than experienced individuals if the rules of the game are slightly altered. Empirical evidence for the phenomenon of negative transfer at the organizational level can be found in the paper by Haleblian and Finkelstein (1999) who show that firms suffer in their acquisition performance if they generalize inappropriately from prior acquisition experience.

Furthermore, fieldwork by Tripsas and Gavetti (2000) on digital imaging raises the question whether the top management team can simultaneously manage businesses with different dominant logics (Prahalad and Bettis, 1986). They argue that managers at Polaroid found it difficult to endorse a different business model for digital imaging than for their traditional instant photography business.

As a firm's activity in different product niches leads to different experiences that may conflict with the core principles of the niche in which a new product is released we conclude that:

Hypothesis 2a: The success of a new product decreases in the levels of product niche experience breadths of the individual firms.

While organizational breadth might have a negative impact on the success of new products, we argue that this effect is even stronger if the experience breadth is accumulated within the firm dyad. Research in social psychology supports the idea that repeated interaction

among team members with some knowledge of how things are supposed to be leads to the construction of a shared understanding of the situation in which the individuals find themselves (Hutchins and Klausen, 1996). In the management literature such shared understanding has been referred to as mental models, i.e. unconscious assumptions about the way the world works (Senge, 1990). Transferring this idea to the new product development setting suggests that a firm dyad that works together in a specific product niche develops a shared understanding of how best to address this product niche. Although this shared understanding might include elements from prior work with other partners it is likely to comprise mainly of elements arising within the dyad. While shared mental models might have a positive impact on the new product development outcome if used properly (Madhavan & Grover, 1998) they can also be the subject to a negative transfer as shown by Cohen and Bacdayan (1994). We thus hypothesize that:

Hypothesis 2b: The success of a new product decreases more in the level of the product niche experience breadth of the dyad than in the levels of product niche experience breadths of the individual firms.

Methods

Research setting

The research context of our study is the electronic game industry. While electronic games were considered a mere toy for children or young men in the mid 1980ies, the industry is now one of the major players in the entertainment industry generating annual revenues of more than \$21 billion in the U.S. alone (NPD, 2009). Whereas the first computer game, “Spacewar”, developed by Steve Russell at MIT in 1961 (Kent, 2001), was never intended to be sold, the best selling game to date, “Wii Sports”, has sold more than 74 million copies worldwide.

Our study focuses on the software side of the electronic game industry which comprises developers and publishers. The developer designs, creates, and codes the game, and the publisher provides financing, localization, packaging, marketing, and manages relationships with hardware providers.

The electronic game industry offers an excellent opportunity to address our research questions for several reasons. First, publishers and developers have to renew their product portfolio constantly as product life cycles are short. The diffusion of an electronic game follows an L-shaped curve so that sales are highest in the first two months and then rapidly decline. Thus, products have to be replaced regularly and successful product development is vital for long term success. Electronic Arts, one of the largest publishers in the world, spent \$1,359 billion on research in development in 2008 alone (Electronic Arts, 2009)

Second, new technological platforms are introduced every five years, so that publishers and developers have to constantly update their knowledge about the underlying technologies. While developers have to learn how to effectively program for the new platform, publishers have to figure out what type of gamers the new platform will attract and how to best address them.

Third, although the first games were often produced by individuals or small teams, the vast majority of electronic games nowadays is produced jointly by a publisher and a developer. Developers and publishers must work closely together to ensure that the game appeals to the market and that it is developed on time and on budget. The developer needs to inform the publisher on the game's progress, and the publisher needs to provide financial resources and timely feedback (Chandler, 2009).

Fourth, publishers can choose whether to have a game developed by an in-house developer studio or by an independent developer studio. About 34% of all games in our sample are developed in-house. However, even large publishers like Electronic Arts who

owned 17 developer studios worldwide in 2008, use both internal and external studios to develop their games (Electronic Arts, 2009). As publishers and developers are quite often distributed in different geographic areas they have to learn how to effectively coordinate their actions. Experience in working together thus matters for both types of games: those which are produced by a vertically integrated firm and those that are produced by two firms.

Data and sample

The main source of information we use in this paper is the MobyGames database. MobyGames is the world's largest video game documentation project on the internet, containing information on more than 48,000 games released from the beginnings of the industry in 1972 to the present.³ For these 48,000 games we have detailed information on the genre, the platform, the release date, the developer and the publisher. To avoid double counting we first removed about 3,000 games classified as a compilation, i.e. a bundle of games already released. The resulting 45,000 games are used to construct all independent and most of the control variables. We then matched the data set with information on monthly revenues of games collected by NPD, a market research firm that has tracked sales of electronic games in the U.S. since 1995. Combining both datasets yields 10,645 unique observations. Controlling for the performance of the publisher and the developer in the year before the launch of the focal game leads to a loss of 120 games which are either released in the first year of the publisher or in the first year of the developer. Finally, we matched the data with information on the size of the game developing team derived from credits information from MobyGames. As only about a third of all games in the database have credits information we end up with a sample of 6,635 games for which we have the different experience measures, the financial performance and the size of the development team.

³ For a detailed description on the coding procedure and some background information on MobyGames see paragraph **Error! Reference source not found.**

Dependent variable

The dependent variable, revenue, is the natural logarithm of the sum of the revenues a game made in the U.S. in the first twelve months after its release. It is appropriate to focus only on the first year of revenues for two reasons. First, a primary objective in the electronic game industry, like in many other blockbuster industries, is to maximize the revenues associated with the fixed costs of product development and release (Ubisoft, 2009). Second, revenues of electronic games follow an L-shaped curve so that the average game in the NPD database makes 80% of its revenues within the first year on the market (see Figure 1).⁴ This approach of comparing game revenues within the first 12 months after release instead revenues in a given year means we are not making the mistake of games in different stages of their diffusion.

Insert Figure 1 about here

Independent variables

Two types of experience measures are of central interest to our study: product niche experience depth and product niche experience breadth. There are various possible specifications for a product niche in this market; in this study we define it along two dimensions: its genre (e.g. Sports) and the platform it is designed for (e.g. Playstation 3). Each genre represents a distinct product with regard to story, design, game play and art. Different genres require different skills in game development and appeal to different types of players. The second dimension is the game's platform. This is important as different platforms require different programming skills of the developer and different marketing strategies of the

⁴ Comparing the revenues of the first year with the revenues of the first two years leads to a correlation coefficient of .98.

publisher.⁵ To account for skewness we ln-transform each of the experience measures, first adding one to each count to deal with zero experience observations.

Product niche experience depth. Product niche experience depth counts how many games a certain entity developed and/or published in the specific product niche of the focal game before its introduction. We construct this variable at five different levels of observation.

Product niche experience depth of the developer is computed as the number of games the developer developed for the product niche of the focal game prior to its release.

Product niche experience depth of the publisher is the corresponding measure for the publisher.

Product niche experience depth of the dyad counts how many games the specific publisher-developer-dyad of the focal game developed and published together in the product niche of this game before its introduction.

Product niche experience depth of the developer accumulated with other publishers measures how often the developer produced a game in the specific product niche with other publishers than the one of the focal game. It is computed as the difference between product niche experience depth of the developer and product niche experience depth of the dyad. The measure captures the additional experience the developer accumulated in a specific product niche without working with the publisher of the focal game.

Product niche experience depth of the publisher accumulated with other developers is a count of the number of games a publisher released in the product niche of the focal game with developers different from the one of the game of interest.

Product niche experience breadth. Product niche experience breadth measures the number of different product niches a specific entity developed and/or published games in

⁵ We experimented with two alternative definitions of a product niche by splitting up the combination of the genre and the platform into its two components. Results are qualitatively unchanged.

before the introduction of the focal game. Again, we construct this measure for all five units of observations.

Product niche experience breadth of the developer is the number of product niches a developer has ever been active in prior to the release of the focal game.

Product niche experience breadth of the publisher is the corresponding measure for the publisher.

Product niche experience breadth of the dyad measures the number of product niches in which the specific developer-publisher-dyad of the focal game has previously jointly developed and published games.

Product niche experience breadth of the developer accumulated with other publishers is computed as the difference between product niche experience breadth of the developer and product niche experience breadth of the dyad.

Product niche experience breadth of the publisher accumulated with other developers is the analogous measure for the publisher.

Control variables

Besides the independent variables of interest we include a large set of control and dummy variables in our regression models that might affect the financial performance of a game.

Team size counts the number of persons involved in the developing and publishing of the game. The size of the team is an important variable for two reasons. First, larger teams are able to create more complex and more technologically sophisticated games, potentially appealing to a larger amount of customers. Second, the size of the team is the main driver of the production costs. Since other costs like the advertising budget are often budgeted as a fixed fraction of production costs, team size can be seen as a good proxy for the total production budget, an approach also taken in the movie industry (Rossman et al., 2010).

To control for games based on licensed intellectual property from movies, comics, books or sports leagues we include the dummy **licensed game**, which equals one if the game includes licensed content and zero otherwise. The use of externally developed content has increased from zero percent in the early years of the industry to seventeen percent in 2002 (see Figure 2).

Insert Figure 2 about here

In recent years the percentage decreased as the royalties to licensors have increased (Edge, 2005) and publishers have focused more on internally owned and developed intellectual property (TakeTwo, 2008).

Some of the large electronic game publishers own several in-house developing studios. To capture the potential benefits from such a tight relationship, we construct a dummy variable, **vertical integration**, which takes on value one if the developer and publisher belong to the same firm, and zero otherwise. Prior research (Gil & Warzynski, 2001) suggests that games developed and published by the same firm perform better as publishers spend more money for advertising for in-house developed games. Further, Ohashi (2005) empirically shows that integrated games are released further apart in time than non-integrated games so that competition is softened.

As the financial success of a game may be influenced by the size of a firm, we include the variables **developer size** and **publisher size**. Both variables are counts of the number of games the respective company released in the same year as the focal game.

To control for unobserved firm-specific factors like payment schemes or a highly talented workforce that might positively or negatively affect the performance of a game, we add the variables **developer performance** and **publisher performance** to our analysis. The measures

are defined as the natural logarithm of revenues of the company in the year before the game of interest is released.

Some genres and some platforms appeal to a broader audience compared to others and also attract fiercer competition. To control for this we include 8 **genre** and 24 **platform** dummies.

Release year indicator variables are included to address issues arising from shifts in the preferences towards electronic games over time or other macroeconomic changes.

Finally, as demand and supply in the electronic game industry peak during the holiday season and during the large fair trades, we include 12 **release month** dummies to control for within-year seasonality.

Results

We ran ordinary least squares (OLS) regressions to test our hypotheses, with each new released game as the unit of observation. Standard errors are robust to heteroskedasticity and clustered at the publisher-developer-dyad level. Table 1 presents descriptive statistics and the correlation matrix for all variables. PNED and PNEB designate product niche experience depth and breadth, respectively.

Insert Table 1 about here

While the average product niche experience depth of the dyad and of the developer alone are similar in magnitude (0.3) the product niche experience depth of the publisher alone is three times larger, indicating that publishers work on more projects than developers. A similar pattern can be seen for the product niche experience breadth, where the experience breadth of the publisher alone (2.2) is twice as large as the experience breadth of the dyad or of the developer alone.

The correlations among the size and performance measures of the publisher and the developer respectively raise the possibility of multicollinearity problems. However, the highest variance inflation factor of all variables in the full model was 4.91 for the publisher performance, which is below the rule of thumb cutoff value of 10 for multiple regression models (Kutner et al., 2004).

Controls

The results of our regression models are reported in Table 2.

Insert Table 2 about here

We first note the coefficients of the control variables referring to model (1) in Table 2 although neither significance nor sign change in subsequent specifications. Team size is positive and significant ($p < 0.01$) as expected, indicating that more complex and technological superior games attracting either more gamers or gamers with a higher willingness to pay require larger teams. The licensed game indicator is positive and significant ($p < 0.01$) supporting the notion that games that are based on external intellectual property appeal to a wider market as the brand and characters are already well-known. The vertical integration dummy is positive but not significant in any specification. The performance of the developer and the performance of the publisher in the year prior to the release of the focal game both have a positive and significant ($p < 0.01$) performance enhancing effect, indicating that firms who were successful in the past are also successful with current games. The variables developer size and publisher size are negative and significant ($p < 0.01$), suggesting that games of smaller and possibly more focused firms perform better.

Product niche experience depth

In Table 2 column (2) we add the product niche experience depth of the publisher and the developer to the regression model. Both measures reflect the experience with a certain product category but do not distinguish with whom the firms made the experience, i.e. whether they worked together on the past projects in the same product category or not. Product niche experience depth of the developer is positive and significant ($p < 0.05$), as expected. Product niche experience depth of the publisher is also positive and significant ($p < 0.01$). Both results support Hypothesis 1a.

In Table 2 column (3), we split the product niche experience depth measures and look at both product niche experience depth that comes from joint projects of the developer-publisher dyad and product niche experience depths arising from work with other partners. Product niche experience depth of the dyad is positive and significant ($p < 0.01$). Product niche experience depth of the developer accumulated with other publishers and product niche experience depth of the publisher accumulated with other developers are also both positive and significant ($p < 0.01$). Although the coefficient of product niche experience depth of the dyad is larger than the other two coefficients, an F-test reveals that the coefficient of the variable product niche experience depth of the dyad is statistically only different from the coefficient of the product niche experience depth of the publisher accumulated with other developers ($p < 0.1$). The results show that both types of experience depth positively influence the success of a game but that the experience of the dyad has a larger impact at least compared to the product niche experience depth that the publisher made with other developers than the focal one. This partially supports Hypothesis 1b.

Product niche experience breadth

Columns (2) and (3) of Table 2 show the results for product niche experience breadth. As noted earlier, the variables in column (2) are the overall values for the publisher and the developer and do not distinguish between the experience breadth of the specific developer-publisher dyad and the experience breadths that arise from work with other partners. Product niche experience breadth of the developer and product niche experience breadth of the publisher are both negative and significant ($p < 0.01$), indicating that very broad experience hampers the success of the focal game. This result supports Hypothesis 2a.

In Table (2) column (3) the variables are again split between the experience breadth of the dyad and the experience of the developer and publisher stemming from games made with other partners. Product niche experience breadth of the dyad is negative and significant ($p < 0.01$). Experience breadth of the developer accumulated with other publishers and experience breadth of the developer accumulated with other publishers are negative and significant ($p < 0.01$). Two F-tests of equality of the coefficients indicate that the coefficient of experience breadth of the dyad is statistically different from the coefficient of the experience depth of the developer accumulated with other publishers ($p < 0.05$) and also from the coefficient of experience breadth of the publisher accumulated with other developers ($p < 0.01$). Hence the results support Hypothesis 2b: the experience breadth of the dyad has a larger negative effect than the experience breadths that the firms made with other partners.

Robustness

Here, we look more closely at the second hypothesis and explore whether the negative effect of product niche experience breadth disappears for products that are

released in niches in which the developer and/or the publisher have no prior experience. To do so we run three additional regressions. Results are reported in Table 3.

Insert Table 3 about here

Column (2) in Table 3 encompasses all games released in a product niche in which neither the publisher nor the developer, and consequently also not the dyad, had any experience so far. The negative coefficients of the three product niche experience breadth measures remain unchanged although the significance of the product niche experience breadth of the developer accumulated with other publishers dropped to the 5% level. Column (3) entails games in niches in which the developer may have accumulated experience but not the publisher. Product niche experience depth of the developer is positive but not significant; indicating that the experience depth of the developer is only valuable if the publisher also has some experience. All three product niche experience breadth measures are negative and significant, consistent with our main results in Table 3 column (3). Column (3) in Table 3 contains all games for which only the publisher has prior experience in the specific product niche but not the developer. Product niche experience depth of the publisher is positive and significant ($p < 0.05$). The three variables of product niche experience breadth are again negative and significant although the significance of product niche experience breadth of the publisher dropped to the 10 % level. Overall the results in Table 3 suggest that the negative impact of product niche experience breadth does not differ for products in product niches that are either new to the dyad or new to either the developer or the publisher individually.

Discussion

In this paper, we examine the impact of experience depth and experience breadth on the success of new product development activities. We further distinguish between the experience that the dyad of firms has accumulated together and the experience arising from work with other partners. By linking the literature on the relational view of the firm with the literature on experiential learning in new product development, we report empirical evidence supporting our proposition that product niche experience depth accumulated by the specific dyad helps the dyad to develop successful products. Although the dyad also benefits from the experience depths that the firms accumulated with other partners, the impact of the dyad-specific product niche experience depth is larger. In contrast, product niche experience breadth harms the success of new products as negative transfer might occur. This negative effect is larger for the dyad specific experience breadth than for the experience breadths that the firms accumulated with other partners. In a robustness test we find that the negative effect of experience breadth does not differ for products released in new niches in which neither the dyad nor one of the single firms had prior experience.

Theoretical and managerial implications

Of these findings, one of the most interesting insights is that the impact of the experience depth accumulated by the dyad on product performance is higher than the experience depth developed with other firms. This result supports the idea that the effect of the partner-specific absorptive capacity is strengthened if it is combined with experience accumulation within the same product niche as hypothesized but empirically not shown by Zollo et al. (2002).

Another insight of our study is related to the work of Hoang and Rothaermel (2005) on the impact of general and partner-specific alliance experience on alliance performance. They hypothesize that partner-specific alliance experience positively relates to the success of an alliance but find no empirical evidence for their hypothesis.

Moreover, our results speak to the literature on new product development by highlighting that the impact of experience on performance might be underestimated in joint product development projects if the level of observation is a single entity rather than a dyad. This is true for products created within one firm or by two firms as the dyad might be a developer and a publisher like in our case, or an R&D department and the marketing department.

Finally, the results of our study suggest some points of intervention for managers trying to maximize the performance of newly developed products. Specifically, our results suggest that firms should try to accumulate as much experience as possible within a specific product niche with the same partner and not work with different partners in the same niche, as the experience depth of a dyad has a larger impact on product development success than the experience depths accumulated with other partners. Moreover, firms should focus on specific niches rather than working in several different niches, as product experience breadth negatively influences the success of a new product.

Limitations and directions for further research

We recognize that there are some limitations to the validity and generalizability to this work.

First, as the electronic game industry is a technology driven, creative industry the problem of negative transfer in product development might be less pronounced in

industries where product niches are more similar to each other and where the transfer of knowledge between niches might be easier.

Second and related, we treat each niche as being equally similar to all other niches. While prior studies often rely on product classification schemes (like SIC codes) to build their experience breadth variables there is no such classification scheme for the video game industry. To address this issue one could conduct several interviews with industry experts to develop a relatedness index for product niches in this industry. However, even this would be highly subjective and would require that the interviewee has experience in every niche.

Finally, our result on the experience breadth might depend in part on our level of measurement. Experience breadth might for example be helpful for choosing the right product niche or for structuring the product portfolio. This might mean there would be a positive influence if the dependent variable is measured at the firm level and not on the level of the single product.

Our research opens up several directions for further research. As we have only shown in this study that the experience of the dyad has a larger impact on the outcome of the joint work of the dyad than the experience that the dyad members made with other partners, case based research could provide further insights how a firm dyad actually uses the experience from within the dyad and the experience from outside of the dyad.

Moreover, while we have shown in this study that negative transfer might occur in new product development, further research is needed to understand the circumstances under which such a negative transfer occurs. As the knowledge of how to address a specific product niche includes both tacit and explicit knowledge the interesting

question remains whether the likelihood of a negative transfer increases in the level of tacit knowledge involved in the understanding of a specific product niche.

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Table 1 Descriptive Statistics and Correlations (N=6,635)

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13
1 Revenue (LN)													
2 PNEB of the Dyad	0.08*												
3 PNEB of the Developer awoP	-0.01	-0.03											
4 PNEB of the Publisher awoD	0.07*	-0.01	0.18*										
5 PNEB of the Dyad	0.18*	0.52*	-0.08*	-0.07*									
6 PNEB of the Developer awoP	0.08*	-0.19*	0.35*	-0.04	-0.25*								
7 PNEB of the Publisher awoD	0.14*	-0.28*	0	0.42*	-0.43*	0.13*							
8 Team Size	0.36*	0.12*	0.06*	0.19*	0.14*	0.01	0.16*						
9 Licensed Game	0.18*	0.05*	0.02	0.07*	0.07*	0.05*	0.11*	0.03					
10 Vertical Integration	0.03	0.32*	-0.09*	-0.17*	0.50*	-0.21*	-0.45*	0.04	-0.01				
11 Developer Performance	0.65*	0.24*	0.10*	0.02	0.44*	0.19*	-0.01	0.29*	0.22*	0.17*			
12 Publisher Performance	0.59*	0.12*	-0.04*	0.33*	0.25*	0.05*	0.45*	0.35*	0.21*	-0.07*	0.60*		
13 Developer Size	0.15*	0.34*	0.16*	-0.07*	0.57*	0.20*	-0.22*	0.12*	0.15*	0.27*	0.57*	0.23*	
14 Publisher Size	0.29*	0.15*	-0.07*	0.41*	0.28*	-0.05*	0.53*	0.26*	0.19*	-0.07*	0.35*	0.77*	0.27*

Table 2 Impact of Experience on Performance

	Revenue (LN)		
	(1)	(2)	(3)
PRODUCT NICHE EXPERIENCE DEPTH			
of the Developer		0.089*** (0.030)	
of the Publisher		0.072*** (0.022)	
of the Dyad			0.153*** (0.041)
of the Developer accumulated with other Publishers			0.098*** (0.037)
of the Publisher accumulated with other Developers			0.075*** (0.023)
PRODUCT NICHE EXPERIENCE BREADTH			
of the Developer		-0.091*** (0.019)	
of the Publisher		-0.077*** (0.021)	
of the Dyad			-0.167*** (0.030)
of the Developer accumulated with other Publishers			-0.093*** (0.022)
of the Publisher accumulated with other Developers			-0.078*** (0.022)
CONTROLS			
Team Size	0.243*** (0.024)	0.243*** (0.024)	0.243*** (0.024)
Licensed Game	0.231*** (0.047)	0.228*** (0.047)	0.228*** (0.047)
Vertical Integration	0.027 (0.039)	0.025 (0.039)	0.027 (0.044)
Developer Performance	0.409*** (0.015)	0.411*** (0.015)	0.411*** (0.015)
Publisher Performance	0.264*** (0.016)	0.265*** (0.016)	0.265*** (0.016)
Developer Size	-0.472*** (0.027)	-0.424*** (0.030)	-0.424*** (0.030)
Publisher Size	-0.279*** (0.027)	-0.250*** (0.030)	-0.250*** (0.030)
Constant	3.280*** (0.330)	3.359*** (0.322)	3.362*** (0.322)
DUMMIES:			
Platform	Yes	Yes	Yes
Genre	Yes	Yes	Yes
Release Year	Yes	Yes	Yes
Release Month	Yes	Yes	Yes
Number of Observations	6,635	6,635	6,635
Adj. R ²	0.630	0.634	0.634
F Statistic	128.7***	121.2***	118.5***

Notes. OLS Regressions of different types of experience on performance. Variables are defined in the text. Standard errors in parentheses are robust to heteroskedasticity and clustered at the developer-publisher dyad level. *, **, *** denote significance at the 10%, 5%, and 1% levels respectively.

Table 3 Results for products released in new product niches

	Revenue (LN)		
	(1)	(2)	(3)
PRODUCT NICHE EXPERIENCE DEPTH			
of the Developer		0.102 (0.065)	
of the Publisher			0.065** (0.029)
PRODUCT NICHE EXPERIENCE BREADTH			
of the Dyad	-0.128*** (0.045)	-0.141*** (0.044)	-0.124*** (0.036)
of the Developer accumulated with other Publishers	-0.085** (0.035)	-0.090*** (0.034)	-0.090*** (0.025)
of the Publisher accumulated with other Developers	-0.101*** (0.034)	-0.108*** (0.035)	-0.050* (0.028)
CONTROLS:	Yes	Yes	Yes
DUMMIES:	Yes	Yes	Yes
Number of Observations	1,642	2,046	3,509
Adj. R ²	0.671	0.664	0.674
F Statistic	51.81***	56.85***	90.81***

Notes. OLS Regressions of different types of experience on performance of products released in new product niches. Variables are defined in the text. Regressions include dummy variables for platform, genre, release year and release month and the following control variables: team size, licensed game, vertical integration, developer performance, publisher performance, developer size and publisher size. *, **, *** denote significance at the 10%, 5%, and 1% levels respectively.

Figure 1 Average monthly revenues per game

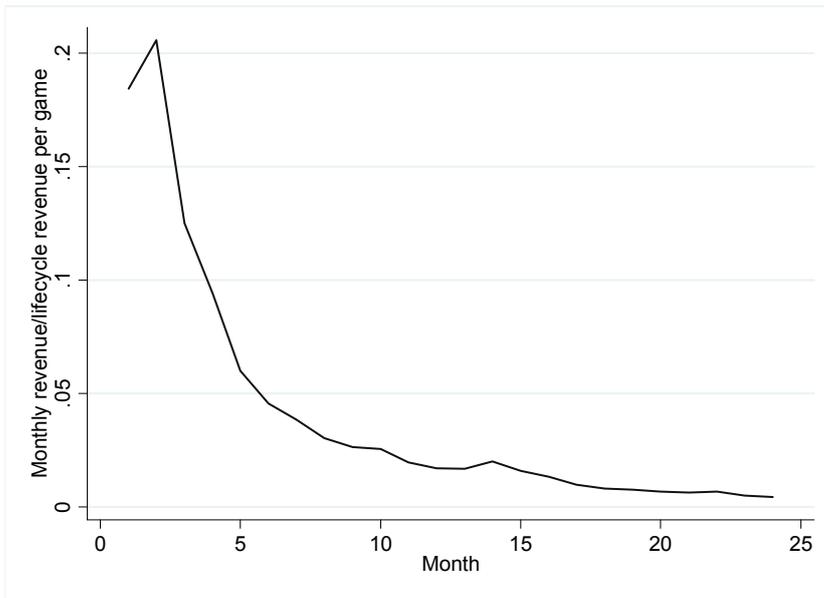


Figure 2 Evolution of the percentage of games based on licensed content

