People and Process, Suits and Innovators: Individuals and Firm Performance

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ABSTRACT

Performance differences between firms are generally attributed to organizational factors – such as routines, knowledge, and strategy – rather than to differences among the individuals who make up firms. As a result, little is known about the part that individual firm members play in explaining the variance in performance among firms. The absence of evidence at the individual level of analysis also prevents a thorough understanding of which roles beyond those of top managers contribute most to firm performance. This paper employs an empirical study of over 1,500 products across 602 firms in the computer game industries to test the degree to which organizational or individual factors explain firm performance. The analysis also examines whether individual differences among middle managers or innovators best explain firm performance variation. The results indicate that variation among individuals matter far more in organizational performance than is generally assumed. Further, I find that variation among middle managers has a particularly large impact on firm performance, much larger than that of those individuals who are assigned innovative roles. These results demonstrate the importance of individual factors in explaining firm performance, suggesting that firms may be serving a social purpose, as well as a performance-based one. The results also show that middle managers are necessary to facilitate firm performance in creative, innovative, and knowledge-intensive industries.

People and Process, Suits and Innovators: Individuals and Firm Performance

Is firm performance driven by people or by process? The strategy and organization literature has historically argued that a good process is the key to good performance. The result is a long tradition of using organizational factors, rather than differences among individual employees, to explain differences in firm performance. For example, routines (Nelson and Winter 1982), firm capabilities (Teece, Pisano, and Shuen 1997), and resources (Barney 1991) all operate at the organizational, not individual, level. Even approaches that explain performance differences from a human capital perspective usually view employees as an aggregate resource (Wright, Dunford, and Snell 2001), and focus on organizational processes for developing human capital rather than individuals firm members (Hitt, Bierman, Shimizu, and Kochhar 2001). And yet, firms ultimately consist of people whose performance can vary widely. This opens the possibility that, especially in industries with high rates of entrepreneurship, or where there are few economies of scale, firm composition – the people who actually make up the firm – may account for much of often widely varying differences in performance among firms. Yet despite the potential importance of individuals in explaining performance differences between firms, there are few prior studies that separate firm performance into compositional differences versus organizational factors, with the exception of those studies examining the specialized cases of top management (Bertrand and Schoar 2003; Lieberson and O'Connor 1972) and entrepreneurship (Gimeno, Folta, Cooper, and Woo 1997; Johnson 2007).

The absence of compositional differences in explaining performance has an additional consequence. It has prevented a thorough understanding of which individuals actually play a role in determining firm performance. It would be reasonable to expect that not all variation among individuals contributes equally to explaining performance differences between firms. Top managers, for example, are generally considered to be important in determining firm performance, as evidenced by many studies on top management teams (Bertrand and Schoar 2003; Hambrick, Cho, and Chen 1996; Hambrick and Mason 1984; Lieberson and O'Connor 1972; Wiersema and Bantel 1992). This impact is based on the expectation that the cognitive and personality differences among the most powerful executives in a firm have an influence over strategies and outcomes (Hambrick and Mason 1984), and so would ultimately explain variation in performance of the firms they lead. In other words, we would expect Apple to behave differently depending on whether Steven Jobs or John Scully was CEO. Much less clear, however, is the impact of variation among the individuals who fill the more numerous and less influential role of middle manager.

Unlike top managers, middle managers are more constrained by existing organizational context, with the effectiveness of managers in product development depending on large part on the structure of the organization itself (Katz and Allen 2004; Larson and Gobeli 1989). Although variation among mid-level managers can affect their subordinates (Bidwell and Burton 2006), at the wider scale of organizational performance, the actions of middle managers are bounded by the nature of the firm (Wooldridge and Floyd 1990). Therefore, we would expect to see that organizational factors, rather than compositional factors, determine much of the impact of middle management on performance. And, in those cases where variation among individuals in mid-level managerial roles does explain firm performance, we would expect managers charged with creative or innovative tasks to matter more than the "suits," who are given more standardized managerial roles. This is because creative, innovative, and knowledge work is generally expected to be highly variable at the individual level (Brooks Jr 1978; Stephan 1996), as these types of work rely on skills where there is evidence of wide distributions in innate ability and inspiration. We can only speculate on the relative contributions of individual variation of middle managers to firm performance, however, because no studies measure the performance contribution of these two middle manager types across firms.

This paper addresses that gap by determining the relative contribution of organizational and compositional differences on performance with an analysis of the computer game industry. Besides the fact that this industry has features typical of many knowledge-driven industries, games represent a case where the tension between the firm and the individual should be at its most visible. On one hand, the game industry is almost entirely organized around formal, relatively long-lived firms with well-articulated product strategies; yet, on the other hand, a large driver of industry performance should be the innovative output of key individuals. Additionally, success in the game industry relies not just on managers in charge of innovation, but also on project managers capable of organizing dozens of programmers and coordinating budgets that often reach into the tens of millions of dollars. Thus the computer game industry is an important research site for exploring the contrasts between organizational and individual factors in explaining performance differences, as well as the extent to which creative work (as opposed to managerial work) is responsible for any individual impact on performance.

To that end, the paper employs an empirical analysis of over 1,500 products across 602 companies to examine the role of individuals in innovative and managerial roles as a component in the performance differences between firms. The potentially large role of individuals, however, is more than simply another way to explain performance differences between firms. It also offers a challenge to the expected role of organizational factors in explaining firm performance.

Organizational Factors, Individual Factors

In a tradition leading back to Weber (1946) and the ideal of the rational bureaucracy incorporating individuals into a world of routines and structure, the intuition that organizational, industrial, and environmental factors – rather than individual differences – are responsible for variations in firm performance is deeply embedded in organizational theory and strategy. And in traditional industries where economies of scale and scope are critical, such as manufacturing, there indeed seems to be little need to take individuals into account to explain performance. Take, for example, Toyota as described by Adler et. al (1999). With a six-layered bureaucracy, cross-trained workers, and clearly delineated departments, Toyota built a manufacturing powerhouse that integrates workers into a complex mechanism to produce cars efficiently. In the Toyota Production System, success is based on routines and organizational processes (Nelson and Winter 1982) multiplying the effects of the individual workers who are ultimately replaceable and interchangeable with others who have received the same extensive training. The result is a consistent and reliable process that does not rely on any individual worker's skills, but rather firm-level processes to hire and train the appropriate individuals for the appropriate roles.

As is the case in the Toyota Production System, differences in ability among individuals are often assumed to be unimportant in large firms. Rather, the overall functioning of the structure of the firm determines performance, with individuals serving as little more than cogs in the machine. In the words of Teece, Pisano, and Shuen (1997: 525), "the firm is much more than the sum of its parts," suggesting that "to some extent individuals can be moved in and out of organizations, and so long as the internal processes and structures remain in place, performance will not necessarily be impaired." This sentiment is echoed by most theories of firm performance, which conceive of professional managers running formal organizations in which no individual, with the possible exception of a few top executives, are irreplaceable, and in which individual contributions account for little variation in performance.

However, other research traditions implicitly challenge this assumption and give us reason to believe that in many other industries, especially those focusing on knowledge work, compositional factors a critical role in explaining performance differences. This evidence of the impact of compositional differences on firm performance across many industries suggests that we may not be able assume that organizational-level processes are the lowest relevant level of analysis in explaining performance differences between firms. For example, we know individual actors can have a significant impact on the performance of large organizations, and even entire industries. The most common example of this is the entrepreneur, whose individual action may influence entire markets (Schumpeter 1934) and who has a persistent impact on firms long after they are founded (Baron, Hannan, and Burton 1999; Eisenhardt and Schoonhoven 1990).

Outside of entrepreneurship, variation among individuals in innovative capacities seems to have a potentially large impact on firm performance. For example, star scientists who operate within firms and universities have a significant individual effects on the performance of firms in the biotechnology (Zucker, Darby, and Armstrong 2001; Zucker, Darby, and Armstrong 1998) and semiconductor (Torero 1998) industries. Further, the distribution of ability across innovative roles is highly skewed. Software development exhibits extreme individual differences, as studies have demonstrated that a top computer programmer typically produces the same amount of work as ten to twenty average programmers during any given time period, and with fewer errors (Cusumano 2004; Sackman, Erikson, and Grant 1968). A similar skew is found in scientific research, where Lotka's Law observes that just six percent of publishing scientists are responsible for fifty percent of all publications, a difference due at least in part to varying abilities among scientists (Stephan 1996). In general, there are substantial ranges of variation in performance among individuals in most fields that involve creative and knowledge work (Simonton 2003). We would therefore expect that individuals in innovative roles would contribute to variation in firm performance.

More elusive is the effect of individual managers on firm performance. Recent research on top management teams has shown that CEOs, CFOs, and other top-level executives can have an effect on large firms, although the magnitude of their impact is limited. Bertrand and Schoar (2003) find that these top position explain less than 5% of the variation in firm performance among Fortune 800 companies, compared with between 34% and 72% of the variation explained by firm-level fixed effects. The impact of middle managers, those managers operate in the levels below C-level executives but above line managers (Wooldridge and Floyd 1990), is much less clear. Middle managers with particular personality traits and positions inside the organization play a role in facilitating innovation (Moss Kanter 1982), communication (Allen 1971), and organizational commitment (Bidwell and Burton 2006), but the success of managers is heavily dependent on the structure of the organizations in which they are placed (Katz and Allen 2004). According to this perspective the impact of middle managers on performance is determined by firm structure and culture, rather than individual differences (King and Zeithaml 2001; Westley 1990). Thus, we would expect managers to contribute less than innovators to variation, and that much of the impact of managers on performance would appear as organization-level effects. I will next test this presumed relationship between managers and innovators, and between firms and individuals, in the computer game industry.

ANALYSIS

EMPIRICAL APPROACH

While there are strong theoretical reasons to challenge the idea that variations in firm performance are explained primarily by organizational factors, actually separating individual and firm performance has historically been highly problematic. This is reflected in a literature on firm performance variation that focuses on contributions to firm performance from organizational or industry-wide factors, rather than individuals. Instead, factors such as industry structure (Schmalensee 1985), country-level effects (Makino, Isobe, and Chan 2004), and routines and capabilities (McGahan and Porter 1997; Rumelt 1991) have been important foci of analysis. The exception are a few papers that focus on the role of top managers or entrepreneurs in explaining performance variation (Bertrand and Schoar 2003; Hargadon and Douglas 2001).

In particular, the methods used by Bertrand and Schoar (2003), who focus on top-level managers in their study, offer the best approach to teasing apart the role of individuals and organizations. Bertrand and Schoar examined the role of top managers on Fortune 800 firms using a fixed effect regression to separate out the effects of individual leaders and firms. They found that the combined effects of CEOs, CFOs, and other top managers on Forbes 800 firm performance explains less than 5% of the variation, compared with between 34% and 72% of the variation explained by firm-level fixed effects. This is in-line with most theories of firm performance: in large, established organizations, the top managers, at least, contribute relatively little to firm performance. However the methodology provided by Bertrand and Schoar allows us to move beyond looking at top managers at large companies, and to instead examine firms more granularly to determine whether differences among individual firm members matter.

Using this approach, we will be able to test the degree to which firms or individuals are responsible for a firm's performance. The basic approach to testing this hypothesis is to estimate the following equation:

$$y_i = \gamma_i + X_i + \lambda_{producer} + \lambda_{designer} + \epsilon_i$$

Where y_i is the dependent variable of interest for a product *i*, γ_i are firm-level fixed effects, X_i are various product-level controls, and ϵ_i is an error term. The terms $\lambda_{producer}$ and $\lambda_{designer}$ are the fixed effects of producers and designers, the lead innovative and managerial roles within a computer game, which will be discussed in more detail shortly. We are interested in how much of the variation in performance is attributable to these fixed effects.

This approach will therefore compare the amount of the variation in performance explained by the individuals occupying two roles in a team to total variation explained by γ_i, which encompasses both firm fixed effects, but also other effects related to the other individuals within the firm, such as management and other team members. Thus, even under ideal conditions where firm effects approach zero for the entire population being studied (which would be unlikely given the expected heterogeneity within an industry sample), γ_i will still not itself be zero. That is because $\lambda_{producer}$ and $\lambda_{designer}$ take into account only two roles out of a team that averages over 40 people, some of which will be reflected in γ_i.

EMPIRICAL SETTING: THE GAME INDUSTRY

This analytical approach requires a unique set of data. The dataset must allow the tracking of a wide range of individuals and their jobs longitudinally, something best done with product-level data, with identifiable team members on each project. Firms must use multiple people for the same role and individuals also need to move across multiple firms so that performance is comparable both between and within firms, matching multiple combinations of individual team members and firms over time. Further, it would be useful if the types of roles varied, to encompass both innovative (and therefore more portable and variable) jobs and less-portable traditional managerial jobs that presumably are more tied to firm-specific routines and knowledge. Finally, an appropriate industry would offer a dynamic environment of firms, with opportunities for both new ventures and larger, long-standing organizations.

The video game industry matches all of these requirements and offers a particularly valuable perspective into the world of firms and markets. That is because each game has an identifiable, credited team of creators, including a development team of designers, programmers, and artists. These teams, in turn, work for developers, game programming firms ranging from just a few people to several thousand employees. These firms may produce dozens of games a year. Because accurate credits at both the individual and firm level are available for many games developed within the industry, it is possible to trace precisely both the individuals and firms responsible for innovation and entrepreneurship within the industry.

Now nearly thirty years old, electronic gaming software is a major industry, with over $25.4 billion in software revenues in 2005, and over 144,000 fulltime employees in the United States alone in 2004 (Crandall and Sidak 2006). It also straddles the line between creative industries and knowledge-intensive industries, combining elements of entertainment and technological innovation. The dual nature of the game industry is best seen through its two key roles, the managerial role of producer and the innovative role of designer.

Producers, despite the similarity in name, have very little in common with the eponymous job in the entertainment world[1], matching more closely the role of project manager in the software industry. A producer "is ultimately responsible for every aspect of the game. It is the producer's job to make sure that the project is completed on time and on budget, while maintaining a commitment to industry standards" (Irish 2005). This includes team management, resource allocation, team communication, and external relations ranging from PR to interfacing with company management.

In fact, the scale of modern game projects rivals most enterprise software efforts, and uses many of the same techniques. Though the size and scope of games vary widely, one game from 2004 may serve as an example of the complexity of the game development process. In that case, the core team consisted of 35 people, who, over the course of 18 months wrote 480,000 lines of code, separated into 740 computer instruction files, with a budget of $7 million (Hardy 2004). Games can easily reach over 3 million lines of code, and cost up to $50 million with hundreds of employees involved, which represents a more significant effort than many business applications. Thus, while innovation and creativity are important in the game industry, the execution of the concept resembles standard software development. It is also critical to note that despite superficial resemblances to Hollywood in areas like job titles, the operation of game companies is much closer to that of other software companies, including incorporation of standard programming techniques, bug testing, and quality assurance.

The second role of interest is that of the designer, who invents game ideas and is in charge of guiding the development team to make his vision a reality. In the words of one guidebook to the industry, "the game designer is the center of creativity in the game industry. From the designer's vision emerges the entertainment, in the form of game play and story... the game designer needs to be a Renaissance man or woman—they must be able to understand people and story and character, but also to understand logic and sequence and interaction in a very precise way." (Baldwin 2006: 37) Designers often start their careers as programmers, and are usually very involved in the day-to-day technical work involved in building a game. While there are a handful of famous game designers, the vast majority is unknown, and, in interviews, even other game designers were not able to recall the names of designers of some of the best-selling games of the past few years.

Between them, designers and producers are responsible for the overall execution of a game. The average game design team in the sample has 45 people, and often several dozen more temporary workers, such as voice actors and beta testers. There may be several designers and producers on each project. The designers fill the lead innovative roles, and the producers, the managerial roles. Having both of these job descriptions allows us to examine the effects of individual differences by job function: innovative roles where we would expect individual variation to be quite high (designers) and managerial roles where presumably variation in performance is less (producers).

These individuals do not operate independently; they are part of firms known as game developers. Game developers are almost always organizations as well as firms; less than 1% of all games with identifiable revenues were the work of lone individuals, and less than 2.5% of all games credited fewer than five people. The demographics of the 602 firms that appear in the sample used for the analysis are given in Table 1 below. As can be seen in the table, game developers exhibit the characteristics we would expect to see in firms in most industries. For example, these firms have average lifespans that exceed a decade, and, on average, over 140 uniquely identified individuals have participated in each firm's core teams during the life of the firm, though the actual number of employees is likely much larger than the number credited.

INSERT TABLE 1 ABOUT HERE

In addition to game developers, there is an additional role that firms play in the game industry, that of game publishers. Publishers fund game development, and also distribute and market end products for a share of the revenue. Some game developers also operate as publishers, such as Electronic Arts, but the role is often separated into two different companies. There are many publishers, 398 of which have published games with identifiable revenues in the sample. Since publishers have little impact on the day-to-day process of game development, they are not dealt with in detail in this study, although potential effects are controlled for in later analyses.

Additionally, while there are several subsets of the video game market, I have chosen to focus specifically on one segment, PC games, as opposed to console games like those that run on the Nintendo, Xbox, or Sony systems. There are a number of advantages to examining PC games, which make up about 15% of all games sales in recent years. First, as compared to the console game industry, barriers to entry are quite small, as the PC is an open platform, and there are no requirements imposed by manufacturers, as there are with console games. Therefore, we would expect to see the widest diversity of organizational forms in this submarket. Secondly, PC games have tended to be the innovation leader in the game space, since PC technical characteristics were decisively ahead of consoles through 2006 – almost all major game genres have begun on the PC first. Finally, consoles tend to be limited to the technical frontiers of a particular system, making high graphics and sound quality a priority, while PC games have traditionally had successful games that run the gamut from sophisticated 3-D worlds to static puzzle-solving mysteries, again making it easier to observe a range of potential organizations.

THE DATASET

For this analysis, I used a unique dataset, the MobyGames database. An internet repository of game information, MobyGames lists their goal as: "*To meticulously catalog all relevant information about electronic games on a game-by-game basis, and then offer up that information through flexible queries and data mining. In layman's terms, it's a huge game database.*" MobyGames has information on over 34,000 games, all entered by users of the site on a volunteer basis, according to a detailed set of coding instuctions. To ensure accuracy, MobyGames requires peer review for all data entered into the database before such data is accepted. Though the database is not complete, in that there is not full information for all games, the data are of high quality and normalized to well-established standards established by MobyGames. The dependent variable data come from additional sources, as discussed later.

The full dataset on the PC games industry covers twenty-five years from 1981 to 2006 and contains 5,794 games with full credits and normalized titles. As will be discussed, the data are further matched with two sources of performance information – revenue and critical reception. Since performance data was limited to commercial games sold between 1994 to 2006, this culled the sample somewhat: 1,970 credited games had revenue information, and 2,117 credited games had critical reception information. These games involved a substantial number of individuals in the development process. Core team[2] sizes ranging from 1 to 395, with a mean of 45 people in the core team for games which have both credits and performance information

In order to differentiate between firm and individual effects, the analysis includes only those individual designers and producers who created games for more than one organization. Additionally, to differentiate between various individual effects, the analysis only includes designers and producers who worked with other combinations of designers and producers, rather than repeatedly being part of the same team. Dropping games with individuals that did not meet those criteria resulted in a final sample of 1,536 games with critical reception information and 1,507 games using revenue information. This ultimately allowed me to identify fixed effects on revenue for 412 individual designers and 706 individual producers, and fixed effects on critical reception for 441 designers and 700 producers. While designers and producers analyzed for fixed effects will obviously tend to have a longer industry tenure and more games to their credit than the average individual who is not part of the fixed effects analysis, their project history is generally not significantly different. However, the limit of the analysis to only those individuals that move between firms is a potential cause of concern because of recent research that has discovered that, under some conditions, skills are not portable between firms (Groysberg and Nanda 2001; Huckman and Pisano 2006). Comparisons between the sample group and the general population, which can be seen in Table 2, gives us some confidence that the sampled designers and producers remain representative. Of all of the dependent variables, only the game ratings for designers differ significantly between the two groups, and there by about 1 rating point out of 100, while revenue and rating for producers and revenue for designers shows no significant variation.

INSERT TABLE 2 ABOUT HERE

VARIABLES

Using the data on individual games, we will use a fixed effect model to separate out the extent to which project success is attributable to individual designers and producers, as opposed to all other factors, including that of firms (Bertrand and Schoar 2003). There are two separate dependent variables, as well as a wide variety of controls used in the analysis.

DEPENDENT VARIABLES

Revenue Between 1995 and 2006, research company NPD Funworld tracked the sales data of every PC game sold through US retail channels for most major retailers, and projected revenues for the rest. This dataset was matched with the MobyGames dataset, and a total of $8.2B worth of revenue was identifiably linked with games in the database. As PC games are, in part, a hit-driven industry (average revenue was $3.2M, but the best-selling PC game of all time, *The Sims*, sold $260M, more than twice its closest competitor), I used the more normally-distributed log of revenue (lrevenue) for my analysis.

Rating Games are often reviewed by third-party critics from specialized magazines and websites. These critics assign scores to each game using a variety of systems. I used the Game Rankings database of 36,792 reviews from reputable magazines and websites as my source of ratings information. Each review was normalized on a 1%-100% scale, with 100% being the highest. Ratings were only used when two or more separate ratings were available for an individual game.

INSERT TABLE 3 ABOUT HERE

Rating and lrevenue are only moderately correlated (.42). Measuring both rating and revenue allows me to control for a number of factors that might affect one outcome and not the other. For example, name recognition or marketing spending may affect the revenue generated by a game, but would generally have a more modest affect on critical reception. Similarly, the critical reception of a game may not be an indicator of mass-market success, while revenue obviously is.

I excluded from my analysis all expansion packs, which are value-added games that will only operate with the original software package, and that add features or additional gameplay elements. Since the performance of expansion packs on the market are circumscribed by the sales of the games on which they expand, they are not easily comparable. I also did not include "casual games" which consist of card games and puzzle games, "adult"-oriented titles, and educational games, as they are generally considered to represent separate markets from the standard PC games industry.

CONTROL VARIABLES

In order to isolate the effects of individuals and firms, I controlled for a number of factors:

Team Size Core team size is a good estimate of cost and effort associated with a game, as personnel costs are the primary expense of most development companies (Rosmarin 2006). Additionally, a large core team size would indicate a more challenging managerial environment, with more need for coordination among multiple individuals. The median team size for games with known revenue or rank is 45.

Year The market for games can vary from year to year, as both the economy and related markets, such as video game consoles, vary. Year controls for the release date of each game in the United States, or, for games that launch in multiple countries, the worldwide release date.

Genre Games can be published in a number of genres, ranging from business simulations to "shoot-em-up" arcade games. These genres may attract different audiences and thus have different market receptions. Since designers and producers could specialize in particular types of games, I control for five separate genres and the combinations thereof[3]. These genres are coded by individuals entering them into MobyGames, and go through at least one peer review before being accepted.

Publisher In addition to developers, game publishing firms play an important role in the PC game industry. Though the financial effects of publisher funding is captured by team size, there could potentially be an effect where larger publishers, with more resources, have better ability to develop top titles. I control for whether a game was published by one of the largest ten publishers (controls based on past publisher performance yielded similar results).

Sequel and **Licensed** Two additional game-level characteristics are whether a game is the sequel of a previous game, and whether it includes licensed content. Licensed content refers to intellectual property from an outside source (such as a movie or television program) that has been incorporated into the game. Sequels and licensed content could offer additional name recognition to games, thus boasting their appeal relative to new or unlicensed games.

RESULTS

The results in Tables 4 and 5 show the F-tests and Adjusted R^2 for four models. The first model includes only the control variables, the second model adds firm-level fixed effects, the third adds designer fixed effects, and the fourth model adds producer fixed effects. The first row gives the number of games in each sample. The rows labeled *Company*, *Designers*, and *Producers* give the F-statistic for the joint significance of the company, designer, and producer fixed effects respectively, with the p-value below in parentheses. The last two rows report the F-statistic and Adjusted R^2 for each model.

INSERT TABLE 4 ABOUT HERE

INSERT TABLE 5 ABOUT HERE

The analysis shows that behind the veil of the firm, variation in individual managers and innovators has a both large and significant effect on the success of individual projects when looking at both revenue and ratings . Adding individual designers to the model incorporating firms increased the adjusted R^2 for ratings by over .05 and revenue by over .10. The impact of producers proved much more significant, increasing adjusted R^2 by around .14 for ratings and revenue. In total, the individuals in just these two roles accounted for 25% of the variation in revenues and 19% of the variation in rating for the products for which they were responsible. Additionally, the individuals with the managerial role of producer explained more of the variation in performance than the individuals who filled the innovative role of designer.

Firm-level effects are also significant and account for as much variation as the two individual roles tested. However, the firm-level effects likely overstate the importance of firms relative to individuals because they incorporate all additional team members for each game (on average, over 40 different individuals) as well as the effects of people not given in the credits, such as marketers and company leaders, in addition to other factors which may have been left out of the controls. Firm-level effects also would encompass dyadic effects created by the teamwork between lead designers and lead producers as well as team effects more broadly, that are really the result of groups of individuals achieving a synergy where they are more than the sum of their parts. Thus, while some variations in revenue and ratings likely remains attributable to firm-level effects, the variations in the performance of individuals for these two roles alone is at least as important. This finding was robust even when firm age and size were taken into account by creating dummy variables for firms over 5 years of age; for firms that were over one standard deviation larger than average; and for firms that were both older than 5 years and larger than average.

Since some games are blockbusters or flops with revenues far above or below the mean, I also performed a robustness check on the revenue results by removing the top ten percent and bottom ten percent of games by revenue. These results (Table 6) further demonstrate the role of managers over firm-level effects or innovators. With blockbusters and flops removed, the effect of firms in explaining performance variation drops to 20%, for designers it drops to 7%, and for managers it increases sharply to 27%. Table 7 offers a summary of all the results.

INSERT TABLE 6 ABOUT HERE

INSERT TABLE 7 ABOUT HERE

There are a number of limitations to this study. First, the game industry may serve as a special case, with its low capital requirements and relatively fluid employment systems making it more suited to individual achievement than other industries. However, the game industry does echo aspects of other highly innovative industries where firms remain the dominant form of organizing – such as software, web services, and biotechnology – and which might serve as future models for study. Also, the fact that managerial producers explained more of the variation in performance than innovative designers indicates that the importance of individuals is not limited to innovative roles, and so is likely not purely an artifact of creative industries. A second limitation is that, in order to conduct the fixed effect analysis, the sample only includes individuals who moved between companies; these individuals may be more uniquely productive, and therefore have a greater affect on performance, than those who decided to stay within the organization. Alternately, by virtue of moving, these individuals may instead be much less productive than the average (Groysberg and Nanda 2001; Huckman and Pisano 2006). In both these cases, though, the initial demographic features described in Table 2 do offer some reassurance. Additionally, as has been noted, team and dyadic effects are not included in this study, opening the possibility that it might be small groups, rather than individuals, that affect performance. In discussions with game company founders, particular teams did not seem to be the driving force behind variations in performance, and teams were often rotated, but the possibility cannot be ruled out. Even if this were the case, however, teams would represent a level of analysis not currently used in explaining firm performance.

Discussion and Implications

These results exceed by a large margin the threshold of the performance derived from individuals that we would expect to see from traditional views of the firm where organizational and environmental, rather than compositional, factors that drive performance. Especially when the potential for the over-inflation of firm-level effects are taken into account, it is unclear how significant firm-level processes actually are in explaining performance, but they are, at most, on the same scale as the role played by just two individuals within the product team. The effects of individuals in this case also greatly exceed those found in Bertrand and Schoar (2003) for top-level executives. Far from being interchangable, individuals uniquely contribute to the success or failure of a firm.

Additionally, the relative contribution of the two roles to firm-level variation is also unexpected. Even in a young industry that rewards creative and innovative products, innovative roles explain far less variation in firm performance than do managers. This is surprising for two reasons. First, we would expect that individual variation in innovative roles would be greater than that of more standardized managerial roles. Second, given the research tradition on the importance of organizational factors to facilitate the success of middle managers (Westley 1990; Wooldridge and Floyd 1990), the finding that individual managers account for more variation in performance than firm-level factors in some occasions is particularly intriguing. These two results – that individuals explain much of the performance difference between firms and that managerial roles have more impact on performance than innovative ones – challenge long-held assumptions about firm performance.

IMPLICATIONS FOR SUITS VS. INNOVATORS

The first intriguing finding is the relative importance of individual managers over individual innovators within organizations. Rather than acting as cogs in the machine, dwarfed by organizational level effects, the effect of managers on firm performance was actually larger than that of organizational factors, when the top and bottom earning products were removed. This effect was robust even when firm size and age were taken into account, implying that individual managerial differences play an outsized role in firm performance. Though this finding might seem surprisingly at the scale of firms and industries, it is supported by intrafirm-level research on the role of middle managers in the innovation process.

Recent research on the role of individuals and groups in industries as diverse as consulting (Hargadon and Bechky 2006) and comic books (Taylor and Greve 2006) supports a longer literature on project management (see Brown, (1995)) that has demonstrated the complex interaction between individuals and teams in successful innovation. The finding that managers have significantly more impact on firm performance than individual innovators aligns with this tradition. It suggests that high-performing innovators alone are not enough to generate performance variation; rather, it is the role of individual managers to integrate and coordinate the innovative work of others.

There are a number of ways in which this might practically occur within the game industry. For example, good managers will be able to whittle down a designer's product ideas into a realistic project plan, while a less capable manager working with a more capable designer may be unable to translate a better design into reality. Or, it may be that certain managers are good at facilitating the sort of collective creativity that results in high-quality products (Hargadon and Bechky 2006), while others are less capable of making their teams more than the sum of their parts. Regardless of the particular mechanism, it suggests that the oft-overlooked middle manager may play a far greater role in industry-wide innovation than is typically acknowledged. And the large role of managers raises a second question, why do these extremely productive individuals choose to remain inside firms, rather than act as free agents?

Implications for Theories of the Firm

All current theories of the firm rely on organizational, rather than individual, factors to explain performance, though the details of which organizational factors matter vary from theory to theory. For example, Blau (1966) and Thomson (1967) have argued that firms offer special efficiencies in coordination and control, while economists such as Coase (1937) and Williamson (1985) have postulated that organizations arise when individuals would face too much uncertainty and opportunism to use free market contracts. According to these views of the firm, if individuals, rather than organizational factors, largely determine firm performance differences, individuals should tend to operate more as free agents, rather than become long-term employees of established firms. But free agency is rare among designers and producers in the game industry, who instead operate as employees (Rollings and Adams 2003). And yet firms contribute relatively little to performance.

Perhaps individuals remain part of firms not because individual firms enhance performance, but rather because firms as a category might be required for coordination among employees. Within the game industry, however, there is ample evidence that firms are not strictly required for coordination, even for complex projects. A parallel market, that of customer-driven modifications to commercial games (called "mods") demonstrates that individuals can operate independently of firms. Motivated individuals and teams have created tens of thousands of mods over the last twenty years, resulting in some mods that are more professional and popular than the original games themselves. Postigo (2007) identified 39 large mods for the top selling action games of 2004, finding that one representative mod development team consisted of 27 people from seven countries who programmed for about 15 to 20 hours a week for over a year and a half. These mods are coordinated without the benefit of firms, without contracts, and often without any personal contact between team members. This strongly suggests that firms are not strictly required in order to produce computer game products.

If conventional performance-based rationales for the existence of firms are not convincing in explaining the results of this study, an alternative role of the firm is possible: that, in some cases, firms can be socially necessary to facilitate individual action, rather than directly increasing performance through strategy, routines, or resources. This view draws a distinction between the firm as a public and visible player in an industry, and the functional or productive organization that we assume a firm contains. These two entities need not always be the same. Broadway (Uzzi and Spiro 2005) and Hollywood (Bechky 2006), both have functional organizations but not firms, since they depend on individual free agents brought together on a project. Similarly, the reverse case might be true. In many industries the firm may merely serve to indicate, sometimes falsely, to that outside world that an organization exists, rather than as a source of organizational capability itself.

This approach not been previously been directly invoked in the literature, but it is a natural implication the work of Hannan and Freeman (1984) on the forces that underlie the existence of firms. Hannan and Freeman challenged the idea that market efficiency is the sole reason that firms are organized, instead firms have a social advantage over individuals. Firms routinize individual action, smoothing out individual differences and ensuring that an organization will have lower performance variance than a randomly drawn free agent. Similarly, firms can rationally explain their actions, making consistent arguments using appropriate rules and procedures. For example, firms can demonstrate to employees that they offer predictable career paths, to investors that they have formal management processes for money being spent, and to governments that they are appropriately certified to do business.

Those theories imply that while individuals may be the relevant productive units in an industry, appearing to operate as firms they may still need to wear the garb of organizations in order to do business with other organizations. In many industries, therefore, new firms may be created in a self-perpetuating cycle – they arise not in order to maximize productivity, but rather as a response to an environment which demands their creation in order for a business venture to be taken seriously. Since this study cannot discount all firm effects, more research is needed to definitively demonstrate that firms are operating in this social role, rather than a purely productive one. However, the comparatively large impact of individual differences over organizational factors in firm performance strongly suggest that firms may be serving a purpose beyond mere performance.

Conclusions

While any population of firms is ultimately heterogeneous at some level of analysis, the general assumption has been that variations in firm performance are largely the result of processes, rather than people. This paper argues that the performance of organizations may actually vary greatly as the individuals within the firms vary. Further, it is the individuals who fill the role of middle managers – the "suits" – rather than the creative innovators that best explain variation in firm performance.

While these findings may vary across industries, and even within industries, they suggest that scholars should pay more attention to the individual makeup of organizations, rather than focusing solely on organizational-level characteristics. Additionally, this study also challenges the assumption that firms are formed solely for reasons of performance, instead suggesting that firms may sometimes serve social, as well as productive, functions. Finally, this paper underlines the importance of middle managers, who are critical to firm performance even in highly innovative industries, and suggests the need for further research into the mechanisms by which middle managers influence firm performance.

END NOTES

[1] This blurring was sometimes purposeful in the early days of the game industry, when it aspired to the luster of Hollywood. For example, the term “producer” to describe the role of product manager was first used in 1982 by Trip Hawkins, founder of Electronic Arts, who had previously worked as an early in employee of Apple. Despite no experience in films, he choose to use terms from the film industry, in a case of what one industry analyst called "Hollywood envy.” (Crawford 1995)

[2] I use the concept of core team so as to include only those credited individuals who are involved throughout the development of a typical product. This excludes specialized roles such as testers, researchers, voice actors, and movie production crew that are limited to a subset of games. The core team includes designers, producers, programmers, artists, and management. Full teams range from 1 to 1,485 in size, mean 55.93, SD of 80.

[3] The genres are: action-adventure, racing and driving, sports, role-playing games (RPGs), and simulation-strategy games. Individual games can be coded with multiple genres, such as a game that includes both role-playing and sports elements.

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Table 1:**Game Developer Company Demographics**

Companies	N	N Acquired	Mean Founding Date	Mean Lifespan✧	Mean # of Games	Mean Percent Credited	Mean Unique Credited Workers/Firm⋆
Operating	332	61	1994.2	12.8	4.3	0.72	174
Exited	270	57	1992.5	8.9	4.5	0.77	112
Total (SD)	602	69	1993.5 (6.4)	11.1 (6.7)	4.4 (7.3)	0.74 (.26)	146 (191)

SD given in parentheses below totals

✧ Lifespan is right-truncated for firms still operating.

⋆ Determined by counting the number of unique core team individuals for credited games only.

Table 2: **Means for sampled Individuals with Fixed Effects Compared with All Individuals (SD in parentheses)**

	N Games	Rating/ Game	Log(Revenue)/ Game
All Designers (N=3805)	4.2 (4.8)	0.73 (.12)	6.15 (.72)
Sample Designers (N=531)	7.5* (6.5)	0.74* (.10)	6.19 (.65)

	N Games	Rating/ Game	Log(Revenue)/ Game
All Producers (N=2827)	5.7 (6.0)	0.71 (.12)	6.10 (.72)
Sample Producers (N=826)	9.3* (7.1)	0.71 (.10)	6.11 (.61)

Note: Sample Designers and Producers include only those with both rating and revenue information.

* p <.05

Table 3: **Descriptive Statistics for Dependent Variables for Games with Credits**

Variable	Obs	Mean	Std. Dev.	Min	Max
Revenue	1970	3576009	1.06e+07	25003	2.61e+08
lrevenue	1970	13.6488	1.729752	10.12675	19.37981
Rating	2117	.6979901	.1449379	.06	1

Table 4: **Fixed Effect F-Test Results for Ratings**

Results given are the F-statistic, the p value of the F-statistic is given in parentheses.

	Model 1	Model 2	Model 3	Model 4
	Controls	All Firm-Level and Controls	Model 2+ Designer FE	Model 3+ Producer FE
N	1536	1536	1536	1536
Firm		2.09*** (.000)	1.98*** (.000)	2.05** (.003)
Designer			1.33** (.001)	1.71* (.016)
Producers				1.86* (.007)
F-statistic	7.99*** (.000)	2.52*** (.000)	2.08*** (.000)	2.51*** (.000)
Adjusted R^2	.1373	.4001	.4556	.5918

* p <.05
** p <.01
*** p <.001

Table 5**: Fixed Effect F-Test Results for Revenue**

Results given are the F-statistic, the p value of the F-statistic is given in parentheses.

	Model 1	Model 2	Model 3	Model 4
	Controls	All Firm-Level and Controls	Model 2+ Designer FE	Model 3+ Producer FE
N	1507	1507	1507	1507
Firm		2.12*** (.000)	1.97*** (.000)	1.99** (.001)
Designer			1.75*** (.000)	2.57*** (.000)
Producers				2.26*** (.000)
F-statistic	24.1*** (.000)	3.14*** (.000)	2.88*** (.000)	3.80*** (.000)
Adjusted R^2	.2341	.4832	.5872	.729

* p <.05
** p <.01
*** p <.001

Table 6**: Fixed Effect F-Test Results for Revenue, Subtracting the Top and Bottom 10%**

Results given are the F-statistic, the p value of the F-statistic is given in parentheses.

	Model 1	Model 2	Model 3	Model 4
	Controls	All Firm-Level and Controls	Model 2+ Designer FE	Model 3+ Producer FE
N	1207	1207	1207	1207
Firm		2.02*** (.000)	1.49*** (.000)	2.29*** (.000)
Designer			1.26** (.002)	2.43*** (.000)
Producers				2.26*** (.000)
F-statistic	10.71*** (.000)	2.01*** (.000)	1.87*** (.000)	3.1*** (.000)
Adjusted R^2	.1387	.3387	.4038	.6759

* p <.05
** p <.01
*** p <.001

Table 7**: Summary of Fixed Effects**

	Revenue (N=1507)		***Rating (N=1536)***		***Trimmed Revenue (N=1207)***	
	F-statistic (p-value)	Contribution t to Adjusted R^2	F-statistic (p-value)	Contribution t to Adjusted R^2	F-statistic (p-value)	Contribution t to Adjusted R^2
Controls		0.23		0.137		0.139
Firm	1.99*** (.001)	0.249	2.05** (.003)	0.263	2.29*** (<.001)	0.2
Designer	2.57*** (<.001)	0.104	1.71* (.016)	0.056	2.43*** (<.001)	0.065
Producer	2.26*** (<.001)	0.142	1.86** (.007)	0.136	2.26*** (<.001)	0.272
Model Total	3.80*** (<.001)	0.729	2.51*** (<.001)	0.591	3.10*** (<.001)	0.676

* p <.05
** p <.01
*** p <.001