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Fitness Determinants in Creative Industries: A Longitudinal Study on the Hollywood Film-Making Industry, 1992-2003

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Abstract It is often overlooked that fitness is a multidimensional concept, and that its components are context-specific. The multifaceted nature of fitness is most evident in cultural/creative industries, because firms are confronted with the challenge of balancing seemingly conflicting needs: artistic performance and commercial imperatives have to be satisfied for long term survival. In this study we examine two important component-traits that make up the fitness function for the Hollywood motion picture industry, which we argue are human capital and network capital. Although many studies have recognized the critical role of 'creative' human capital – which is typically embedded in individuals and groups – and network capital – that is, inter-organizational networks – we do not have many studies that empirically analyze their complex relationships using large scale data sets. We situate the analysis within the period 1992-2003, one in which we have good data and the industry appears relatively stable and very productive. While still exploratory, our paper shows how such human capital and network resources interact with the structure of the industry and influence different dimensions of the fitness

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function. We show how the traits work differently on the different dimensions of fitness to create a dynamic tension between creativity and performance.

Keywords Fitness · Human Capital · Network Resources · Commercial and Artistic Performance

1 Introduction

Studying the determinants of organizational fitness has a long-standing presence in the management and organization literatures. Structural contingency theory, for instance, maintains that fitness differences originate from the level of internal consistency or fit between organizational structure and strategy (e.g. Chandler 1962; Learned et al. 1965), environmental conditions (e.g. Burns and Stalker 1961; Lawrence and Lorsch 1967; Pennings 1987) or technology (Scott 1975; Barley 1990). Similarly, the strategy-structure-performance paradigm, a sub-stream of structural contingency, argues that firm fitness – as captured by firm performance – essentially depends on the alignment between strategy, structure and the environment (e.g. Child 1972; Miles and Snow 1978; Porter 1980; Doty et al. 1993).

Despite its widespread acceptance, however, this stream of research suffers from several shortcomings such as the reliance on single contingencies (for a comprehensive review, see Galunic and Eisenhardt 1994). Although, recent research has attempted to tackle some of these problems (e.g. Levinthal 1997; Rivkin 2000; Siggelkow 2001, 2002; Zajac et al. 2000), a few issues deserve further investigation.

First, the choice of the traits or attributes that are presumed to affect organizational fitness is not always adequately related to the selection environment. It is unclear why certain attributes, and not others, are to be treated as fitness determinants without a finer-grained qualification of the context in which firms operate. In this paper, we take it as axiomatic that fitness is a complex multifaceted concept that is 'context-dependent' (e.g. Hawley 1950; Hannan and Freeman 1989; Hodgson 1996; Levinthal 1997; Knudsen 2004). As in biology, the nature of the selection environment determines which traits or attributes affect organizational fitness (e.g. De Jong 1994).

Second, while the identification of the relevant organizational attributes is context-specific, their relative importance is likely to be contingent upon the particular dimension of the fitness measure being chosen. Reliance on a single fitness dimension can be misleading (Meyer and Gupta. 1994), and different fitness dimensions may interact. Success along one dimension may interfere with another.

The objective of this paper is to look at the relationships of each dimension with organizational traits that are typically viewed as critical in a particular environment. We chose a research site, the film production companies of the Hollywood movie industry, which we traced over the period 1992-2003. In this industry, artistic performance is said to be both necessary and antithetical to commercial success: creativity helps underpin future commercial success and the survival of the genre, but attributes that significantly affect box office receipts are less relevant for artistic performance. Our twelve-year time slot allows us to study the tension between these two dimensions of fitness. To this end, we distinguish between fitness as a measure, i.e., box office and artistic performance, and fitness

as a function, i.e., the specific functional form that relates those attributes to the fitness value (Hannan and Freeman 1989; Venkatraman 1989; Knudsen 2004).

While film production companies have to control many dimensions, we concern ourselves with two critical traits: *human capital* and *network resources*. We focus on these two traits for both theoretical and empirical reasons. Theoretically, a large body of research has shown the way in which human capital and network resources critically affect firm performance (e.g. Nahapiet and Goshal 1998). Moreover, as we shall see, movie production companies are essentially project-based organizations, and human capital and network resources are among the most salient factors. On the human capital side, fitness stems from the ability to attract and retain 'creative' resources, typically embedded in individuals and groups (Caves 2000); on the network resource side, the creation of social networks allows consistent access to creative and financial resources (e.g. Jones and DeFillippi 1996). We therefore build on past work to create a more integrated perspective. Our purpose is to study the impact of human capital and network resources on the previous fitness dimensions, i.e., commercial and artistic performance.

The paper is organized as follows. In the next section, we elaborate on the notion of fitness. We then examine our research question in the context of creative/cultural industries. In particular, we describe the context-specific organizational traits that affect organizational fitness, and advance some conjectures that we explore in the empirical section. We then describe the data, the model, the methods used in the analysis, and the results of the statistical analysis. We conclude with the main implications of the findings and the conclusions that follow from them, and we identify important topics for future research.

2 Theory

As Stearns (1976, 4) puts it, fitness is "something everyone understands but no one can define precisely." Despite a wealth of diversity in fitness definitions, full agreement is hardly achieved. In biology, fitness has been alternatively used to indicate a short-term measure of reproductive success or a measure of general *adaptedness*. A common shortcoming of these fitness definitions is that they amount to "a description of natural selection, not an explanation, thus ... rejecting any use of fitness that refers to an innate quality or a good design" (De Jong 1994, 4).

The determinants of fitness are, of course, difficult to assess. A first strategy to study them is to "describe the association between a trait considered to be of interest and fitness, or, more usually, a fitness component" (De Jong 1994, 6). This association corresponds to a fitness function, which relates the value of a trait to the value of fitness, however measured. A potential problem of this approach is that "the relation between trait and fitness might be developmental and incidental, in that trait differences accompany fitness differences, but do not give rise to fitness differences" (De Jong 1994, 6). To get around this issue, an alternative approach is to study the association between traits of interest and fitness components with respect to a specific context (De Jong 1994; Metcalfe 1998; Knudsen 2004). From this perspective, fitness is defined as a mapping between amounts of a trait at two different points in time, and is used to measure whether the 'genetic' makeup of

particular types is superior to the makeup of other types, but with respect to a specific context or selection environment (e.g. Sober 2000).

In this paper, we use the second approach, that is, we map traits onto performance dimensions. We ground the analysis in a well defined empirical setting on the premise that the nature of the selection environment determines which traits are likely to affect the degree of organizational fitness at any given point in time. The next section provides a more detailed discussion of the determinants of fitness in the selected context, the Hollywood film-making industry. The objective is to pin down which traits seem to be related to organizational fitness – a preliminary but necessary step before estimating their relative weight or contribution.

3 The selection environment of the film industry

The film industry is an ideal setting for studying the multifaceted nature of organizational fitness. As is often the case with the "art world" (Becker 1982) and "creative industries" (Caves 2000), filmmaking exhibits an intrinsic tension between artistic and economic or commercial success (Baker and Faulkner 1991; Lampel et al. 2000). Commercial considerations are often negatively correlated with artistic performance because "in an effort to achieve greater market success, the producers of culture tend to aim their offerings at the lowest common denominator of mass acceptance . . . " (Holbrook 1999, 144). On the other hand, though firms need enough financial resources to produce the next movie, no enduring success can be attained without producing movies of good artistic quality. We first explain more clearly the firms in question and then the selection environment.

The Hollywood film-making industry consists of several categories of players that operate across a complete value chain. Along with audiences and distributors (or majors), production companies are among the key industry players. Since audiences pay for the producer's goods (i.e., the movies) and the distributors create a market for them, producers "make the most sound and profitable decisions for their pictures and their companies if they hold themselves accountable to these two categories. Audiences and distributors are the producers most beneficial and crucial sources of business checks and balances" (,see also Lee 2000; Honthaner 2001, 7,).

Production companies can be classified into two groups. First come the production company-subsidiaries of the 8 major firms, seven of which are established players – i.e., Metro-Goldwyn-Mayer, Paramount Pictures, Sony Pictures Entertainment (Columbia-Tristar), Twentieth Century Fox, Universal Studios, Walt Disney Company, and Warner Brothers – and one of which is a newcomer Dreamworks (Scott 2002, 961). The other group consists of a large number of independent production companies. These firms "interact with one another in complicated ways as any given motion-picture production project moves through it three main stages of development, namely: (a) pre-production [. . .]; (b) production [. . .]; and (c) post-production [. . .]" (Scott 2002, 961). This independent sector "consists of hundreds of very small production companies of a few key employees each" (Litman 1998, 37). These companies are typically established around few key figures (producers, budgetary personnel and maybe some creative people) whose work essentially consists of assembling packages of scripts, talents (director, actors,

cinematographer, etc.) and other assets to present to the studios in the hope of securing a distribution agreement and, quite possibly, some financing.

There are three approaches to feature-film production. The majors produce projects autonomously, fully relying on their financial and physical assets (with varying degrees of vertical integration). Since the break-up of the vertical structure of the industry some years ago, this is not a common practice. Most commonly, the large firms work closely with independent production companies, with the latter assuming primary responsibility for organizing overall production tasks. Finally, independent companies may work autonomously, approaching the majors as distributors rather than partners.

In understanding the selection environment it is important to realize that the friction between artistic aspirations and commercial needs has shaped the dynamics of the movie industry virtually from the outset (Vogel 1998; Svejenova and Alvarez 2002). Caught in the middle of a ceaseless tension between the studios' urgency to capitalize on large and highly uncertain investments and the creative ambitions of imaginative filmmakers, production companies have to make movies that are the expression of relentless and strenuous attempts at reconciling opposing imperatives. A distinctive feature of this search is the classic struggle between the producer and the artists, where "the producer's interests (making a film that will attract a large audience that is also in time and on budget) are in conflict with the director's (creating a work of art) and the director can misrepresent actual expenditures of time and money" (Baker and Faulkner 1991, 286).

Artists usually desire the freedom to generate a creative outcome without being constrained by financial or market-related considerations. In contrast, the production company's financial backers seek to maximize returns on their investments (Glynn 2000). As the popular film producer and director Roger Corman noted (Corman and Jerome 1990, 237), filmmaking "is a compromised art form. It's a 50-50 split, art and commerce. Maybe that's why Americans are good at it. In a time when American industry is falling behind other countries, the American film industry is by far the most successful in the world. That's what we're good at–art and commerce, compromised." The reward for those who know how to reconcile such contrasting tensions is great, leading to worldwide recognition and success.

In his attempt to explain the way that selection operates, Lee (2000) argues that companies resolve these tensions by adopting one of the following two styles: creative protectionist and balanced. The first style reflects the stance of most of the independent producers and is characterized by its creative protectionist attitude toward distributors. More specifically, producers who take this stance in a film are so "intensely focused on the creative aspects of their pictures that distributors appear to represent a threat to the artistic integrity of their pictures and are commonly blamed if their pictures financially under-perform. This attitude often creates a love-hate relationship with their distributors" (Lee 2000, 8). But the industry also comprises a relatively small group of producers – e.g., Imagine Entertainment, Intermedia and Phoenix Pictures – whose objective is to strike a balance between their focus on creative movies and the need to please an audience and generate profits. Unlike creative protectionists, balanced producers tend to produce lower-risk movies by avoiding overemphasizing one aspect (creativity) at the expense of the others (income and audiences).

We do not use Lee's distinction to classify companies because we observe that companies change their stance over time and because the classification is overly crude in terms of understanding the fitness-dimensions and how traits operate. However, the point made regarding the tensions between creativity and financial performance is clearly correct. Firms are in fact expected to balance between these opposing imperatives (Hirsch 1972; Lampel et al. 2000). As a result, in their pursuit of the mass entertainment goal, firms "should not lose sight of artistic values. If artistic values dominate, commercial survival dictates that market realities cannot be ignored indefinitely" (Lampel et al. 2000, 265). These tensions map out in complex ways as this industry is beset by high levels of uncertainty and high mortality.

If commercial success and artistic performance are critical dimensions of fitness, what are the organizational attributes that influence them? While several traits could be taken into consideration, our analysis focuses on the roles of *human capital* and *network resources* both for theoretical and empirical reasons. The next two sections further elaborate on this point.

3.1 Traits: human capital and organizational fitness

Human capital refers to the talent, skills, knowledge and creativity of individuals working within an organization (Becker 1993). A large body of research in the resource-based tradition, for instance, emphasizes that human capital is among the firm's most critical resources (see Penrose 1959; Reed and DeFilippi 1990; Castanias and Helfat 1991; Coff 1997). The focus on "people" as a source of fitness is hardly new (e.g. Pfeffer 1994; Gimeno et al. 1997). However, human capital has become even more salient on the grounds that knowledge that lies at the core of an organization's competitive advantage (Grant 1996) is largely embedded in individuals (e.g. Nonaka and Takeuchi 1995).

Several studies have shown that the firm's stock of human capital bears a strong relationship with fitness. In particular, a firm's stock of human capital accounts for stable performance (Hitt et al. 2001; Bailey and Helfat 2003) and survival differences among firms (Bröcheler et al. 2004; Pennings et al. 1998). Not surprisingly, in knowledge intensive industries, organizations strive to retain their members (Coff 1997; Argote and Ophir 2002) or to expand their knowledge base by 'poaching' skilled individuals from rival organizations (Baty et al. 1971; Flides 1990; Rao and Drazin 2002).

The quality of human capital is undoubtedly important for both the artistic and economic performance of any creative industry, whereby the long-term survival of firms heavily depends on the ability to replenish 'creative' resources (White 1970). Talent is essential for the production process because creative activities critically bear on the imaginative and unique inspiration of gifted people who concern themselves with the originality, technical prowess, and harmony achieved in a creative act (Caves 2000). The quality of human capital also signals the value of goods that can hardly be assessed *ex-ante* because of the experiential nature of consumption in cultural/creative industries.

However, as creative resources are typically embedded in individuals and groups, firms usually have limited control over them (Stearns et al. 1987; Robins 1993;

Saundry 1998). Consequently, they are faced with the need to "recruit and motivate individuals who seem to possess the insight and intuitive understanding of how creative resources can be discovered and nourished. Their competitive advantage depends on finding these individuals and also on developing structures which leverage creative resources without at the same time stifling them" (Lampel et al. 2000, 265).

This is a vital challenge in any industry such as the movie industry, where individual talents, skills, values and creative experiences are the keystones around which critical decisions are made (Morley and Silver 1977). As the world acclaimed director Peter Weir said: "…behind movies shown worldwide there are just men and their talent." This point is also shared by Michael Medavoy, Phoenix Pictures chairman: "…it is the object of every producer to work with more talented filmmakers…because in the final analysis, you're in their hands. It is their vision that makes the film whatever it finally becomes" (in Squire 1992). By the same token, Sidney Lumet noted: "The contributions by the director, actors, music, sound, camera, set, editing, are so crucial that the film keeps changing continuously …all the efforts from the various professionals add up to a final result that is far better than any single part."

3.2 Traits: network resources and organizational fitness

While human capital is arguably a major fitness component, firms are also embedded in a dense system of inter-organizational ties and linkages. Firms can leverage these networks and their structural position in them as strategic resources. Drawing from the structural embeddedness perspective, Gulati (1999) defines *network resources* as resources that accrue to firms as a result of their position within the networks to which they belong. McEvily and Zaheer (1999) likewise assume network resources to coincide with the informational advantages associated with a firm's structure of ties. In essence, a firm's network resources or interfirm ties expose it to new ideas, information, and opportunities enhancing its capacity to compete. Along this line, a number of organizational theorists have demonstrated the impact of such positional traits as network centrality and/or density on firm innovativeness (Ahuja 2000) and performance (Powell et al. 1999, missing: Powell et al., 1999). Taken together, these studies suggest a link between an organization's position in a network structure and its fitness.

The importance of network resources in this industry is supported by several related arguments. First, the film industry is organized around projects, so the structuration of the field heavily rests on inter-organizational and personal networks. That is why organizational scholars often refer to this industry as a project-network organization (Jones 1996; Alvarez and Svejenova 2002). And indeed: "It all works like a network – noted an experienced film production manager – everyone knows everyone. If you do not know them, you normally know about them. If you don't know you can find it out" (Jones and DeFillippi 1996, 92). The film industry's network organization "is constantly being created and re-created. Firms and subcontractors combine for a specific project, disband when the project is finished, and then combine for new projects" (Jones 1996, 58). Since there is basically no formal authority overseeing this field structuration, emerging processes and outcomes are tightly linked to network structure and properties (White 1970).

In other words, the structure of the network is highly informative on its members' choices and decisions.

Second, through network resources, industry participants may gather different kind of relevant information. For instance, network resources may provide information about *talent*. As Sorensen and Waguespack (2004, 7) suggest: "Industry participants clearly believe that certain actors draw audiences, that some directors usually deliver good movies and that a few producers have good instincts for producing winning pictures. And they act on this belief." Thus, while a production company may know some key players (writers, directors, composers, cinematographers), a cinematographer may know other critical talents (designers, camera operators). Since, as Nahapiet and Goshal (1998, 252) argue, "who you know affects what you know," industry participants with a good position in this range of connections are more likely to match the right talents for the project (Jones et al. 1997). This matching process is part of the filmmaking process: once the script is done – explains director Talor Hackford – "…you're ready to go out and try to match the unique talents of other artists with the qualities of the script" (Brouwer and Wright 1991, 34).

Networks also permit the companies to gather information about *ideas* or project *opportunities* such as promising scripts, books or stories, new technologies, whose copyrights have not yet been secured. While a film project must bring together a complex assortment of creative and business-oriented people, the most important element in this mix is the creative idea itself (Litman 1998). Good ideas, however, are scarce and hard to locate, a point compellingly made by Kathleen Kennedy, president of Spielberg's Amblin Entertainment: "This company always looks for a good story. That sound very simplistic…but you'd be surprised – it is the most difficult thing to find" (Brouwer and Wright 1991, 17). Network resources thus enhance the ability to gain control of valuable assets (talents and ideas), pick the right project, and thus pursue winning ventures.

The previous discussion suggests that fitness in creative industries – and in the Hollywood film industry in particular – results from properly balancing artistic and commercial performance. Because for the reasons illustrated before a firm's human capital and network resources are expected to influence both artistic and commercial performance, and by implication firm fitness, establishing the relative importance of their influence might help properly strike that balance.

4 Methods

4.1 Data

To provide empirical grounding to our discussion, we collected data on all feature length movies distributed in the United States by the eight Majors (listed earlier) and the two largest independent distributors (Miramax and New Line) over the twelve-year-period 1992-2003. This time period was one of relative technological and market stability, for which comprehensive data are available. In the last decade, these distribution companies accounted for approximately 90% of the entire U.S. box-office. Our dataset does not include documentaries, foreign-made films, short films, and compilation screen classics. Figure 1 shows the yearly distribution of the sampled movies.

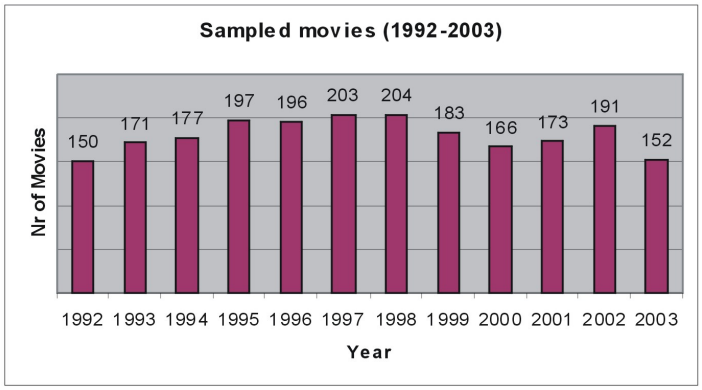

Fig. 1 Frequency distribution of movies by year of release

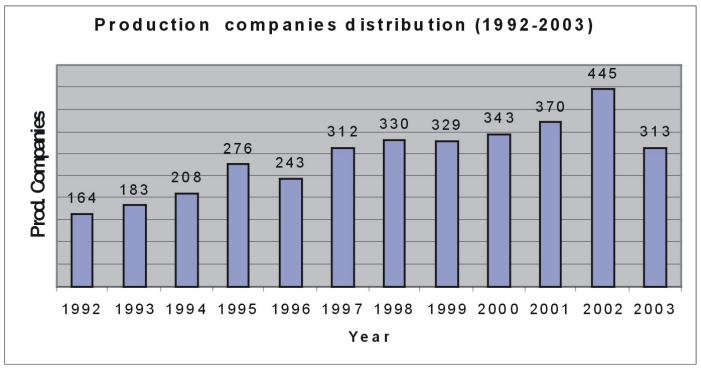

Fig. 2 Frequency distribution of production companies by year

Our dataset contains 2,146 movies. For each movie, we identified the corresponding production companies, resulting in a population of 1,912 firms (Figures 2 and 3). It is worth noting that about 85% of all the movies involve co-productions. Our data source was the Internet Movie Database (IMDB) – an online source owned by Amzon.com and largely supported through advertising. Most of the data provided by IMDB are submitted on a voluntary basis and validated by an in-house staff of 70 members. Whenever possible, we crosschecked the reliability of the data with the Alan Goble Film Index (Goble 2003).

Using the same data sources, we also identified the 12, 244 professionals involved in these companies. Given the great variety of professional profiles that operate in filmmaking, the analysis was restricted to the following set of roles: producer, director, writer, cinematographer, editor, production designer and actors (the four main actors based on the order of appearance in the movie credits). These roles, taken together, are the key representative of the so-called “core team” – i.e., the group of professionals involved during the actual shooting whose contributions are considered to be paramount for the realization of the film (Goldman

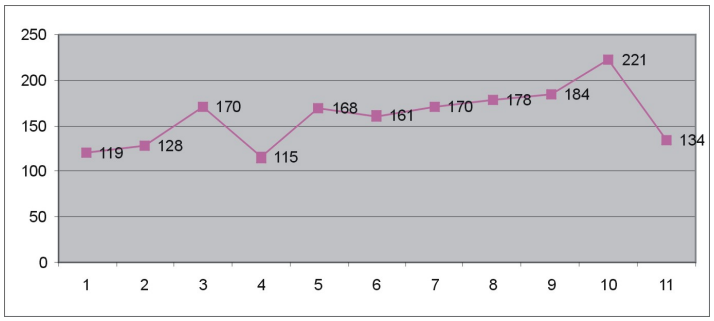

Fig. 3 Production companies entries (1992-2003)

1983). This team represents the organizational heart of the film-project during its shooting phase, as it includes all the key roles from each of the "departments" (art department, camera crew, lighting crew, etc.) in which the production crew is divided (Ascher and Pincus 1999, 210).

We analyzed the network of co-productions or alliances established by the production companies in our sample over the study period by creating a set of 12 squared valued adjacency matrices (one per each year). The data for this analysis are derived from two-mode affiliation data, where the production companies are the actors and each movie is the event. In this way, a connection between production companies is assumed on the basis of their collaborative production activity. We set elements ij and ji equal to 1 if the database treated production companies i and j as movie co-producers. Furthermore, because two or more companies could co-produce more than one movie in a given year, the element ij (and the symmetric ji) may also assume values greater than 1. The 12 resulting matrices were used to compute all network measures at the production and the professional levels.

It is worth noting that, while some production companies were active in the industry before the beginning of the observation period, others started during the study period. As a result, firms differ with respect to their histories and past experiences. Similar considerations hold true also for the professionals involved in the movies produced by the firms in our sample. In the analysis we accounted for differences in initial conditions by adopting a window of three years and running the analysis for the period 1995-2003.

4.2 Measures

4.2.1 Dependent Variables

We measured commercial and artistic performance – the two key fitness dimensions in our setting – by looking at movie box office receipts and critical reception.

Commercial Performance. We measured commercial performance in terms of box office receipts, following the lead of many other studies that have investigated issues of performance in the film industry (Faulkner and Anderson 1987; Baker and

Table 1 Measure of Critical Reception

Dimensions	METASCORE RANGE
General Meaning of Score	Movies & Music
Universal Acclaim	81-100
Generally Favorable Reviews	61-80
Mixed or Average Reviews	40-60
Generally Unfavorable Reviews	20-39
Overwhelming Dislike	0-19

Source: metacritic.com

Faulkner 1991; Sawhney and Eliashberg 1996). While the advent of new technologies – television, VCR, cable and DVD – has clearly expanded the number of viable revenue sources, box office remains the "the most important benchmark when considering a film, as these ancillary revenues tend to correlate highly to the movie's performance during its theatrical exhibition period" (Sorensen and Waguespack 2004, 14). Given the uncertainty surrounding the movie business, we evaluated commercial performance based on the "annual slate of productions rather than on the performance of individual films" (Miller and Shamsie 2001, 731) – i.e., summing up the box office receipts of all movies each production company produced in a given year. Box office receipts were adjusted by a price deflator based on the consumer price index (CPI) per year (with 2003 as our base year).

We used revenues instead of profits as our dependent variable mainly for two reasons. First, budgets often include costs that are tied to the overall success of the movie (e.g., bonuses in actors' contracts). The upshot is that such costs vary endogenously with our dependent variable (on this point, see also Sorensen and Waguespack 2004). Second, our choice was made for practical reasons: only a small portion of the movies in the sample reports budget data.

Artistic Performance. As an indicator of artistic performance, we used an aggregate measure of critical reception. Our data came from a public online source ("www.metacritic.com") that rates movies distributed in the U.S. using an original algorithm. The meta-score is a weighted average of up to 30 reviews from national critics and publications for a given movie. For each review, the score given by the critic is converted to a 0-100 point scale – and for those critics who do not provide a score, a score from 0-100 based on the general impression given by the review is assigned (see Table 1). The choice of weights varies: some critics are weighted more heavily reflecting the fact that they consistently write better (more detailed, insightful and articulate) reviews than others. Moreover, some publications typically have more prestige and carry more weight in the industry. We cross checked the reliability of metacritic scores by using alternatives measures such as the number of awards and nominations (with and without Oscar awards/nominations) received by the movies each production company produced in a given year, but found no significant difference.

4.2.2 Independent Variables

Human Capital. We measured the quality of human capital – *Human Capital* – by calculating the cumulative number of awards won and the nominations received up to time $t-1$ by the key professionals (i.e., producer, writer, director, leading and supporting actors, editor and cinematographer) involved in all movies realized by the focal production company at time t. We then scaled the resulting measure by the total number of movies produced by the focal company at time t. Our goal was to have a measure capturing the average quality of the human capital a production company employed in a given year.

Our human capital measure is fine-grained in comparison to that used in other studies because we do not focus exclusively on Academy Awards – as is often the case with research in the film industry (Faulkner and Anderson 1987; Miller and Shamsie 1996, 1999). Our data was gathered on the six most prestigious awards assigned by the film industry: Academy Awards, Golden Globes, Guilds Awards (Directors Guild of America, Writers Guild of America, Producers Guild of America), National Board of Review Awards (NBR), Los Angeles Film Critics Awards (LAFC) and New York Film Critics Awards (NYFC). These awards are voted either by peer experts from the industry (Academy Awards & Guilds Awards), foreign press representatives (Globes), or film critics (NBR, LAFC and NYFC). Besides being assigned to individuals of exceptional ability, these awards reflect how successful a production company was at recruiting, combining and supporting talents (Miller and Shamsie 1999). The primary source for these data was a complete list of movie awards published by O'Neil (2000). We referred to the Internet Movie Database for the years not covered by the guide.

Network Resources. We measured a production company's network resources – *Network Resources* – by looking at its structural position in the network, using a network centrality measure. The level of centrality in a network indicates the extent to which the firm (actor in network language) occupies a strategic position by virtue of being involved in many significant ties (Wasserman and Faust 1994). High centrality enhances the informational values of network resources mainly through two dimensions: access and power. Being at the point of convergence of multiple sources of information conveyed by their ties, central actors are more likely to discover new opportunities (Valente 1995) and thereby have timely access to promising new ventures (Powell et al. 1996). Since central connectedness affects reputation and generates visibility, firms that are more centrally located enjoy status benefits (Brass and Burkhardt 1992).

We operationalized production companies' centrality using the *Eigenvector Centrality* approach (Bonacich 1972). The eigenvector approach builds on the notion of closeness/distance and is an effort to find the most central actors (i.e., those with the smallest "farness" from others) in terms of the "global" or "overall" structure of the network, and to pay less attention to patterns that are more "local" (Hanneman 2001). Given the adjacency matrices A, the eigencentrality of vertex i (denoted c_i), is given by $c_i = \alpha \sum A_{ij} c_j$ where α is a parameter. The centrality of each vertex is therefore determined by the centrality of the vertices

to which it is connected.[1] We computed all measures using UCINET VI (Borgatti et al. 2002).

4.2.3 Controls

Given the twofold nature of the outcome variable (artistic and commercial performance), we included several control variables to rule out alternative explanations for our results.

Major Co-production. The production of a new movie critically depends on the availability of financial resources. Not surprisingly, it is quite common for the distributor to be also a co-producer of the movies that it releases. A production company's involvement with a major distributor typically "includes a production loan . . . and ensures preferential access to the best theaters during the most favorable times" (Litman 1998, 183). For each production company, we thus created the variable *Major Co-production* – i.e., the ratio of movies co-produced by a major distributor to the total number of movies produced in a given year by a given production company.

Sequel. The oligopolistic structure of the distribution market, with a few Majors controlling the entire channel, might lead to an overemphasis on the bottom line at the expense of truly creative outcomes. Firms might then focus on formulaic content, such as sequels, which reduce the risk of a new production (Shamsie 2003), and hence forestall the search for artistic novelty. Several movies that do well at the box office are indeed sequels. Accordingly, we computed the variable *Sequel* as the ratio of movies that are sequels to the total number of movies each company produced in a given year.

Non-original script. Similarly, movies that are adaptations of, or are based on, a previously known story (e.g., books, novels, comic strips, or TV shows) are more likely to appeal to the audience than movies that rely on an entirely new script because the public is already familiar with the story (Litman and Kohl 1989). To account for this effect, we created the variable *Non-Original Script* as the percentage of all movies produced by a company in a given year that is based on prior material.

Family movie. Another important factor on the creative side is the rating assigned by the Motion Picture Association of America (MPAA). Ratings signal the degree of graphic sequences, violence and harsh language in a movie. Prior research suggests that features produced for mature audiences (R and NC-17) perform worse at the box office (Ravid 1999; Ravid and Sunder 2002). Moreover, since movies rated G, PG and PG-13 have greater audience potential, and mall owners sometimes by contract require theaters not to show NC-17 films, quite often studios

[1] The parameter α is required to give the equations a non-trivial solution and is therefore the reciprocal of an eigenvalue. It follows that the centralities will be the elements of the corresponding eigenvector. The normalized eigenvector centrality is the scaled eigenvector centrality divided by the maximum difference possible expressed as a percentage (Bonacich 1972).

exert some pressure on producers and directors to ensure their films receive a rating aligned with their market aspirations. This practice can obviously constrain creativity such as, for example, in the treatment of controversial material or the choice of scenes to edit. We accounted for this possible source of interference by creating the variable *Family Rating* as the percentage of all movies produced by a company in a given year that fall in P, G or PG-13 category.

Opening Theatres. Following prior studies, we calculated the average number of opening screens – *Opening Theatres* – on which each firm's movies are initially released in a given year. This measure partly reflects the distribution and marketing strategy of each production company.

Release Date. The release dates of a motion picture also provide some indications on its box-office potential. Since moviegoers tend to crowd during certain periods (e.g., for Christmas and in the summer), high caliber movies are released only on those dates. We thus created a variable – *Release Date* – measuring the percentage of movies shown during these two peak periods.

Year. Since we have no a priori expectations about the existence of a time trend over the study period, we ran the analysis by using firm-year fixed effects. We also entered the variable year into the model as a continuous variable, but found the results to be qualitatively similar to those reported here.

4.3 Analysis I: A visual inspection of the data

We use Pajek (de Nooy et al. 2003) to offer a visual framework in which one can simultaneously appreciate the dynamics between human capital and network resources at the firm level with respect to the two fitness dimensions of interest (i.e., commercial and artistic performance). We expect these dimensions to be associated with different network structures and resources endowments. Pajek is a software package that permits the visualization and inspection of large size networks and has been used in diverse disciplines from physics (Albert et al. 2000) to management (Owen-Smith et al. 2002) to sociology (Powell et al. 2005).

The approach we follow has two major attractions. First, Pajek generates visualizations of networks that position nodes (firms) in a two-dimensional Euclidean space such that their nearness is a function of their *level* and *intensity* (in case of valued graphs) of connectedness. This is accomplished through a "spring embedded" network, drawing algorithms that simulate the network of inter-organizational connections as a system of interacting particles, where organizational nodes (production companies) repel one another unless network ties act as springs to draw connected nodes closer together. In our network, all companies that co-produced the same movie are assumed to have varying intensity of reciprocal attraction. The attraction between companies is stronger when: a) the collaboration is repeated multiple times over time; and b) the collaborators have third party ties in common. The network layout so generated is an iterative representation that minimizes the variation in length of the lines. As a result, highly connected nodes are

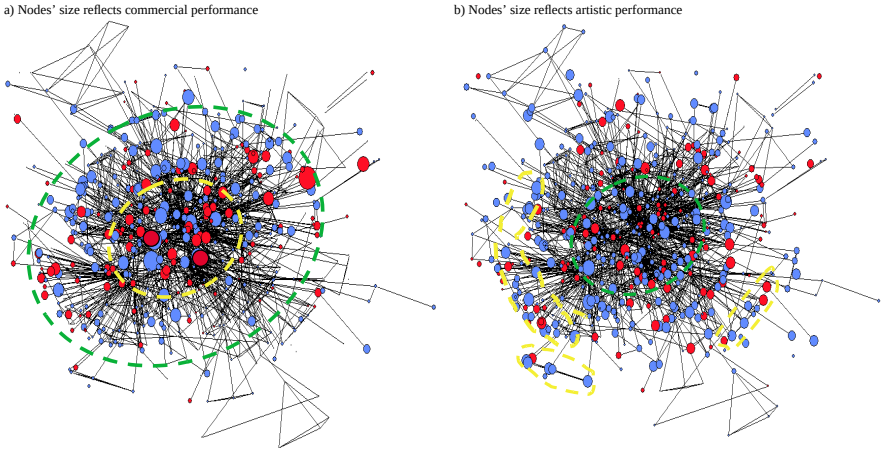

Fig. 4 1995 Production companies' network topology by commercial (a) and artistic performance (b) and human capital endowment

placed at the core and weakly connected nodes at the periphery, while the relative distance among nodes is a function of their shortest network paths.

The second major attraction of this approach is that, while we are able meaningfully to represent the topology of the field based on the relational data, we can also combine this analysis with non-relational attribute data at the firm level. In practice, we can discern among firms based not only on their structural position, but also on the level of human capital possessed as well as performance achieved. This multidimensional representation of the data allows for a rich and immediate appreciation of the theoretical issues of interest. It can thus be thought of as a "visual goodness of fit" (Powell et al. 2005) for our conjectures.

The analysis is presented in Figures 4 to 6, where each drawing is a snapshot at time t of the network of connections among the production companies still active up to that point in time. We obtained the drawings by sequentially running two algorithms. Following Powell et al. (2005), we first drew on the Fruchterman-Reingold algorithm (1991), which optimizes network images without reference to the graph theoretic distance among nodes. This provides a reference topology for all nodes in the network. We then turned to the Kamada-Kawai (1989) algorithm to obtain a representation of substantive relational interest with nodes' Euclidean distance proportional to their graph theoretic one.

Nodes represent individual production companies and lines represent co-production agreements. The size of the nodes is proportional to the firms' commercial (Figures 4a-6a) and artistic (Figures 4b-6b) performance, respectively.

To show how the traits of human capital influence artistic and commercial performance, we assign each node the value 1 (red nodes or dark shading) or 0 (blue nodes or light shading) based on whether the value of "human capital" at the firm level is greater or lesser than the average value of human capital for all companies in the sample. We opted for this simple dichotomization as it helps maintain clarity in the appreciation of the network drawings without subtracting from their illustrative intent. These visualizations provide a multi-faceted appreciation of the industry network topology, in which nodes' structural characteristics

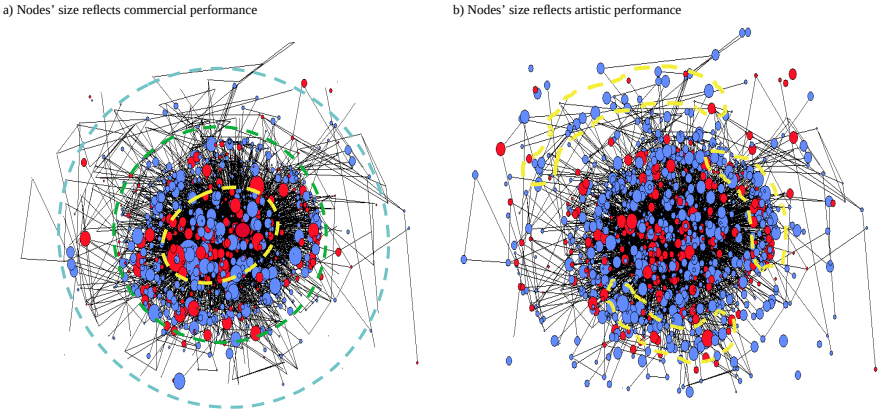

Fig. 5 1999 Production companies' network topology by commercial (a) and artistic performance (b) and human capital endowment

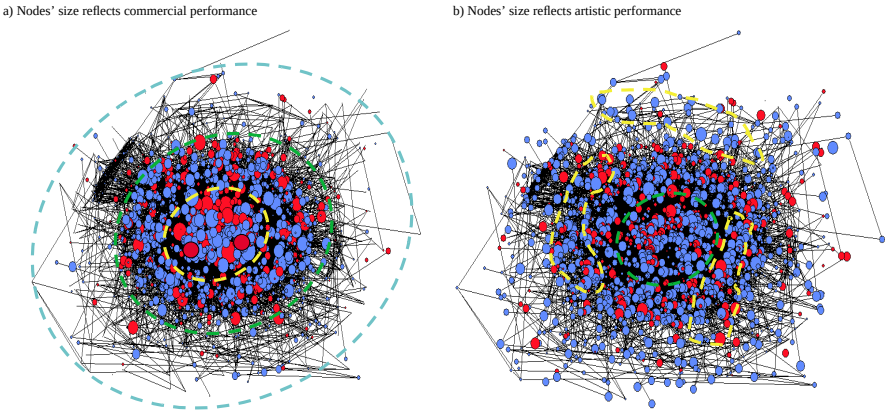

Fig. 6 2003 Production companies' network topology by commercial (a) and artistic performance (b) and human capital endowment

and attributes can be appreciated simultaneously. Due to space constraints, we only present a selection of drawings at 3 points in time, i.e., 1995-1999-2003.

Several interesting features stand out in the Figures. First, starting from the 1995 data on commercial performance shown in Figure 4a, we see that nodes of bigger size are highly clustered towards the centre (yellow ellipse) of the network field, while small size nodes are 'pushed' to the periphery (green ellipse). The nodes within the white ellipse are, on average, 0.4 times bigger than the nodes that lie outside, suggesting a positive association between commercial performance and central network topology.

This structural stratification is not only consistent, but also more evident over time. In fact, the 1999 and the 2003 network drawings suggest the emergence of a second periphery (light blue ellipses) as the performance gap between the relational core and the periphery gets larger. In 1999 (Figure 5a), the nodes in the

core (yellow ellipse) are, on the average, 0.5 times bigger than those in the first periphery (green ellipse) and 0.9 times bigger than those in the second periphery. The gap is roughly the same in 2003 (Figure 6a). Furthermore, the dominant color within the clustering core is always red. This means that greater commercial performance appears to be associated not only with richer relational positions, but also with richer human capital endowments. On the average, red nodes are 0.37 bigger than blue nodes in 1995, 0.50 in 1999 and 0.47 in 2003. Network and human resources do seem to play a critical role when looking at commercial performance.

We get quite a different picture when we turn to our second fitness dimension: artistic performance. Starting from artistic performance in 1995, shown in Figure 4b, it is apparent that the relational core of the system is not where artistic work is actually produced. The drawings suggest quite the opposite. While the average size of the nodes in the relational core is only slightly lower than the size of peripheral nodes, the periphery is now scattered and displays a few pockets of high artistic performers (we highlighted them by tracing yellow dashed line around some of these groups). This reversal in the role of the network finds confirmation in subsequent drawings. As we move through time, the results do not change. Again, in 1999 the nodes in the network core do not outperform those in the periphery: several 'islands' of peripheral nodes (yellow dashed lines) do better than the core. Year 2003 exhibits a very similar pattern, suggesting that art may just as well thrive on the fringes of the network.

The saliency of human capital for artistic performance is less clear than in the other case. In 1995, the 'red' appears uniformly scattered across nodes of varying size. On the average, red nodes i.e., firms with high level of human capital – are only 0.02 bigger than blue nodes, indicating that companies employing highly talented professionals perform just as well as companies employing less talented professionals. In 1999 (Figure 5b), the size gap between red and blue nodes increases slightly, rising from 0.02 to 0.04, but it moves back to 0.01 in 2003. Once again, this suggests a very weak association, if any, between the two attributes.

Although these visualizations provide many suggestive insights into the shifting role of key organizational traits in the pursuit of organizational fitness, they cannot support in any statistical sense our conjecture nor can we infer any direction of causality by merely inspecting the drawings. Is a central position in the network of production alliances conducive to greater commercial performance? Is this effect consistent across fitness dimensions? Are firm with high levels of human capital more likely to achieve organizational fitness?

To address these questions and test the insights derived from the visualizations, we now turn to a multivariate analysis in which we account for our traits of interests as well as many other control variables.

4.4 Analysis II: Estimation model

To test the previous hypotheses, we estimated a random intercept effects model. The model has the following basic form:

$$y_{it} = \mu_t + \beta x_{it} + \gamma z_i + \alpha_i + \varepsilon_{it} \quad (1)$$

Instead of assuming that α_i represents a set of fixed parameters as in the fixed-effects model, in the random-effects model each α_i is a random variable with a specified probability distribution. Typically, it is assumed that α_i has a normal distribution with a mean of 0 and constant variance, and that it is independent of x_{it}, z_i and ε_{it}. Although our focus is mainly on the role of *human capital* and *network resources*, we included in the model several other variables that previous studies found to be important fitness determinants.[2] To correct for the skeweness in the dependent variables, we took the log of the two measures.[3] The two finals models are:

$$\begin{aligned}\log(\textit{Box Office}_{it}) &= \alpha_i + \beta_1(\textit{Firm Movies}) + \beta_2(\textit{Major Co-Production}_{it}) \\ &+ \beta_3(\textit{Sequel}_{it}) + \beta_4(\textit{Non-Original Script}_{it}) + \beta_5(\textit{Opening Theatres}_{it}) \\ &+ \beta_6(\textit{Family Rating}_{it}) + \beta_7(\textit{Release Date}_{it}) + \beta_8(\textit{Human Capital}_{it-1}) \\ &+ \beta_9(\textit{Network Resources}_{it-1}) + \textit{Year Dummies} + \epsilon_{it}\end{aligned} \tag{2}$$

and

$$\begin{aligned}\log(\textit{Meta-score}_{it}) &= \alpha_i + \beta_1(\textit{Firm Movies}) + \beta_2(\textit{Major Co-Production}_{it}) \\ &+ \beta_3(\textit{Sequel}_{it}) + \beta_4(\textit{Non-Original Script}_{it}) + \beta_5(\textit{Opening Theatres}_{it}) \\ &+ \beta_6(\textit{Family Rating}_{it}) + \beta_7(\textit{Release Date}_{it}) + \beta_8(\textit{Human Capital}_{it-1}) \\ &+ \beta_9(\textit{Network Resources}_{it-1}) + \textit{Year Dummies} + \epsilon_{it}\end{aligned} \tag{3}$$

We obtained our estimates using PROC MIXED and PROC GENMOD in SAS (version 9.1).

5 Results

Descriptive statistics is presented in Tables 2 and 3. We checked for multicollinearity by calculating the tolerance factor, which is measured as the difference between 1 and the R^2 value from the model. Usually statisticians suggest 0.3 as a threshold for the tolerance factor below which multicollinearity might become an issue (Allison 1999). We found no variable to violate such level.

Random-effects estimates for the model where commercial performance (i.e., box office receipts) is the dependent variable are displayed in Table 4, while those for the model where artistic performance (i.e., critical reception) is the dependent variable are displayed in Table 5. Both tables report the estimates for the baseline model (Model 1), the model including the controls and the measure of human capital (Model 2), the controls and measure of network resources (Model 3), and the full model (Model 4), respectively. In each model, we entered year dummies. In the last column of each table, we computed standardized coefficients for the full model to estimate the relative importance of each variable in affecting the dependent variable.

[2] Our approach is then somehow consistent with the *systems* approach to fitness (see Drazin and Van den Ven 1985; Van de Ven and Drazin 1985; Galunic and Eisenhardt 1994).

[3] We should expect the dependent variables to be skewed because most of the Hollywood movie productions perform poorly and just a few are very successful.

Table 2 Descriptive Statistics

Variables	N	Mean	Std Dev	Minimum	Maximum
1. Box Office (log)	5096	16.39	2.01	7.69	20.32
2. Critical Reception	5253	5.53	1.46	0.7	9.5
3. Rated Family	5182	0.49	0.5	0	1
4. Sequel	5269	0.08	0.27	0	1
5. Non-Original Script	5224	0.39	0.55	0	3
6. Major Co-production	5280	0.29	0.45	0	1
7. Opening Theatres	4552	6.31	2.33	0	8.25
8. Release Date	5262	0.31	0.46	0	1
9. Firm Movies (log)	5280	0.9	1.01	0	3
10. Human Capital	5280	60	88	0	904
11. Network Resources	5280	0.04	0.09	0	0.55

The baseline model (Model 1) in Table 4 presents the results for the controls that turned out to be significant and in the expected direction, with the exception of the variable controlling for the number of movies produced by a firm in a given year (*Firm Movies*) and the variable that accounts for whether a Major is a co-producer (*Major Co-production*). Movies that are based on an existing story (*Non-Original Script*) appeal to the audience more than movies that rely on a new script. Similarly, a movie's commercial success is enhanced when the movie release dates coincide with Christmas or the summer, and the movie addresses a broader audience (*Family Rating*), is a sequel, and is distributed on a large scale as captured by the number of opening theatres.

The baseline model (Model 1) in Table 5 offers quite a different picture. Artistic performance declines when production companies produce movies that address a broader audience (*Family Rating*), are sequels, are distributed on a large-scale distribution – i.e., movies for which box office considerations are typically more salient – and a production company distributes a larger number of firm in that year. In contrast, movies that are based on an existing story (*Non-Original Script*) and are co-produced with a Major on the average attain higher level of artistic performance.

In Model 2 of Tables 4 and 5, we entered our measure of human capital, i.e., the average number of awards and nominations that the core members staffed by the production company received until the year prior to the focal one. The variable is statistically significant and in the expected direction in both models, suggesting that the quality of the professionals' human capital enhances production companies' commercial and artistic performance. Also, the inclusion of the human capital variable improves the overall fit of the model relative to the baseline model, as indicated by variation in the value of the -2 Log Likelihood statistics.

In Model 3 of Tables 4 and 5, we entered our measure of network resources, based on the Eigenvector approach, i.e., the relational position of the companies with respect to the overall structure of the network. The variable is statistically significant and in the expected direction for the model where commercial success is the dependent variable, suggesting that production companies that are part of rich inter-organizational network of co-production alliances are more likely to pick the right projects and talent and hit the market with high grossing films. The inclusion of the variable improves the overall fit of the model. Production compa-

Table 3 Pearson Correlation Coefficients

Variables	1	2	3	4	5	6	7	8	9	10	11
1. Critical Reception	1										
2. Box Office (log)	0.126	1									
3. Rated Family	-0.134	0.262	1								
4. Sequel	-0.102	0.147	0.061	1							
5. Non-Original Script	0.115	0.102	0.096	0.015	1						
6. Major Co-production	0.008	0.132	0.07	0.055	0.009	1					
7. Opening Theatres	-0.286	0.675	0.288	0.174	0.025	0.126	1				
8. Release Date	0.141	0.164	0.151	0.083	0.081	0.011	0.039	1			
9. Firm Movies (log)	-0.016	0.173	0.068	0.04	0.019	0.804	0.188	0.006	1		
10. Human Capital (1-year lag)	0.25	0.224	0	0.044	0.11	0.003	0.049	0.104	0.008	1	
11. Network Resources	-0.018	0.11	-0.009	0.045	0.017	0.298	0.121	-0.001	0.448	0.028	1

Table 4 Determinants of *Commercial Performance*. Random Intercept Regression

Dependent Variable = Movie Box Office Receipts, 5280 Observations

Variables	Model 1	Model 2	Model 3	Model 4	Standardized Coefficients
Intercept	12.75^{***}	12.41^{***}	12.72^{***}	12.39^{***}	
	(0.099)	(36.167)	(36.176)	(36.198)	
Year (dummies)	yes	yes	yes	yes	
Rated Family	0.114^{**}	0.164^{***}	0.120^{**}	0.169^{***}	0.042
	(0.046)	(0.045)	(0.046)	(0.045)	
Sequel	0.223^{**}	0.214^{**}	0.215^{**}	0.207^{**}	0.028
	(0.077)	(0.075)	(0.077)	(0.075)	
Non-Original Script	0.318^{***}	0.251^{***}	0.317^{***}	0.251^{**}	0.069
	(0.038)	(0.038)	(0.038)	(0.038)	
Major Co-Production	0.182	0.149	0.200^{*}	0.164	0.037
	(0.121)	(0.116)	(0.120)	(0.115)	
Opening Theatres	0.525^{***}	0.519^{***}	0.525^{***}	0.518^{***}	0.6
	(0.010)	(0.010)	(0.010)	(0.010)	
Release Date	0.621^{***}	0.548^{***}	0.621^{***}	0.548^{***}	0.125
	(0.046)	(0.045)	(0.046)	(0.045)	
Firm Movies (log)	0.055	0.048	0.006	0.008	0.004
	(0.045)	(0.044)	(0.047)	(0.045)	
Human Capital		0.003^{***}		0.003^{***}	0.131
(1-year lag)		(0.0003)		(0.0003)	
Network Resources			1.290^{***}	1.071^{**}	0.048
			(0.351)	(0.343)	
-2 Log Likelihood	15278	15090	15264	15081	
Likelihood ratio test (vs. baseline)		376^{***}	28^{***}	394^{***}	

$^{*}p < 0.1, ^{**}p < 0.05, ^{***}p < 0.001$
Two-tailed tests for all variables

nies' network resources, on the contrary, seem to have no effect on movies' artistic performance.

The results for the full model (Model 4) are consistent with those of the previous models. While the quality of professionals' human capital employed in a movie is significant and positively affects both commercial success and artistic performance, network resources have a positive and statistically significant effect only in the case of commercial success. The last column in Tables 4 and 5 reports the standardized coefficients to establish which variable is more important in affecting the dependent variable. Since we concern ourselves primarily with the human capital and network resources variables, we restrict the comparison to them. Interestingly, professionals' human capital has a stronger effect – almost 3 times more – than production companies' network resources on movie box office. In conclusion, the results suggest that the quality of the human capital employed is important for movie commercial and artistic performance, while production companies' network resources (i.e., relations to other companies) have a significant positive effect only on movie box office.

Robustness Tests. We tested the robustness of the results to alternative model specifications. First, we estimated the random effects model using the Generalized

Table 5 Determinants of *Artistic Performance*. Random Intercept Regression

Dependent Variable = Critical Reception, 5280 Observations

Variables	Model 1	Model 2	Model 3	Model 4	Standardized Coefficients
Intercept	6.384^{***}	5.964^{***}	6.386^{***}	5.970^{***}	
	(0.095)	(0.094)	(0.095)	(0.094)	
Year	yes	yes	yes	yes	
Rated Family	-0.307^{***}	-0.244^{***}	-0.308^{***}	-0.246^{***}	-0.061
	(0.044)	(0.043)	(0.044)	(0.043)	
Sequel	-0.351^{***}	-0.360^{***}	-0.350^{***}	-0.357^{***}	-0.048
	(0.074)	(0.071)	(0.074)	(0.071)	
Non-Original Script	0.309^{***}	0.224^{***}	0.309^{***}	0.224^{***}	0.061
	(0.037)	(0.036)	(0.037)	(0.036)	
Major Co-Production	0.248^{**}	0.207^{*}	0.246^{**}	0.201^{*}	0.045
	(0.121)	(0.109)	(0.121)	(0.109)	
Opening Theatres	-0.163^{***}	-0.172^{***}	-0.163^{***}	-0.172^{***}	-0.199
	(0.010)	(0.009)	(0.010)	(0.009)	
Release Date	0.423^{***}	0.332^{***}	0.423^{***}	0.332^{***}	0.076
	(0.044)	(0.043)	(0.044)	(0.043)	
Firm Movies (log)	-0.001^{***}	-0.017	0.004	-0.001	-0.001
	(0.044)	(0.042)	(0.046)	(0.043)	
Human Capital		0.004^{***}		0.004^{***}	0.175
(1-year lag)		(0.0002)		(0.0002)	
Network Resources			-0.135	-0.425	-0.019
			(0.340)	(0.325)	
-2 Log Likelihood	14971	14633	14970	14631	
Likelihood ratio test		776^{***}	2	780^{***}	
(vs. baseline)					

$^{*}p < 0.1, ^{**}p < 0.05, ^{***}p < 0.001$
Two-tailed tests for all variables

Estimating Equations (GEE). In the case of linear models, GEE is equivalent to generalized least squares (Allison 2005). The GEE method makes no explicit assumptions about random components in the regression model, but simply allows for correlation in the dependent variable across observations over time. We assumed this correlation to be equal across time using an exchangeable correlation structure (Liang and Zeger 1986). It is worth noting that the GEE coefficients are population averaged (i.e., they describe what happens to the whole population, not a particular individual, if everyone's predictor values are increased by one unit). The results for the GEE model turned out to be qualitatively similar to those for the random intercept model and are available from the authors upon request. Second, we compared the results with those for the fixed effects model to verify whether unobserved heterogeneity might be a problem in our analysis. Again, the coefficient estimates for the fixed effects regression model are qualitatively similar to those obtained using the random intercept and the GEE models.

We also ran additional analyses using alternative measures for artistic performance, such as the total number of awards and nominations (with and without Oscars) received by each production company in a given year. Though not reported here, the results did not vary appreciably from those presented in the paper.

Like in many other industries, success or failure is highly dependent on the intensity of competition in the marketplace. Previous research (for a review see Litman 1998) showed that high levels of box office concentration for the top (i.e., most successful) movies have a negative impact on both theatrical rentals and the length of run. We likewise controlled for the degree of concentration of the industry at the firm, not the movie, level using the top four production company concentration ratio – $C4$ – which we computed by taking the revenues accruing to the top four firms in a given year as the percentage of total industry revenues for the year in question. Moreover, intense competition makes it more difficult for firms to survive and grow. Organizational crowding and resource scarcity force firms to rely on inferior resources, jeopardizing their ability to spot valuable opportunities. Production companies can stimulate demand by offering more innovative products to counter declining performance as the environment becomes less munificent (Miller and Shamsie 1996). Since movies compete directly with each other for the same consumer dollars, awards and critical attention, we controlled for the degree of market competition by including the variable *Film Crowding*, which we calculated as the total number of movies released each year in the industry. Using year dummies already controls for the degree of industry concentration and film crowding. But the results did not change when we entered these two variables into the model with *year* as a continuous variable.

Furthermore, we made an assumption about the duration of sampled co-production alliances whose termination dates were not available. Following a common practice in alliance research (e.g. Bae and Gargiulo 2004; Gulati and Gargiulo 1999), we used various moving windows to account for the duration of each alliance, making the adjacency matrixes time-varying. Results were consistent across 2, 3 and 4 year-window specifications.

Finally, we re-estimated our models adopting other measures of network centrality than the Eigenvector. We opted for two measures that are well-suited to deal with centrality in valued matrices. In one set of analyses, we used a simple measure of degree centrality that counts the number of co-production partners with which the focal firm works. Next, we employed *Bonacich Power* measure (Bonacich 1987), which is a generalization of degree-based approaches to centrality and estimates an actor's centrality as a function of the number of connections that both she and the actors in her neighborhood have. In all such cases, the results were consistent with our prior findings.

6 Discussion and conclusions

We began with the observation that fitness is a multidimensional concept and its components are contest-specific. As such, the determinants of fitness can only be identified with respect to a particular context. On the premise that the nature of the selection environment determines which traits eventually affect the degree of organizational fitness, we employed multiple fitness measures and studied their relationships with specific fitness dimensions. We situated the analysis in the Hollywood motion picture industry, since, as in the case of other cultural/creative industries, firms are confronted with the challenge of striking a balance between seemingly conflicting needs such as artistic performance and commercial imper-

atives. These are two critical fitness dimensions in that organizational fitness in those industries stems from striking a balance between them.

Besides identifying some of the key determinants of fitness, our primary objective was to gauge the relative contribution of different organizational attributes – most notably, human capital and network resources – to movie production companies' commercial and artistic performance, respectively. In the movie industry, firm performance critically depends on the ability to replenish creative resources – which are typically embedded in individuals and groups; and to establish social networks with other companies to have easier access to such resources.

The results of the analysis suggest three main findings. Fist, the quality of human capital is valuable not only in generating a creative outcome, but also in attaining higher levels of commercial performance. Second, network resources contribute to enhancing production companies' commercial success, but seem to have no impact on artistic performance. Finally, the quality of human capital is more strongly associated than network resources with production companies' commercial success.

An important implication of these findings is that the impact of different attributes on organizational fitness varies with the particular dimension of fitness that is being considered. For instance, if one measures fitness in terms of commercial success, network resources have a positive impact. But different conclusions are drawn if one uses artistic performance as a measure of organizational fitness. Since, in our setting, artistic performance and commercial success are not independent, in that organizational fitness is the result of properly balancing between artistic and commercial performance, focusing on attributes that influence only one dimension but not the other, or attributes the influence of which is different for each dimension, might prove to be misleading. The attention should then be directed to the identification of organizational attributes with a similar effect on both dimensions. Ceteris paribus, the quality of human capital production companies employ in each new movie is especially important.

The finding that network resources – which in this paper we defined as firms' network centrality – has no effect on artistic performance deserves further attention. We surmise that one possible explanation for this somewhat unexpected result is that an increase in connectedness could engender a proclivity towards conformity. As firms become entrenched into the relational system, their incentive to deviate from the 'norm' declines, mostly because of the higher stakes they have in case of failure. Moreover, creating and maintaining many tight-knit links between different actors cost time and energy, with the effect of smothering creativity under a blanket of homogeneity.

By contrast, firms that remain at the periphery of the system could be in a better position to contribute some 'freshness' to the dominant practices of the system. Peripheral firms are in fact less strongly embedded in a given network as compared to more central ones. Not only are they more likely to have a distinctive perspective resulting from divergent ideas sparked by isolates or outsiders; they can also pursue these ideas without facing the constraints of breaking established norms, or worrying about deviating from accepted tenets of the network (Perry-Smith and Shalley 2003). As we noted before, the visual inspection of the data further suggests that firms are more likely to achieve higher levels of artistic performance when they are located on the fringes of the network.

This line of reasoning is consistent with evidence from research on the conditions favoring the introduction of breakthrough inventions. In the telecommunications industry, for instance, corporations interested in point-to-point wireless telegraphy (e.g., RCA, Westinghouse, AT&T) viewed the scattering of radio waves as a nuisance, whereas amateur radio enthusiasts saw the potential of point-to-multipoint broadcasting (Sawhney and Lee 2003). Also, recent findings in the movie industry have shown how an intermediate position between the core and the periphery of the social network enhances individual creativity (Cattani and Ferriani 2005). Likewise, peripheral firms – which are not too far from the core – are more likely to retain the ability to think outside the box because a peripheral position "may suggest connections outside the network that facilitate creativity" (Perry-Smith and Shalley 2003, 98).

The need to strike a balance between opposing polarities is not unique to cultural/creative industries, but is common to a wide range of industries characterized by high levels of ambiguity and dynamism (Lampel et al. 2000). The trade-off between exploration and exploitation in research on learning bears some similarity with the issue under investigation (March 1991; Levinthal and March 1993). According to this research, for instance, firms have "to cope with confusing experience and the complicated problem of balancing the competing goals of developing new knowledge (i.e., exploration) and exploiting current competencies in the face of dynamic tendencies to emphasize one or the other" (Levinthal and March 1993, 95). There is an intuitive similarity between the concept of exploration and the quest for a creative outcome; and the pursuit of commercial performance, which appears well matched to the idea of exploitation. Although the distinction between *creative protectionist* and *balanced producers* reflects the different emphasis firms place on one fitness dimension or the other, organizational performance and survival depends on the ability to reconcile the aforementioned polarities. A study on whether traits which are typically referred to as important fitness determinants have a similar or a different effect depending on the particular fitness dimension being considered represents a step towards a sharper understanding of how that reconciliation can be obtained.

There are some obvious limitations to the study. First, the unique nature of the industry raises questions about the generalizability of our findings that can only be answered by examining other contexts. Industries such as fashion, architecture, design, publishing, and the life science in general, are all intriguing candidates due to the friction between innovative endeavors and budgetary constrains that lies at the very core of their business models. Second, while network and human resources are both important traits in the movie industry, a finer understanding of their effect on movie performance would probably require a deeper examination of their relationship. For instance, many studies suggest that, while relational ties and connections critically improve the value of human capital within an organization (Seibert et al. 2001), superior human resources likewise enhance an organization's networking capability (Florin et al. 2003). Accounting for the interaction effect between human and network resources in shaping artistic and financial performance, therefore, would probably represent a viable extension of this study. In addition, a deeper analysis of the relationship between human capital and network resources, and other organizational fitness traits should be investigated more deeply and might thus represent an interesting avenue for future research.

Finally, though we drew from prior studies to create measures of human and network resources, our composite measures are indirect proxies for largely unobservable phenomena. As such, they might lack the required precision. For instance, if one takes the perspective of a movie production company, an individual's web of relations is an integral dimension of the human capital resource. The overall quality of each individual's human capital can in fact be more correctly conceptualized as resulting from talents and social capital. We thus need a more fine-grained measure of human capital to estimate its actual impact on firm fitness. In a similar vein, it would be interesting to account for network resources resulting not only from alliances (co-productions) between production companies, but also from the relationships between production companies and distributors. Finally, while we opted for a linear model linking different fitness measures to its determinants, a viable alternative might be the use of structural equation modelling to more effectively capture the trade-off between artistic and financial performance.

Of course, this paper is a first attempt to explore determinants of fitness in the context of cultural/creative industries where the complex nature of the relation between commercial and artistic performance critically affects firm performance and survival. The results are, therefore, still preliminary and do not lend themselves to any generalization. Nevertheless, the pattern shown in the analysis corroborates our initial intuition and is consistent with the nature of the industry under investigation.

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References

Ahuja G (2000) Collaboration networks, structural holes, and innovation: A longitudinal study. Admin Sci Quart, 45: 425–455

Albert R, Jeong H, Barabási AL (2000) Error and attack tolerance in complex networks. Nature, 406: 378–382

Allison PD (1999) Logistic Regression Using the SAS System: Theory and Application. SAS Institute, Cary, NC

Allison PD (2005) Fixed Effects Regression Methods for Longitudinal Data. SAS Institute, Cary, NC

Alvarez JL, Svejenova S (2002) Symbiotic careers in movie making: Pedro and Agustin Almodovar. In: Peiperl M, Arthur M, Anand N (eds.) Career Creativity: Explorations in the Remaking of Work, Oxford University Press, Oxford

Argote L, Ophir R (2002) Inter-organizational learning. In: Baum JAC (ed.) Companion to Organizations, 181–207, Blackwell, Oxford

Ascher S, Pincus E (1999) The Filmmaker's Handbook: A Comprehensive Guide for the Digital Age. Plume

Bae J, Gargiulo M (2004) Partner substitutability, alliance network structure, and firm profitability in the telecommunications industry. Acad Manage J, 47, 6: 843–859

Bailey EE, Helfat CE (2003) External management succession, human capital, and firm performance: An integrative analysis. Managerial Dec Econ, 24, 4: 347–369

Baker WE, Faulkner RR (1991) Role as resource in the Hollywood film industry. Am J Sociol, 97, 2: 279–309

Barley SR (1990) The alignment of technology and structure through roles and networks. Admin Sci Quart, 35: 61–103
Baty GB, Evan WM, Rothermel TW (1971) Personnel flows as inter-organizational relations. Admin Sci Quart, 16: 430–443
Becker G (1993) Human Capital: A Theoretical and Empirical Analysis with Special Reference to Education. University of Chicago Press, Chicago, IL, 3rd edn.
Becker H (1982) Art Worlds. University of California Press, Berkeley
Bonacich P (1972) Factoring and weighting approaches to status scores and clique identification. J Math Sociol, 2: 113–120
Bonacich P (1987) Power and centrality: A family of measures. Am J Sociol, 92: 1170–1182
Borgatti SP, Everett MG, Freeman LC (2002) Ucinet 6 for Windows. Analytic Technologies, Harvard
Brass DJ, Burkhardt ME (1992) Centrality and power in organizations. In: Nohria N, Eccles RG (eds.) Networks and Organizations, HBS Press, Boston
Bröcheler V, Maijoor S, van Witteloostuijn A (2004) Auditor human capital and audit firm survival: The Dutch audit industry in 1930-1992. Account Org Soc, 29, 7: 627–646
Brouwer A, Wright T (1991) Working in Hollywood. Reissue Edition. Avon Books, NY
Burns T, Stalker GM (1961) The Management of Innovation. Tavistock, London
Castanias R, Helfat C (1991) Managerial resources and rents. J Manage, 17: 155–171
Cattani G, Ferriani S (2005) A Social network perspective on individual creative performance: Evidence from the Hollywood film-making industry, 1992-2003. Paper presented at the 21st EGOS Conference, June 30 - July 2, Berlin
Caves ER (2000) Creative Industries. Harvard University Press, Cambridge, MA
Chandler A (1962) Strategy and Structure. MIT Press, Cambridge, MA
Child J (1972) Organizational structure, environment and performance: The role of strategic choice. Sociology, 6: 1–22
Coff R (1997) Human assets and management dilemmas: Coping with hazards on the road to resource-based theory. Acad Manage Rev, 22: 374–402
Corman R, Jerome J (1990) How I Made a Hundred Movies in Hollywood and Never Lost a Dime. Random House, New York
De Jong G (1994) The fitness concepts and the description of natural selection. Q Rev Biol, 69, 1: 3–29
de Nooy W, Mrvar A, Batagelj V (2003) Exploratory Social Network Analysis with Pajek. Cambridge University Press, New York
Doty DH, Glick WH, Huber GP (1993) Fit, equifinality, and organizational effectiveness: A test of two configurational theories. Acad Manage J, 36: 1196–1250
Drazin R, Van den Ven AH (1985) Alternative forms of fit in contingency theory. Admin Sci Quart, 30: 514–539
Faulkner RR, Anderson AB (1987) Short-term projects and emergent careers: Evidence from Hollywood. Am J Sociol, 92: 879–909
Flides RA (1990) Strategic challenges in commercializing biotechnology. Calif Manage Rev, 63–72
Florin JM, Lubatkin M, Schulze W (2003) A social capital model of new venture performance. Acad Manage J, 46, 3: 374–384
Fruchterman T, Reingold E (1991) Graph drawing by force-directed replacement. Software Pract Exper, 21: 1129–1164
Galunic DC, Eisenhardt KM (1994) Renewing the strategy-structure-performance paradigm. In: Staw BM, Cummings LL (eds.) Research in Organizational Behavior, vol. 16, 215–255, JAI Press, Greenwich, CT
Gimeno JF, Folta TB, Cooper AC, Woo CY (1997) Survival of the fittest? Entrepreneurial human capital and the persistence of underperforming firms. Admin Sci Quart, 42: 750–783
Glynn MA (2000) When cymbals become symbols: Conflict over organizational identity within a symphony orchestra. Organ Sci, 11, 3: 285–298
Goble A (2003) The Complete Index to World Film. Valan Publishing
Goldman W (1983) Adventures in the Screen Trade. Scribner, New York
Grant RM (1996) Toward a knowledge-based theory of the firm. Strategic Manage J, 17: 109–122
Gulati R (1999) Network location and learning: The influence of network resources and firm capabilities on alliance formation. Strategic Manage J, 20, 5: 397–420

Gulati R, Gargiulo M (1999) Where do inter-organizational networks come from? Am J Sociol, 104, 5: 1439–1493
Hannan MT, Freeman JH (1989) Organizational Ecology? Harvard University Press, Cambridge, MA
Hanneman R (2001) Introduction to Social Network Methods. University of California, Riverside
Hawley AH (1950) Human Ecology. A Theory of Community Structure. The Ronald Press, New York
Hirsch P (1972) Processing fads and fashions: An organization-set analysis of cultural industry system. Am J Sociol, 77, 4: 639–659
Hitt MA, Bierman L, Shimizu K, Kochhar R (2001) Direct and moderating effects of human capital on the strategy and performance in professional service firms: A resource-based perspective. Acad Manage J, 44: 13–28
Hodgson GM (1996) Economics and Evolution. The University of Michigan Press, Ann Arbor
Holbrook MB (1999) Popular appeal versus expert judgments of motion picture. J Consum Res, 26: 144–155
Honthaner EL (2001) The Complete Film Production Handbook. Focal Press, Burlington, MA, 3rd edn.
Jones C (1996) Careers project-networks: The case of film industry. In: Arthur MB, Russeau DM (eds.) The Boundaryless Career, Oxford University Press, New York
Jones C, DeFillippi RJ (1996) Back to the future in film: Combining industry and self knowledge to meet career challenges of the 21st Century. Acad Manage Exec, 10, 4: 89–104
Jones C, Hesterly WS, Lichtenstein B, Borgatti SP, Tallman SP (1997) Intangible assets of teams: How human, social end team capital influence project performance in the film industry. Working Paper, Organization Studies Department, Boston College
Kamada T, Kawai S (1989) An algorithm for drawing general undirected graphs. Inform Process Lett, 31: 7–15
Knudsen T (2004) General selection theory and economic evolution. J Econ Methodology, 11, 2: 147–173
Lampel J, Lant T, Shamsie J (2000) Balancing act: Learning from organizing practices in cultural industries. Organ Sci, 11, 3: 263–269
Lawrence P, Lorsch J (1967) Organization and Environment. Harvard Business School Press, Boston, MA
Learned E, Christensen C, Andrews K, Guth W (1965) Business Policy: Text and Cases. Irwin, Homewood, IL
Lee JJ (2000) The Producer's Business Handbook. Focal Press, Burlington, MA
Levinthal DA (1997) Adaptation on rugged landscapes. Manage Sci, 43, 7: 934–950
Levinthal DA, March JG (1993) The myopia of learning. Strategic Manage J, 14: 95–113
Liang KY, Zeger SL (1986) Longitudinal data-analysis using Generalized Linear-Models. Biometrika, 73, 1: 13–22
Litman BR (1998) The Motion Picture Mega-Industry. Allyn and Bacon, Boston
Litman BR, Kohl LS (1989) Predicting financial success of motion pictures: The '80s experience. J Media Econ, 2: 35–50
March JG (1991) Exploration and exploitation in organizational learning. Organ Sci, 2, 1: 71–87
McEvily B, Zaheer A (1999) Bridging ties: A source of firm heterogeneity in competitive capabilities. Strategic Manage J, 20: 1133–1156
Metcalfe SJ (1998) Evolutionary Economics and Creative Destruction. Routledge, London, UK
Meyer MW, Gupta V (1994) The performance paradox. In: Cummings LL, Staw BM (eds.) Research in Organizational Behavior, 309–369, JAI Press, Greenwich CT
Miles RE, Snow CC (1978) Organizational Strategy, Structure and Process. McGraw-Hill, New York
Miller D, Shamsie J (1996) The resource-based view of the firm in two environments: The Hollywood film studios from 1936 to 1965. Acad Manage J, 39, 3: 519–543
Miller D, Shamsie J (1999) Strategic responses to three kinds of uncertainty: Product line simplicity at the Hollywood film studio. J Manage, 25, 1: 97–116
Miller D, Shamsie J (2001) Learning across the life cycle: Experimentation and performance among the Hollywood studio heads. Strategic Manage J, 22: 725–745
Morley E, Silver A (1977) A film director's approach to managing creativity. Harvard Bus Rev, 55, 2: 59–68

Nahapiet J, Goshal S (1998) Social capital, intellectual capital and the organizational advantage. Acad Manage Rev, 23: 242–266
Nonaka I, Takeuchi H (1995) The Knowledge-creating Company. Oxford University Press
O'Neil T (2000) Movie Awards. Variety Books
Owen-Smith J, Riccaboni M, Pammolli F, Powell WW (2002) A comparison of U.S. and European university-industry relations in the life sciences. Manage Sci, 48, 1: 24–43
Pennings JM (1987) Structural contingency theory: A multivariate test. Organ Stud, 8: 223–240
Pennings JM, Lee K, van Witteloostuijn A (1998) Human capital, social capital and firm dissolution. Acad Manage J, 41, 4: 425–440
Penrose ET (1959) The Theory of the Growth of the Firm. Blackwell, Oxford
Perry-Smith JE, Shalley CE (2003) The social side of creativity: A static and dynamic social network perspective. Acad Manage Rev, 28, 1: 89–106
Pfeffer J (1994) Competitive Advantage Through People. Harvard Business School Press, Boston
Porter ME (1980) Competitive Strategy. Free Press, New York
Powell W, ??, ?? (1999) ?? ??, ??, ??: ??
Powell W, Koput KW, Smith-Doerr L (1996) Inter-organizational collaboration and the locus of innovation: Networks of learning in biotechnology. Admin Sci Quart, 41: 116–145
Powell W, White DR, Koput KW, Owen-Smith J (2005) Network dynamics and field evolution: The growth of inter-organizational collaboration in the life sciences. Am J Sociol, 110, 4: 1132–1205
Rao H, Drazin R (2002) Overcoming resource constraints on product innovation by recruiting talent from rivals: A study of the mutual fund industry, 1986-1994. Acad Manage J, 45, 3: 491–507
Ravid SA (1999) Information, blockbusters, and stars: A study of the film industry. J Bus, 72, 4: 463–492
Ravid SA, Sunder (2002) ?? ??, ??, ??: ??
Reed R, DeFilippi RJ (1990) Causal ambiguity, barriers to imitation, and sustainable competitive advantage. Acad Manage Rev, 15, 1: 88–102
Rivkin J (2000) Imitation of complex strategies. Manage Sci, 46: 824–844
Robins JA (1993) Organization as strategy: Restructuring production in the film industry. Strategic Manage J, 14: 103–118
Saundry S (1998) The limits of flexibility: The case of UK television. Brit J Manage, 9: 151–162
Sawhney H, Lee S (2003) Arenas of Innovation: Fringe Groups and Discovery of New Liberties of Action. Working Paper of the Center for Social Informatics SLIS, Indiana University Bloomington
Sawhney MS, Eliashberg J (1996) A parsimonious model for forecasting gross box-office revenues of motion pictures. Marketing Sci, 15, 2: 113–131
Scott AJ (2002) A new map of Hollywood: The production and distribution of American motion pictures. Reg Stud, 36: 957–975
Scott WR (1975) Organizational structure. Annu Rev Sociol, 1: 1–20
Seibert SM, Kraimer ML, Liden RC (2001) A social capital theory on career success. Acad Manage J, 2: 219–237
Shamsie J (2003) Exploiting the tie that binds: Dealing with issues of resource mobility in the U.S. motion picture industry. Working Paper of the Michigan State University
Siggelkow N (2001) Change in the presence of fit: The rise, the fall, and the renaissance of Liz Claiborne. Acad Manage J, 44, 4: 838–857
Siggelkow N (2002) Evolution toward fit. Admin Sci Quart, 47: 125–159
Sober E (2000) Philosophy of Biology. Westview Press, Boulder, CO
Sorensen O, Waguespack D (2004) Social Networks and Exchange: Self-Confirming Dynamics in Hollywood. Working Paper presented at the Wharton School, University of Pennsylvania
Squire JE (1992) The Movie Business Book. Fireside Book, New York, 2nd edn.
Stearns SC (1976) Life-history tactics: A review of the ideas. Q Rev Biol, 51: 3–47
Stearns T, Hoffman A, Heide J (1987) Performance of commercial television stations as an outcome of inter-organizational linkages and environmental conditions. Acad Manage J, 30: 71–90
Svejenova S, Alvarez L (2002) Imprints of creative style on project network governance. Working Paper of the IESE School of Business

Valente TW (1995) Network Models of the Diffusion of Innovations. Hampton Press, Cresskill, NJ
Van de Ven AH, Drazin R (1985) The concept of fit in contingency theory. In: Staw BM, Cummings LL (eds.) Research in Organizational Behavior, 333–365, JAI Press, Greenwich, CT
Venkatraman N (1989) The concept of fit in strategy research: Toward verbal and statistical correspondence. Acad Manage Rev, 14, 3: 423–444
Vogel HL (1998) Entertainment Industry Economics. Cambridge University Press, Boston, MA
Wasserman S, Faust K (1994) Social Network Analysis: Methods and Applications. Cambridge University Press, Cambridge, Boston, MA
White H (1970) Careers and Creativity: Social Forces in the Arts. Westview Press, San Francisco
Zajac EJ, Kraatz MS, Bresser RKF (2000) Modeling the dynamics of strategic fit: A normative approach to strategic change. Strategic Manage J, 21: 429–453