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Age-dependent business failures in the US construction industry

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Age-dependent failure in the construction industry is explored over two 11-year periods (1973–1983 and 1984–1994) by analysing the age distribution of failed construction companies in each year and computing age-specific failure probabilities over a 10 year period (1985–1994). The conflicting perspectives of organizational theory are reconciled by taking advantage of the complementary nature of the adaptationist and organizational ecology theories while the effects of the characteristics of the construction industry are also considered. The research findings reveal an age-dependent business failure pattern in the US construction industry where the risk of failure increases initially with increasing age, reaches a peak point and decreases thereafter as companies grow older. Newness of a construction company which implies lack of organizational learning and lack of legitimacy, appears to be the main factor explaining this pattern.

Keywords: Construction company, business failure, adaptation, inertia, learning, legitimacy

Introduction

The main research stream of organizational theory is driven predominantly by two schools of thought. Each postulates competing paradigms for success and survival of organizations and uses different levels of analysis. Organizational ecology (Hannan and Freeman, 1977, 1984) favours the Darwinian approach and emphasizes the importance of the natural selection process in organization populations. It advocates the transformation of a population of organizations through selection, retention and creation of new organizations: i.e. organizations that best fit their environment are selected and retained but others that do not are dropped out of the population and are replaced by newly established organizations. The environment is argued to be the primary mechanism for explaining the survival or death of an organization by organizational ecologists. Organizational ecology tends to analyse organizations by studying mostly complete populations (Carroll and Hannan, 1995). At the opposite end, the adaptationist perspective (Thompson, 1967; Child,1972; Pfeffer and Salancik, 1978; March, 1981; Bourgeois, 1984 and Levitt and March, 1988) takes the Lamarckian view and emphasizes the importance of the adaptation process of organizations, i.e., of the leaders' decisions, choices and actions for aligning the organization with its operating environment, as key to survival; researchers favouring the adaptationist perspective often study individual organizations. Mounting evidence in support of each perspective suggests that they represent realistic views of organization theory (Brittain, 1989). As pointed out by Aldrich and Auster (1986) and Burgelman (1991), the adaptationist view, particularly strategic management, can benefit from organizational ecology research.

The phenomenon of business failure has been addressed by a number of academic disciplines. In the context of construction management research, business failure is mainly addressed from the accounting perspective for developing empirical models for pre-qualification purposes (Russell and Skibniewski, 1988; Russell, 1990b) or for predicting the failure of construction firms (Russell and Jaselskis, 1992;

Langford *et al.* 1993; Russell and Zhai, 1996). It is also addressed from the legal perspective (Russell and Casey, 1992). However, from the organizational theory perspective, the process which leads to construction business failures has found limited space in published research studies, the notable exception being a study by Hall (1994), who explored the factors associated with the failure of construction companies in the British construction industry.

The influences of contextual factors, particularly age and size, on organizational performance have received considerable treatment in the literature. Wholey and Brittain (1986) assert that separating the effects of newness and smallness is difficult since most of the newly established firms tend to start small. However, the research studies which claim to measure the effect of newness and smallness on performance conclude that whereas both features are observed, the effect of newness is usually stronger (Halliday *et al.*, 1987). Therefore the scope of this paper is confined to the study of the influence only of age on business failures.

This paper studies age-dependent failures in construction organizations by building on the complementary nature of the organizational ecology and adaptationist approaches and by incorporating the characteristics of the construction industry. The objective is not to contribute to the current debate in organization theory by emphasizing the importance of factors suggested by one school of thought over the other, but to highlight the influence of certain factors which are typically underrepresented in the strategic management of construction companies.

Liability of newness

In connection with organizational ecology research, Stinchcombe's (1965) 'liability of newness' hypothesis has become an important issue in organization theory over the last decade (Brüderl and Schüssler, 1990). Hannan and Freeman (1977, 1984) developed a theoretical model to explain age-dependent decline in failure probabilities by building on the liability of newness hypothesis. Two decades of research on age-dependent failure of organizations has provided some empirical support for this argument and has also received some criticism in the literature (see Young, 1988; Aldrich, 1991). The liability of newness hypothesis claims that certain external and internal factors influence a newly established organization's performance, and hence its survival, and impose challenges on newly established firms. On the one hand, liability of newness is related to processes that are internal to the organization such as learning and inventing new roles, and developing trust and cooperation among organizational members. On the other hand, it is related also to processes that are external to the organization such as establishing stable exchange relationships with clients, creditors, suppliers and other organizations. The inadequacy of these internal and external processes in the early life of an organization creates a major barrier for newly established organizations to compete effectively against previously established organizations, therefore jeopardizing the survival of the newly established firms.

Internal processes and failure

Organizations overcome liability of newness by accumulating and leveraging organizational learning (Burgelman, 1991). Organizational learning is defined as capacity or process within an organization to maintain or improve its performance based on experience. As an organization gains experience, its average performance improves and the variation in performance is reduced (March 1991). It is the feature which reduces variation in performance that organizational ecology research (Hannan and Freeman, 1977, 1984) has used as a building block towards the 'structural inertia' theory (Levinthal, 1991), which postulates the existence of age-dependent decline in organizational failures. The basic theoretical argument underlying Hannan and Freeman's (1977, 1984) structural inertia theory is that organizations that are characterized by high reliability and accountability for organizational actions are favoured by the selection process. Pressures for accountability are intense under certain conditions when substantial risk exists and when the relations between an organization and its clients are long lasting in nature (Hannan and Freeman, 1984). A fundamental prerequisite for reliability and accountability is reproducibility of the structure. Organizations attain reproducibility of structure through gaining inertia: institutionalization of the organization's goals (developing trust, coordination and cooperation among organizational members) and routinization (developing standard operating procedures). As the organization ages, its inertia increases through organizational learning (institutionalization and routinization), hence its reproducibility improves and therefore the probability of failure monotonically declines.

External processes and failure

The second part of the liability of newness hypothesis is related to external processes that also impact an organization's survival. The link between an organization and its environment has been addressed by both the

organizational ecology and adaptationist views. These two views acknowledge the importance of this linkage in explaining the performance of an organization, even though each approach postulates a different paradigm to explain survival.

An organization receives input from its operating environment and transforms this input into output for the continuation of its existence. It often requires a special effort to get access to the resources that are available in an organization's operating environment. This process of managing access to these resources is problematic for newly established firms. Singh *et al.* (1986) assert that as an organization ages it gains external legitimacy by creating and developing relationships and obtaining support from its clients, creditors and suppliers. According to Miner *et al.* (1990), gaining of legitimacy is an institution-based buffer which emerges from organizations' compliance with other parties' expectations in previously conducted operations. Therefore, creating an institution-based buffer and establishing stable exchange relations with clients, creditors suppliers and other parties protects the organization from environmental selection forces and fends off any challenges that may jeopardize its survival (Carroll and Hannan, 1995).

Conflicting perspectives and reconciliation

The liability of newness hypothesis, and hence organizational ecology research, has theoretically and empirically been challenged from two fronts. The first criticism originates from the mainstream of research in organizational ecology. Fichman and Levinthal (1991) and Brüderl and Schüssler (1990) modified the liability of newness hypothesis which states that the probability of failure declines from the beginning monotonically with age, by arguing for the 'liability of adolescence' hypothesis, which claims that the risk of failure increases for a certain period at the beginning of the life of an organization, reaches a peak and declines thereafter. The decline in the risk of failure in the later life of the organization is linked to the same reasons cited in the liability of newness hypothesis. The newly established firm has an initial stock of assets, goodwill, trust, psychological commitment, positive prior beliefs and financial resources (Fichman and Levinthal, 1991) which provide the firm with a buffer for a certain period of time for establishing exchange relations with clients, creditors, and other organizations and to channel the flow of financial and human support to the organization. The success or failure of an organization cannot be judged from the very first month of its existence (Brüderl and Schüssler, 1990) since it takes some time to get some feedback to judge the organization's performance. These initial resources and endowments reduce the risk of failure even if the performance is negative. Therefore the organization will not be terminated unless sufficient proof of negative performance becomes available to the decision-maker. This initial waiting period for assessing performance is termed 'adolescence' by Brüderl and Schüssler (1990) and 'the honeymoon period' by Fichman and Levinthal (1991). While an organization faces no risk of failure during adolescence, its performance is judged at the end of this period, and the organization's risk of failure rises sharply from that point on (Brüderl and Schüssler, 1990). If an organization survives the first assessment of its performance, its risk of failure decreases monotonically with ageing as shown in Figure 1. The aggregate pattern of many individual organizations is likely to follow an inverted U shape as depicted in Figure 2, since organizations have different initial resources, endowments and performance criteria, and since individual decision-makers differ on how much information is enough to judge failure and success (Brüderl and Schüssler, 1990). The peak of the aggregate pattern defines the average end of the adolescence period.

The second challenge to organizational ecology originates from scholars of the adaptationist view, which includes a wide variety of perspectives: contingency theory (Thompson, 1967), resource dependency theory (Pfeffer and Salancik, 1978); strategic management theory (Child, 1972; Bourgeois, 1984), and adaptive organizational learning theory (March, 1981; Levitt and March, 1988). The emergent perspective from the challenge of these competing views is an important debate in organization theory which centres on the influence of environmental selection (i.e. gaining

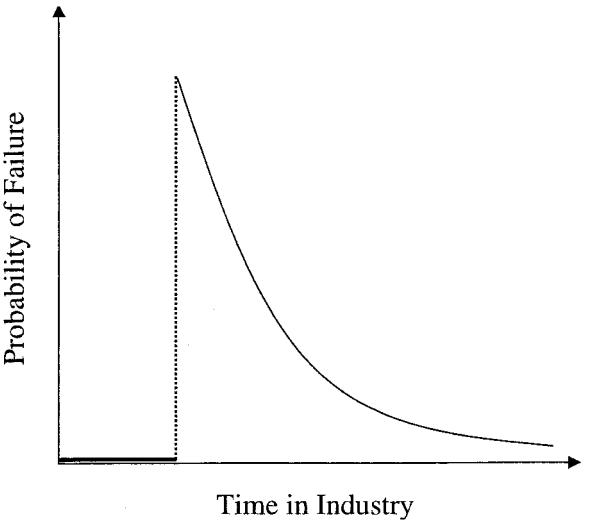

Figure 1 Probability of failure of individual company (adapted from Brüderl and Schüssler, 1990)

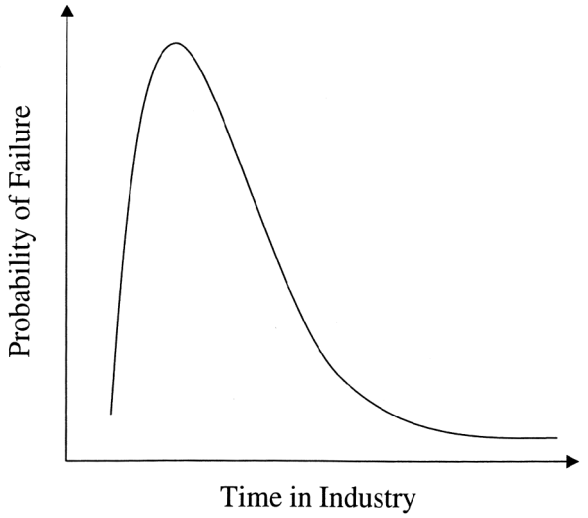

Figure 2 Failure pattern in an industry (adapted from Brüderl and Schüssler, 1990)

of legitimacy and inertia) and adaptation in explaining the survival of organizations. Organizational ecology postulates that any attempt to change the core features of an organization such as its stated goals, forms of authority within the organization, its core technology and finally its marketing strategy will create problems associated with liability of newness (Hannan and Freeman, 1984). It is also pointed out that changes in core features engender the loss of an organization's accumulated competency in its activities, decrease its reliability on performance, upset its exchange relationships, raise questions about its legitimacy and hence reset the liability of newness clock back to zero (Baum and Singh, 1996).

Organizational ecology argues that adaptation is an environmentally determined process where strategic leaders have limited or no effect on the performance of organizations' and where change occurs primarily not through adaptation initiated by their members but rather through a process of organizational death and replacement in a population of comparatively inert organizations. In contrast to the organization ecology view, the adaptationist view (Thompson, 1967; Child, 1972; Pfeffer and Salancik, 1978; March, 1981; Bourgeois, 1984; and Levitt and March, 1988) asserts that organizations are capable of responding to environmental threats and opportunities by altering their organizational strategies, structures and processes guided by the decisions of their strategic leaders whose job is to ensure survival and to enhance performance.

These two conflicting perspectives are now considered to be complementary rather than at the opposite end of a continuum (Hrebiniak and Joyce, 1985; Burgelman, 1991; Levinthal, 1991; March, 1991). March (1991) and Burgelman (1991) approach the reconciliation of these conflicting perspectives from the point of view of organizational learning by focusing primarily on inertia and change. March (1991) points to the existence of these twin processes as an outcome of organizational learning. According to March (1991), organizational learning does not only consist of gaining competence in certain activities, routines, technologies or goals but also involves a process which is characterized by search for and exploration of alternative routines, technologies and goals based on the realization that certain competencies can no longer meet the previously set targets. Levinthal and March (1993) emphasize that inertia ensures an organization's short term survival but that adaptation is also required to ensure its long term survival. Burgelman (1991) supports the view that for survival, organizations should keep these two competing processes, inertia and adaptation, in balance during their organizational life cycle. The balance between these processes is difficult to determine and achieve, and the loss of the balance can cause organizational failure (March, 1991).

Hrebiniak and Joyce (1985) reconcile competing views in organization theory by arguing that environmental selection and adaptation are different processes which influence organizational performance and that both processes can operate simultaneously. The relative influence of these processes depends on the "strength and type of power and dependency between organization and environment" (Hrebiniak and Joyce, 1985). Therefore any attempt to find an unconditional universal relationship between environmental selection and adaptation without considering industry characteristics is futile. Consideration of the characteristics of the construction industry can provide some insights into the influence of these internal and external processes on the failure of construction companies.

Well recognized construction industry characteristics such as the fragmented nature of the industry structure, the fragmented nature of the organization of the construction process, easy entry to the construction business, post-demand production, the one-off nature of projects, the high uncertainty and risk involved, the high capital intensiveness of the constructed facilities and the temporary nature and duration of exchange relationships, impose great challenges on the companies operating in it. Jointly these factors cause tests of reliability and accountability to be severe in the construction industry, and hence construction companies are exposed heavily to environmental selection processes. Even though environmental selection is severe in the construction industry, there is still room for the possibility that strategic leaders of the companies can influence their performance and hence their fate (Betts and Ofori, 1992; Pries and Janszen, 1995), since strategic leaders of the companies do matter

even though their actions are constrained by the environment (Hambrick and Mason, 1984). Presiendorfer and Voss (1990) empirically illustrate the existence of the subtle operation of environmental selection and adaptation in the context of the German construction industry. They find an age-dependent failure pattern which supports environmental selection arguments but introduces a managerial characteristic (age of entrepreneur) that also influences organizations' survival chances.

Research methodology

One of the important sources of historical data on business activity in the USA has been provided by the Dun and Bradstreet Corporation through various reports it has been publishing for a long time. The research reported in this paper extracts data from Dun and Bradstreet (1973–1994, 1996): two reports on business activity, *Annual Business Failure Record (1973–1994)* and *A Decade of Business Starts*, for exploring age-dependent failure in the construction industry. Dun and Bradstreet has used slightly different data collection methods in annual business failure reports published before 1984 and afterwards and in business starts reports published before 1985 and afterwards. To eliminate incompatibility of data, age-dependent failure in the construction industry is explored by analysing the age distribution of failed construction companies each year over two 11-year periods (1973–1983 and 1984–1994) and by computing failure probabilities for specific ages for a 10-year period (1985–1994).

The term 'construction industry' used in the Dun and Bradstreet reports refers to the 'Standard Industry Classification Code' (SIC) and includes building construction general contractors (SIC 15), heavy construction general contractors (SIC 16) and special trade contractors (SIC 17). The standard industry classification used in the published series is based on SIC 1972 for reports published during 1973–1987 and on SIC 1987 for reports published after 1987. A review of the SIC 1972 and SIC 1987 codes reveals that while coverage of the codes has changed for some industries, it remained the same for the construction industry.

Business failure in Dun and Bradstreet's (1973–1994) report refers to 'a business that ceases operations following assignment or bankruptcy; ceases operations with losses to the creditors after such actions as foreclosure or attachment; voluntarily withdraws leaving unpaid debts; is involved in court actions such as receivership, reorganization or rearrangement; or has voluntarily compromised creditors'. The reported business failures represent a subset of total closings which include not only business failures but also simple discontinuances, i.e., disclosures of business termination without loss to the creditors. The right-censored nature of the data confined both analyses to an age range of 1 year old or younger companies to 10 year old companies. Data on business failures at specific ages for companies over 10 years old are not available.

The historical nature of the research does not allow us to control the contextual factors of the organizations explicitly. Data on legal type and size of failed construction companies are not available in Dun and Bradstreet's reports. A limitation of this kind can be overcome by studying sets of large sample sizes, companies numbering in hundreds and thousands, since this makes it possible to identify differences in subtle processes and systematic effects that could be discerned when there is considerable randomness (Carrol and Hannan, 1995). When there are many potential factors affecting organizations and not all can be controlled explicitly, it often makes sense to treat them as random (Carrol and Hannan, 1995). The total numbers of construction companies which failed at the age range of 1 year old or younger to 10 years old were 20 078 and 61 075 in 1973–1983 and 1984–1994, respectively. The number of business failures in the construction industry for each year in the study period ranges from a minimum of 903 to a maximum of 7608 construction companies in 1976 and 1992, respectively.

The age profile of the population is an important determinant of the age distribution of failed construction companies. Therefore the age-dependent failure pattern in a year can be the result of the age profile of the population under consideration for that specific year. Yet data on the age profile of the population of construction companies listed in the Dun and Bradstreet's database are not available. In the absence of the age profile of the population, the research methodology incorporates two longitudinal analyses for gaining insight into the possible existence of subtle processes taking place in the construction industry, since such analyses incorporate inevitably the ageing of companies listed in the database (companies getting older) and the macro-economic business cycles which are correlated with new business formations and business failures and hence with the age profile of the population. The first longitudinal study which analyses the age distribution of failed construction companies over the two 11-year study periods aims to capture whether the age distribution of failed companies is consistently following a similar pattern. The consistent recurrence of a similar pattern can be considered as an evidence of the existence of subtle processes, since the study period is long enough to incorporate the possible changes in the profile of the population.

The second longitudinal study introduces business births into the analysis in order to capture the dynamics taking place in the age profile of the population since business starts are likely to change the age profile in subsequent years. A new entry to the Dun and Bradstreet database is defined as a company that reports a birth date within the previous 36 months. However, Dun and Bradstreet emphasizes that an entry to the database generally coincides with the point at which a business begins actively to compete in the marketplace. Business starts consist of only newly active establishments and do not include changes in ownership of previously operating businesses or changes in the name, location and legal type or mergers. The formula used for computing the probability of failure at specific ages is as follows:

$$P_{i,t} = \frac{F_{i,t}}{S_{(i-1),t}} \quad (1)$$

where $P_{i,t}$ is the probability of failure at age i in year t, $F_{i,t}$ is the number of business failures for companies at age i in year t, $S_{(i-1),t}$ is the number of business starts $(i-1)$ years before year t, i is the age of companies (1 year old or younger $< i <$ 10 years old), and t is the year (1985–1994). $F_{i,t}$, the number of business failures at age i in year t, is calculated by multiplying the percentages of companies failed at age i with the total number of companies failed in year t. Both sets of information are obtained from Dun and Bradstreet's *Business Failure Records (1985–94)* according to which the total number of business failures in the period 1985–1994 at the age range of 1 year old or younger to 10 year old companies is 55 959. $S_{(i-1),t}$, the number of business starts in year in t-$(i$-$1)$, is taken directly from Dun and Bradstreet's (1996) *A Decade of Business Starts* according to which the total number of business starts in the study period (1984–1995) is 247 456. The number of business starts ranges from a maximum 34 962 to a minimum of 17 533 companies in 1985 and 1993, respectively.

Research findings and discussion

Analysis of the age distribution of failed construction companies in the two 11-year time intervals 1973–1983 and 1984–1994 highlights that the percentage of failed construction companies increases over the first few years after their establishment, reaches a peak, and decreases afterwards (Figures 3–5) and this pattern consistently governs the age distribution of failed construction companies every year under consideration, with the exception of 1984 which is characterized by a monotonic decline. The general decrease in the standard deviation over both periods (Figure 6),

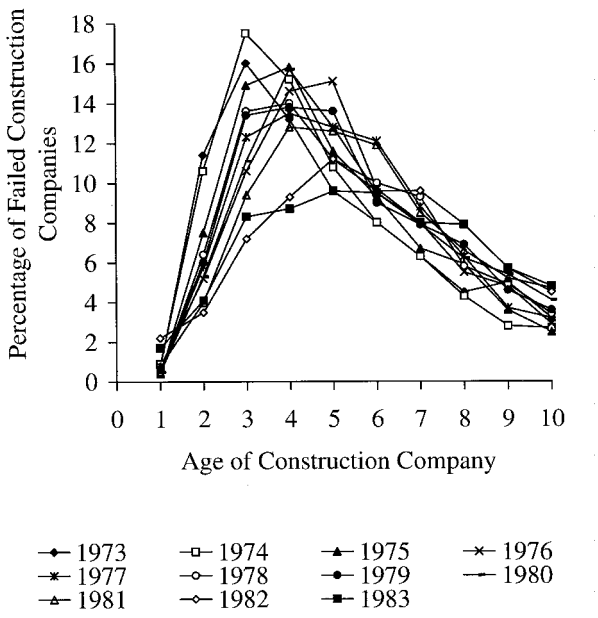

Figure 3 Construction business failures by age, 1973–1983

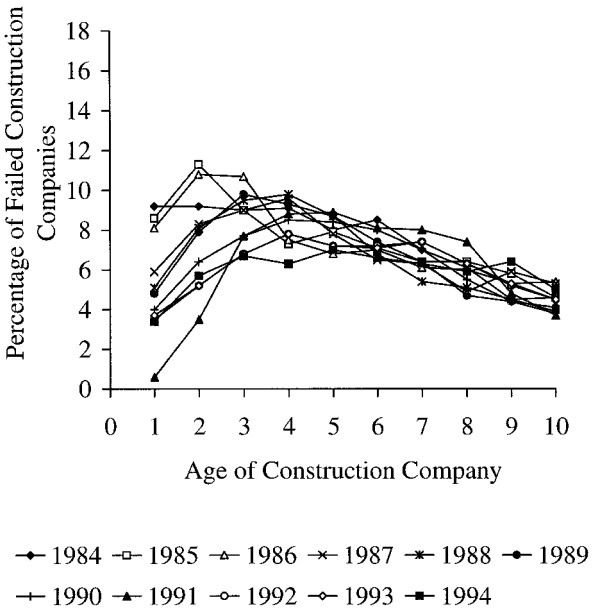

Figure 4 Construction business failures by age, 1984–1994

except for the first three years in the 1973–1983 period, supports the validity of the findings. The computed failure probabilities by specific age ($P_{i,t}$) over the 10-year period 1985–1994 are presented in Table 1. Plotting the average values of failure probability at specific age (P_i) also reveals an inverted U pattern that governs age-dependent business failures in the

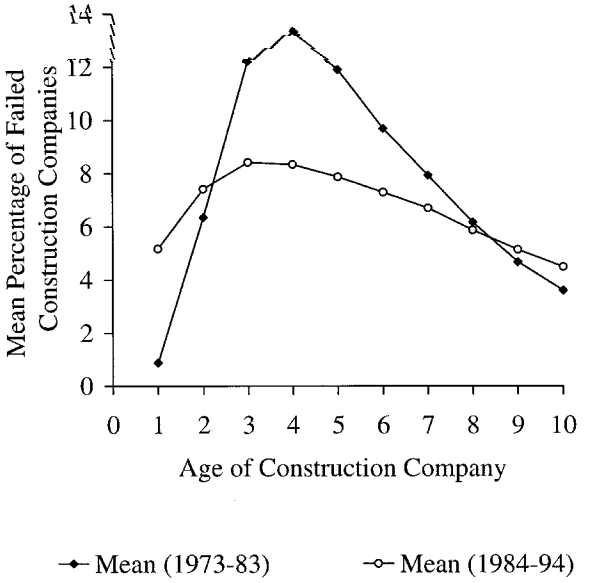

Figure 5 Means of percentages of failed construction companies

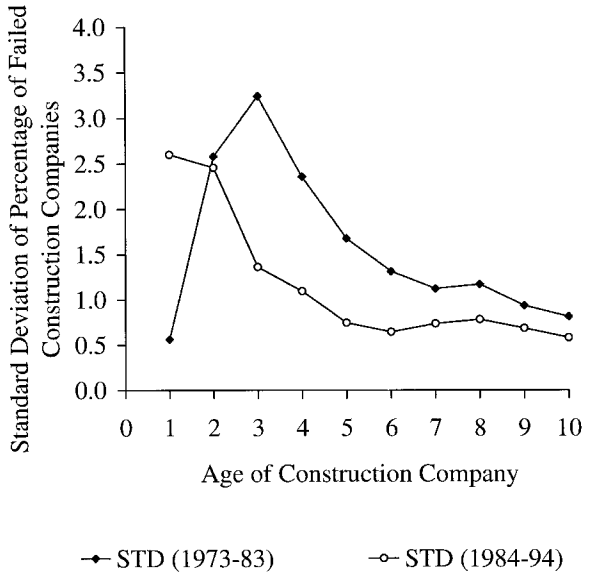

Figure 6 Standard deviation of percentages of failed construction companies

Figure 7 Business failure probabilities by specific age, 1985–1994

construction industry (Figure 7) and provides support for the liability of adolescence arguments. The duration of the adolescence period appears to be 3–4 years in all analyses (Figures 3, 4 and 7).

Overall research findings reveal the existence of an age-dependent failure pattern in the construction industry as postulated by Brüderl and Schüssler's (1990) liability of adolescence hypothesis. The inverted U pattern that is obtained in Figures 3 and 4 suggests that failures among newly established construction companies are much more common compared with older establishments in the construction industry. The probability of failure of construction companies increases up to a certain age, reaches a peak and decreases thereafter. The increasing pattern reflects the existence of an adolescence period where the degree of success is being assessed. During the adolescence period, a construction company is involved in attempts at establishing exchange relationships with organizations such as clients, subcontractors, financial organizations and suppliers which potentially can create a demand for its services or opportunities for long term business alliances. In the adolescence period, the construction company also is being judged as to whether the performance achieved until then is reasonably successful to allow it to continue its operation or whether it should exit from the industry. The length of the adolescence period differs for each construction company, since normally a firm's actions are determined by the owner (proprietor, partner or stakeholders) and the officers (board of directors, the chief executive officer, etc.) of the company and since each individual uses a different time horizon and performance criteria for assessing performance. The observed pattern reflects the differences in competence, background, risk related behaviour, education and style of decision-makers, and the heterogeneity in the organizations' resources. The length of the adolescence period depends also on the availability of each company's different resources to continue its operations. The existence of the adolescence period in the construction industry is influenced not only by the rate

Table 1. Business failure probabilities by specific age (Pi,t), 1985–94.

	Age of construction company (i) in years									
Year (t)	1	2	3	4	5	6	7	8	9	10
1994	0.0150	0.0261	0.0295	0.0264	0.0270	0.0211	0.0186	0.0147	0.0151	0.0115
1993	0.0223	0.0301	0.0374	0.0396	0.0303	0.0276	0.0243	0.0195	0.0160	
1992	0.0239	0.0338	0.0407	0.0387	0.0330	0.0278	0.0271	0.0224		
1991	0.0038	0.0201	0.0367	0.0388	0.0331	0.0293	0.0274			
1990	0.0157	0.0207	0.0231	0.0215	0.0201	0.0187				
1989	0.0136	0.0208	0.0217	0.0194	0.0177					
1988	0.0128	0.0171	0.0189	0.0190						
1987	0.0123	0.0164	0.0173							
1986	0.0171	0.0222								
1985	0.0172									
Average P_i	0.0154	0.0230	0.0282	0.0291	0.0269	0.0247	0.0243	0.0189	0.0155	0.0115

at which construction companies acquire resources such as capital and business alliances and establish networks but also by the fact that the construction business is not capital intensive. The working capital required to start a construction company is relatively low. Construction operations are financed mainly by the owner, with interim payments made to the construction company based on the progress of the construction process. The emergent challenge facing a construction company from this process of financing is achieving a positive cash flow from project(s) that it undertakes since a negative cash flow increases the working capital requirements and hence can risk its survival. However, a construction company can afford to maintain a negative cash flow for some time and this duration depends upon the scarcity or abundance of its resources. The time necessary to acquire resources and to generate business coupled with the low capital intensive nature of the industry forces the decision-maker in the construction company to stay in business rather than to exit the industry, even though the short term does not show any signs of promise. Another reason why construction companies do not decide hastily to quit the construction business is because they can afford to wait since profit margins in the construction industry are not generally as high as in other industries which are characterized by high level capital investment. In other words, construction companies are expected to get the expected return on their investment by earning small profits over extended periods of time rather than large profits over a short time. The failures among construction companies decrease after the adolescence period. The decreasing probability of failure after the peak point can be linked to two interrelated processes: 'organizational learning' and 'gaining of legitimacy'.

Influence of organizational learning on failure

The decline in the probability of failure of older firms may be due to organizational learning, which makes the organization more efficient over time. The influence of organizational learning on performance is well documented at the construction site level for repetitive field operations (e.g. Everett and Farghal, 1994; Farghal and Everett, 1997) and at the headquarters level for cost estimating (e.g. Olu, 1991; Lowe and Skitmore, 1994). The benefits are not confined to these areas but include a vast area of processes, methods, and procedures such as administration, planning, and finance. As construction companies gain experience they develop procedures, methods, and routines to cope with uncertainty and risk which are embedded in the construction business, and in this way they increase their chances of survival. To improve their performance and reduce variation, construction companies gain experience not only from intrafirm activities but also from interfirm activities.

Construction projects often are carried out by a temporary alliance of organizations (Cherns and Bryant, 1984) and involve interorganizational interfaces. Lack of learning, trust and cooperation among the parties involved in the interorganizational interfaces (e.g. the client, the contractor, the designer, and subcontractors) can have detrimental effects on project outcomes and, in turn, can have negative performance implications for the parties involved and in some cases can cause business failures. Indeed, research findings of Russell and Jaselskis (1992) indicate that one of the most common failures occurs when the contractor does not have experience with the client. The same phenomenon can also occur between the general contractor

and subcontractors and design firms, depending on the procurement method chosen and the number of interorganizational interfaces.

The complementary effects of inertia and adaptation suggest that as a construction company gains experience in intrafirm and interfirm activities, its survival chances increase through inertia in the short run and through adaptation in the long run, since both processes are considered as consequences of organizational learning (March, 1991). The tension between these two processes depends on the rate and form of the changes prevailing in the environment. In some environments that are characterized by a low level of turbulence, inertia can be beneficial since it can provide reliability and can increase efficiency (Miller and Chen, 1994). The construction industry is characterized by slow and incremental changes, and is driven by operation efficiency based on experience, with primary focus on production (Pries and Janszen, 1995). Further evidence of the relatively stable conditions that prevail in the construction industry comes from the rate and form of innovations taking place in the industry. Innovations in construction processes and methods, project financing techniques, corporate structuring, and administrative methods generally are slow and incremental in nature rather than rapid and radical. Operating under these conditions, construction companies capture the benefits of organizational learning particularly gaining competence in their activities and operations. This gained competence becomes obsolete in the long run (not in the short run) and hence construction companies have to undergo adaptation processes to increase their chances of survival.

Influence of gaining of legitimacy on failure

A construction company's chances of survival increase as it gains legitimacy from its environment that includes clients, subcontractors, material vendors, and financial institutions and sureties. Construction clients, construction firms, subcontractors, financial institutions and material vendors act reciprocally and selectively in establishing exchange relationships with each other. The failure of one party is not confined only to the party that experienced the failure but has negative consequences also for the other parties. The outcome of the failure of a party can take different forms for each party: time and cost overruns and legal overburden for clients; unpaid contract amounts to construction companies by clients; failure of subcontractors following failure of general contractor and vice versa but more rarely; high cost to financial institutions especially sureties. Selectivity in establishing relationships is governed by the uncertainty and risk embedded in construction projects, and causes tests of both reliability and accountability to be severe in the construction industry.

The client of the construction industry cannot use off-the-shelf product appraisal and selection methods (Mohsini and Davidson, 1992). The one-off nature, the capital intensiveness and risk associated with construction projects forces construction owners to choose well known contractors that will implement dependable methods and production technologies in their projects. In the construction industry, the owner–contractor relationship does not terminate at the actual completion date of the project. It can extend to a total of 14 years in the USA because of the product liability imposed by contract documents. Some of the contract clauses such as liquidated damages, completion of project, and product liability, and documents such as performance, bid, and payment bonds, building codes and regulations, and technical specifications are used to ensure reliability and accountability in exchange relations in construction.

In the construction industry, exchange relationships between client and contractor are not based purely on price competition as commonly assumed. A closer look at the bidding process suggests that many owners use selective tendering for their construction projects. The common usage of such a procedure, i.e. limiting the number of bidders and creating a short-list, is linked partly to the resource consuming nature of the bidding process (Carter and Dunne, 1992) but also to the owners' sensitivities to the selection criteria. Construction firms are often required to pass prequalification before submitting their bids or post qualification if they are the winning bidders. Age-dependent factors including history, experience, listing of major projects completed, and reputation as reported by major suppliers, subcontractors, banks, and creditors frequently are given a large weight in qualification models (e.g. Russell and Skibniewski, 1988; Russell, 1990b). The risk and uncertainty embedded in the construction project coupled with the uncertainty in the previous performance of a construction company often force the construction owner to choose well known and experienced construction firms.

The exchange relationships between general contractor and subcontractor are not based purely on price competition either but rather on more stable and informal arrangements. Eccles' (1981) study in the US construction industry reveals reciprocal actions of this nature by general contractors and subcontractors that govern their relationships. General contractors tend to rely on a few subcontractors in each trade and tend to establish long term relations with them (Eccles, 1981). Similarly, subcontractors mostly

prefer to work with a rather small set of general contractors with whom they establish long term and flexible relationships (Eccles, 1981).

The selection processes taking place in the construction industry are not only confined to the exchange relationships between the client, the general contractor, and subcontractors. As an extension of the transfer of risk, the contract surety industry also exerts selection forces on the construction firms. Russell (1990a) suggests that in extreme cases the surety industry can cause construction companies, particularly small and medium size construction companies, to exit from the industry or to get involved in a search for alternative ways of bonding or to bid on unbonded projects. The primary reason for surety companies being selective by imposing stringent rules is the risk that may cause large losses to them. The total amount of losses incurred by the surety industry was over $4 billion in just the last decade (Gorke, 1996).

The exchange relationships between a construction firm and its clients, sureties, subcontractors, vendors, and financial institutions and others take place in an established environment. In this established environment, newly established companies which lack legitimacy will be much more exposed to environmental selection processes.

Concluding remarks

There are several important conclusions from the research presented in this paper. First, the study reveals an age-dependent pattern of failure in the US construction industry in which the risk of business failure increases in the first few years of a company's life, reaches a peak point and decreases thereafter as the company ages. Second, the increasing risk of failure in the early life of construction companies can be attributed to the possible existence of an initial assessment period also referred to as the adolescence period. During this period, the performance achieved by the company is assessed and a decision is made either to continue with the construction business or to exit from the industry. The heterogeneity of the companies' resources and differences in the decision-makers' time horizon and performance criteria suggest that this assessment period may be different for each individual company. The probability of failure in the US construction industry also follows an inverted U pattern where the peak point defines the end of the adolescence period for the construction industry. Organizational learning and gaining of legitimacy increase the survival chances of a construction company. It is evident from the research that overcoming the liability of adolescence is not as easy as entering the construction industry.

Finally, the research findings of this paper provide some support for the environmental selection arguments in the context of the construction industry but should not be considered as a rejection of the adaptationist perspective.

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