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Critical growth factors of ICT start-ups

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Abstract

Purpose – The present study in this paper seeks to deal with the crucial topic of growth determinants for ICT start-ups. In this emerging industry high firm birth rates go hand in hand with a great risk of failure and only one firm out of three survives the first three years.

Design/methodology/approach – The paper analyzes 220 start-ups of the ICT service sector and verifies the influence of individual and organisational factors on growth.

Findings – The paper finds that human capital and working experience have no significant impact on the success of young ICT firms.

Originality/value – The paper shows that critical growth factors are mostly financing and customer related variables (firm size and capital at start-up, customer structure, regional market orientation, etc.).

Keywords Small to medium-sized enterprises, Communication technologies, France

Paper type Research paper

Introduction

The information and communication technology sector (ICT) becomes to shift from an emerging industry to a major growth industry and occupies an important place in the contemporary knowledge based economy. Implications for management practice are numerous and most economic actors, such as venture capitalists, bankers, public authorities and local governments put high expectation in the growth potential of ICT start-ups.

Entrepreneurship in the ICT sector gives birth to 84,535 new firms, with a total of 160,000 jobs at start-up between 1993 and 2001 in France. But the overall tendency masks sharp infra sectoral disparities, mainly between services and industry. The growth of the whole sector is driven by the services, especially the subdivisions linked to the computer science (consulting in information and computer systems; software development). Consequently, we focus on this subdivision of the ICT sector.

But in this industry, entrepreneurial opportunities are linked to a high risk of failure, and only one firm out of three, passes the crucial first three-year threshold in France (38,7 percent; Lasch, 2003a). The perception of this sector is but partially complete. Most economic actors have great difficulties in clearly understanding this sector and are not always aware of the problems new ICT firms have to face.

Paradoxically few research results are available on the growth (or failure) conditions of this particular industry. Most research has been conducted on new firm survival in general without distinction of selected sectors. Consequently, this article studies one sector at a time and focuses on one crucial question: what are the key factors of growth for new high tech ventures like ICT start-ups?

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Literature on success factors of new firms put forward especially two critical success factors: human capital of the entrepreneur and the initial organizational setup of the new firm. We analyze the impact of both factor groups and use a cohort analysis of ICT start-ups (services). In the final model, we measure the impact of human capital and organizational start-up setting for the 200 ICT start-ups that survived the critical three-year post creation threshold.

The results relativize the impact of human capital and working experience of the entrepreneur on growth and favor factors linked to the initial organizational setting (firm size and capital at start-up, customer and market orientation).

Theoretical background

Determinants of growth of ICT firms

A large number of researches devoted to the identification of success factors of new ventures are published (for a literature see Lasch *et al.*, 2005b), but no solid theoretical framework on this particular crucial topic exists. A large number of determinants are used to analyze the question of sustainability (survival and growth) of start-ups, but in literature various results and often contradicting findings demonstrate that explaining these differences in successful entrepreneurship is an extremely task (Brüderl and Preisendörfer, 2000; Brüderl *et al.*, 1996; Brüderl and Schüssler, 1990; Castrogiovanni, 1996; Cooper *et al.*, 1994; Dahlqvist *et al.*, 2000; Delmar and Wiklund, 2003; Engel, 2002; Greve and Salaff, 2003; Heiss and Köke, 2001; Johannisson, 1998; Lasch, 2003a, b; Lechner and Dowling, 2003; Littunen *et al.*, 1998; Lumpkin and Dess, 1996; Nerlinger, 1998; Schutjens and Wever, 2000; Wiklund, 1999; Wiklund and Shepherd, 2001).

Most authors classify success factors in three groups: the entrepreneur, the firm and the socio-economic environment. All three of these main elements of entrepreneurship are interrelated but explaining these differences in successful entrepreneurship, as a result of different combinations of individual, organizational and environmental factors, is somewhat ambiguous. Many variables are used to produce predictive growth models, but our literature review outlines that the results are extremely heterogeneous and bring often contradicting findings. Studies that analyze all these three factor groups in one model are an exception, which may be explained by a certain lack of data especially for the regional pre-conditions of growth. Consequently, when authors compare and balance the impact of each of the three variables, they often stress that human capital has a stronger impact as the initial organizational setting, and environmental influences are supposed to be relatively minor (Solymossy, 2000, p. 80). This interpretation has certainly to be relativized and some authors affirm the importance of the local context and underline that regional conditions and opportunities for entrepreneurship, competition and interaction are the main factors in starting and developing new firms (Littunen *et al.*, 1998). The local socio-economic environment may so not only produce different levels of start-up activity, but also different structural characteristics of the new firms and here we reach a point where the environmental can directly be linked to growth (Tödtling and Wanzenböck, 2003).

In the present study, we focus our analysis on individual and organizational factors to explain the growth of new ICT firms (services). We were not able to measure the impact of the socio-economic environment, as for this modeling the sample size proved to be empirically insufficient (220 ICT start-ups for 348 labor market areas in France).

The impact of individual factors on growth

A number of variables are used to explain the impact of human capital of the entrepreneur (motivation and entrepreneurial orientation, general human capital, working experience, preparation and pre-founding activities). A number of studies have developed "trait models" and link the success of new firms to personality characteristics of the entrepreneur, as strong motivation for example (Bellu, 1993; Chell *et al.*, 1991; McClelland, 1961). The relationship between intentional behavior and the success of new firms has been widely discussed and outlined in literature (Wiklund, 1999; Wiklund and Shepherd, 2001; Delmar and Wiklund, 2003). We may so believe that success belongs to those who believe it in the strongest and the longest.

For our study, we do not link motivation or entrepreneurial orientation to growth. We make the assumption that starting up an innovation and knowledge-based firm demands not only a high level of qualification and particular technical skills, but also a strong motivation and a positive intentional behavior (Brüderl *et al.*, 1996; Nerlinger, 1998; Seeger, 1997). Entrepreneurs in the ICT sector are supposed to be particularly motivated and to fulfill the key criteria of EO: a propensity to act autonomously, a willingness to innovate and to take risks, and a tendency to be aggressive toward competitors and proactive relative to marketplace opportunities (Lumpkin and Dess, 1996, p. 137).

General human capital is frequently analysed in literature (age, education level, unemployment, gender, and ethnicity, etc.). Age is naturally strongly correlated to the education level and in fact, high tech entrepreneurs are in average two to five years older than those in non-innovative sectors (start-up age between 36 and 39; Lasch, 2003a; Pleschak and Rangnow, 1995; Seeger, 1997). These differences in age between innovative and non-innovative entrepreneurs are generally explained with a higher level of education for knowledge-based entrepreneurship. While some studies measure a positive relationship between age at start-up and the success of the firm (Wicker and King, 1989), others present negative results (Pleschak, 1997) or find no significant differences at all (Brüderl *et al.*, 1996). Consequently, different interpretations are possible. Therefore, young entrepreneurs are considered to be more ambitious and motivated, but older ones have developed stronger networks, have accumulated more experienced and may have an easier access to funding and capital. Even if there is no agreement in literature about this relationship, age is correlated to a high qualification level, which is pointed out as to be one of the key success factors in most of the studies (Brüderl *et al.*, 1996; Cooper *et al.*, 1994; Dahlqvist *et al.*, 2000; Wiklund and Shepherd, 2001).

The influence of gender and ethnicity is considered to concerns more the long-time sustainability and growth performance than the growth of start-ups. Female entrepreneurs and ethnic minorities are not less successful than others, but they start high-performance ventures to a less extent (Brüderl *et al.*, 1996; Cliff *et al.*, 2004; Dahlqvist *et al.*, 2000). Similar results exist for entrepreneurs that started their business from a situation of being unemployed, but authors are more convinced that chances of failure are greater for this type of firm.

The experience of the entrepreneur is one critical success factor advanced by most studies suggesting that relevant work experience contributes to success (Wiklund and Shepherd, 2001), especially when the entrepreneur worked in the same industry before (Brüderl *et al.*, 1996; Cooper *et al.*, 1994).

The size of the firms of the last employment is a rarely studied variable, but nevertheless crucial for the learning process of managerial abilities. Employees in SMEs are suspected to have more opportunities to gain entrepreneurial and managerial knowledge than those in large firms (higher division of labor; Greenan, 1994). Employees in SMEs fulfill more often managerial tasks, are more involved and their employment security depends directly on the performance of the firm (Schmude, 1994a). They may so develop a more entrepreneurial attitude, while entrepreneurs with mainly working experience in large firms, fail more often (Pleschak, 1997).

While the importance of industry specific knowledge is generally admitted, for other types of specific experience findings are somewhat troubling: management experience is crucial for certain authors (Cooper *et al.*, 1994; Pleschak, 1997), but not for others (Brüderl *et al.*, 1996). Previous start-up experience appears not to be automatically a precondition for success. Experienced entrepreneurs can profit from their entrepreneurial knowledge to realize more rapidly an unsuccessful future of their business and may hesitate less to close it down than inexperienced ones (Dahlqvist *et al.*, 2000).

Finally, social and personal networks (family) facilitate the access to different kinds of knowledge (tacit knowledge, specific knowledge, entrepreneurial knowledge, etc.) and thus contribute to the success of the new firm, especially when they present opportunities for networking (Aldrich and Zimmer, 1986; Aldrich and Cliff, 2003; Brüderl *et al.*, 1996; Greve and Salaff, 2003; Hansen, 1995; Johannisson, 1998; Nijkamp, 2003; Varamäki and Veslainen, 2003).

Following this discussion, we consequently hypothesize a positive relationship between general human capital and the success of ICT firms.

H1. Growth of ICT start-ups is positively related to the human capital and the working experience of the entrepreneur.

The impact of organizational factors on growth

Organizational characteristics are another explanation for differences between successful firms and failures. The initial organizational setup is supposed to have a strong impact on the sustainability of start-ups. Authors stress above all the importance of financing and firm size (Brüderl *et al.*, 1996; Cooper *et al.*, 1994; Dahlqvist *et al.*, 2000; Wiklund, 1999). There are many indicators for financial capital: the amount of capital raised at start-up (Brüderl *et al.*, 1996; Cooper *et al.*, 1994; Dahlqvist *et al.*, 2000; Wiklund, 1999), the availability of venture capital (Engel, 2002; Dahlqvist *et al.*, 2000), public aids (Brüderl *et al.*, 1996; Dahlqvist *et al.*, 2000). The availability of significant financial capital gives the entrepreneur the possibility to start his business from the beginning with a certain firm size in terms of employment. Therefore, the number of employees at the start determines, to some extent, the performance of the firm and increases the chances of success.

A number of authors stress that the chances of success increase, when the founder is assisted in his decision-making process by a business partner or an entrepreneurial founding team (Ruef *et al.*, 2003; Brüderl *et al.*, 1996; Pleschak, 1997; Schutjens and Wever, 2000; Teal and Hofer, 2003). But the theoretical competitive advantage of an entrepreneurial founding team (complementarities, a broader "knowledge-base", an efficient task division) is not totally supported by certain authors that point out possible risks that can lead to failure, like disharmonies between partners (Almus *et al.*,

1999; Nerlinger, 1998; Seeger, 1997). Nevertheless, complementarities should prevail and produce positive effects especially in innovation and knowledge-based firms.

Starting with a certain number of possible customers or a file of clients may reduce the risks of failure, especially for innovation and knowledge-based firms that have to support additional costs due to a high R&D intensity and time-expensive development of innovative market ideas or high-tech products (Kulicke, 1990). Some authors (Koschatzky, 1997; Seeger, 1997) also stress the importance of the number of clients (degree of dependence) and the type of clients (private customers, public institutions, other firms).

The success of new firms may also depend on the market orientation (local, national, international markets), but for this variable, various viewpoints exist. Therefore, certain authors stress that firms with a high degree of specialization should diversify regionally their markets (Bathelt, 1992) and, especially for innovation-based firms, competing from the start-up at a national level increases the chances of success (Koschatzky, 1997). In fact, some authors point out higher growth risks for firms that follow from the beginning internationalization strategies (Bürgel *et al.*, 2001; Sapienza *et al.*, 2003).

The location choice is mostly motivated by private reasons of the entrepreneur, as proximity to the place of residence (Schmude, 1994b). Innovative firms have specific needs concerning their location, but also a particular interaction with the local economy, thus the choice of localization may also affect the growth. In literature a number of authors stress the importance of these innovation and technology based externalities (localization and agglomeration effects) as well as the role of the regional context as a source of particular kinds of knowledge and expertise, that promotes (or inhibits) new technology-based start-ups (Audretsch, 1998; Collinson, 2003; Lasch and Le Roy, 2005a; Nguen and Vicente, 2003).

Several researches note that knowledge spillovers are far more important than agglomeration effects for the new firm formation in innovation-based sectors (Armington and Acs, 2002; Capello, 2002; Lasch *et al.*, 2005b). Consequently, we can suppose that access to market and resources (agglomeration effects), knowledge-spillovers (localization effects) and other cost-reducing reasons should determine the choice of localization of an entrepreneur in the ICT sector far more than personal reasons. As a refinement, we suggest that the impact of organizational change in the post start-up period may affect change in a significant way.

Following the previous discussion, we consider that organizational factors determine the growth of new firms.

H2. Growth of ICT start-ups is positively related to pre start-up activities (organizational setup I).

H3. Growth of ICT start-ups is positively related to post start-up activities (organizational setup II).

Method

Databases

We use a data set that offers the opportunity to gather information of the firms at their start and once again three and five years later. This is a dataset collected by the French national institute of statistics and economic studies, INSEE, that considers cohorts of

new firms since 1994 ("enquête SINE"), where one firm out of five is observed during five years (in average three questionnaires). For our study, the first wave was used (first questionnaire at the start-up in 1994 and second questionnaire in 1997). In this database, questionnaires of 24,191 firms (all sectors) were available and, as we focus on the ICT service sector, our data size comprehends the 220 ICT service firms that survived the first three years.

Defining the ICT sector

Our definition is similar to what is used in most of the recent publications in France (Heitzmann and Rouquette, 1999; Lasch and Le Roy, 2005a; Rouquette, 1999) and the delimitation of the ICT sector is realized by using the actual French sector classification ("Nomenclature d'Activités Française, Naf"[1]). According to our definition, the ICT sector is composed by three sub sectors (Table I): high tech industries (first category of the OECD definition), ICT services (computer/software services and telecommunications, except "France Télécom"), as well as other knowledge intense services (non university R&D, technical studies, analysis, testing and inspections). We focus on the most important subdivision, the ICT services.

Measuring the variables

We use a multiple regression model to text proxies (Table II) for critical growth factor related to human capital and initial organizational characteristics of the ICT start-ups (dependent variables). The index of growth, our dependent variable, is defined as the growth of employees' number in the first three years.

Results

Even if there are many studies of the determinants of survival and the growth of new firms, there is no real agreement in literature about the key factors of success (proxyed by growth) and different studies produce different results. One explanation given in literature is that sector specificities are often neglected and can thus bias the findings.

The overall result of the regression model is the strong impact of organizational factors on growth, especially those related to pre start-up activities (initial organizational setup I). Nevertheless, post start-up activities find strong support as well (initial organizational setup II). Human capital and working experience of the entrepreneur prove to have no sustainable effect on growth of ICT start-ups. For the ICT services, nine variables out of 26 are strongly significant: one to a 1 percent level, 4 to 5 percent level, and another 4 to 10 percent level (Table III). Three variables are

Code NAF700	
642B	Other providers except national (France Télécom)
713E	Location of business machines and computer system
721Z	Consulting in information and computer systems
722Z	Software development
723Z	Data administration and use
724Z	Development and administration of databases
725Z	Repair and services for business machines and computer systems
726Z	Other computer related services

Table I.
Subdivisions of the ICT service sector

Success factors	Proxies
H1. Human capital and working experience	
General human capital	Age of founder; university or high school graduation; start-up from a situation of unemployment; academic spin-offs
Firm size of last employment	Firm size of former employment (<3, 3-9, 10-49, 50-199, >200)
Industry specific knowledge	Start-up in the same activity/sector as former employment
Management experience	Experience as manager, cadre
Preparation activities	Start-up training
H2. Pre- start-up activities (organizational set-up)	
Existing clients at start-up	Clients approached or file of clients
Start-up capital	Amount of start-up capital, public aids
Firm size at start-up	Number of employees at start-up
Founding team	Entrepreneurial founding team
Subcontractor	Essentially subcontractor activities
H3. Post- start-up activities (organizational set-up)	
New capital	Capital from other firms incorporated
Type of clients	Private, firms, great distribution, public sector, sub-contractors
Evolution of number of clients	Number of clients (1-2, 3-10, >10)
Local market	Clients essentially in local market
National market	Clients essentially in national market
International market	Clients essentially in international market
Evolution of products and services	Diversification of products and services
Cooperation	R&D co-operations; other co-operations

Table II.
Proxies of growth factors

between the 10 and 20 percent level and can be considered as of lesser explanatory value.

Human capital and working experience seems not to influence at all firm growth for ICT services (all proxies are insignificant). Consequently, *H1* is rejected.

H2 (pre start-up activities) is confirmed, three variables are significant at the 5 percent level (file of clients at start-up, firm size at start-up, and entrepreneurial founding team). Two variables are significant on the 10 percent level (little capital. The negative sign of the numeric variable "firm size at start-up" means that a relatively small number of employees at start-up affect negatively the growth of the firm. The proxy "entrepreneurial founding team" (dichotomy variable) means a negative effect of the variable at a whole.

H3 (post start-up activities) finds also strong support; one variable is significant at the 1 percent level (evolution of number of clients), one at the 5 percent (mainly private customers) and two at the 10 percent level (new capital, international market orientation).

Discussion

We share with many predecessors the experience that discussing our research results in making the link with the existing literature is a very difficult and complex task. The previous researches are too heterogeneous and additionally, to our knowledge, growth

Dependent variable: growth of the number of employees between 1994 and 1997 (log) Variables	ICT services
H1. Human capital and working experience	
Education level (university or high school graduation)	0,0877
Last employment in firm with less than three employees	−0,0315
Last employment in firm with three to nine employees	0,0216
Last employment in firm with 50 to 199 employees	−0,1330
Last employment in firm with more than 200 employees	−0,0936
Start-up in the same activity/sector as former employment	0,0102
Specific working experience (manager, cadre)	−0,0253
Start-up training	0,0647
H2. Pre- start-up activities (organizational setup)	
Clients approached before start-up or file of clients	0,1697***
Public aids	−0,1306*
Capital raised at start-up less than 15.000€	−0,0361**
Capital raised at start-up between 40.000€ and 74.999€	0,2936*
Capital raised at start-up more than 75.000€	0,4020**
Firm size at start-up (number of employees)	−0,0140***
Entrepreneurial founding team	−0,2330***
Mainly subcontractor activities	0,0904
H3. Post- start-up activities (organizational setup)	
Capital from other firms incorporated	0,2165**
Clients mainly private customers	−0,4002***
Clients mainly other firms (SME)	0,0312
Clients mainly other firms (large firms)	0,1733°
Evolution of number of clients	0,2960****
Clients mainly in locale/regional market	−0,0616
Clients mainly in international market	−0,3889**
Diversification of products and services	0,1280*
R&D co-operations	−0,1388*
Other co-operations	−0,0127

Notes: ****sign. 1 percent level; ***sign. 5 percent; **sign. 10 percent; *sign. 20 percent; $R^2 = 0.4406$ (adj. $R^2 = 0.2776$); $R^2 = 0.4290$ (adj. $R^2 = 0.2365$)

Table III.
Results of the multiple regression model

factors for the very specific ICT sector have not yet been sufficiently studied. Consequently, we concentrate on two points where, to our eyes, the predictors of growth identified by our research can advance existing knowledge: First, we discuss why human capital and working experience have no significant effect on growth, and, second, we point out the critical key success factors ICT entrepreneurs, venture capitalists, bankers and support infrastructure should be aware of (Table IV).

No significant results were obtained for the all the variables related to the human capital of the entrepreneur, like education level, working experience in SMEs, or specific experience (entrepreneur, manager). Starting-up a business in the same sector as the last employment is also not automatically related to success. The importance of start-up training is not confirmed for growth as well. Consequently, one may argue that other qualities, like managerial competencies may prime, but not even for this variable our model turned out a significant result. This finding may lead us to a different interpretation of human capital as critical key success factor for high tech venturing.

Initial organizational setup	
Critical growth factors (pre- start-up, *H2*)	Effect
File of clients at start-up	Positive
High capital at start-up (>75.000€)	Positive
Low capital at start-up (<15.000€)	Negative
Firm size at start-up (employees)	Positive
Entrepreneurial founding team	Negative
Critical growth factors (post- start-up, *H3*)	Effect
New capital from other firms	Positive
Evolution of number of clients	Positive
Mainly private customers	Negative
Mainly international market orientation	Negative

Table IV.
Main results

We argue that the paradox of insignificant human capital variables on successful high tech venturing may be simply explained by the fact that a high qualification, industry experience or very specific technical skills are a *conditio sine qua non* to bring an ICT creation project to life. Consequently, differences between successful and unsuccessful ICT entrepreneurship related to human capital cannot be identified when anyway most of the entrepreneurs in our sample are high-educated people. This viewpoint would explain the somewhat ambiguous findings of previous research about qualification as success factor (Wicker and King, 1989; Pleschak, 1997; Brüderl *et al.*, 1996; Dahlqvist *et al.*, 2000; Wiklund and Shepherd, 2001).

The lack of management experience is often advanced as a main reason for failure of novice entrepreneurs (Cooper *et al.*, 1994; Pleschak, 1997) and authors agree that especially in SMEs future entrepreneurs find a benefic environment of managerial learning (Greenan, 1994; Schmude, 1994a; Nerlinger, 1998). Being mainly focused on the technical feasibility of an innovative product or service may be a reason for failure, but if the financing and the employment policy does not match the needs of the high tech venture, failure is to be predicted anyway. So, we argue based upon our findings that the initial organizational setup of an ICT venture, especially a sufficient and long-term financing, is a very pragmatic pre-condition for sustainable growth. Perhaps a long-term analysis would enable us to see the effects of a high performance management outmatching the long-term financial shortness at start-up? Finally, the fact that start-up training does not have any sustainable effect on growth can easily explained by short-term effects on survival during the post creation period (Lasch and Le Roy, 2005a).

Critical growth factors of ICT start-ups are mainly financing and customer related variables. This finding results in important implications for managers, entrepreneurs and economic actors like venture capitalists, bankers, public authorities and local governments to foster the high growth potential of ICT start-ups. First of all, our results indicate the strong needs for capital of ICT start-ups. Initial organizational characteristics can produce sustainable effects and are positively related to growth, especially when a high start-up capital is available. Starting with a small firm size reduces the chances of growth for ICT services. An interesting finding for the French context and its support infrastructure for entrepreneurship which is often stigmatized as system that provides over support is the fact that public aids obtained at start-up have no further effects on the growth of the firms. This may indicate a support policy

that is too much focused on short-term effects (survival of the critical three year threshold) or inadapted selection criteria that may benefit to underperforming firms that normally should not receive public financing. Connecting to this point, both the financing infrastructure and the public authorities should be aware of the importance to provide promising ICT ventures with sufficient and long-term financing to manage the delay between product or service development and market entry, but also to allow the entrepreneurs to start-up with a critical size in terms of employment (Brüderl *et al.*, 1996; Dahlqvist *et al.* 2000). Another critical growth factor we identified is a file of client that already exists at start-up. This means that the new venture can provide services to first customers and is profitable from the start on. Finally, the theoretical competitive advantage of an entrepreneurial founding team (complementarities, a broader "knowledge-base", an efficient task division; Ruef *et al.*, 2003; Schutjens and Wever, 2000; Teal and Hofer, 2003) cannot be confirmed by our results and we outline possible risks that can lead to failure, like disharmonies between partners (Almus *et al.*, 1999; Nerlinger, 1998; Seeger, 1997).

In our regression model we observe also the evolution of some initial organizational characteristics over time and measure their impact on the growth chances of the firms (post start-up activities). So, financing performances, like the introduction of new capital from other companies, tend to increase the growth of ICT services. To our surprise, (R&D) co-operations with other firms turn out to be insignificant. This may indicate that strategic R&D co-operations may be more important for the survival period but not for a long-term growth and indicate changing networks and interaction structures over time. A similar result is obtained for a diversification of products and services (10 percent level), but the chances of growth increase strongly with the number of clients. Nevertheless, they decrease when the file of clients is mainly constituted by private customers. Finally, a high degree of internationalization is linked to high risks.

Especially for ICT start-ups, which are often, considered as global ventures, competing on international markets and early internationalization bears high risks for growth and confirms the results of other authors (Bürgel *et al.*, 2001; Sapienza *et al.*, 2003). Successful internationalization means to prepare the international business perhaps more slowly and carefully.

Conclusion

The main objective of the present paper was to deal with the crucial topic of growth in an emerging sector characterized by high firm birth rates, but also high risk of failure. Even if there are many studies of the determinants of survival and the growth of new firms, there is no real agreement in literature about the key factors of success (proxyed by growth) and different studies produce different results. Advancing the perception of ICT entrepreneurship with a high growth potential is crucial, regarding how relatively little research has been undertaken into its specificities. The present research studies one sector at a time. We analyze the impact of human capital of the entrepreneur and the initial organizational setting and use a cohort analysis of ICT start-ups (services). The main objective is to identify critical growth factors of ICT start-ups. The results relative the impact of human capital and working experience of the entrepreneur on growth and favor factors linked to the initial organizational setting (firm size and capital at start-up, customer and market orientation).

These results clearly portray the significant influence on growth of a number of variables. Implications for management practice are numerous and our results may be useful for practitioners who are involved in new firms, such as venture capitalists, bankers, but also for those of the public authorities.

Our study opens some directions for future research. In order to increase understanding of the complexity of a new venture's survival and success, especially in emerging sectors like the ICT, future studies should be based on broader empirical samples, should integrate as well regional effects on the outcomes of new high tech ventures. To consider deeper the heterogeneity of the ICT sector, pointed out in prior research work, could help to advance our understanding of the ICT sector. A distinction between the main branches of the sector (ICT services, other knowledge intense services and high tech industry) would help us to complete the results obtained here only for the ICT services.

Future research should also consider more multiple level designs. In connecting with this point, we put particular focus on the need for transferring results obtained on an aggregate level to an individual level (for example the impact of regional contingency variables). Therefore, a number of our findings could be detailed and our results give a first idea of the possibilities.

Note

1. SIC four digit code.

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