

EDITOR'S COMMENTS

IT and Entrepreneurism: An On-Again, Off-Again Love Affair or a Marriage?

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Advances in information technologies and the growth of a knowledge-based service economy are transforming the basis of technological innovation and corporate competition, and....this transformation requires taking a broader, institutional and political view of information technology and knowledge management (Van de Ven 2005, p. 365).

What is the nature of the relationship between IT and entrepreneurship (either small start-ups or intrapreneurial ventures within large multinationals)? Our steadfast belief is that IT is the magic ingredient that inspires and most often enables contemporary entrepreneurial endeavors. Our argument is that it is more like a long-standing marriage than a transient love affair. Why (and if) this occurs has been debated in the literature, but we would suggest that looking only at the traditional economic roots of analysis will not yield a deep understanding of the phenomenon. The creation of an entrepreneurial culture reflects profound social and organizational changes, and, more generally, the growth of an entire economic ecosystem that goes beyond the simple introduction of greater volumes of capital and labor into production processes (Audretsch 2003; Audretsch and Thurik 2004). Entrepreneurism, in the thinking of Thurik and Grilo (2005), is a multidimensional and multilevel phenomenon, open to a variety of viewpoints, and taking place from the individual to the systemic level. Even so, and paraphrasing Lowe and Marriott (2006), the starting point of every entrepreneurial activity lies in the ability to thoroughly understand the macro environment, its variables, and the impending threats and opportunities. Because of the increasing globalization of communications, the evolution of regional trading blocks (EU, ASEAN, and NAFTA among others), the constantly changing behavior of consumers, and the emergence of an “anywhere” and “anytime” competition in global markets (Bosma et al. 2003; Boyer 2004), whoever is willing to start a business up must deal with constantly changing technological paradigms (Van Stel 2006; Wennekers et al. 2005) and be able to succeed in spite of the radical transformations exploding all around one.

The globalization of new enterprises (with its initial and initiating website, firms are “born global”) and the IT revolution (modern corporations, indeed, modern life, cannot exist without IT) have together redefined the world map of start-ups, not only with respect to the movement of capital but also the movement of information from expensive locations in the developed world to low-cost sites spread across the entire globe (Audretsch and Thurik 2004; Wennekers et al. 2005). From this perspective, the market mechanism of replacing inefficient enterprises with more efficient and creative entities that are better able to acknowledge and exploit the opportunities provided by technological change, described many years ago by Schumpeter, applies even more to the still neglected link (or logical nexus) between IT and entrepreneurship.

Wherein does this marriage lie and what brings it about? Scholars like Ma and Wang (2006) argue that entrepreneurial opportunities inherent in IT grow day by day with the development of new technologies. Technology (in particular, information

technology) and organizations coevolve, alternating periods of social construction with periods of technological determinism (Groenewegen and Taminiu 2003). If computing resources and existing knowledge are combined and well-utilized, there is a greater chance that people and corporations will have the inclination to create ever more entrepreneurial endeavors. There are two fundamental conditions for this to occur with greater frequency and greater resilience: (1) access to architectural tools for exploiting business and business knowledge and (2) an understanding of the opportunities originating from new IT (See 2004). Preston (2001) was alluding to such conditions when, 10 years ago, he wrote that "MIT's Technology Licensing Office files four patents a week, licenses hundreds of inventions to industry each year, and creates ten to twenty new start-ups a year around these inventions" (p. 1).

During the past 15 years, IT has played a central role in the entrepreneurial development of virtually every country in the world, as well as contributing crucially to the performance of advanced economies. These technologies have become pervasive in all economic sectors, thus making an overall major contribution to capital stock. They have also, *de facto*, radically modified how business economics functions, causing a substantial change in the nature of enterprises and accelerating factors of market competitiveness. Therefore, the contribution of IT capital to the growth of an economy is not limited solely to an increase in established factors of production, but it is also significant for its impact on the birth rate of new entrepreneurial ventures and the general business environment in which those ventures coexist.

Exactly why should the adoption and use of IT technologies facilitate start-ups and improve business performance? On the one hand, they reduce transaction costs and losses in terms of coordinating different activities (Malone et al. 1987; Skinner 2008); on the other hand, they lead to the improvement of intra- and interorganizational routines (Timmers 1999). Connected to this is also the entrepreneurs' desire to improve relationships with clients and suppliers and to enhance market positions. The competitive edge that can be achieved by adopting IT is manifest, for example, in higher competitiveness, reduction of lead times and better customer service, and the researching and selection of new business and partnership opportunities (Ray et al. 2005). But the act of establishing a new enterprise by leveraging the advantages provided by IT may also lead to unsound approaches, such as mindlessly embracing the image of always being in the vanguard of new technology applications, a poorly thought-out strategic positioning that could be mere fad or fashion (Abrahamson 1996).

Empirical research carried out to date at the crossroads of entrepreneurship, management, and IT confirms these high level observations. Vu (2004) shows how, in the 1990s, IT development effectively drove productivity gains and created an entrepreneurial culture in numerous advanced economies. A clear example is the strong growth during the period 1995–2000 of U.S. productivity when IT capital came to represent over one-fifth of gross domestic product (GDP) (CEA 2001; Jorgenson and Stiroh 2000; Oliner and Sichel 2001).

The impact of IT on the creation of an entrepreneurial culture and market growth has also been shown in Australia (Parham et al. 2001), Canada (Armstrong et al. 2002), Korea (Kim 2002), the United Kingdom (Oulton 2002), the Netherlands (Van der Wiel 2001), and Finland (Jalava and Pohjola 2001). The international management literature confirms the strong correlation between the growth of the economic system, in terms of the birth and development of new enterprises, and the diffusion of information technologies (Meso et al. 2009). Thus Gretton et al. (2002), analyzing the results of the private sector in the Australian Business Longitudinal Survey, found significant correlations between the development of business competitiveness and the use of information technologies in both the manufacturing and service industries. Similar results were found by Brynjolfsson and Hitt (2003), who examined U.S. innovative enterprises, and by Pilat and Wolf (2004), who studied the birth of new IT-based enterprises in OECD countries including Finland, Ireland, and Korea. These studies have been echoed over the years by an economic analysis of new German and Dutch enterprises in the service industry (Hempell et al. 2004) and, more recently, by Leitão and Ferreira (2009), who focused on the impact of the privatization of European telecommunications markets on variables such as business ownership rate, employment, GDP, and IT investments in Germany and Portugal.

These studies are also confirmed by the numerous successful cases of synergy between IT networks and territorial networks: from the clustered aggregation of enterprises (Porter 1998) to industrial districts (Becattini 1990; Biggiero 1999); from learning regions (Cooke and Morgan 1998) to *milieux innovateurs* (Maillat and Lecoq 1992); and, finally, from physical districts to virtual or digital districts (Chiarvesio et al. 2004). The scientific debate to date has confirmed that economies in which productivity dynamics have not shown signs of acceleration are those in which IT applications have been introduced later than in other places (Leitão and Ferreira 2009).

Given this discussion, what is the best evidence that there is a strong connection between the availability of IT technologies and the birth of new enterprises and the increase of their market competitiveness? On this point, the management literature highlights how IT capital equipment can have positive effects on the functioning of enterprises in markets, in terms of greater relational capacity, faster exchange of data and information, and greater efficiency in the general economic system, all of which go well beyond a mere increase in physical capital equipment (Gani and Sharma 2003; Van Stel et al. 2005).

The concept used in the literature to accumulate such changes is that of *total factor productivity*, a variable that can be calculated with growth accounting equations. It is a measure of the rate of technical progress not incorporated in the factors of production. It reflects numerous elements, such as innovations of production processes, improvements in labor, organizations, or managerial techniques, economies of scale, and improvements in the qualitative level of capital or the experience and education of a labor force.

Variants of total factor productivity are calculated residually and, therefore, they also reflect these changes in non-observable factors (for example, the composition of the labor force), as well as errors in measurement. Moreover, because of the heterogeneity of the phenomena captured by the dynamics of total factor productivity, the specific contribution arising from IT cannot be simply and immediately detected. In addition to these points, ascribing all of the variance of total factor productivity to the impact of IT on enterprise systems, and hence trying to justify in this way the greater movement of individuals toward the birth of new enterprises, would almost certainly overstate the case. The counterargument is that two explicit links can be detected between IT capital equipment and labor productivity growth, which, interpreted from a particular standpoint by focusing on a certain industry, might encourage an individual to create an enterprise in a given industry.

The first link is *capital deepening*, that is, the increase in capital share per labor unit. The more the stock of productive capital available to each worker increases, the more his or her productivity grows, all other factors being equal. Capital deepening allows us to measure the efficiency of the structure of production with respect to the diffusion and intensity of IT capital introduced into an enterprise system.

The second link, on the other hand, concerns the indirect effect of technological change on the potential growth of a new enterprise system, constituted by positive spillover effects, such as network externalities. The quantification of this second link is much more controversial. The problem is that, although there is a wide agreement on the fact that IT technologies have a positive impact on the competitiveness of new enterprises in their early years (Goode and Stevens 2000; Leitão and Ferreira 2009; Linde et al. 1989), such effects generally tend to occur only if IT introduction is complemented by other factors. These include a corporate governance system sufficiently oriented toward the value-creation possibilities of IT capital and the availability of adequate managerial skills to introduce new technologies strategically into an enterprise.

Of course the link between entrepreneurship and IT is also a result of local policy initiatives. OECD member countries continuously update their own IT policies (such as broadband plans in Australia, Ireland and Korea or the new ICT Numérique 2012 policies in France, Avanza 2 in Spain, Digital Britain in the UK). In Europe, for example, the Digital Britain plan aims to improve and modernize digital networks, creating a favorable climate for investments in content, applications, and digital services, stimulating universal availability, expertise, and digital alphabetization, as well as allowing widespread accessibility to public online services and creating an interface with public administration. The Spanish plan, Avanza 2, is designed to contribute to economic recovery through a common and intensive use of IT, with a special eye on future Internet and digital content. And, in Southeast Asia, Korea has relaunched the New Growth Engines Initiative focused on IT goods, services, and software.

Our overall argument has been that there are many reasons that IT and entrepreneurship should be seen as a permanent loving couple and not as an *ad hoc* relationship. For those who wish to pursue this topic further in their thinking and their research, we offer an empirical investigation and an analytical model in the Online Supplement to this editorial.

The innovation induced by modern entrepreneurial ventures nearly always calls for a complementary introduction of new IT to support the idea. Even when an innovation is not inherently technological, globalization enters the picture and organizations must immediately think about the wide array of technologies (especially IT) that are required to coordinate and match, control operations, remedy defects, ensure quality, and market manufacturing and service products on a worldwide basis.

Given the critical importance of IT in the emergence of new ideas (and hence new firms), we would like to encourage scholars worldwide to engage in a concerted effort to better and more deeply study the nature of this marriage. How do firms coordinate the needs of investment in fresh, firm-specific strategic goals and investments in new IT? Does this differ according to region of the world, industry type, extent of capitalization, or a myriad of other factors that could explain differential codevelopment? Exactly how does IT contribute value to entrepreneurial ventures? What kinds of IT investment work best at which stage of development? The fascinating research questions that can be asked (and presumably answered) are endless. We need to start the journey.

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EDITOR'S COMMENTS – SUPPLEMENT

A Study in IT and Entrepreneurism in the Campania Region of Southern Italy

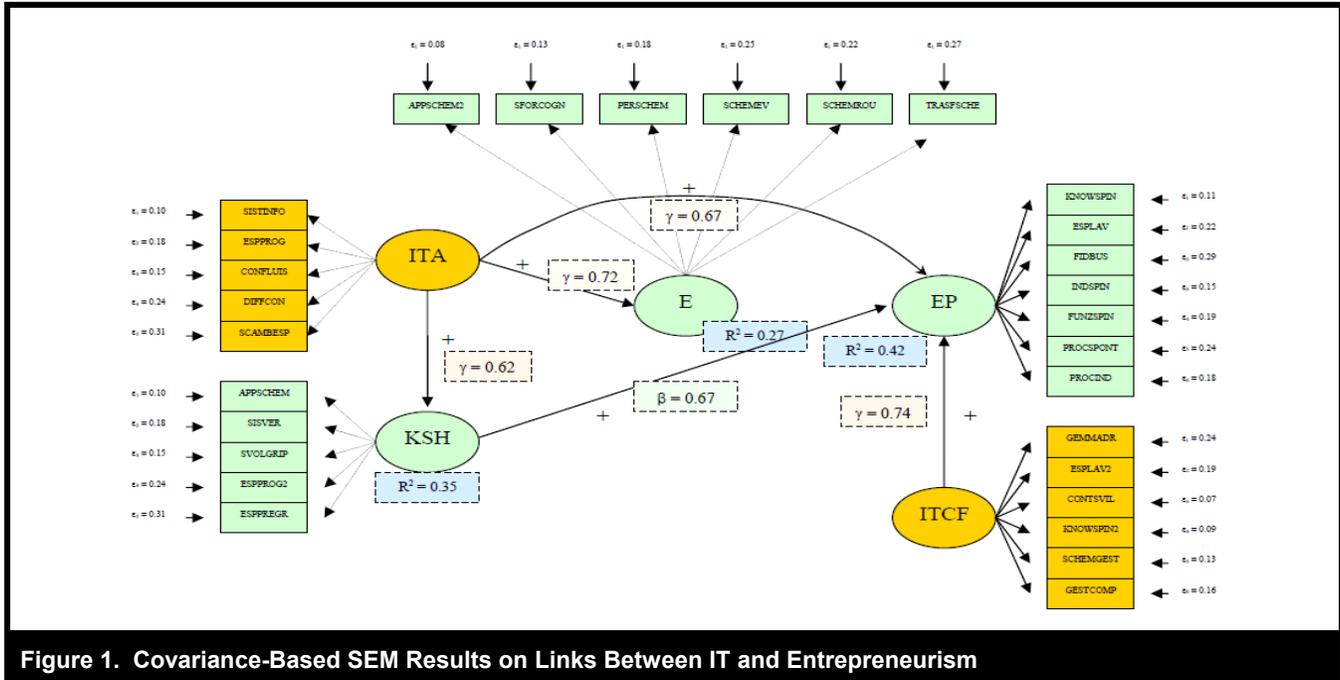
A recent empirical investigation¹ involving a sample of 567 entrepreneurial enterprises confirms the intimate link between new entrepreneurs and IT. To get a feeling for what questions could and should be asked of entrepreneurs, focus groups were first assembled, a process which involved querying a selected number of firms and participants. Participants were encouraged to discuss and publicly examine their IT requirements, especially with reference to the opportunities, impacts, and, above all, issues and obstacles related to the adoption of such new technologies.

To carry out data collection in the followup field study, a questionnaire was utilized. This questionnaire was administered using the CATI (computer-aided telephone interview) method, and consisted of 40 questions regarding the use of IT and its connection to start-up decisions and business performance. Identified initially in the population of entrepreneurial firms in Campania were 3,112 entrepreneurial enterprises; of these, 932 were excluded from the sampling frame because they were not suitable (in response to an opening question they declared that they did not use IT systems for the management of their business). Of the 2,180 remaining, 537 could not be contacted, leaving 1,643 in the sampling frame. Of these, 394 could not find the time to participate and 682 turned down the interview, leaving 567 in the sample for a 35 percent response rate.

Results

In general terms, more than half of the interviewed enterprises were very positive about the capacity of IT to stimulate entrepreneurship—*ex ante*, encouraging the individual to create a new enterprise; *ex post*, intervening in order to improve performances and business processes, increasing business productivity, redesigning internal processes, making existing processes more efficient, and extending organizational flexibility. Over 70 percent of the firms agreed on the capacity of IT to make an impact on relational and communication systems, especially with regard to improving relations with customers and suppliers, increasing the sharing of information and resources, facilitating the exchange of information and the sharing of strategic lines. The same group of interviewees noted the strong influence of these IT capabilities on their decision to create a new enterprise. In particular, the 567 start-ups confirmed, without significant differences among them, that they had established their enterprises relying on IT to manage external relations (for example, sales, marketing, customer management, and external logistics), administrative functions (for example, accountancy and management control), and internal business processes (for example, production, warehouse, and internal logistics). The empirical data, analyzed through structural equation models (see Figure 1), provides interesting results, prompting further in-depth investigation to confirm the close correlation between the availability of information technologies and the inclination to entrepreneurship. The research model allowed the team to test additional variables that were posited to have a direct or indirect effect (entrepreneurial performance, IT capacity factors, etc.) (see Figure 1).

¹The study was conducted by researchers associated with the Faculty of Economics of the Second University of Naples.



Notes:

Exogenous Variables

ITA = IT Availability
ITCF = IT Capacity Factor

Endogenous Variables

KSH = Knowledge sharing ($R^2 = 0.35$)
E = Entrepreneurism (= propensity to entrepreneurship) ($R^2 = 0.27$)
EP = Entrepreneurial performance ($R^2 = 0.42$)

***Solid lines indicate significant paths.

Discussion

H1 ⇒ ITA is positively associated with E.

The positive impact of the ITA variable on the E variable was registered by a value of the structural coefficient $\gamma = 0.72$, compatibly with a measurement error (E) variable in a range of $0.08 < \epsilon < 0.24$ ($\chi^2 = 27.20$, $df = 566$, $P < .05$; GFI = 0.84; AGFI = 0.92).

H2 ⇒ ITA is positively associated with EP.

The positive impact of the ITA variable on the EP variable was registered by a value of the structural coefficient $\gamma = 0.67$, compatibly with a measurement error (EP) variable in a range of $0.11 < \epsilon < 0.29$ ($\chi^2 = 32.50$, $df = 566$, $P < .05$; GFI = 0.80; AGFI = 0.91).

H3 ⇒ ITA is positively associated with KSH.

The positive impact of the ITA variable on the EP variable was registered by a value of the structural coefficient $\gamma = 0.62$, compatibly with a measurement error (KSH) variable in a range of $0.10 < \epsilon < 0.31$ ($\chi^2 = 33.29$, $df = 566$, $P < .05$; GFI = 0.77; AGFI = 0.85).

H4 ⇒ ITCF is positively associated with EP.

The positive impact of the ITCF variable on the EP variable was registered by a value of the structural coefficient $\gamma = 0.74$, compatibly with a measurement error (EP) variable in a range of $0.11 < \epsilon < 0.29$ ($\chi^2 = 31.20$, $df = 566$, $P < .05$; GFI = 0.76; AGFI = 0.89).

H5 ⇒ KSH is positively associated with EP.

The positive impact of the ITCF variable on the EP variable was registered by a value of the structural coefficient $\beta = 0.67$, compatibly with a measurement error (EP) variable in a range of $0.11 < \epsilon < 0.29$ ($\chi^2 = 28.43$, $df = 566$, $P < .05$; GFI = 0.81; AGFI = 0.87).

Furthermore, the covariance-based SEM analysis shows how firms born from a strong IT strategy continue to improve their performance, always establishing new interaction models with consumers, based on

- Individual involvement of the consumer in a culture of cocreation
- Increasingly more direct, non-intermediated interaction
- Transition from the personalization of communication (content and channels) to contextualization of customer interest and purchases
- Transition from behavioral targeting to a sharing of the identity of the corporate brand

Future Research and Conclusion

The model in Figure 1 enabled the research team to formulate tentative conclusions and to propose future research using a methodology that explains the impact of IT capital on performance and thus on the growth of new enterprises. The theoretical model of growth accounting (elaborated in greater detail below) stresses determinants of economic growth; in fact, it is broken down into contributions arising from different factors. The underlying theoretical model is the neoclassical theory of production, according to which it is possible to describe technology in terms of a continuous and differentiable production function that correlates output, factors of production, and technical progress. It is assumed that the production function, which links the output (that is, the product) to the production inputs (labor and capital, the latter possibly divided into IT and non-IT), has the functional form of a Cobb-Douglas equation:

$$Y_t = A_t L_t^\alpha K_t^{\beta_1} I_t^{\beta_2} \quad \alpha + \beta_1 + \beta_2 = 1 \quad (1)$$

where Y_t is the added value to time t , L_t is the labor input (measured in working hours), K_t is the input of non-IT capital and I_t is IT capital. A_t identifies the shifts of the production function linked to technical progress, that is, the total factor productivity (TFP), which residually captures all of the changes of the output not explained by the other factors.

In the hypothesis of perfect competition (and profit maximization), α , β_1 , and β_2 , which identify product elasticity compared to every factor of production (labor, non-IT capital, and IT capital, respectively) are equal to the quota cost of that factor on the output value.

Expressing the growth rates in logarithmic terms (where $Y^\circ = \ln Y_t - \ln Y_{t-1}$; that is, the growth rate), (1) becomes:

$$Y^\circ = A^\circ + \alpha L^\circ + \beta_1 K^\circ + \beta_2 I^\circ \quad (2)$$

where $\beta_2 I^\circ$ identifies the contribution of IT capital to product growth. From (2), the total factor productivity growth is residually calculated:

$$A^\circ = Y^\circ - \alpha L^\circ - \beta_1 K^\circ - \beta_2 I^\circ \quad (3)$$

Labor productivity is obtained by dividing the production function (1) by the labor input (measured, in our case, in working hours, but, as an alternative, labor units could be taken into account):

$$y_t = Y_t / L_t = A_t (K_t / L_t)^{\beta_1} (I_t / L_t)^{\beta_2} = A_t K_t^{\beta_1} i_t^{\beta_2} \quad (4)$$

where with k , i , and y per capita values are indicated (or, in this case, per working hour). From the logarithmic differentiation of (4), the deconstruction of labor productivity growth is obtained in order to highlight the effect of capital deepening:

$$y^\circ = A^\circ + \beta_1 k^\circ + \beta_2 i^\circ \quad (5)$$

Finally, to highlight the contribution of IT not only to growth productivity ($\beta_2 i^\circ$) due to capital deepening, but also to technical progress (from TFP), the formulation adopted by the European Commission in its work on productivity growth engines can be applied (European Commission European Economy (2004), n.6, Directorate-General for Economic and Financial Affairs, p. 156):

$$y^\circ = (1 - \alpha)(1 - \eta) [K^\circ - L^\circ] + (1 - \alpha)\eta [I^\circ - L^\circ] + A_{it\ ind}^\circ \quad (6)$$

where

- η identifies the IT capital quota on added value ($= \beta_2 / 1 - \alpha$)
- $(1 - \alpha)\eta [I^\circ - L^\circ]$ is the contribution to productivity growth due to *capital deepening*
- $A_{it\ ind}^\circ$ indicates the contribution to technical progress (TFP) that comes from IT industries

We urge researchers to think along these lines when trying to establish economic links between IT and entrepreneurial activity.