

Innovation, Creativity and Success

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ABSTRACT. This article explores the role of innovation in small and medium sized firms, in relation to the firm's success. After a discussion of the relationship between success, innovation and creativity, some possible backgrounds of creativity and innovation are presented. For one part these are of a personal nature, like the entrepreneur's values, attitudes and level of education. For another part they concern institutional aspects of the firm.

After the development of a number of hypotheses these are empirically checked with data from a survey among 200 entrepreneurs in six countries. In the appendices some details of the data and variables may be found.

I. Innovation and creativity as success factors

The chances of a small firm to survive and to be successful are becoming ever more dependent on innovation. Not only product innovation is important to maintain a sufficient market share, but also process innovation to produce below price level, and social innovation to maintain a flexible and durable organisation.

Generally spoken, innovation is to be defined as 'the successful implementation of a creation' (Heunks and Roos, 1992, p. 6). This innovation seems to foster growth, profits and success (Hyvärinen, 1990, p. 73). We define success of a firm as 'any sign of economic profitability, like growth, increasing productivity and profits'.

- * **Hypothesis 1:** The success of a small firm, measured by its growth, increasing productivity and profits, depends on its innovation.

The entrepreneur-founder gradually becomes burdened with management responsibilities (Swayne and Tucker, 1973, pp. 13–16). The tasks and mental outfit of the founders differ from those of the later managers.

The founder of a firm nearly by definition is an entrepreneur and innovator. In the beginning (the birth- or start-up stage) innovation consists mainly of the firm itself as a new product-market combination. In this stage of uncertainty survival is most important. In a new business there is room for a craftsman-entrepreneur, confined to one idea.

In later stages an opportunistic entrepreneur is needed to adapt the firm better to the environment (Davidsson, 1989, p. 140). To strengthen the firm and to pass through the stage of growth, the emphasis has to shift to innovation within the firm and its context. To qualify as an entrepreneur, applying new ideas, the manager has to be oriented towards, and actively pursue change (Davidsson, 1989, p. 6).

- * **Hypothesis 2:** Younger firms are less innovative than older ones.

According to West and Farr (1990, p. 252) innovation is the conception of a new idea, transformed into an invention, and exploited as much as possible, whereas creativity is only the conception of the idea. Ivancevich et al. (1994) and Kao (1991, pp. V–VI) agree with this strict definition of creativity. Several others regard the technical implementation of an idea also as a matter of creativity. According to them innovation is only the choice of a suitable organisational and economical context in which to exploit the invention (Swayne and Tucker, 1973, pp. 74–75; Nyström, 1979, p. 1; Hyvärinen, 1990, p. 66; Emory, 1968, p. 75). Of course, this is typically the task of an entrepreneur, recognizing the opportunity in an idea and translating it into an

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economic reality. He must give chances to good ideas in doing so. He has not to be creative himself, but manage creativity by finding out where ideas come from and subsequently facilitate them.

We define creativity as divergent thinking to conceive new ideas, whereas innovation is the successful technical and economic implementation of a creation.

According to hypothesis 2 innovation and new ideas are most relevant after a firm's birth- or start-up stage. Therefore, particularly at that time, in the growth and maturity stages of an established organisation the question is how the creative and entrepreneurial spirit can be preserved and stimulated (Kao, 1991, pp. 4–7).

- * **Hypothesis 3:** Innovation and success of a small firm depend on creativity, particularly after the start-up stage.

II. Innovation, creativity and personality

Because creativity is related to innovation we should know their common and specific backgrounds. If creativity as a matter of divergent thinking has to result in innovation, it should be followed by convergent thinking (Nyström, 1979, p. 40). So, the ideal is a sequence of intuitive openness and analytic closure (Nyström, 1979, pp. 1, 55–58). Innovative firms should balance between internal flexibility and control, whereas more positional (less innovative) companies are less interested in divergence and flexibility and prefer convergence and control by theoretical analysis and formal planning. Fairtlough (1994, p. 307) shows the HRM side of this mix, in saying that innovation asks for low control, bottom-up initiatives and commitment. 'The loose-tight rule is the key one for organizing innovation . . . People should be loosely managed, but a lot should be expected from them' (Fairtlough, 1994, p. 334).

- * **Hypothesis 4:** Innovation depends on a combination of flexibility and control.

The essential element of creativity remains divergent thinking which requires flexibility. Research findings indicate that divergent thinking supposes tolerance for ambiguity and lack of rigidity. These in turn assume great psychological safety and

freedom as a base for self-confidence and an internal locus of control (Nyström, 1979, pp. 41–43). From a list (Ivancevich et al., 1994, p. 608) with characteristics of creative people we mention the following. Creative people tend to:

1. have knowledge of their specialty and be more or less intelligent,
2. be extravert, sensitive to problems and highly motivated,
3. be independent, persistent, self-confident and sceptical, and tolerate isolation,
4. take risks, be open to new ideas and tolerate ambiguity,
5. be flexible in combining things and synthesize information.

Because creativity is concerned with new ideas, and innovation with using them, their backgrounds will partly differ. From several lists (Schöllhammer and Kuriloff, 1979, pp. 10–14; Ivancevich et al., 1994, p. 564) we collected some characteristics of innovative or successful entrepreneurs. They tend to:

1. have a high level of knowledge,
2. be sociable, embrace challenges and be energetic,
3. be independent, persistent, self-confident and optimistic,
4. take calculated risks and be open to new ideas,
5. be flexible and creative,
6. desire responsibility, need achievement, value money and have a future orientation,
7. be a dynamic leader, take initiative and have organizing skills.

Both lists have much in common, the main difference being the dynamic personality of the innovator (6–7) as an addition to his more or less creative nature (1–5). This is agreed upon by Schumpeter, cited by Scherer (1986, p. 13): The entrepreneur-innovator is characterized by "initiative," "authority," and foresight"; he is "the captain of industry" type.

- * **Hypothesis 5:** Creativity and innovation tend to share some personal backgrounds, like a high level of education, extraversion, acceptance of challenges, a need for independence, self-confidence, risk-taking and flexibility.

- * **Hypothesis 6:** Innovation has some specific personal backgrounds, particularly a future orientation and leadership affinities.

III. Institutional aspects of innovation

Finally, we should look for institutional backgrounds of innovation. Innovation is a characteristic of an organisation, its members and its context (Nooteboom, 1994, p. 332). Essential in innovation, distinguishing it from creativity, is the successful implementation of a creation. This is often a matter of resources (Kono, 1988, p. 107). Institutional factors fostering innovation are the availability of qualified personnel, external information, external cooperation and external capital (Oldenboom and Kleinknecht, 1994, p. 29; Hyvärinen, 1990, p. 71). Freeman mentions 'networking relationships with external sources of information, knowledge and advice' and 'continuous interactive learning' (from own experiences as well as from external sources) (Freeman, 1994, pp. 82–83).

- * **Hypothesis 7:** Innovation depends on the availability of external capital, information, cooperation and qualified personnel.

Depending on the emphasis being laid on either development or efficiency, firms tend to be of an innovative or a positional type. Innovative firms are both more oriented towards and capable of innovation (Nyström, 1979, p. 13). Rizzoni (1990, pp. 31–40) found 6 types of small firms, depending on their orientation towards technological innovation.

They may be bracketed as follows:

- 1–2 traditional (including static) firms,
- 3–4 cooperating (dominated or imitative) firms, and
- 5–6 (new) technology based (and cooperating) firms.

Of course, technology-based firms (types 5 and 6) are the most innovative ones, whereas all others tend to be more or less positional. They are positioned more or less in traditional styles or in the realm of other firms.

This taxonomy expresses some differences between small firms. However, they tend to have much in common too, when being compared with

larger firms. Hyvärinen collected characteristics of small and big enterprises from the literature. According to him big enterprises tend to excel in all kinds of resources and knowledge. On the other hand, small enterprises tend to excel in all kinds of flexibility and to know how to use creativity (Hyvärinen, 1990, p. 72). Arrow states that large firms have disproportionate access to the external capital market (Ronen, 1983, p. 24).

Strengths and weaknesses of small firms may sometimes stimulate innovation, sometimes hamper it. It is therefore understandable that the relationship between innovation and firm size is not very clear. Some find this relationship to be negative. Hansen (1992, p. 37) for example concludes that firm size is inversely related to innovative output, and Hyvärinen (1990, p. 72) found that big enterprises tend to refrain from creative and considerable innovation.

Whereas large firms have material advantages, small firms have behavioral advantages, which is expressed in a curvilinear relationship between size and innovation and also in the phenomenon that small and large firms often cooperate (Dodgson and Rothwell, 1994, pp. 315, 323).

Nooteboom emphasizes the simplicity of both culture and structure of small firms, fostering motivation, flexibility and originality, but risks and lack of information as well (Nooteboom, 1994, p. 334). On the other hand Acs reminds us of the bureaucracy of size which is less well suited for innovation (Acs and Audretsch, 1990, p. 52).

- * **Hypothesis 8:** Innovation in small firms profits from their flexibility and creativity, and in larger firms more from the availability of resources like external capital and qualified personnel.

Acs and Audretsch (1990, p. 77) are of the opinion that an innovation-strategy of small firms can offset size-related disadvantages facing small enterprises. Nooteboom (1994, p. 339) finds a complementarity of small and large firms in innovation. Small business is likely to be better in application, development and introduction to the market, and large business more in the generation of fundamentally new and 'science based' high technologies. According to Arrow less costly and more original innovations will come from small firms, and those involving higher development

costs but less radical departures in principle will come from larger firms (Ronen, 1982, p. 16)

- * **Hypothesis 9:** Innovation in small firms emphasizes new products and processes, whereas innovation in larger firms emphasizes more R & D.

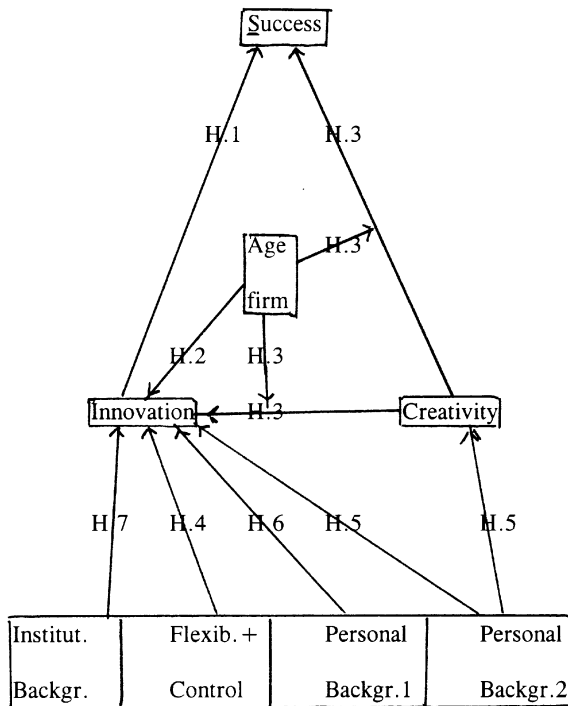


Fig. 1. Conceptual scheme.

Hypotheses 1 through 7 may be summarized in Figure 1.

IV. An empirical check of the hypotheses

In order to see whether our hypotheses hold true in reality, we organized interviews with 200 managers in six countries. They are in charge of the main responsibility for a firm in light engineering or in road cargo transport, and may therefore be called entrepreneurs. The interviews were held in 1992 in Great Britain, The Netherlands, Germany, Belgium, France and Italy. The interviewees managed firms with a labour force between 10 and 200 people. *Details of the sample and the variables used are to be found in the appendices.*

* Our **first hypothesis** states that growth, increasing productivity and profits (as indicators of success) of a small firm depend on innovation. Several kinds of innovation are distinguished: the number of the firm's new products (product innovation), changes in the production process (process innovation), new methods of marketing (marketing innovation), and changes in research and development (R&D innovation), all of these in the last five years. Instead of R&D activities, only changes in these activities are counted as innovation, in accordance with Freeman who found that R&D activities are not per se stimulating growth (Freeman, 1994, p. 78). For the precise operationalisation of the variables used see Appendix 2.

When we relate growth, increasing productivity and profits to innovation (Table I), it proves that product innovation hardly contributes to these aspects of success. However, process, marketing and R&D innovation tend to stimulate growth. Moreover, process innovation stimulates productivity (probably because it permits more of any given output to be produced by the average worker by improved methods, materials and equipment (Scherer, 1994, p. 263)). These relationships exist mainly in the smallest firms with 10 to 50 people in their labour force.

However, innovation and particularly process innovation tends to go along with low profits or losses, except for R&D innovation stimulating profits of medium sized firms. So, innovation tends to result in growth and efficiency, but not immediately in more profits.

We may conclude that hypothesis 1 is mainly supported for the smallest firms, regarding the relationship of innovation with increasing productivity and growth, but not with profits which tend to be low in innovating small firms. This may be explained in two ways. Low profits might be the price of innovative investments in the first instance and/or could be a main reason for innovation, if they do not follow but precede innovation. That is to say, one might innovate either despite profits increase only some years after the innovation, or because profits are low. In both cases innovation relates negatively to profits, whereas hypothesis 1 expresses a longterm positive effect of innovation upon profits.

* **Hypothesis 2** is hardly supported by our data.

TABLE I
Success and innovation by firm size

Firm Size	Innovation	Success		
		Growth	Productivity increase	Profits
All firms (N = 200)	Product	0.10	0.13	-0.06
	Process	<u>0.19</u>	<u>0.22</u>	<u>-0.16</u>
	Marketing	<u>0.20</u>	0.03	0.00
	R&D	<u>0.15</u>	0.10	-0.01
10–50 fte (N = 101)	Product	0.09	0.12	-0.07
	Process	<u>0.22</u>	<u>0.29</u>	-0.19
	Marketing	<u>0.25</u>	0.01	-0.07
	R&D	<u>0.26</u>	0.10	-0.15
51–200 fte (N = 99)	Product	0.10	0.08	-0.03
	Process	0.14	0.07	-0.11
	Marketing	0.14	0.03	0.09
	R&D	0.01	0.04	0.17

Pearson r; underlined = significant at 0.05 level.

Firm age does not correlate with any kind of innovation. Maybe the birth-stage of a firm, before innovation becomes necessary, is very short. Therefore, we should distinguish very young from all other firms. But, in our sample the 9 % youngest firms (younger than 10 years) tend to be even somewhat more innovative than the older ones, except for product innovation which tends to occur somewhat less often in the youngest firms. However, these differences are not significant.

* **Hypothesis 3** relates success and innovation of small firms to creativity (see Appendix 2), particularly after the ‘start-up’ stage. However, growth is not particularly stimulated by such an attitude (see Table II) and profits are even lower in ‘creative’ firms. Only productivity is significantly more increasing ($r = 0.14$) in firms whose managers favour creativity. As expected, this relationship is only found ($r = 0.24$) in older firms (over 32 years old). In these firms product innovation is also significantly related (0.21) to creativity (0.18 for process innovation). So, hypothesis 3 is supported only partially.

According to our conceptual scheme (Figure 1) innovation should play an intermediate role in the relationship between creativity and productivity increase. And indeed, if product- or process innovation is kept constant this correlation decreases from 0.14 to 0.08. So, this relation between creativity and success is partly indirect.

* **Hypothesis 4** is supported (see Table III) so far as R&D innovation is significantly related (0.17) to a combination of flexibility and control (see Appendix 2). However, the same is true for pure flexibility (0.21). Therefore, flexibility still seems to be more important than control.

This is in line with Nyström's idea (1969, p. 57) that innovative companies should recruit and stimulate intuitive individuals and individuals who can switch between intuitive and analytic patterns of thought. The relationships found are not fostered by an intermediate role of creativity, because when the latter is kept constant, they remain intact.

TABLE II
Creativity as a background of innovation and success

	Creativity		
	All firms	Old firms	Young firms
Growth	0.08	0.03	0.11
Increasing productivity	<u>0.14</u>	<u>0.24</u>	0.02
Profits	-0.09	-0.17	-0.04
Product innovation	0.14	<u>0.21</u>	0.05
Process innovation	0.13	0.18	0.08
marketing innovation	-0.02	-0.05	0.03
R&D innovation	0.04	0.03	0.07
	(N = 200)	(N = 99)	(N = 91)

Pearson r; underlined = significant at 0.05 level.

TABLE III
Flexibility and control as background of innovation

	Flexibility			Flexibility + control		
	All firms	Small firms	Medium firms	All firms	Small firms	Medium firms
R&D innovation	<u>0.21</u>	<u>0.20</u>	<u>0.21</u>	<u>0.17</u>	<u>0.27</u>	0.07
process innovation	-0.03	0.15	<u>-0.22</u>	-0.03	0.16	<u>-0.22</u>
N:	191	98	93	191	98	93

Pearson r; underlined = significant at 0.05 level.

When correlations are calculated for smaller and larger firms separately, flexibility remains important for R&D innovation in both categories of firms, whereas the combination of flexibility and control is only important in the smaller firms (see Table III). In other words only in small firms R&D innovation benefits from less extreme flexibility, possibly because larger firms already have enough control in their structure.

The situation regarding process innovation is partly different. In larger firms flexibility as well as the combination of flexibility and control show a negative relationship with process innovation, whereas in smaller firms this relationship tends to be positive, which means that process innovation in larger firms is counteracted by any flexibility.

* **Hypothesis 5**, about common backgrounds of innovation and creativity, is partly supported by the fact that both creativity and innovation are more or less related to risk-taking and flexibility (see Table IV). However, the entrepreneur's education and self-confidence mainly promote innovation, and acceptance of challenges and extraversion only promote creativity. The wish for independence is unimportant for creativity and even detrimental for innovation.

Possibly, some background variables may influence innovation only indirectly via creativity (Figure 1). Some of the variables mentioned in hypothesis 5 (risk-taking, education and self-confidence) show a significant correlation with innovation. But, when creativity is partialled out (see the last column of Table IV) education and self-confidence maintain the same levels of correlation with innovation, whereas risk-taking loses that relation. It is only indirectly related to innovation via creativity. Actually, the direct influence

on innovation by the entrepreneur's education and self-confidence concerns product and R&D innovation.

* As expected in **hypothesis 6** innovation has some specific backgrounds in addition. Indeed, innovation is increased more than creativity by the entrepreneur's future orientation and by his wish for leadership (Table IV). However, if creativity is kept constant the relationship of innovation with future orientation remains the same whereas with leadership it decreases strongly, and proves to be indirect.

* As expected in **hypothesis 7** innovation depends on cooperation with other firms and on the availability of external capital, but this regards mainly marketing innovation. In other words, firms cooperating with other firms and using

TABLE IV
Backgrounds of creativity and innovation

Backgrounds	Creativity	Innovation	Innovation (creat. const.)
Risk-taking	<u>0.21</u>	<u>0.16</u>	0.08
Flexibility	0.11	0.12	0.10
Education	0.06	<u>0.20</u>	<u>0.21</u>
Self-confidence	0.09	<u>0.16</u>	<u>0.19</u>
Challenges	<u>0.18</u>	0.01	-0.04
Extraversion	0.11	-0.03	-0.05
Independence	0.06	-0.14	<u>-0.22</u>
Future orientation	0.10	<u>0.27</u>	<u>0.28</u>
Leadership	0.09	<u>0.22</u>	0.10
Entrepreneurship	<u>0.19</u>	0.08	0.05
Cooperation	-0.06	0.13	0.15
External capital	-0.03	<u>0.18</u>	<u>0.24</u>
Information	0.14	<u>0.21</u>	<u>0.26</u>
Education personnel	-0.01	0.06	-0.01

Pearson r; underlined = significant at 0.05 level; N = 200.

external capital tend to innovate their commercial systems more than others. Firms using external information in their turn tend to excel in process and R&D innovation. All of these relationships of innovation with institutional backgrounds are of a direct nature so far as they remain intact when creativity is kept constant. The educational level of personnel does not play any role in innovation.

Some of the background variables mentioned in hypotheses 5 through 7, namely self-confidence and future orientation, not only have a significant relationship with innovation but also with success of the firm. According to Figure 1 (conceptual scheme) the latter relationship should disappear when innovation is kept constant. Actually, only the relationship between future orientation and success decreases from 0.27 to 0.08, whereas the one between self-confidence and success remains at the same level (from 0.16 to 0.15). So it seems that self-confidence is important for success (direct connection to be added in Figure 1), and a positive future orientation also but only via innovations.

Apart from the hypotheses and the conceptual scheme there is still another way of looking at the various background variables, namely as elements of broader factors. We have selected the most important background variables mentioned in hypotheses 5 through 7, and put them in a factor analysis. We derived two principal components (after Varimax rotation) as shown in Table V. The first one is called 'desire' because it mainly consists of Schein's occupational values. The second one is called 'opportunity', mainly consisting of capacities and perceived opportunities.

The first factor hardly correlates with creativity (0.11), innovation (−0.04) and success (0.06). The second one significantly correlates with creativity (0.22), innovation (0.36) and success (0.21). The correlations with innovation and success do not decrease when partialling out creativity and/or innovation. So, the relations found are of a direct nature.

All this means that innovation and success are not dependent on emotional motivation but fairly much on practical orientations and capacities.

* In **hypothesis 8** we expect different backgrounds of innovation in small and medium sized firms. Actually, there are only clear backgrounds

TABLE V
Factor matrix of background variables

Variables	Factor 1 'Desire'	Factor 2 'Opportunity'
Entrepreneurship	<u>0.70</u>	0.09
Leadership	<u>0.67</u>	0.39
Challenges	<u>0.60</u>	−0.05
Independence	<u>0.57</u>	−0.20
Risk-taking	−0.38	<u>0.44</u>
Future orientation	−0.36	<u>0.61</u>
Self-confidence	0.03	<u>0.61</u>
Education	−0.08	<u>0.65</u>
Ext. information	−0.03	<u>0.52</u>
Cooperation	0.08	<u>0.44</u>
External capital	−0.37	0.10
Variance explained	19%	19%

TABLE VI
Backgrounds of innovation and firm size

Backgrounds	Innovation		
	All firms	10–50 fte	50–200 fte
Risk-taking	<u>0.16</u>	0.20	0.07
Flexibility	0.12	0.17	0.05
Education	<u>0.20</u>	<u>0.37</u>	−0.06
Self-confidence	<u>0.16</u>	<u>0.22</u>	−0.01
Challenges	0.01	−0.05	0.08
Extraversion	−0.03	−0.10	0.05
Independence	−0.14	−0.15	−0.09
Future orientation	<u>0.27</u>	<u>0.29</u>	0.11
Leadership	<u>0.22</u>	<u>0.22</u>	0.16
Entrepreneurship	0.08	0.15	0.02
Cooperation	0.13	0.13	0.16
External capital	<u>0.18</u>	<u>0.24</u>	0.07
Information	<u>0.21</u>	<u>0.21</u>	0.08
Education personnel	0.06	0.13	0.00
N:	200	101	99

Pearson r; underlined = significant at 0.05 level.

of innovation in small firms (see Table VI). In these firms with less than 50 fte, the entrepreneur's educational level, his future orientation, leadership and self-confidence, and the firm's external capital and information are important for its innovation of various kinds. In larger firms (50–200 fte) such relationships hardly exist (see Table VI).

The fact that in the smallest instead of the larger firms innovation tends to be increased by the availability of external capital probably indicates the scarcity instead of the importance of capital

for these firms. Furthermore, the expected importance of the personnel's level of education for innovation in larger firms does not show up. Rather this would be the case in smaller firms. Hypothesis 8 also mentions some specific backgrounds of innovation in smaller firms. This is supported somewhat for flexibility (see Table VI) and also for creativity (not included in the table) but not significantly ($r = 0.12$ for smaller firms and 0.04 for larger ones). So, there is only little support for this hypothesis.

Hypothesis 9 expects an emphasis of the smallest firms on product- and process innovation, whereas larger firms would excel in R&D innovation. Actually, most kinds of innovation tend to occur significantly more often in larger firms (r with fte ranges from 0.13 to 0.23). So far, this hypothesis is not supported.

V. Conclusions

When we look back at the results of our analyses we can say that most of our hypotheses are partly supported. We will now resume and try to interpret these results.

H1: Innovation of any kind fosters growth of small firms (10–50 fte). However, only process innovation stimulates productivity. In a medium sized firm (50–200 fte) innovation is not very important for success. Innovation often goes along with low profits either as a reason for innovation or as a price of innovative investments. Only R&D innovation in medium sized firms fosters profits.

H2: The youngest firms, less than 10 years old, are not less innovative than older ones. Possibly, the role of innovation starts earlier in the firm's life cycle.

H3: Creativity fosters product- (and possibly process-) innovation and increase of productivity only in older firms (> 32 years). So, the role of creativity for innovation and success increases during the firm's life cycle, possibly to compensate for increasing bureaucracy and stagnation.

H4: R&D innovation is stimulated by flexibility, and only in small firms by a mix of flexibility and control.

H5: Creativity and innovation only share risk-taking as a personal background.

H6: Innovation tends to have some specific personal backgrounds: level of education, self-

confidence, future orientation and leadership affinity. But creativity has some specific ones too: acceptance of challenges and entrepreneurship.

H7: Marketing innovation is fostered by cooperation with other firms and availability of external capital. External information stimulates process and R&D innovation.

H8: Innovation in small firms depends more than in larger ones on the entrepreneur's educational level, his future orientation, leadership and self-confidence, and the firm's external capital and information.

H9: Medium-sized firms (50–200 fte) show higher levels of all kinds of innovation than small firms (10–50 fte).

VI. How to interpret these results?

We have seen that firm size correlates positively with innovation (H9). This implies that relatively many small firms show little innovation, which explains why only in small firms success depends on innovation (H1). The relative scarcity of innovation in small firms also explains why innovation in small firms depends on a number of personal and institutional backgrounds like future orientation and the use of external capital and information (H8). Such conditions make innovation less self-evident in small firms.

We expected that brand-new firms would have no reason to innovate (H2). Actually, firm age does not correlate with innovation. This may however be the result of the very tiny number of new firms in our sample. Nevertheless, creativity proved to be important for innovation and success only in older firms (H3), which indicates that innovation asks for an extra effort after the start-up stage.

A number of hypotheses pointed at various backgrounds of innovation (H4–H7). Flexibility fosters R & D innovation, although in small firms a mix of flexibility and control works better. So, order may be as important as flexibility. Unexpectedly, the backgrounds of creativity and innovation are largely different. Factor-analysis produced an 'opportunity' factor which proved to correlate fairly strongly with innovation. Another factor ('desire') did not correlate. This means that adequately running a firm, depends on using opportunities and not on the sheer desire to run a firm.

Appendix 1. Sample and survey

Seven of the twelve countries of the European Community (E.C.) were selected. The smallest one (Luxembourg) and those in the remote corners of the E.C. (Greece, Portugal, Ireland and Denmark) were excluded. In each country interviews would be held in two regions. In each region we aimed at a response of 25 entrepreneurs managing firms in the branches of light engineering or road cargo transport, with a labour force between 10 and 200 employees. Actually, we were not able to receive enough cooperation in Spain, whereas in Germany and France eventually only one region was covered by the survey.

The sample was divided over the regions as follows: Dundee area (GB) (24), Kent (GB) (18), Rotterdam area (NL) (12), Tilburg area (NL) (23), Ruhrgebiet (GM) (24), Liège area (BG) (17), Louvain area (BG) (24), Rhône-Alpes (Lyon area) (FR) (15), Lombardia (Milano area) (IT) (20), Emilia-Romagna (Bologna area) (IT) (23).

After having developed a questionnaire, this was translated into six languages. Respondents were recruited by local or regional chambers of commerce. If necessary, a random selection was made from the lists of relevant firms. After several pilot studies we decided to shorten the questionnaire. Interviewers were recruited by university staff members in the respective regions. Respondents were approached with a letter of recommendation from their chamber of commerce. Cooperation by the selected entrepreneurs varied from 70% in Great Britain to 30% in Germany.

Appendix 2. Variables (measured as replies on answers in oral interviews in 1992)

Firm-characteristics

- ‘Firm age’ (0–4) is the year when the firm was established (> 82, 75–81, 60–74, 45–59, 45).
- ‘Firm size’ (10–200) is the full time equivalent (fte) of the firm’s labour force.
- ‘Cooperation’ (0–1) is any cooperation with other firms or agencies.
- ‘Information’ (0–6) is the number of domains (technical, commercial, financial, labour, managerial and political) in which specific external sources and agencies of information are used.
- ‘External capital’ is the percentage of external capital invested in the firm.
- ‘Education of personnel’ (1–2) is the level of education of the firm’s personnel.
- ‘Level of education’ (1–4) measured as the respondent’s age when he/she left school.

Innovation and success

- ‘Product innovation’ (1–3) is the number of new (types of) products during the last five years.
- ‘Process innovation’ (1–2) is any change of the organisation of the production process during the last five years.
- ‘Marketing innovation’ (1–2) is any change of methods of sales and marketing in the last 5 years.

- ‘R&D innovation’ (1–2) is any important change of research and development during the last five years.
- ‘Innovation’ is the respondent’s factor score on the first unrotated first factor (principal component) of the four innovation variables mentioned above.
- ‘Growth’ (1–5) is the firm’s returns in proportion to its returns five years ago.
- ‘Productivity’ (1–3) is any increase of efficiency and productivity during the last five years (decrease, stationary, increase).
- ‘Profits’ (1–3) in the previous year (losses, less than 5%, 5% or more).
- ‘Success’ is the respondent’s factor score on the first unrotated first factor (principal component) of the three success variables mentioned above.

Factor scores regarding ‘innovation’ and ‘success’ are derived from the following unrotated first factors (principal components) of innovation and success variables:

<i>Innovation</i>		<i>Success</i>	
R&D	0.72	Growth	0.77
Process	0.67	Increasing productivity	0.65
Marketing	0.58	Profits	0.58
Product	0.57		
variance expl.:	41%		45%

Attitudes

- ‘Extraversion’ (1–3) (2 items) is one’s need for making social contacts (Eysenck).
- ‘Self-confidence’ (1–3) (2 items) is the opposite of alienation (Photiadis and Schweiker), referring to sufficient possibilities to improve one’s position and to solve problems.
- ‘Future Orientation’ (1–4) (1 item) is a positive view at the future (disagree with item: ‘the future is so insecure that it is best to live from day to day’).
- ‘Flexibility’ (1–3) (2 items) is the opposite of uncertainty avoidance (Hofstede), referring to not feeling nervous or tense at work, and approval of breaking rules at work.
- ‘Flexibility + control’ (1–2) is a dichotomy in which medium scores for flexibility are opposed to all other cases.
- ‘Creativity’ (1–3) (3 items) is an attitude favouring intuition, experiments and new ideas, instead of calculations, familiar practices and outlined policies (Heunks).

Occupational values (Schein’s Career Anchors)

- ‘Leadership’ (0–20) (2 items) is the importance one attaches at supervising and leading people and being in charge of an organization.
- ‘Independence’ (0–20) (2 items) is the importance one attaches at doing things one’s own way and one’s own sense of freedom and autonomy.
- ‘Risk taking’ (0–20) (2 items) is the subjective unimportance of long-term stability and a lifetime employment.
- ‘Acceptance of challenges’ (0–20) (2 items) is the importance one attaches at competing and solving problems.
- ‘Entrepreneurship’ (0–20) (2 items) is the importance one attaches at entrepreneurial activities and at creating something that is entirely one’s own product or idea.

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