

The Entrepreneur's General Personality Traits and Technological Developments

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Abstract—Technological newness and innovativeness are important aspects of small firm development, growth and wealth creation. The contribution of the study to entrepreneurship personality research and to technology-related research in entrepreneurship is that the model of the general personality driven technological development was developed and empirically tested. Hypotheses relating the big five personality factors (OCEAN: openness, conscientiousness, extraversion, agreeableness, and neuroticism) and technological developments were tested by using multiple regression analysis on survey data from a sample of 160 entrepreneurs from Slovenia. The model reveals two personality factors, which are predictive of technological developments: openness (positive impact) and neuroticism (negative impact). In addition, a positive impact of firm age on technological developments was found. Other personality factors (conscientiousness, extraversion and agreeableness) of entrepreneurs may not be considered important for their firm technological developments.

Keywords—Big five factors, entrepreneur, personality, technology development.

I. INTRODUCTION

TECHNOLOGICAL newness and innovativeness are important aspects of small firm development, growth and wealth creation. The economic importance of innovation has increased with the spread of the knowledge-based economy, globalization and the pressure of international competition [1], [2], [3], [4], [5], [6]. Technological innovativeness plays an important role for firm performance in developed and transition economies [7], [8], [9]. Small firm entrepreneurs are central for performance of their firms and are usually crucial decision makers for introduction of technological newness and innovation. The personality of entrepreneurs may be crucial for their small firm-related decisions [10]. In this paper a relationship between the entrepreneurs' general personality traits and technological developments is investigated. This study has an important scientific relevance, since it fills the gap in research by including and testing the general personality characteristics (the big five personality factors) together with small firms' technological developments in a model.

Key research objectives of the study are to develop and empirically test a model linking (through hypotheses) general

personality characteristics of entrepreneurs (the big five personality factors) and their firms' technological developments. More specifically key research objectives, which are reflected in the structure of the paper, are the following: (a) To develop a conceptual model (with hypotheses) of entrepreneurs' personality driven firm technological developments. (b) To collect data on the model elements and control variables. (c) To test the model hypotheses using methods of quantitative analysis. (d) To present and discuss the findings of the model. (e) To present contributions and implications of the study.

II. THEORY AND HYPOTHESES

Making investments in developing technologies is important for success of firms in industries with high technological opportunities [11] and in other industries [6]. Technological developments and innovation can be considered important parts of corporate entrepreneurship, which has been also referred to as intrapreneurship [12], [13], corporate venturing [14] or internal corporate entrepreneurship [15]. Corporate entrepreneurship, which is important for performance of firms of all sizes [13], [16], [17] is defined as entrepreneurship within an existing organization, including emergent behavioral intentions and behaviors of an organization related to departures from the customary way of doing things [18]; these entrepreneurial intentions and activities can have several characteristic dimensions such as new business venturing, product/service innovation, process innovation, self-renewal, risk taking, proactiveness and competitive aggressiveness. Corporate technological entrepreneurship can be considered an important element of corporate entrepreneurship and has been defined in terms of technological and process innovativeness activities [9], where the emphasis is given on development and innovation in technology [19], [20], [9]. Technological entrepreneurship can be defined as the processes of assembling organizational resources, technical systems and the strategies used by entrepreneurial firms to follow opportunities [21]. Corporate technological entrepreneurship can be mostly concerned with technology-related innovation [22], [9], where technology (a) can be described as the collection of theoretical and practical knowledge, know-how, skills and artifacts, which are used by the firm for the development, production and delivery of products and services and (b) can be embodied in people, materials, facilities, procedures and processes [23]. The definition of corporate technological entrepreneurship includes a process within an existing organization in which

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the key person – a technological entrepreneur – or a group of technological entrepreneurs establish and manage a firm on the basis of research, development, innovation and technology [9].

The key persons – entrepreneurs, the people who start and manage new businesses – can be considered responsible for technology developments in small firms. Entrepreneurship is based on personality of the entrepreneur [24]. Because of the centrality of the person – entrepreneur – to entrepreneurship, different personal characteristics of an entrepreneur have been investigated in past research (for example, [25], [26], [27], [28], [29], [30], [31], [10]). Brockhaus [25] presented an overview of the psychology of the entrepreneur (including also some classical researchers in entrepreneurship personality, such as, for example McClelland [32] and Rotter [33]) discussing the following psychological characteristics: need for achievement, locus-of-control, risk-taking propensity, and personal values (for example, need for independence and effective leadership). Gartner [26] noted several personal antecedents of entrepreneurial start-up and performance (need for achievement, locus of control, risk-taking propensity, autonomy, commitment, perseverance, vision, creativity, single-mindedness, popularity, physical attractiveness, sociability, intelligence, decisiveness, and diplomacy) but expressed doubts in usefulness of entrepreneurship personality research. Newer reviews and evaluations of entrepreneurship personality research [24], [34], [35] suggest that personality traits of entrepreneurs may be important for entrepreneurship. In particular, insufficient entrepreneurship research attention has been given to the general personality traits, such as the big five personality factors [10]. Older and newer reviews of key personality characteristics of entrepreneurs can be found, for example, in writings of McClelland [32]; Brockhaus [25]; Baum et al. [24]; Rauch and Frese [34]; Chell [35]. In addition to predominantly researched traits (for example, need for achievement, internal locus of control, risk taking propensity, need for independence) and other approaches to personality (for example, entrepreneurial self-efficacy), the big five factors of personality trait approach can be considered a promising research area for linking personality characteristics and entrepreneurship activities [31], [10]. Baum et al. [24] and Chell [35] in their reviews call for more research about personality of the entrepreneur.

Rauch and Frese [34] have distinguished two sets of personality traits: broad (general) personality traits (extraversion, emotional stability, openness to experience, agreeableness, conscientiousness) and specific personality traits (need for achievement, risk-taking, innovativeness, autonomy, locus of control, self-efficacy); both can be related to venture success. In this research the focus is on general personality traits (the big five personality factors). In the big five personality approach (for example, [36], [37]) five key factors were identified (OCEAN: openness, conscientiousness, extraversion, agreeableness, and neuroticism). The taxonomy-building regarding personality traits were initiated by Allport and Odbert [38], followed by Cattell [39], and Norman [40], who identified five basic factors. The big five factors (surgency, agreeableness, conscientiousness, emotional stability and intellect) were

labeled by Goldberg [36], [37] and later relabeled so that the first letters of the five factors are OCEAN (see [41]). The big five personality factors can be described as follows ([42], in [43], p. 239): (O) Openness, originality, open-mindedness (traits, for example: artistic (+), insightful (+), intelligent (+), commonplace (-), narrow interests (-), shallow (-)). (C) conscientiousness, control, constraint (traits, for example: deliberate (+), efficient (+), precise (+), careless (-), frivolous (-), irresponsible (-)). (E) Extraversion, energy, enthusiasm (traits, for example: adventurous (+), assertive (+), dominant (+), sociable (+), quiet (-), reserved (-), retiring (-), shy (-)). (A) Agreeableness, altruism, affection (traits, for example: cooperative (+), generous (+), sympathetic (+), cruel (-), quarrelsome (-), unfriendly (-)). (N) Neuroticism, negative affectivity, nervousness (traits, for example: anxious (+), self-pitying (+), temperamental (+), calm (-), contented (-), stable (-)).

The early relationship between openness and technological newness, developments and innovation can be inferred from the work of Schumpeter [44], who described entrepreneurs as innovative and creative people. The creation of value through innovation [45], the creation of something new [46], innovativeness [18], and newness and originality [47] are central to entrepreneurs and entrepreneurship. Research on the relationship between entrepreneurship and personality found openness a significant factor [48], [31], [10]. On the basis of the above research the following hypothesis is proposed:

Hypothesis 1: The openness factor will be positively related to technological developments.

Some of the traits for personal and entrepreneurship success (traits: strong, self-reliant, powerful, determined, independent, rational, logical, unemotional, aggressive, and competitive; Rychman [49] labels them 'ideal masculine Western society traits') may be found in or are very similar to traits which relate to the conscientiousness factor. Entrepreneurs tend to score higher than the population on the need for achievement [32]. Conscientiousness can be characteristic of the entrepreneur [48]. Conscientiousness traits, such as organized and systematic [37, 50], practical [50], and efficient [37], [42] can be important for technological developments. On the basis of the above research the following hypothesis is proposed:

Hypothesis 2: The conscientiousness factor will be positively related to technological developments.

Some of the traits for personal and entrepreneurship success (traits: strong, self-reliant, powerful, determined, independent, rational, logical, unemotional, aggressive, and competitive; [49]) may be found in or are very similar to traits which relate also to the extraversion factor. Extraversion can be characteristic of the entrepreneur [48]. Entrepreneurs tend to be optimistic [51]. Extraversion traits, such as optimistic [37], active [37], and energetic [37], [50] can be important for technological developments. On the basis of the above research the following hypothesis is proposed:

Hypothesis 3: The extraversion factor will be positively related to technological developments.

Traits of agreeableness may not be related to entrepreneurship. Agreeableness items may be related to entrepreneurship in two opposite (positive and negative) directions, depending on the trait group [10]. Some

agreeableness items from Goldberg [37] may form one group, such as cooperative, helpful, patient, cordial, friendly, trustful and diplomatic, whereas traits, such as combative, harsh, bossy, demanding, domineering, manipulative, rude and ruthless may form the other group. The first group may be important for establishing good supportive relationships for technological innovativeness [9], whereas the second group may be also important for fast implementation of technology development plans. Entrepreneurs can be seen as average in extraversion [48]. On the basis of the above research the following hypothesis is proposed:

Hypothesis 4: The agreeableness factor will not be related to technological developments.

Neuroticism (the reverse of emotional stability) may be negatively related to entrepreneurship activities and orientations [31]. Autonomy or independence may be important motivators for entrepreneurship [52], [46], [53], [10], [54]. Un-emotionality may be crucial for personal success [49]. Emotional stability traits (negative neuroticism), such as autonomy, independence and individualism [37] can be important for technological developments. On the basis of the above research the following hypothesis is proposed:

Hypothesis 5: The neuroticism factor will be negatively related to technological developments.

A model of personality driven technological development, which includes the proposed hypotheses, is depicted in Fig. 1.

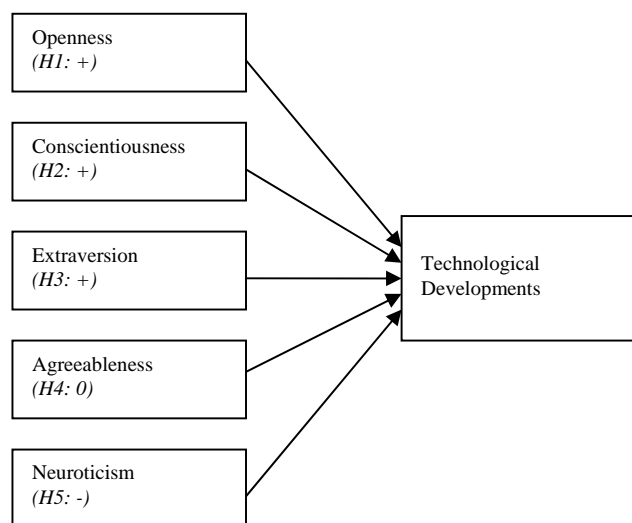


Fig. 1 The model

III. METHODS

The model was tested on 160 usable responses from a sample of 166 entrepreneurs (67.3% male and 32.7% female). Data were collected via face-to-face interaction-based structured-questionnaire survey from entrepreneurs in Slovenia. The typical entrepreneur in the sample was 30 to 40 years old; had 10 to 20 years of entrepreneurial experience and was married. The typical firm in the sample was small with 50 or less employees in the full-time equivalent (90.9% firms in the sample), whereas about a half of the firms (49.7%) had zero to ten employees (micro firms). The typical

firm in the sample was 11 to 20 years old and operated in the service industry. The distribution of the sample firms was found to differ somewhat from the population in terms of the small firm size distribution: a lower percentage of responses in the sample than in the population was received from micro firms with zero to nine employees and a higher percentage from small firms with 11 to 50 employees. However, when taken together, small firms are well represented – more than 90% in the sample and in the population. In the sample different industries were well represented. Overall, the sample may be considered adequately representative of the population of Slovenian firms.

Measurement items for assessing independent and dependent variables were previously tested and used in past studies. Independent variables including the general personality elements – the big five personality factors – were measured by Saucier's [50] Mini-Markers Inventory (also used and tested in entrepreneurship by Singh and De Noble [31]), which includes 8 adjectives per each personality factor: (1) Openness adjectives: creative, imaginative, philosophical, intellectual, complex, deep, uncreative (r), unintellectual (r). (2) Conscientiousness adjectives: organized, efficient, systematic, practical, disorganized (r), sloppy (r), inefficient (r), careless (r). (3) Extraversion adjectives: talkative, extraverted, bold, energetic, shy (r), quiet (r), bashful (r), withdrawn (r). (4) Agreeableness adjectives: sympathetic, warm, kind, cooperative, cold (r), unsympathetic (r), rude (r), harsh (r). (5) Neuroticism adjectives: unenvious (r), relaxed (r), moody, jealous, temperamental, envious, touchy, fretful. Respondents reported the accuracy of the forty adjectives with respect to themselves personally on the Likert-type scale with anchors from 1-very untrue to 5-very true. The dependent variable – technological developments – was measured on the five-point Likert-type scale with anchors from 1-decreased significantly to 5-increased significantly by one item ('your company's emphasis on pioneering technological developments in your industry') from Zahra [19]. Respondents were also asked to check appropriate boxes for two control variables (age of the person and the firm).

Exploratory factor analysis (Principal component analysis with Varimax rotation) was used for testing the dimensional structure of the big five personality factors. Confirmatory factor analysis was not conducted given these measures are already established in the field. The big five personality variables were computed as the means of items for each personality factor separately and standardized. Multiple regression analysis was used for testing the hypotheses. The big five personality variables and the two control variables were used as independent variables in the regression equation with the technological developments variable as the dependent variable.

IV. FINDINGS

Results of the multiple regression analysis are presented in Table I. Hypothesis 1 proposed a positive relationship between openness and technological developments. The coefficient is substantial, positive and significant (standardized coefficient 0.29, significant at 0.001). This

finding is in support of Hypothesis 1. Hypothesis 2 proposed a positive relationship between conscientiousness and technological developments. The coefficient is small, negative and non-significant (standardized coefficient -0.04, sig. 0.667). This finding is not in support of Hypothesis 2. Hypothesis 3 proposed a positive relationship between extraversion and technological developments. The coefficient is small, negative and non-significant (standardized coefficient -0.07, sig. 0.430). This finding is not in support of Hypothesis 3. Hypothesis 4 proposed no relationship between agreeableness and technological developments. The coefficient is small, negative and non-significant (standardized coefficient -0.09, sig. 0.254). This finding is in support of Hypothesis 4. Hypothesis 5 proposed a negative relationship between neuroticism and technological developments. The coefficient is substantial, negative and significant (standardized coefficient -0.19, significant at 0.018). This finding is in support of Hypothesis 5. Overall, three out of five hypotheses on the relationship between the general personality traits and technological developments were supported, with two of the big five personality factors having influence on technological developments (openness – positive relationship, neuroticism – negative relationship).

Two control variables were included in the model. Person age was not found significant, whereas firm age was found positively related to technological developments (standardized coefficient 0.17, significant at 0.047).

TABLE I
 RESULTS OF THE MULTIPLE REGRESSION ANALYSIS

	Unstandardized Coefficients		Standardized Coefficients		Sig.
	B	Std. Error	Beta	t	
(Constant)	3.169	0.294		10.794	0.000
Openness	0.286	0.082	0.293	3.510	0.001
Conscientiousness	-0.038	0.088	-0.040	-0.432	0.667
Extraversion	-0.068	0.086	-0.072	-0.791	0.430
Agreeableness	-0.089	0.078	-0.092	-1.144	0.254
Neuroticism	-0.185	0.078	-0.195	-2.386	0.018
Control: Person Age	-0.080	0.093	-0.073	-0.858	0.392
Control: Firm Age	0.131	0.065	0.170	2.005	0.047

Dependent Variable: Technological Developments
 R-square=0.107, Adj. R-square=0.066
 n=160

V. DISCUSSION AND CONCLUSION

The key finding of this study is that entrepreneurs' big five personality traits can be important for entrepreneurial behavior of their small firms in terms of technological developments. The contribution of the study to entrepreneurship personality research and to technology-related research in entrepreneurship is that the model of the general personality driven technological development was developed and empirically tested.

The model reveals two personality factors, which are predictive of technological developments: openness (positive impact) and neuroticism (negative impact). In addition, firm age can have positive impact on technological developments.

A higher extent of pioneering of technological developments in their industry may be expected from small firms, which are not new, and whose entrepreneurs can be described with openness and emotional stability (reverse of neuroticism) traits, such as: (1-openness) creative, imaginative, philosophical, intellectual, complex, deep, and (2-emotional stability) relaxed, not moody, not jealous, not temperamental, not envious, not touchy, and not fretful. Open and emotionally stable entrepreneurs can have a greater probability of pioneering more technological developments than their entrepreneurial counterparts, who are less open and more neurotic. Consequently, we predict that these personality traits can have indirect effects on small firm performance, since past research found a positive association between technological innovation and developments and firm performance in terms of growth and profitability (for example, [9]). Other entrepreneurs' personality factors (conscientiousness, extraversion and agreeableness) may not be considered important for their firm technological developments.

The study has implications for research and entrepreneurial practice. Entrepreneurship scholars may like to consider using the entrepreneur's general personality variables as crucial elements of firm technological developments. In particular, the big five personality factors should be given a greater emphasis in predicting technology innovation and development. In entrepreneurial practice it may be useful for entrepreneurs to recognize the importance of their personality for successful development of technology and in cases of poorly fitting personality characteristics consider decisions to include better personality fitting persons in their entrepreneurial teams. In addition, entrepreneurship policy-makers may like to consider promoting and enhancing some personality factors (particularly openness and emotional stability) early on in the educational system among children, teens and young adults, who may still have the potential for alterations in their general personality factors.

The study has some limitations. The study focused on the general (big five) personality traits and did not include other more specific personality-related elements. The data were collected in one country, from small firm entrepreneurs. In future research, additional tests and insights may be gained by using samples from other countries. More longitudinal studies may be conducted in future in order to establish predictability. The focus of this study was on the general personality factors of the entrepreneur, so other non-personality elements that may be important for entrepreneurial technology decisions were not included (for example sociological characteristics) and can be used in future studies. Despite the limitations, this study makes a contribution to the personality and technology-related research in entrepreneurship. The big five personality factors can be important predictors of technological developments.

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