Technological Entrepreneurship, Creativity and General Economics: From 'Homo Oeconomicus' to 'Homo Creativus'

Prof. Dr. Bettina Burger-Menzel
(burgerme@fh-brandenburg.de) Brandenburg University of Applied Sciences
Magdeburgerstr. 50 / D-14770 Brandenburg a.H.

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1. Introduction and key objective of paper

What constitutes a creative person? A diverse set of perspectives has been developed and discussed over time by various disciplines like psychology, sociology as well as economic science. Yet, while substantially being analysed in business administration like innovation management, essential motivational factors for innovative behavior have somehow remained a 'hidden' factor in general economics. Theoretical strands like market approaches mainly focus on so-called extrinsic motivation while self-motivation and its partly conflicting relationship with incentives set by third parties are not dealt with or just summed up in a proxy called 'degree of competitive spirit'.

The following paper aims at finding a new interdisciplinary approach to explain technological entrepreneurship within its motivational complexity in order to enrich future approaches in the context of national innovation systems, i.e. to base them on the perception of 'homo creativus' and no longer on the one of 'homo oeconomicus' and to deal with the consequences thereof. The paper is based on a comprehensive and integrative overview on creativity research results as well as on technology entrepreneurship including the long intellectual history that general economics itself has on that matter.

2. Insights into technological entrepreneurship

Several basic concepts are essential for the paper. The first concept is entrepreneurship. The second is technology itself and its combination with entrepreneurship that explicitely links it with the dynamic aspects of innovation. Both concepts are focused upon in this subsection. The third concept is the research into the personality of the creator herself/himself and the motivational forces of creativity which are discussed in subsection three.

Entrepreneurship

Entrepreneurship is clearly associated with risk-taking within a market economy framework because it has to do with the identification of new opportunities and the ability to seize action upon them (table 2.1).

Table 2.1:

The entrepreneur as innovator – historically seen (comp. Link/ Siegel 2007: 14-26)

Author(s)	Characterization of the entrepreneur as innovator
Supply-side theories of entrepreneurship	
Richard Cantillon (1680-1734)	Entrepreneur, as intermediary between landowners and hirelings, is innovative by coordinating production and distribution
Abbe Nicholas Baudeau (1730-1792)	Entrepreneur is innovative by inventing and applying new techniques to reduce costs and increase profits

Author(s)	Characterization of the entrepreneur as innovator
Jeremy Bentham (1748-1832)	Entrepreneur is innovative in its role of an administrative manager through adoptive administrative arrangements
J.H. von Thünen (1785-1850)	Entrepreneur is innovative by ensuring against business losses through ingenuity
Demand-side theories of entrepreneurship	
Gustav Schmoller (1838-1917)	Entrepreneur is innovative as an organizer and manager by introducing new projects
Werner Sombart (1863-1941) and Max Weber (1864-1920)	Entrepreneur is innovative by influencing organizations to change from one stationary state to another
Joseph Schumpete (1883-1950)r	Entrepreneur is innovative when, in response to new information, he creates new goods or goods of higher quality, or creates a new method of production, or opens new markets, or captures new sources of supply, or is involved in a new organization of industry

As Schumpeter (1934: 74) puts it: "The carrying out of new combinations we call 'enterprise'; the individual whose function it is to carry them out we call 'entrepreneur'."

Technology

Although it was not only Schumpeter who put the entrepreneur in the midst of innovation challenges, it was this scientist who had an enormous impact on the analysis of these challenges. The static model was swept away by the same 'creative destruction' which Schumpeter had introduced as the decisive phenomenon of historical economic change.

This also meant that an innovation was no longer only defined as a new technique, which is put in use e.g. as product or process innovation. In a dynamic view, the process which leads to an innovation is highlighted. In the course of this process, knowledge is transformed into an invention and furtheron into an output of research and development (R&D) activities which finally allow an innovation's commercialization and diffusion in a market. Thus, a decisive move from materialized technology towards technology in its wide sense was taken, i.e. towards the knowledge itself about scientific-technical relationships. This knowledge includes tacit know-how and know-why which can be used to solve technical problems as a result of past and present R&D processes. Yet, this knowledge also includes visionary thinking into the far future which implies "the qualitative transformation of the economy by new technologies, rather than the simple quantitative growth of individual industries" (Freeman/ Soete 2004: 20).

Such visions involve the biggest risks that an entrepreneur could think of because the objective would be discovery alone. Key word here is technology push through a radical innovation that usually lacks a critical mass of 'out of the box'-thinking customers and that often goes along with ethical discussions and complex processes within an involuntarily changing society. One example is the sequencing of the human genome which was made possible by the introduction of robotronics into biochemical laboratories.

Technological entrepreneurship in economic models

How and why can technological entrepreneurship be successfully established in the market? As it is common in scientific history, different paradigms have set different starting-points for an analysis and have tried to win over the lead in the corresponding discussion and its transfer to practical implementation. With the following paragraphs, the author will shortly sketch three main controversially discussed approaches which reflect the 'broadband' of ideas in general economics to approach technological entrepreneurship and its potential to build up relative comparative advantages.

The first two approaches (Harvard School, Chicago School) have already been broadly popularized by strategic management authors while the third approach (Austrian School) has never made a well-respected entrance into that strand of literature due to its more philosophical discussion of human nature like the importance of freedom for individual behavior. Yet, it is precisely this discussion as well as the analysis of conditions which limit rationalism within societies (Hayek 2005: 31 ff., 527 f.) that could now fruitfully spill over to new approaches as will be discussed later on.

(i) Harvard School and Industry Conditions

The Harvard School (like Scherer 1980) and its so-called 'Structure-Conduct-Performance' (SCP)

approach has become a widely accepted framework for strategic management when Porter (1980, 1985) transformed it into a competition analysis tool. Basic idea of SCP is that in a relevant market a bundle of conditioning factors called structure (S) determines a firm's strategy mix called behavior (B) and leads to the same firm's market success or failure called performance (P) that is described through various indicators as well. Innovative processes are assumed to be especially triggered through structural conditions which allow competitive pressure like low market entry barriers. The actual or expected pressure from other companies will then make an entrepreneur willing to undertake expensive and high-risk projects and survive the selection process through successful creative performance (Herdzina 1999: 24). By market definition, the group of relevant competitors is identified as the "group of sellers or of close-substitute outputs who supply a common group of buyers" (Bain 1968: 6), a definition which has entered European as well as U.S. antitrust practice.

Goal is to achieve temporary monopoly profits until imitators are attracted to the market, thus, assuming that innovative behavior is exclusively stimulated by market signals. As the SBP-framework is applied within the whole industry setting, a firm's competitive advantage does not only result from its interplay with competitors but also from its interactions with complementors and vertical partners (suppliers, customers) and can be dynamically challenged if a corresponding set of structural conditions is given in each relevant market. Examples for such challenges are technologically merging markets like in information, telecommunication and media industries.

(ii) Chicago School and the Resource-Based View

The Chicago School (like Demsetz 1973) takes a closer look at a firm's own capabilities (i.e. competencies plus assets) to build up relative competitive strength in a market. The Chicago approach therefore takes a complementary look at entrepreneurial behavior and performance compared to Harvard School and has been extended into strategic management literature by authors of the so-called resource-based view ((RBV) like Wernerfelt 1984; Prahalad/Hamel 1990). There is a shift in the scientific focus away from a firm's external competitive environment (industry conditions) towards a firm's internal processes with their effects on efficiency and innovation. Investment into internally performed R&D activities or into network efforts like strategic alliances is rather perceived as a need to build up dynamic capabilities for a firm's survival than as an indicator for a potential misuse of market power, especially in sectors with quick technological changes. The empirical literature is mostly based on plant- or firm-level panel data and analyses shifts in labour composition (e.g. more educated workers) or/and shifts in capital composition (e.g. higher computerization) and their effects on labour, capital or total factor productivity (like McGuckin/ Streitwieser/ Doms 1998). But, even in a broader set of indicators, RBV approaches refer to the innovative behavior of a 'homo oeconomicus' that is stimulated by "the mechanics of value creation" as Westland (2008: 83) puts it.

New tendencies are bridging the gap between Harvard and Chicago School. One tendency is to discuss the challenges for a firm's innovation strategies with regard to its industry's change trajectory. If a firm does not align with this trajectory, its profitability might dramatically suffer when an industry's core assets or/and core activities are threatened with obsolescence (Westland 2008: 109). One example is the internet-enabled mobility of digital media content and its challenge for the business model of record companies. Another tendency is to discuss the interaction between the parties in a relevant market (including network partners) from a game theoretical perspective (like Besanko/ Dranove et.al 2004) and, by doing so, to allow for strategic considerations that are also based on a firm's internal conditions like discussed in Chicago School.

(iii) Austrian School and the Creative Power of Freedom

While Harvard School concludes in favour of welfare-oriented state intervention into markets, the practitioners of Austrian economics (like Kirzner 1973) remain rather skeptical that theory can be tested empirically and then be used for public policy considerations. Thus, Harvard and Austrian School mark opposite sides within an

interval of contrasting approaches with Chicago School being somewhere inbetween. The Austrian School rejects a positive and politically pragmatic characterization of market processes because these processes are complex and historically open ones where the state due to a lack of knowledge and in case of lacking welfare-oriented behavior could only bias technological change trajectories. Thus, according to Hoppmann (1968: 36f.) state action should be limited to per-se rules and to safeguarding individual freedom. It is especially Hayek (2005: 43ff.), famous representative of the Austrian School, who analyses individual freedom and names it as the cornerstone of a creative society. He reasons that individual freedom is needed because majorities in society are stability-oriented and that individual freedom alone leads away from path-dependency into an unpredictable future. Entrepreneurs that are creators cannot operate with perfect knowledge because they are investigating the unknown in order to create a hitherto unknown problem-solution framework.

There is no explicit reference to the Austrian School in business management literature although topics like organizational behaviour, leadership skills and employee empowerment could be named as potential interfaces. With the discussion of individual freedom, Hayek comes quite close to the perception of an individual who can also feel an internal desire to be creative even if the Austrian School questions the coherence of many results of behavioral economics due to its closeness to historical science and sociology (Caplan 2003 in McCabe/ Vernon/ Chorvat 2005: 73).

In the context of this paper, it is essential to note that Hayek's conclusions are indirectly backed by creativity research respectively psychology which empirically shows that creators can feel hampered in their potential if they face a restriction of freedom through control. New approaches in general economics profit from this discussion. With the so-called 'homo oeconomicus maturus', scientists like Frey (1997; Frey/Neckermann 2008) introduce a new perception of microeconomic marginal-utility considerations into traditional models although this perception still has a limited impact on mainstream economics. This mature individual is not only stimulated into (non-)action by market signals or public policy instruments but can also be internally driven, thus, giving room for enhancing or crowding-out effects between so-called intrinsic and extrinsic motivation (comp. subsection three). It would be interesting to see how fruitfully this approach could merge with experimental economics including neuroscience (like Smith 1991; 2000; Parisi/Smith 2005) which examines the localizations of functions in the human brain and their corresponding performance and would allow for tests of conditions which limit the individual willingness to be creative.

Subsection 2: Summing up

Subsection two clarified the concept of entrepreneurship in the context of technological change. The corresponding research in general economics was highlighted by shortly characterizing three main approaches with their reflections on innovative behavior and their transfer to business administration literature. Additionally, hints on new (interdisciplinary) approaches were given although this overview could only be limited in its representative character.

By understanding the interplay between industry conditions and the internal processes of firms, the motivational power of these processes with regard to microeconomic innovation strategies was sketched. Yet, individual creativity still remains a somehow hidden factor in mainstream economics although a more and more endogenous one. It also became clear that the analytical and deductive instruments of economic theory have to be reshaped to deal with interdisciplinary findings, especially from psychology, to allow for a more complex nature of motivational factors. The following subsection puts an eye on those interesting developments in creativity research which have relevant implications for the notion of technological entrepreneurship in economic models.

3. Insights into creativity

how is creativity understood by those who studied it? According to Sternberg (2006: 2), one of the leading researchers in this field, it is rather uncritical to describe creativity as a form of thinking which leads to something relatively novel and compelling, based on domain-general as well as domain-specific capabilities and which is partly measurable. This

clearly is where innovation research links itself to creativity research.

Interdisciplinary Nature of Creativity

Science, however, is still in search of a clear and unequivocal definition because disciplines perceive and approach creativity differently. According to Simonton (2006: 491f.), focus in research could be on mental operations which underlie creative processes (cognitive psychology), on determinants for individual variations in creative potentials (differential psychology), on family circumstances and educational experiences in childhood and adolescence which contribute to creative growth (developmental psychology), or on general sociocultural environments and conditions that shape and stimulate creativity (social psychology). Business administration has benefited from insights in creativity especially with regard to approaches to foster the creativity of employees (industrial psychology like in Kirchler 2008: 23ff. with Meier-Pesti and Hofmann) and which has further developed into idea and innovation management. In this paper, concentration is on research insights into the technological creativity described above, i.e. a creativity that underlies the process from invention to innovation (commercialized invention) and diffusion.

Creators and drivers of creativity

Who are creators and what drives them? According to Ellen Winner in the context of gifted children (in Westland 2008: 300) "creators are hard-driving, focused, dominant, independent risk-takers". In the context of creative professionals, also a variety of personality traits has been associated with these individuals like imagination, independence, intelligence, intuition, originality, sensitivity, self-suffiency or suspicious nature (Genovard et al. 2006: 88). The professionals characterized like that are actors, artists, designers, inventors as well as entrepreneurs – and let me add - scientists because creativity is one aspect of a human's unique capability for abstract thought which scientists are usually gifted with to a high extent. Shi (2001: 61) even links scientists to entrepreneurs by describing a scientific innovation as "essential for the entrepreneurial activity of a scientist".

What drives people to be creative? Creativity as an invidual act is transformed into a goal-driven action through motivation which according to Huczynski and Buchanan (2001: 240) is "the cognitive decision-making process through which goal-directed behavior is initiated, energized and directed and maintained". As already prepared for in subsection 2, motivaton can be triggered extrinsically or intrinsically. While extrinsic motivation is usually conditioned by rewards (and not punishment), intrinsic motivation is driven through the action itself. Heckhausen (1989: 456ff.) characterizes intrinsic motivation mainly through a need for personal growth with a continuous impulse; through the goal itself and not through the consequences of success; and through self-determination which allows an immediate sensation of competence and is accompanied by a complete devotion to the activities (flow effect).

As to motivation research, the relationship between intrinsic and extrinsic motivation is a complex one. Intrinsic motivation might be crowded our or enhanced through extrinsic incentives depending on the conditions given. Kirchler refers to a meta analysis of 128 studies by Deci, Koestner and Ryan (1999 in Kirchler 2008: 325 with Walenta) which confirms that activities that attract a person per se have less appeal when combined with rewards (especially monetary rewards) or coercion but also potentially through critique, control, rebuke or timely conditions. This is confirmed for special aspects by Preiser (2006: 194) who refers to the charta of the German Association for Creativity which states that "fear and lack of freedom in a work environment can heavily obstruct creativity". Frey and Neckermann (2008: 9) back this by concluding on awards as follows: "Awards are less likely to crowd out intrinsic motivation of the recipients than monetary compension. Typically, awards are perceived as supportive rather than controlling" and might therefore even enhance a creative drive to tackle difficult challenges. There is experimental evidence that such challenges can also be better resolved by intrinsically motivated individuals (Frey 1997: 96).

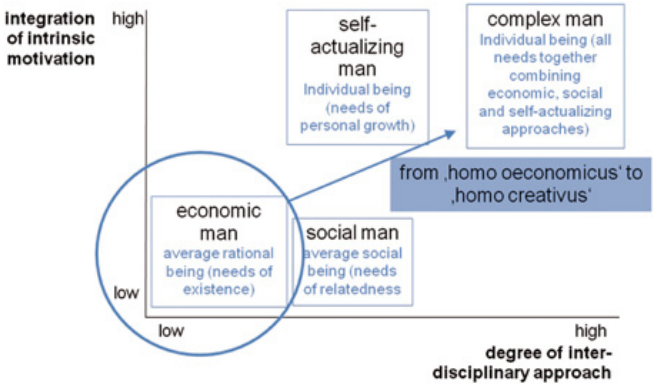
Intrinsic motivation can therefore be considered as a powerful force in creative achievement like technological progress. Activities, however, which have not been attractive to a person might gain

in appeal if combined with extrinsiv incentives. Research on new paradigms like open innovation profit from these insights and point to already existing managerial practice where a company hires "external contract inventors for the sole purpose of ensuring that creativity was maintained without being hampered by corporate norms and bureaucratic burdens" (Corelli O'Connor 2006: 73).

From 'Homo Oecnomicus' to 'Homo Creativus'

Insights into interdisciplinary research demonstrate that a creative person is far from being the 'homo oeconomicus' that still dominates numerous areas of economic science, i.e. a rational utility optimization that is assumed to determine human average behavior. Profiting especially from the rich insights of psychology, the homo creativus is not a simple man but rather the 'complex man' of Schein (1980: 94f.) who states that "adhering to rational-economic, social, or self-actualization assumptions … may be wrong in some situations and with some people. Where we have erred is in oversimplifying and overgeneralizing." The notion of the complex man (table 3.1) like the 'homo creativus' is an attempt to lead to solutions which are specific to situations and individuals in an innovation context.

Figure 3.1: From the 'economic man' to the 'complex man' (own figure)



This creative person does certainly not correspond with the average person. It will include aspects of the 'homo oeconomicus maturus' suggested by Frey (1997: 113) which has an intrinsic motivation which is sensitive to being affected by others depending on the conditions given. And it will futheron challenge generalized model assumptions like those being used in approaches of innovation systems which Metcalfe (1995: 212) defines as "…a system of interconnected institutions to create, store, and transfer the knowledge, skills, and artifacts which define new technologies".

As there are local, regional and (inter)national innovation systems which differ especially between industrialized and industrializing countries, the 'homo creativus' will also differ as to cultural features. Therefore the importance of local originality and diversity must be stressed. One has to point to the fact that it is more a Western perspective to attribute personally meaningful and intrinsic motives as a driver for creative behavior. In the research on Korea and other Asien countries, "negative conceptions of creative individuals" make creators more "concerned about social responsibility, harmony and ethics" although the new generation might go for a slightly different avenue as a new field of research (Choe 2006: 414). A similar phenomenon is confirmed for African settings where creativity has a social-group basis rather than showing individual characteristics (Mpofu et al. 2006: 471). Yet, also Africa sees a pattern of change where "innovation, adaptation, and replication for successful participation within an ecocultural setting (i.e., modern, transitional, and traditionalist) calls for redefinition of the self at both the individual and the collective (e.g., clan or community) level" (Bekker 2001; Franchi and Swart 2003; in Mpofu et al. 2006: 461).

As a consequence of an interculturally diverging estimation of creativity and the creative being, a non-Western research on technology policy might end up with different conclusions than its Western counterpart. This paper is representative for the Western approach without denying that innovative process may also include substantial interaction.

Subsection 3: Summing up

In Subsection 3, creativity was conceptualized as being seen from its interdisciplinary angles. Creators were defined and their drivers for creative behavior discussed.

As a consequence of the fragmented and heterogeneous findings, a more experimental and inductive methodology seems to be required in economic models when dealing with the complex needs of a creative man. Here, the author is

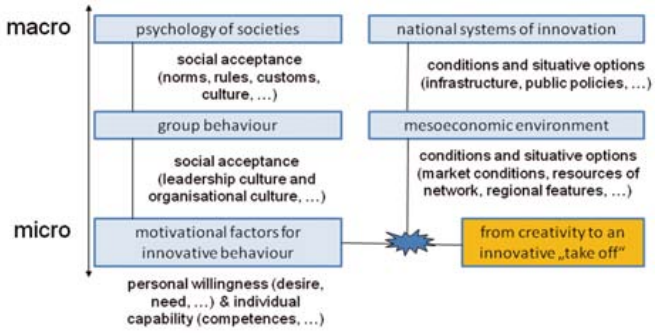
especially interested in areas for application in general economics that refer to innovation systems.

4. Conclusions on innovation systems and outlook

There is a big variety of innovation systems worldwide with partly very contrasting features. And even within a relatively homogeneous group, systemic conditions differ substantially and all the more in times where formerly domestic companies have gone global in outsourcing, production and sales and countries have started to strategically use their locational advantages to attract multinationals.

Thus, future models on innovation systems have to be sensitive of how to mold the incentive structure for technological entrepreneurs in a way which efficiently stimulates creativity without abstracting from the complex setting given (table 4.1).

Figure 4.1: The complex setting for technological creativity (own figure)



The scientific challenge is a considerable one. Even if theoretical insights seem to be appropriate for understanding technological entrepreneurship and its motivational structure, empirical differences blur the picture due to e.g. a lack of precise indicators, specific characteristic of countries and cultures, sectors and relevant markets, different types of companies and competitive spirit, an unclear role of new principles like open innovation as well as – at the core of it all – diverging incentive structures of all the players concerned including local, regional and (inter)national politicians and bureaucrats. Thus, new approaches like Burger-Menzel (2008) will certainly put less emphasis on mathematical models and rigorous proof and more emphasis on insights based on the tradition of the Austrian School.

Creativity research has certainly been helpful to understand more about the interaction between creators and government in the context of innovation systems and about the potential risk of crowding-out effects associated with it. Yet, it is clear that the contribution of this paper is realistically small and eclectic. A theory still needs to be developed if possible at all. Not only increased technological dynamics and globalization turn this intention into a scientific challenge – as well as into a creative one.

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