The Interaction between Personality, Social Network Position and Involvement in the Innovation Process

Abstract

This dissertation proposal investigates how personality and individuals' social network position affect individuals' involvement into the innovation process. It posits that people would feel inclined to become involved into the different phases of the innovation process depending on their Big Five personality traits. Additionally, this research elaborates on personality antecedents of social relationships and network structure. Furthermore, it accounts for the dynamic relationship between stages in innovation process and social network structure. Finally, it posits that there is potentially a mismatch between social network structure in different stages of the innovation process, and that this mismatch is caused by individuals' personality. The suggested conceptual framework contributes to the innovation literature by enriching our understanding of why people create markedly different patterns of social ties in the workplace and how this tie formation process and personality influence innovation process. An empirical study aimed at testing the suggested propositions is suggested.

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1 Introduction

Innovation has been recognized as the driving force that insures the long-term survival of organizations. Since the times of Schumpeter (1942) scholars quest to understand the forces that stimulate innovation in organizations and enhance individuals' ability to come up with novel and useful solutions and to implement them.

In search for the antecedents of innovation on the individual level of analysis, the social network view provided few revealing insights. Individuals' structural position – being in the right place - appears to be a determining factor in fostering innovation (Ibarra, 1993; Burt, 2004; Perry-Smith & Shalley, 2003, 2006; Obstfeld, 2005). Although a good number of management scholars focused their attention on grasping the impact of network structure on the productivity of innovation (Ahuja et al., 2008), the antecedents of network position remain under researched (Klein et al., 2004; Borgatti & Foster, 2003). The quest for determinants of network configuration points researchers into the direction of individual differences (Emirbayer & Goodwin, 1994; Masuda & Konno, 2006). In particular, research has indicated that the structural position of the individual is in part shaped by his / her personality (Klein et al., 2004; Mehra, Kilduff, & Brass, 2001), and that personality and social network position interrelate to influence important organizational outcomes such as performance. However, until now research did not address the question of how personality and individuals' position inside of the social network interact to advance or constrain the innovation process.

This paper aims to address the above challenge and concentrates on the following research questions:

1. How do personality traits affect the individuals' involvement in the different phases of innovation process?
2. How do personality traits influence social network position?
3. How does the individuals' network position affect the individuals' involvement in the innovation process over time?

To find the determinants of the social network structure one needs to understand what constitutes and impacts the relationships among people inside of the network. The question of what shapes interpersonal relationships has been addressed in social and differential psychology. Few studies assessed the impact of personality on interpersonal outcomes such as relationships (peer, family and romantic ones), but research linking personality factors to structures of the social worlds remains particularly scarce (Ozer & Benet-Martinez, 2006). In particular, a comprehensive analysis of determinants of relationships in organizational setting is to be performed.

This conceptual framework adds its bit to the innovation literature by explaining how individuals create distinct social structures and how this process affects their involvement in the innovative process. Furthermore, this article enriches the social network research by taking into account the antecedents and consequences of the social network structure in one study. Studies that emphasize the consequences of network structure prevail in the field of the social network analysis, leaving the antecedents of the network structure barely explored. In addition, according to Borgatti & Foster (2003), the origins of the research on consequences and antecedents of the network structure are grounded in different – even conflicting – research traditions. The investigation of network structure consequences relies on the structuralist heritage, which assumes that actors' environment or context provides opportunities and constraints of behavior. In contrast, studies that quest for causes of the network structure interpret them in terms of actors' personalities or latent propensities, which contradict with structuralist view. This research contributes to the social network analysis in determining the impact of both personality and context in one study.

Furthermore, in this dissertation we would like to monitor the development of network across time, creating the dynamic picture of influences in network development. This proposal adds to research agenda by elaborating on how actors and networks mutually constitute each other (Parkhe et al., 2006). Another expected contribution is to be made in the area of organization studies to the continuing quest that addresses the question whether an organizational behavior is an outcome of social structure or human agency (Heugens & Lander, 2008). In summary, the goal of this investigation is to understand the role of personality and social network structure in shaping innovation process inside of the organizations.

2 Theoretical Framework

In sketching the theoretical framework for this research, definitions would be provided first. Then the link between social network characteristics and innovation would be outlined. Further, the research on the contribution of individuals' characteristics to innovation will be reviewed, followed by an overview of empirical investigations that link personality characteristics to social network set up.

2.1 Innovation and Social Network Characteristics

2.1.1 Innovation

Innovation is a scattered field as it lies on the cross-section of many disciplines – economists, management scholars, psychologists and sociologists looked into the nature of this phenomenon. Therefore, many conceptualizations of innovation exist, depending on the theoretical lens and level of analysis chosen. One of the major distinctions could be drawn between conceptualizing innovation as an process (Lubart, 2001; Mintzberg et al., 1979; Khurana & Rosenthal, 1998) versus as an end product (Amabile, 1996). Another line of innovation conceptualization stretches between different levels of analysis – innovation is being studies at the individual, group, network, intraorganizational, organizational, industry and country levels of analysis.

Defining innovation on the individual level of analysis that is in focus of this study is challenging in the light of an ongoing discussion about the difference between creativity and innovation. Some authors argue that creativity and innovation are the same phenomenon, where the term innovation is used at the organizational level, and creativity at the individual level (Sternberg & Lubart, 1999). West (2002, p. 356-357), on the other hand, takes a process view and states that "Creativity is the development of ideas while innovation implementation is the application of ideas. … Innovation can then be defined as encompassing both stages - the development of ideas - creativity; followed by their application - the introduction of new and improved products, services, and ways of doing things at work. Innovation … is therefore a two-component, but essentially non-linear process, encompassing both creativity and innovation implementation. At the outset of the process, creativity dominates, to be superseded later by innovation implementation processes".

Other researchers conceive innovation even more broadly and state that innovative behavior is a higher-order construct overarching a multi-stage process that includes problem recognition, generation of ideas or solutions, building support for the idea, and idea implementation (Kanter, 1988; Scott & Bruce, 1994). The decision-making literature also adopts the process view. So, Mintzberg et al. (1979) acknowledged three phases in the innovation process: the identification phase, encompassing recognition and diagnosis routines; the alternative development phase, which consisted of search and design routines; and the selection phase, which consisted of screening, evaluation-choice and authorization routines.

Most research on creativity has focused on individual creativity and did not acknowledge the social and group factors that influence the creative process (Paulus & Nijstad, 2003), although some attempts has been made to account for contextual factors in the creative process (Amabile, 1996; Csikzentmihalyi, 1999; Kasof, 1995; Montuori & Purser, 1999). Following the move in the social sciences to appreciate the impact of context (Bamberger, 2008) this conceptual piece focuses on how individuals both shape their (social) context and are shaped by it. In this study the innovation will be considered as a multi-stage iterative process, encompassing problem recognition, generation of ideas or solutions, building support for the idea, idea elaboration and idea implementation (adopted from Kanter, 1988; Scott & Bruce, 1994), resulting in an end product. The interaction with social environment – conceptualized here as the system of social relationships – social network – is seen here as a crucial constraining and enabling factor.

Addressing the content of the innovation process, in line with West & Farr (1990: 9) innovation is defined as *"the intentional introduction and application within a role, group or organization of ideas, processes, products or procedures, new to the relevant unit of adoption, designed to significantly benefit the individual, the group, the organization or wider society"*.

2.1.2 Social network analysis

The social network view unites theories, models and applications that are expressed in terms of relational concepts and processes. According to Borgatti & Foster (2003), the growing interest in social network research reflects the general shift "away from individualist, essentialist and atomistic explanations toward more relational, contextual and systemic understandings".

The following theoretical assumptions underpin the network perspective (Kilduff, Tsai & Hanke, 2006; Wasserman & Faust, 1994):

- the primacy of social relations (assumption that relationships among actors are of fundamental importance)
- the ubiquity of social embeddedness (actors and their actions are viewed as interdependent rather then independent, autonomous units)
- the social utility of network connections (relational ties between actors are seen as enabling the flow of resources, either material or nonmaterial) and
- the structural patterning of social life (network structure - lasting pattern of relations among actors - enables or constrains individual action).

Two approaches emerged in the stream of social network research that can be differentiated depending on how the relationships between actors are viewed. The *structural configuration* perspective sees the ties between actors as features of the whole system (Wellman, 1988), whereas *actor centrality* research views actors as strategically rearranging their own personal relationships to maximize own advantage (Burt, 1992).

In more pragmatic terms, the networks are distinguished depending on the content of the relationships. In particular, the literature specifically addresses advice networks, which are aimed at problem resolution, trust networks, in which the information of tactical and political importance is exchanged, communication networks that follow usual job-specific communication patterns (Krackhard & Hanson, 1993). Gargiulo & Benassi (1999) introduced the interested reader to the 'dark side' of social relationships. Klein et al. (2004) and Labianca & Brass (2006) continued this line of research and paid particular attention to the negative relationships (ties, in which parties dislike each other), also called adversarial networks.

Recent developments in network analysis shift from static portrayal of social networks to dynamic representation, to "complex adaptive systems that exhibit both persistence and change" (Kilduff et al., 2006). One of the major challenges posed for the network researchers is to explore "the dynamic interplay between the psychology of individuals and the complexity of social networks within which they interact" (Kilduff et al., 2006, 1038). This study aims to address this challenge.

2.1.3 Social network characteristics and innovation and creativity

In the previous parts the theoretical foundations for the study of innovation and creativity has been reviewed in isolation. This part would connect these concepts and discuss the literature that applies the social network perspective in the innovation research.

Few theoretical papers and empirical studies linked social network characteristics to innovation and creativity. An overview in Table 1 presents major findings of research that addressed the impact of the social network structure on innovative performance at the individual level of analysis. As it becomes apparent from the Table 1, theory suggests that some people may be more innovative than others due to the variation of the social network structure and their individual position inside of the network (Kijkuit & van den Ende, 2007; Perry-Smith & Shalley, 2003). In particular, people who have access to disconnected others and those in the center of the network receive different information that might be beneficial for new idea generation (Perry-Smith and Shalley, 2003). Actors who communicate only with one group are less likely to receive diverse information than people who are linked to various groups (Mehra et al., 2001). Furthermore, reverse causation could also be in place - higher innovation in the workplace might also contribute to network centrality (Perry-Smith & Shalley, 2003). Empirical evidence confirms the linkage between structural position and innovation (Fleming &Waguespack, 2007; Perry-Smith, 2006; Fleming & Marx, 2006).

As revealed by literature review, the above mentioned studies use diverging definitions of innovation. Moreover, few of them concentrate on the static perspective and focus on the certain aspects of innovation, overseeing the multi-stage components of the process. Kijkuit & van den Ende (2007) suggest that different network structures are beneficial across various stages of the innovative process. On the other hand, individual characteristics shape the formation of the social structures and participation in the innovation process, as the following sections would suggest.

Table 1: Overview of research linking social network position and innovation

Article	Level of analysis	Model	Innovation definition	Sample / method	Main conclusions
Kijkuit & van den Ende, 2007	Network	SN I	Process 	Theoretical paper	Develops a framework for the role of social networks from idea generation to selection. The paper focuses on both network structure and content and points out the need for strong ties and prior related knowledge and involvement of decision makers. The network structure also needs to undergo transformation over time from a large, non-redundant and heterogeneous network to a smaller and more cohesive one.
Perry-Smith & Shalley, 2003	Ind.	SN ← → I	Creativity (approach to work) 	Theoretical paper	Network positions can facilitate and constrain creative work, moderated by individual characteristics, diversity, cultural norms and tightness of the symbolic structure in the domain relevant field. A spiraling model is presented, capturing the cyclical relationship between creativity and network centrality. Individual's creative life cycle in terms of network position is described over time.
Fleming & Waguespack, 2007	Ind.	SN ← I		Archival data analysis	Investigates leader emergence in the open innovation communities. Boundary spanners are more likely then brokers to advance to leadership because they do not suffer from the lack of trust. Making strong technical contribution and mobilizing communities are the necessary prerequisites for leader emergence.
Perry-Smith, 2006	Ind.	SN → I	Product (creativity, ind. level)	Researchers in the laboratory / Survey	Explores the impact of relationship strength, network position, and external ties on individual creative contributions. This study concludes that weaker ties are generally beneficial for creativity, whereas stronger ties have neutral effects. Additional finding is that centrality is more positively associated with creativity when individuals have few ties outside of their organization and that the combination of centrality and many outside ties is not optimal.
Fleming & Marx, 2006	Ind.-group	SN → I	Creativity	Database analysis of co-authorship relationships of U.S. patent inventors	Addresses the question of how exactly do researchers collaborate with one another to innovate. This study reveals that the social network of innovators has a "small world" structure (various clusters of people interconnected by different "gatekeepers"), which fosters creativity within a company, but also diffuses new insights to other firms through personnel and knowledge transfer. The article further investigates how to manage innovation in ways that exploit the opportunities while minimizing the risks.
Obstveld, 2005[1]	Ind.	SN → I	 Inn. involvement	Survey and ethnography	Innovation involvement is influenced by a *tertius iungens* orientation, social knowledge and social density.
Ibarra, 1993	Ind.	SN → I	Inn. Involvement 	Survey	Compares the effect of formal and informal networks on innovation involvement. For administrative innovations, informal power is key. It mediates the impact of formal position power and individual attributes on innovation roles.

2.2 Individual Characteristics, Innovation and Creativity

2.2.1 Personality traits and the person-environment interaction

Although many conceptualizations of personality exist, due to accumulative empirical evidence the field of personality psychology has witnessed since 1980s a growing acceptation of the Five Factor Model (FFM / Big Five) of personality (Digman, 1990; McCrae, 1993), often referred to as Big Five. This model argues that there are five universal traits - openness, neuroticism, extraversion, agreeableness, and conscientiousness – that encompass all other facets of human personality. The major subdimentions of the Big Five model are presented in the Table Four.

Table 4: The Big Five traits and their facets

Dimension	Facets
Extraversion	Warmth, gregariousness, assertiveness, activity, excitement seeking, positive emotions
Openness to experience	Fantasy, aesthetics, feelings, actions, ideas, values
Conscientiousness	Competence, order, dutifulness, achievement striving, self-discipline, deliberation
Neuroticism	Anxiety, angry hostility, depression, self-consciousness, impulsiveness, vulnerability
Agreeableness	Trust, straightforwardness, altruism, compliance, modesty, tender-mindedness

Source: McAdams (2006).

The question of how exactly do personality traits affect behavior has been addressed by interactionists (Epstein 1979, 1986), who showed that traits could be strong predictors of behavioral trends when behavior is aggregated across different situations. Traits are generally better at predicting cross-situational trends than they are at predicting exactly what a person would do in a single, particular situation. However, modern interactionism approach within psychology also attends to the person-environment interaction and accounts for the situational manifestations of the traits. Four basic postulates (McAdams, 2006) underlie interactionist perspective:

- Actual behavior is a function of a continuous process of multidirectional interaction or feedback between the individual and the encountered situation.

- Individual is an intentional, active agent in this interactional process.
- On the personal side of the interaction, cognitive and motivational factors are essential determinants of behavior.
- On the situation side, the psychological meaning of situations for the individual is important determining factor.

The principle of trait activation holds that personality traits are expressed as responses to trait-relevant situational cues (Tett &Guterman, 2000). We suggest that various stages of the innovation pose different task demands that would trigger people with certain personality traits, as illustrated in the following section.

2.2.2 Personality and Innovation

Extensive research by Amabile (1983), Barron (1968, 1969), Eysenck (1993), and Gough (1979) demonstrated that certain personality traits characterize people that generate novelties. Through correlational studies and research contrasting low- and high-creativity samples a large range of traits has been determined (Sternberg, 1999). These traits comprise independence of judgment, self-confidence, and attraction to complexity, as well as aesthetic orientation and risk taking. Table 2 provides an overview of empirical evidence supporting the influence of other personality factors on innovation.

A number of studies investigated the relationship between personality and creative achievement in science (Feist, 1999). The vast majority of these studies compared a highly creative sample with a less creative one. The results revealed that following dimensions emerged from the data: openness to experience, flexibility of thought, drive, ambition, achievement, dominance, arrogance, hostility, self-confidence, autonomy, introversion and independence.

Feist (1999) analyzed clusters of personality traits of creative individuals and came to the conclusion, that the creative person is distinguished by relatively high levels of asocial characteristics, such as introversion, independence, hostility, and arrogance. Another compact cluster of traits emerges around the need for power and diversity of experience: drive, ambition, self-confidence, openness to experience, flexibility of thought and active imagination. To challenge the established routines and norms, one also needs to have a high level of energy and drive (Amabile, 1996; Sternberg & Lubart, 1995).

Table 2: Overview of innovation research findings: personality traits influencing innovation

Personality trait	Empirical Evidence
Tolerance for ambiguity	Barron & Harrington, 1981;
Openness to experience	West, 1987, George & Zhou, 2001
Self-confidence	Barron & Harrington, 1981;
Unconventionality	West & Wallace, 1991; Frese et al., 1999
Originality	West & Wallace, 1991;
Rule governed (-)	Simonton. 1991; Frese et al., 1999
Authoritarianism (-)	Simonton. 1991;
Independence	West, 1987;
Proactivity	Seibert et al., 2001
Authoritarianism (-)	Simonton. 1991;

Source: adapted from Anderson et al. (2004).

Although only few researchers investigated the relationship between Five Factor Model of personality and innovation and creativity, some trends have emerged. Multiple authors analyzed the links between the FFM traits and innovation (West, 1987; George & Zhou, 2001). Findings showed that out of all Big Five traits, openness to experience is the one most strongly tied to individual innovativeness.

Similar results emerged from the analysis of the relationship between creativity and FFM (Dollinger & Clancy, 1993; McCrae, 1987; King et al., 1996; Kwang & Rodrigues, 2002; Wolfradt & Pretz, 2001). Creativity and openness show the strongest correlation (McCrae, 1987; Feist, 1999; Runco, 2007). Connections between other four factors of FFM and creativity were also found:

- Neuroticism (Andreason & Glick, 1988; Bakker, 1991; Marchant-Haycox & Wilson, 1992)
- Lack of conscientiousness (Drevdahl & Cattell, 1958, Getzels & Csikszentmihalyi, 1976; George & Zhou, 2001)
- Introversion (Busse & Mansfield, 1984; Helson, 1971, 1977; Rossman & Horn, 1972)

- Lack of agreeableness (Barton & Cattell, 1972; Dudek et al., 1991; Eysenck, 1995; Feist, 1993, 1994; Hall & MacKinnon, 1969).

However, other researchers have found conflicting evidence or null correlations with other factors. Feist (1999) suggests that this contradiction could be attributed to the fact that studies confirming the link between Big Five factors and creativity were conducted on highly creative individuals, where the studies that failed to replicate these findings were conducted on the general population. Feist further concludes that FFM traits are more consistently related to artistic and scientific creativity then to everyday creativity. The last statement still awaits empirical confirmation.

The above reviewed literature exhibits, however, significant limitations. First, majority of studies addresses only the idea generation phase of the innovation process. One exception to this is the study by Schweizer (2006) that presents the process of novelty-seeking as the first component in the onset of the whole novelty generation process, followed by creativity, which in turn is followed by innovative performance that presents a product to a wider social environment. It also links individual neurocognitive and personality traits to particular stages and accounts for the influence of individual motivation and for the impact of social influence in this process.

Secondly, majority of the studies that account for the personality factors originate from the early days of the creativity research. Recent theoretical perspective on this account see creative behavior as a result of complex interaction between person and situational factors (e.g. Amabile, 1996; George & Zhou, 2001), in line with the interactionist approach. This research aims to address these limitations.

In line with reciprocal interactionism we argue that people choose to become involved into certain situations, and not the others, depending on their personality traits. Our goal is to specify a person-situation interactionist model of participation in the innovation process and to specify tasks that will attract people with particular personality traits. We theorize that in self-regulated groups where people have the opportunity to choose tasks, individuals would choose tasks that would be consistent with their personality traits and that they would be comfortable with.

The generation of new ideas requires the interest to the world of ideas, playing around with different alternatives and certain degree of fantasy. Openness to experience is the

personality trait that is characterized by intellectual curiosity, willingness to explore, tolerate and reflect on novel and unfamiliar ideas and experiences (McCrae, 1987). People who value intellectual stimulation would welcome the opportunity to become involved into the idea generation process. Multiple empirical studies suggest that openness is particularly related to creativity (McCrae, 1987, Feist, 1999, George & Zhou, 2001, West, 1987). As creativity involves the generation of novel and useful solutions, we argue that openness to experience would be positively related to idea generation phase.

Proposition 1: Openness to experience would be positively related to individuals' involvement in idea generation phase of the innovation process.

Openness to experience was also found to predict information elaboration (Homan, 2008). Therefore, we suggest that openness would also be positively related to idea elaboration phase.

Proposition 2: Openness to experience would be positively related to individuals' involvement in idea elaboration phase of the innovation process.

As the development of new solutions also requires intellectual deliberation, introverts might become involved into the idea elaboration process. Introverts are energized by their own thoughts and imagination and could keep their attention focused on the subject for a substantial amount of time. Empirical evidence indicates that introversion alongside the creativity emerged from the data as a predictor of creative achievement in science (Feist, 1999). Therefore, we suggest that introversion is related to the idea elaboration phase.

Proposition 3: Introversion would be positively related to individuals' involvement in idea elaboration phase of the innovation process.

During the idea implementation phase the previously outlined course of action is being realized. This part calls for dutifulness, self-discipline and deliberation, and could provide a field of action for conscientious people. Conscientious people are self-disciplined and organized, and conscientiousness was found to predict job performance across all job families (Barrick and Mount, 1991; Schmidt and Hunter, 1997).

Proposition 4: Conscientiousness would be positively related to individuals' involvement in idea implementation phase of the innovation process.

2.3 Personality and Social Network Characteristics

Among different personality theories the trait perspective showed to be most useful in predicting behavioral outcomes that result from aggregation of events across situations (Ozer & Benet-Martinez, 2006). The Five-Factor Model of personality traits, the Big Five (Goldberg, 1990), is broadly used in contemporary research to predict such life outcomes as quality of relationships on the interpersonal level, and occupational choice, job satisfaction and performance at the social institutional level.

Few empirical studies linked personality traits to the social network structure, as summarized by Table 5. Burt et al. (1998) confirmed the idea that personality varies systematically with structural holes. Recent studies also investigated how the certain personality types might affect the structural position of the individual in the network. Klein et al. (2004) looked into the effect of demographic characteristics, values and Big Five personality traits on the network centrality. In particular, they found that individuals that are highly educated and low in neuroticism (high on emotional stability) became high in advice and friendship centrality and low in adversarial centrality. Surprisingly, openness to experience was negatively correlated to friendship centrality. Klein et al. (2004) explained that team members find their open colleagues an irritation, may be due to the fact that they challenge established routines and norms.

The effect of other personality characteristics on the network structure has also been investigated. So, Mehra et al. (2001) examined how self-monitoring orientation and network position are related to workplace performance. Additionally, Casciaro (1998) investigated how personality traits (need for achievement, need for affiliation, self-monitoring and extraversion) and situational factors (position in the hierarchy, work status and network centrality) affect the ability to accurately assess the social network structure. However, none of these studies explicitly addressed the mechanisms of how Big Five personality traits and structural position interact across time and affect innovation.

Table 5: Representative research linking personality traits to the social network structure

Article	Personality traits	Sample / method	Major findings	Implications
Mehra et al., 2001	Self-monitoring	Employees in high-tech company / Survey	High self-monitoring is related to betweeness centrality - Personality predicts social structure; - Personality affects the way	High and low self-monitors pursue different network strategies that enhance organizational effectiveness differently.

			individuals build friendship networks - Personality and centrality in social networks independently predict workplace performance	
Klein et al., 2004	Big Five traits,	Members of residential community program / Survey	Education and personality factors (Five Factor Model) are related to network centrality (advice, friendship, adversarial networks)	Enduring personality characteristics, while modest, play a significant role in determining who becomes central in team advice, friendship and adversarial networks.
Casciaro, 1998	1) Motivation: need for achievement, need for affiliation 2) Motivation: self-monitoring 3) Extraversion	University employees / Survey	Both an individual's place in the formal and informal social structure and his or her personality traits account for the accuracy in social network perception.	The influence of personality factors on accuracy of the network perception is important as it impacts the access to resources potentially available.

Similarity-attraction paradigm (Byrne, 1971; Clore & Byrne, 1974) predicts that people tend to build up relationships with similar others. Abundant evidence exists for homophily (interaction with similar others) on age, sex, education, prestige, social class, tenure, function, religion, professional affiliation, and occupation (Brass, 1985; McPherson & Smith-Lovin, 1987; Ibarra, 1992, 1993). In terms of the network structure homophily means that people tend to build homogeneous clusters. We suggest that homophily in terms of the personality might also exist, driven by the preference of individuals to relate to others similar to them in terms of the character / personality.

Proposition 6: The strength of relationships would be positively related to similarity in personality traits.

Additionally, we suggest that people high on openness to experience are able to connect these different clusters and close structural holes. People differ in terms of their reactions to dissimilar others and openness has been shown to affect the persons' reaction to dissimilarity (Homan et al., 2008). Out of six factors that compose openness to experience (Costa & McCrae, 1992), three affect the response to differences (Homan et al., 2008): ideas (intellectual curiosity and open-mindedness), actions (adaptability, experimentation and preference for novelty) and values (fluid political and religious beliefs). Compared to people low on openness to experience,

people scoring high on this trait have a propensity to be less dogmatic and more willing to reflect on different opinions, to open up to different situations and to face conflicts (Costa & McCrae, 1992; Le Pine, 2003; McCrae, 1987). These characteristics are necessary when working with diverse set of people. People high on openness to experience could deal with different viewpoints, attitudes and ideas (and handle the arising conflict) better then people who are low on this personality trait. Therefore, we suggest that openness to experience helps individuals to bridge over divides, to communicate to people from different groups and to close structural holes.

Proposition 6: Openness to experience would be positively related to bridging through structural holes.

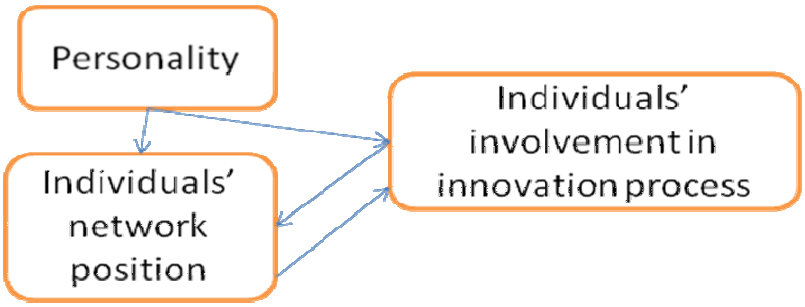
2.4 Suggested Model

As the literatures on the impact of personality and social network position on innovation are loosely connected, one can ask how exactly those variables interact to affect innovation.

Literature suggests that mutual influence exists between social network position and innovation. So, in their theoretical investigation of the context of social relationships and individual creativity Perry-Smith & Shalley (2003) suggest a spiraling model, capturing the cyclical relationship between creativity and network position. The authors propose that a two-phase spiral between creative performance and network centrality exist: in the first phase a positive, self-reinforcing spiral exists between centrality and creativity such that an increase in one leads to increase of the other, until centrality becomes constraining. In phase two the spiral becomes self-correcting so that an increase in centrality no longer leads to an increase in creativity.

Moreover, personality could affect both the composition of social relations (structural network position) and involvement into the innovative process, as suggested by the above reviewed literature. Figure 1 illustrates this process.

Figure 1. Interaction model



Different contributions to innovation from individuals could be due to individual inclination to occupy different positions inside of the network. One could propose that any effect of the personality on innovation is to be attributed to individuals' place inside of the network. So, depending on the personality individuals would occupy a particular network position that would result in certain innovative outcome. As suggested, the individuals high on openness will tend to develop relations with various people and would be able to gain access to diverse information flows that might result in new insights. Or people high on agreeableness and extraversion could develop high centrality in the trust and support networks and would receive support for the implementation of their innovative ideas. Introverts, on the other hand, would prefer to avoid social encounters and might link to a close clique of trusted individuals and would develop a peripheral position inside of the network that would restrain obtaining support for their innovative ideas.

3 Discussion

Based on the overview of research, we can observe some incongruences. So, the personality traits that lead to creative achievement (measured as idea generation) and the personality traits that facilitate the beneficial social network position for implementation of own ideas inside to network centrality do not correspond. In particular, openness to experience that is correlated with creative achievement (McCrae, 1987; Feist, 1999; Runco, 2007) is negatively related to the (friendship) network centrality (Klein et al., 2004). However, Perry-Smith & Shalley (2003) suggest that greater network centrality (up to a certain level) is associated with higher creativity at work. Does it mean that individuals who have the propensity to generate novel ideas (e.g. due to their high openness to experience) do not build or become accepted in

innovation enabling network? This network dynamics is worth investigating as understanding of its mechanisms could provide organizations with insights to encourage innovation.

One of the explanations to this theoretical mismatch could be that different personality characteristics and different parts of the network become activated at various stages of the innovation process. So, as we can see from above research, on one hand, different personality traits are important at various stages of innovation process (Schweizer, 2006). On the other hand, special social network structures are necessary across separate phases of innovation development (Kijkuit & van den Ende, 2007). Moreover, personality affects the social network structure (Klein et al., 2004; Obstfeld, 2005; Mehra et al., 2001).

Integrating those three components, this research contributes to understanding of interaction mechanisms between personality characteristics, network position and innovation along different stages of the innovation process that could help organizations promote employee efforts across different stages of the innovation process. Further empirical evidence on impact of personality and social network position over different stages of innovation process could clarify the picture and help practitioners to leverage on existing human resources inside of the organization.

4 Methodological Approach

The current proposal sketches intended empirical investigation. To test the suggested model, the following study would be conducted.

4.1 Study 1: Exploratory Study

To define antecedents of network structure emergence, a longitudinal exploratory study would be conducted with newly forming networks.

Site. A suitable context for this study would be observing network formation among first-year students throughout their first year at the university. As the influence of personality factors on behavior becomes apparent through repeated interactions overtime across different situations, a group project would create an attractive natural setting for this study. Moreover, groups should be working on deliverable that could be assessed for its innovativeness.

Procedure. The measurements would be collected across five different occasions. At time 1 – before the group work starts - the personality assessment would be conducted for all

relevant personality constructs. At time two (beginning of group work) the first questionnaire seizing the social network structure would be administered. It would be evaluated how well students know each other. The social network structure and the contribution of different members to the group work would be measured repeatedly at times three to five to monitor the development of the network. During the last measurement also the assessment of individual characteristics (especially those of cognitive and motivational character) would be conducted to assess the stability of the constructs. Additionally, experts would evaluate how innovative the end-product of the group is.

To obtain the variation in the network structure, it is important to have groups of at least medium size (e.g. 5 participants).

Measurements

To eliminate the mistakes in the data entry, an online data collection would be conducted. That would also allow to generate automatic feedback (e.g. for the personality structure) for the participants.

Personality variables

Five Factor Model. Commercial instruments such as NEO-PI are available to test for the five factors personality traits. Alternatively, International Personality Item Pool (IPIP, http://ipip.ori.org/) could be used to measure five personality traits (Klein et al., 2004, Goldberg, 1992).

Network Structure

At time two the participants would be asked how long they know other members of the group / course, and the type of the relationship they have with the familiar people (friendship, expertise, trust, liking, etc).

At time three to five the changes in the relationships and perceptions of the other members across the determined categories would be assessed.

Innovation

Following Amabile (1996), the innovativeness of the end product would be rated by two independent judges, who are experts in the field, to insure cross-rater reliability.

Moreover, as research suggests that innovation is an overarching construct that consists of multiple components - problem recognition, generation of ideas or solutions, building support

for the idea, and idea implementation (Kanter, 1988; Scott & Bruce, 1994) – the contribution of individual members to multiple components would be assessed throughout the process.

Controls

Individual level characteristics:

- Demographic characteristics As participants would presumably have the same level of education, the controls would include age, gender, nationality and previous working experience.

Group level controls:

- Group cohesiveness, team climate (participation, norms, conflict resolution)

Data analysis. To account for the multilevel structure of data, the analysis would be conducted with help of the structural equation modeling (SEQ), which also would allow to model different mechanisms of influence between the variables.

References

Ahuja, G. (2000). Collaboration Networks, Structural Holes, and Innovation: A Longitudinal Study. *Administrative Science Quarterly*, 45: 425-455.

Amabile, T. (1983). *The social psychology of creativity* (p. 245). Springer-Verlag.

Amabile, T. M. (1996). *Creativity in Context: Update to the "Social Psychology of Creativity"*. Westview Press Inc.

Anderson, N., de Drew, C. K. W., & Nijstad, B. A. (2004). The routinization of innovation research: a constructively critical review of the state-of-the-science. *Journal of Organizational Behavior, 25*(2), 147-173.

Andreasen, N. C., & Glick, I. D. (1988). Bipolar affective disorder and creativity: Implications and clinical management. *Comprehensive Psychiatry, 29*(3), 207-217.

Baer, M., & Frese, M. (2003). Innovation is not enough: climates for initiative and psychological safety, process innovations, and firm performance. *Journal of Organizational Behaviour, 24*, 45–68.

Bakker, F. C. (1988). Personality differences between young dancers and non-dancers. *Personality and Individual Differences, 9*(1), 121-131.

Bamberger, P.A. (2008). Beyond contextualization: Using context theories to narrow the micro-macro gap in management research. *Academy of Management Journal, 51*, 839-846.

Barrick, M.R. & Mount, M. K. (1991). The Big Five personality dimensions and job performance: A meta-analysis. *Personnel Psychology, 44*, 1-26.

Barrick, M. R., Stewart, G. L., Neubert, M. J., & Mount, M. K. (1998). Relating member ability and personality to work-team processes and team effectiveness. *Journal of Applied Psychology, 83*, 377–391.

Barron, F. (1969). *Creative person and creative process*. Holt, Rinehart and Winston.

Barron, F., & Harrington, D. M. (1981). Creativity, intelligence, and personality. *Annual Review of Psychology, 32*, 439-476.

Barron, F. X. (1968). *Creativity and Personal Freedom*. Wadsworth Publishing.

Barton, K. & Cattell, H. (1972). Personality characteristics of female psychology, science and art majors. *Psychological Reports, 31*, 807-813.

Borgatti, S. P., Everett, M. G., & Freeman, L. C. (2002). *UCINET for Windows: Software for Social Network Analysis*. Harvard, MA: Analytic Technologies.

Borgatti, S. P., & Foster, P. C. (2003). The network paradigm in organizational research: A review and typology. *Journal of Management*, 29: 991–1013.

Brass, D.J. 1985. Men's and women's networks: A study of interaction patterns and influence in an organization. Academy of Management Journal, 28: 327-343.

Brass, D.J. 1985. Technology and the structuring of jobs: Employee satisfaction, performance, and influence. Organizational Behavior and Human Decision Making, 35: 216-240.

Brass, D.J. (1995). Creativity: its all in your social network. In: Ford & Gioia (Eds.) *Creative Action in Organizations: Ivory Tower Visions and Real World Voices*. Sage Pubn Inc.

Brass, D.J., Borgatti, S., Burt, R.S., Casciaro, T., Cummings, J.N., Gargiulo, M., Krackhardt, D., Mehra, A., Obstfeld, D., Cross, R.L., Labianca, G., Mizruchi, M.S., Kilduff, M.J., Johnson, J.L., Shipilov, A.V., Rowley, T., Soda, G., Perry-Smith, J. (2008). *Theoretical and Empirical Applications of Social Network Analysis, Advanced Social Networks.* Workshop conducted at the Academy of Management Meeting 2008, Anaheim, USA.

Brass, D. J., Galaskiewicz, J., Greve, H. R., & Tsai, W. 2004. Taking stock of networks and organizations: A multilevel perspective. *Academy of Management Journal*, 47(6): 795-817.

Burgelman, R. A. (1991). Intraorganizational Ecology of Strategy Making and Organizational Adaptation: Theory and Field Research. *Organization Science, 2*(3), 239-262.

Burt, R. S. (1992). *Structural Holes: The Social Structure of Competition*. Harvard University Press.

Burt, R. S., Jannotta, J. E., & Mahoney, J. T. (1998). Personality correlates of structural holes. *Social Networks, 20*(1), 63-87.

Busse, T. V., & Mansfield, R. S. (1984). Selected personality traits and achievement in male scientists. *Journal of Psychology, 116*(1), 117.

Casciaro, T. (1998). Seeing things clearly: social structure, personality, and accuracy in social network perception. *Social Networks, 20*(4), 331-351.

Chang, M., & Harrington, J. (2007). Innovators, Imitators, and the Evolving Architecture of Problem-Solving Networks. *Organization Science*, *18*(4), 648-666.

Csikszentmihalyi, M. (1997). *Creativity: Flow and the Psychology of Discovery and Invention*. HarperCollins.

Digman, J.M. (1990). Personality structure: Emergence of the five-factor model. In M.R. Rosenzweig and L.W. Porter (Eds.), *Annual review of psychology, 41*, pp. 417-440. Palo Alto, CA: Annual Reviews, Inc.

Dollinger, S. J., & Clancy, S. M. (1993). Identity, Self, and Personality: II. Glimpses Through the Autophotographic Eye. *Journal of Personality & Social Psychology*, *64*(6), 1064-1071.

Drazin, R., Glynn, M.A., Kazanjian, R.K. (1999). Multilevel theorizing about creativity in organizations: A sensemaking perspective. *Academy of Management Review, 24*, 286-307.

Drevdahl, J.E. & Cattell, R.B. (1953). Personality and creativity in artists and writers. *Journal of Clinical Psychology, 14*, 107-111.

Dudek, S.Z., Bernèche, R., Bérubé, H., & Royer, S. (1991). Personality determinants of the commitment to the profession of art. *Creativity Research Journal, 4*, 367-389.

Emirbayer, M., & Goodwin, J. (1994). Network Analysis, Culture, and the Problem of Agency. *American Journal of Sociology*, *99*(6), 1411-1454.

Epstein, S. (1979). The stability of behavior: 1. On predicting most of the people much of the time. *Journal of Personality and Social Psychology, 37*, 1097-1126.

Epstein, S. (1986). Does aggregation produce spuriously high estimates of behavior stability?. *Journal of Personality and Social Psychology, 50*, 1199-1210.

Eysenck, H. J. (1993). Creativity and Personality: Suggestions for a Theory. *Psychological Inquiry*, *4*(3), 147.

Eysenck, H. J. (1995). *Genius: The Natural History of Creativity* (p. 354). Cambridge Univ Pr.

Feist, G. J. (1993). A structural model of scientific eminence. *Psychological Science*, *4*(6), 366-371.

Feist, G. J. (1994). Personality and Working Style Predictors of Integrative Complexity: A Study of Scientists' Thinking About Research and Teaching. *Journal of Personality & Social Psychology*, *67*(3), 474-484.

Feist (1999). Influence of personality on artistic and scientific creativity. In: Sternberg, R. (Ed.). *Handbook of Creativity*. Cambridge Univ Pr.

Fleming, L., & Marx, M. (2006). Managing Innovation in Small Worlds. *MIT Sloan Management Review*, *48*(1), 8-9.

Fleming, L., & Waguespack, D. M. (2007). Brokerage, Boundary Spanning, and Leadership in Open Innovation Communities. *Organization Science*, *18*(2), 165-180.

Ford, C. M., & Gioia, D. A. (1995). *Creative Action in Organizations: Ivory Tower Visions and Real World Voices*. Sage Pubn Inc.

Frese, M., Teng, E., & Wijnen, C. J. D. (1999). Helping to improve suggestion systems: Predictors of making suggestions in companies. *Journal of Organizational Behavior*, *20*(7), 1139.

Gargiulo, M., & Benassi, M. (2000). Trapped in Your Own Net? Network Cohesion, Structural Holes, and the Adaptations of Social Capital. *Organization Science*, *11*(2), 183-196.

George, J.M. (2007). Creativity in Organizations. *Academy of Management Annals, 1*, 439-477.

George, J. M., & Zhou, J. (2001). When Openness to Experience and Conscientiousness Are Related to Creative Behavior: An International Approach. *Journal of Applied Psychology*, *86*(3), 513-524.

Getzels, J. W., & Csikszentmihalyi, M. (1976). *The Creative Vision: Longitudinal Study of Problem Finding in Art* (p. 304). John Wiley & Sons Inc.

Goldberg, L. R. (1990). An Alternative "Description of Personality": The Big-Five Factor Structure. *Journal of Personality & Social Psychology*, *59*(6), 1216-1229.

Goldberg, L. R. (1992). The develoopment of markers for the big five factor structure. Psychological Assessment, 4, 26-42.

Goodwin, C. J. (2004). *Research in Psychology: Methods and Design*. John Wiley & Sons Inc.

Gough, H.G. (1979). A creativity scale for the Adjective Check List. *Journal of Personality and Social Psychology, 37*, 1398-1405.

Gupta, A. K., Tesluk, P. E., & Taylor, M. S. (2007). Innovation At and Across Multiple Levels of Analysis. *Organization Science*, *18*(6), 885-897.

Hall, W. B., & MacKinnon, D. W. (1969). Personality inventory correlates of creativity among architects. *Journal of Applied Psychology*, *53*(4), 322-326.

Hannan, M. T., & Freeman, J. 1984. Structural inertia and organizational change, *American Sociological Review*, Vol. 49: 149-164: American Sociological Association.

Hanneman, R., & Riddle, M. (2005). *Introduction to Social Network Methods*. Retrieved from http://www.faculty.ucr.edu/~hanneman/nettext/.

Hansen, M. T. 1999. The Search-Transfer Problem: The Role of Weak Ties in Sharing Knowledge across Organization Subunits. *Administrative Science Quarterly*, 44: 82-111.

Helson, R. (1977). Women matematicians and the creative personality. *Journal of Consulting and Clinical Psychology, 36*, 210-220.

Helson, R. (1979).The creative spectrum of authors of fantasy. *Journal of Personality, 45*, 310-326.

Heugens, P. P. M. A. R. and Lander, M. (2009). Structure! Agency! (and other quarrels): Meta-analyzing institutional theories of organization. *Academy of Management Journal*.

Homan, A.C., Hollenbeck, J.R., Humphrey, S.E., van Knippenberg, D., Ilgen, D.R., van Kleef, G.A. (2008). Facing differences with an open mind: Openness to experience, salience of intra-group differences, and performance of diverse work groups. *Academy of Mangement Journal, 51*, 1204-1222.

Ibarra, H. (1993). Network Centrality, Power, and Innovation Involvement: Determinants of Technical and Administrative Roles. *The Academy of Management Journal*, *36*(3), 471-501.

Ibarra, H. 1992. Homophily and differential returns: Sex differences in network structure and access in an advertising firm. Administrative Science Quarterly, 37: 422-447.

Ibarra, H. 1993b. Personal networks of women and minorities in management: A conceptual framework. Academy of Management Review, 18: 56-87

Ibarra, H., Kilduff, M., & Tsai, W. 2005. Zooming In and Out: Connecting Individuals and Collectivities at the Frontiers of Organizational Network Research. *Organization Science*, 16(4): 359-371.

Jansen, J. J. P., Van Den Bosch, F. A. J., & Volberda, H. W. 2006. Exploratory Innovation, Exploitative Innovation, and Performance Effects of Organizational Antecedents and Environmental Moderators. *Management Science*, 52: 1661-1674.

Kanter, R.M. (1988). When a thousand flowers bloom: Structural, collective, and social conditions for innovation in organizations. In B.M. Staw & L.L. Cummings (Eds.), *Research in Orgaizational Behavior, 10,* 169-211. Greenwich, CT: JAI Press.

Kasof, J. (1995). Explaining Creativity: The Attributional Perspective. *Creativity Research Journal, 8*(4), 311.

Kijkuit, B. & van den Ende, J. (2007). The Organizational Life of an Idea: Integrating Social Network, Creativity and Decision-Making Perspectives. *Journal of Management Studies, 44*, pp. 863-882.

Kilduff, M., Tsai, W., & Hanke, R. (2006). A paradigm too far? A dynamic stability reconsideration of the social network research program. *Academy of Management Review, 31*(4), 1031-1048.

King, L. A., Walker, L. M., & Broyles, S. J. (1996). Creativity and the Five-Factor Model. *Journal of Research in Personality, 30*(2), 189-203.

Klein, K. J., Beng-Chong Lim, Saltz, J. L., & Mayer, D. M. (2004). How do they get there? An examenation of the antecedents of centrality in team networks. *Academy of Management Journal, 47*(6), 952-963.

Krackhardt, D., & Hanson, J. R. (1993). Informal networks: The company behind the charts. *Harvard Business Review, 71*(4), 104-111.

Kwang, N., & Rodrigues, D. (2002). A Big-Five Personality Profile of the Adaptor and Innovator. *The Journal of Creative Behavior, 36*(4), 254-268.

Labianca, G. (., & Brass, D. J. (2006). Exploring the social ledger Negative relationships and negative asymmetry in social networks in organizations. *Academy of Management Review, 31*(3), 596-614.

LePine, J. A. 2003. Team adaptation and postchange performance: Effects of team composition in terms of members' cognitive ability and personality. Journalof Applied Psychology, 88: 27–39.

Levinthal, D. A., & March, J. G. 1993. The Myopia of Learning. *Strategic Management Journal*, 14, 95.

Levitt, B., & March, J. G. (1988). Organizational Learning. *Annual Review of Sociology, 14*, 319-340.

MacKinnon, D.P., Fairchild, A.J. & Fritz, M.S. (2007). Mediation Analysis. *Annual Review of Psychology, 58,* 593-614.

March, J. G. 1991. Exploration and Exploitation in Organizational Learning. *Organization Science*, 2, 71-87.

Marchant-Haycox, S. E., & Wilson, G. D. (1992). Personality and stress in performing artists. *Personality and Individual Differences, 13*(10), 1061-1068.

Masuda, N. & Kono, N. (2006). VIP-club phenomenon: Emergence of elites and masterminds in social networks. *Social Networks, 28,* 297-309.

McAdams, D. P. (2005). *The Person. An Integrated Introduction to Personality Psychology: A New Introduction to Personality Psychology*. Wiley & Sons.

McCrae, R. R. (1987). Creativity, Divergent Thinking, and Openness to Experience. *Journal of Personality , 52*(6), 1258-1265.

McCrae, R. R. (1993). Moderated Analyses of Longitudinal Personality Stability. *Journal of Personality & Social Psychology*, *65*(3), 577-585.

McPherson, J.M., & Smith-Lovin, L. 1987. Homophily in voluntary organizations: Status distance and the composition of face-to-face groups. American Journal of Sociology, 52: 370-379.

Mehra, A., Kilduff, M., & Brass, D. J. (2001). The Social Networks of High and Low Self-Monitors: Implications for Workplace Performance. *Administrative Science Quarterly*, *46*(1), 121-146.

Miller, D. (1993). The architecture of simplicity. *Academy of Management Review*, *18*(1), 116-138.

Montuori, A., & Purser, R. E. (1998). *Social Creativity: Perspectives on creativity*. Hampton Press.

Moynihan, L. M., & Peterson, R. S. 2001. A contingent configuration approach to understanding the role of member personality in organizational groups. In B. M. Staw (Ed.), Research in organizational behavior, vol. 23: 327–378. Greenwich, CT: JAI Press.

Obstfeld, D. (2005). Social Networks, the Tertius Iungens Orientation, and Involvement in Innovation. *Administrative Science Quarterly*, *50*(1), 100-130.

Ozer, D. J. (1986). *Consistency in personality: A methodological framework.* New-York: Springer -Verlag.

Ozer, D. J., & Benet-Martínez, V. (2006). Personality and the prediction of consequential outcomes. *Annual Review of Psychology*, *57*(1), 401-421.

Parkhe, A., Wasserman, S., & Ralston, D. A. (2006). New frontiers in network theory development. *Academy of Management Review*, *31*(3), 560-568.

Paulus, P. B., & Nijstad, B. A. (2003). *Group Creativity: Innovation Through Collaboration*. Oxford Univ Pr.

Peeters, M.A.G., Rutte, C.G., van Tuijl, H.F.J.M. & Reymen, I.M.M.J. (2008). Designing in teams: Does personality matter? *Small Group Research, 39*, 438-466.

Perry-Smith, J. E. (2006). Social yet creative: The role of social relationships in fascilitating individual creativity. *Academy of Management Journal*, *49*(1), 85-101.

Perry-Smith, J. E., & Shalley, C. E. (2003). The social side of creativity: A static and dynamic social network perspective. *Academy of Management Review, 28*(1), 89-106.

Reis, H.T., Collins, W.A. & Bernscheid, E. (2000). The relationship context of human behavior and development. *Psychological Bulletin, 126*, 844-872.

Rossman, B. B., & Horn, J. L. (1972). Cognitive, Motivational and Temperamental Indicants of Creativity and Intelligence1. *Journal of Educational Measurement, 9*(4), 265-286.

Runco, M. A. (2007). *Creativity. Theories and Themes: Research, Development, and Practice (Academic Press): Theories and Themes: Research, Development, and Practice*. Academic Press.

Schmidt F.L., & Hunter, J.E. (1997). The validity and utility of selection methods in personnel psychology: Practical and theoretical implications of 85 years of research findings. *Psychological Bulletin, 124*, 262-274.

Schumpeter, J. 1942. *Capitalism, Socialism, and Democracy*. Harper and Row, New York.

Schweizer, T.S. (2004). *An Individual Psychology of Novelty-Seeking, Creativity and Innovation.* Rotterdam: Erasmus Research Institute of Management.

Schweizer, T.S. (2006). The psychology of novelty-seeking, creativity and innovation: Neurocognitive aspects within a work-psychological perspective. *Creativity and Innovation Management, 15*, 164-172.

Scott, S.G., & Bruce, R.A. (1994). Determinants of innovative behavior: A path model of individual innovation in the workplace. *Academy of Management Journal, 38*, 483-503.

Seibert, S. E., Kraimer, M. L., & Crant, J. M. (2001). What do proactive people do? A longtitudinal model linking proactive personality and career success. *Personnel Psychology*, *54*(4), 845-874.

Simonton, D. (1991). Latent-Variable Models of Posthumous Reputation: A Quest for Galton's G. *Journal of Personality & Social Psychology*, *60*(4), 607-619.

Steiner, I.D. (1972). *Group processes and productivity*. New York: Academic Press.

Sternberg, R. J. (1999). *Handbook of Creativity* (p. 502). Cambridge Univ Pr.

Sternberg, R. J. & Lubart, T.I. (1999). The Concept of Creativity: Prospects & Paradigms. In R.J. Sternberg (Ed.), Handbook of creativity (pp.313-335). New York: Cambridge University Press.

Tett, R.P. & Burnett, D.D. (2003). A personality trait-based interactionist model of job performance. *Journal of Applied Psychology, 88*, 500-517.

Tett, R.P., & Guterman, H.A. (2000). Situation trait relevance, trait expression, and cross-cultural consistency: Testing a principle of trait activation. *Journal of Research in Personality, 34*, 397-423.

Tsai, W. (2001). Knowledge transfer in intraorganizational networks: Effects of network position and absorptive capacity on business unit innovation and performance. *Academy of Management Journal, 44*, 996–1004.

Tsai, W., & Ghoshal, S. (1998). Social capital and value creation: The role of intrafirm networks. *Academy of Management Journal*, 41, 464.

Wasserman, S., & Faust, K. (1995). *Social Network Analysis: Methods and Applications*. Cambridge University Press.

Wellman, B. (1988). Social Structures: A Network Approach. Cambridge University Press.

West, M. A. (1987). Role innovation in the world of work. *British Journal of Social Psychology, 26*, 305–315.

West, M. (2002). Sparkling Fountains or Stagnant Ponds: An Integrative Model of Creativity and Innovation Implementation in Work Groups. *Applied Psychology: An International Review*, *51*(3), 355-387.

West, M. A., & Farr, J. L. (1991). *Innovation and Creativity at Work: Psychological and Organizational Strategies.* John Wiley and Sons Ltd.

Williams, L.J. & Podsakoff, P.M. (1989). Longtitudinal field methods for studying reciprocal relationships in organizational behavior research: Toward improved casual analysis. *Research in Organizational Behavior, 11*, 247-292.

Wolfradt, U., & Pretz, J. E. (2001). Individual differences in creativity: personality, story writing, and hobbies. *European Journal of Personality, 15*(4), 297-310.

Yli-Renko, H., Autio, E., & Sapienza, H. J. (2001). Social Capital, Knowledge Acquisition, and Knowledge Exploitation in Young Technology-Based Firms. *Strategic Management Journal*, 22: 587-613.

Zuckerman, M. (1994). *Behavioral Expressions and Biosocial Bases of Sensation Seeking.* Cambridge: Cambridge University Press.