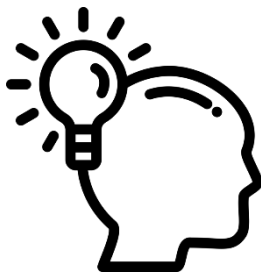


Linking schema theory to innovation processes

*What are the effects of exposing individuals to schema
(in)consistency to quantity and quality of creative ideas in online
ideation contests?*



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Abstract

Innovations begin with venture ideas that enable the creation of future goods and services in the absence of current markets for the customer unmet needs. Collaborative practices that involve customers in search and development of creative ideas can be viewed as a core element of innovations. A way to elicit the creative ideas of people is to involve them in a controlled environment of an ideation contest. The aim of this study was to investigate the link between schema theory and innovation processes. To this purpose an experiment was performed to test if exposure of participating subjects to inconsistent schemata leads to a higher number and creative quality of ideas generated than exposure to consistent schemata, or no exposure to schemata. The results of the experiment did not agree with the findings of past research on the effects of schema inconsistency. Our hypotheses that exposure of participating subjects in an ideation contest to inconsistent schemata leads to a higher number and creative quality of ideas than exposure to consistent, or no exposure to schemata, cannot be accepted. According to past research, the view that a heightened need for (non specific) closure may inhibit the generation of innovative and creative ideas may not be valid under all circumstances. Therefore, the need for closure of the participating subjects to the experiment was assessed. However, our hypothesis that the relationship between the exposure of participating subjects to schema (in)consistency and idea generation is moderated by the need for closure of the participants cannot be accepted.

Keywords: schema theory, schema inconsistency, innovation, innovation contest, ideation contest

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1 Introduction

1.1 The Research Question

Generally speaking, in view of disruptive technological advances, increasing international as well as local competition and dynamic customer activities, firm level competitiveness depends to a great extent on innovation of products or processes (Friesenbichler et al, 2016; OECD/Eurostat, 2018: p. 68). Nevertheless, an innovation is not only an output, being that a product or a process, but it is an iterative process in its own right that begins with the inception of a venture idea, signifying the close affinity to the concept of creativity, to be followed by an evaluation and its implementation (Rietzschel & Ritter, 2018; Frederiksen & Knudsen, 2017).

Venture ideas, beliefs, and actions of R&D personnel that enable the creation of future goods and services in the absence of current markets for them, are the constituent parts of business opportunities (Vogel, 2017). Furthermore, if both sources of supply and demand exist, their connection is referred to as simple opportunity recognition, as in the case of a franchise venture. If the demand exists but not the supply, as in the case of an unknown cure for a known disease, the opportunity has to be discovered. And finally, if neither the demand nor the supply exist, inventions in technology, marketing or financing, have to be made, and the opportunity is created (Sarasvathy et al, 2010: pp.79, 81). Therefore, customer unmet needs can be met through the exploitation and development of business opportunities.

The search for opportunities has forced firms to innovate (Massa & Testa, 2011), a fact that has lead to the integration of external sources of Research and Development (R&D) and the adoption of an **open innovation model** (Gassmann et al., 2010). A broad categorization of practice approaches to collaborative innovation activities includes technology, customer and service driven perspectives (Russo-Spena & Mele, 2012). In turn, the customer driven perspective includes a number of diverse practices, that encompass lead users (Thomke & von Hippel, 2002), virtual customer environments (Nambisan & Baron, 2007), crowdsourcing innovations (Ebner et al., 2009) and **open community-based innovation** (Füller, 2010).

Collaborative practices that involve customers in search and development of venture ideas can be viewed as a core element of innovation, and a critical element of a future failure or success (Goldenberg et al., 2001). Nevertheless, it is a challenge to foresee the customer unmet needs, as they themselves cannot usually imagine how an innovative product would look like. However, is the legendary phrase (Vlaskovits, 2011), attributed to Henry Ford “If I had asked people what they wanted, they would have said faster horses” a suggestion where not to look for creative ideas? Creativity is acknowledged as an important factor for innovation processes, but there are also ways to elicit the creative ideas of people. One way is to involve them in a controlled environment of an ideation contest, where participants are faced with an open and/or innovation-related problem (Majchrzak & Malhotra, 2013). These contests range from searching for a logo (Wooten & Ulrich, 2017), to developing a new product idea (Poetz & Schreier, 2012) or solving a research problem (Jeppesen & Lakhani, 2010). Cognitive science research findings support the view that if participants in ideation contests are faced at the same time with incongruous information challenging or violating their mental structures (schema violating), items or ideas generated are more creative.

A schema as a cognitive structure is “a nonspecific but organized representation of prior experiences” (Neisser, 1967: p. 272). An external or internal stimulus will conjure up a schema as a mental picture of an object, of a person, of an activity or of a concept, with some but not all its attributes. A schema changes with time. The never stopping mental processes of conscious and unconscious thought processes, i.e. memory recollections, associations, judgments, evaluations and affective responses, keep adding missing or imagined information (Heit, 2003). The schema usefulness is unquestionable for encoding the vast amount of perceived information. However, real life events may contradict or challenge an existing schema that inhibits or deters as irrelevant the acceptance of new information or disconfirm one’s expectancies, and bipolar terms such as congruent/incongruent expected/unexpected, consistent/discrepant are being used to describe schema incongruities (Heckler & Childers, 1992).

A number of experimental studies, under conditions of schema violation, have ascertained the effect of different factors on creativity and innovation, as documented by the following cases.

There are instances, when a schema-violation environment enhances creativity (Gocłowska et al., 2013; Wan & Chiu, 2002). Likewise, schema inconsistencies increase cognitive flexibility, i.e. the ability to interrupt established cognitive patterns, to overcome functional rigidity, and as a result, to make novel associations between concepts (Ritter et al., 2012a).

Following schema-inconsistent rather than schema-consistent information, participants low rather than high in need for structure, showed better creative performance (Rietzschel et al., 2007). Following schema-inconsistent imagery, participants, low rather than high in need for structure, showed increased, rather than decreased, divergent thinking (Gocłowska et al., 2014). Divergent thinking is not synonymous with creativity, but it is considered as a intellectual process that moves in varied directions and, as a result, leads to original ideas (Runco, 2010). Extensive multicultural experiences are associated with greater creativity among participants open to experience (Leung & Chiu, 2010). Thus, studies support the idea that the reaction of people to various types of schema-violations depends on individual differences.

Marketing and advertising have been privileged areas of research of schema theory. Schema theory has demonstrated that individuals are motivated to resolve schema violations or incongruities because of sensation and novelty seeking, as a result of emotive arousal and surprise (Flaherty & Mowen, 2010; Yoon, 2013). For example, as regards degree levels (low, moderate, high) of incongruity, a moderate incongruity requires little cognitive effort to resolve it by assigning the incongruous object to an alternative classification or to a subcategory, and results in a favorable evaluation and has a positive affect (Meyers-Levy & Tybout, 1989). Affective states, such moods, play apparently an important role in how individuals process incongruities, especially in an information overloaded environment. Participants in negative mood, process incongruous information slower than in the other moods (Braun-LaTour et al, 2007). Likewise, in their affective processing their reactions can be positive or negative, upbeat (e.g., active, adventurous), negative (e.g., angry, annoyed) or warm (e.g., calm, contemplative) (Yoon, 2013).

However, there is a crucial difference between empirical research in marketing related to schema incongruity and the use of schema incongruity in ideation contests. In

marketing the research is aiming to discover and analyze the psychological mechanisms underlying the incongruity resolution and to recognize the important factors that would increase the success of incongruity strategies in advertizing, i.e. it does not evolve the search for an innovative object or idea. In an ideation contest, as in this theses, a successful resolution leads to something, hitherto not known or articulated. Nevertheless, marketing research has thus identified a number of self-perceptions as well as personality traits that are moderating the relationship between schema violation and its resolution. Creativity of individuals with a heightened need for (nonspecific) closure (Kruglanski, 2013) for example, may be hindered, because, amongst other reasons, they tend to make fewer hypotheses (Mayseless & Kruglanski, 1987), make efforts to achieve consensus (Kruglanski et al., 1993) and uniformity (De Grada et al., 1999) in groups.

As mentioned above in order to find opportunities and unmet needs firms adapt an open innovation model. In open innovation, personality traits, such as openness to experience, conscientiousness and being introverted are significantly associated with generating new product ideas, successful prototyping and commercial, but not peer-to-peer diffusion respectively (Stock et al., 2016). Likewise, the motivation of users to participate in an innovation development process may affect the novelty and utility of the developed solutions (Stock et al., 2015).

Therefore, on the basis of past research it is expected that exposure to schema inconsistency has a positive influence on individual creativity. The proposed study involves a co-ideation online contest for the elicitation of an idea about the name of a new product and a marketing concept about its promotion when participants are presented with schema violating stimuli. Hence, the following research question is asked:

What is the effect of schema (in)consistency on the number and creative quality of ideas generated in an innovation contest?

Furthermore, as different personality traits have been associated with the outcomes of innovation processes, the self-perception of the participants as regards their Need for Cognitive Closure (Webster & Kruglanski, 1994) is assessed (Roets & Van Hiel, 2011).

An individual's need for cognitive closure may moderate the relationship between the schema (in)consistency and the number and creative quality of ideas generated in an innovation contest. Therefore, in this study, this moderating effect will be investigated.

1.2 Relevance

The main contribution of this thesis is to shed light to the field of open innovation by organizing an online ideation experiment. In particular, it is related, from a customer driven perspective (Von Hippel & Katz, 2002; Nambisan, 2002; Füller, 2010; Ebner et al., 2009) to the effect of exposure of individuals to (in)consistent schemata on the quantity and quality of the generated ideas. By conducting this research, companies will gain useful insights on how to elicit novel and creative ideas of customers during an innovation process. This can help companies to connect venture ideas to the opportunity development stages, the consumer unmet needs and eventually to gaining a competitive advantage over their competitors.

Existing literature has investigated how schema incongruities may enhance individual creativity (Gocłowska et al., 2014; Miron-Spektor et al., 2011; Ritter et al., 2012; Wan & Chiu, 2002) as well as the impact of the personal need of closure of individuals on creative behavior (Kruglanski, 2013). This thesis will contribute to the existing literature by linking schema theory to creativity of individuals participating in (open) innovation contests. For managers, this research is relevant as it can help them to understand the usefulness, in terms of creativity, of exposing participants to (in) consistent schemata when they look for “out of box” ideas in ideation contests for an innovation.

1.3 Thesis Outline

The present thesis is organized as follows. The introduction is followed by two sections on the relevant literature review, one on the concept of innovation and one on schema theory. In the sequel a section describes the research methodology, followed by the analysis of the results. The last section is devoted to concluding remarks, the managerial and theoretical implications of this study, its limitations and suggestions for future research.

2 Literature Review

2.1 Innovation

2.1.1 Preamble

A general definition of the term innovation for the business enterprise (corporate) sector is provided in the Guidelines for Collecting, Reporting and Using Data on Innovation of the Organisation for Economic Co-operation and Development (OECD). According to these Guidelines “[a] business innovation is a new or improved product or business process (or combination thereof) that differs significantly from the firm's previous products or business processes and that has been introduced on the market or brought into use by the firm.” (OECD/Eurostat, 2018: p. 68).

Innovations, as determinants of competitiveness at firm's level are identified in a number of empirical research (Forsman et al., 2013; Reeves & Deimler, 2011). Likewise, new product development and product differentiation as determinants of competitiveness at firm's level are also identified in empirical research (Dangelico & Pujari, 2010; Buckley et al., 1988). The lack of a standard definition of competitiveness and methods of measurement, have not been an obstacle in employing the term both by academics and practitioners in economics and management (Momaya, 2019; Siudek & Zawojcka, 2014; Vlachvei & Notta, 2017). Competitiveness can be framed at the state or the nation, an industry or the firm level (Nelson, 1992).

There are differences between SMEs and large corporations in their organization structure, management practices, response to external stimuli and the ways they compete with each other. In the case of SMEs, generally speaking, approaches to competitiveness are focused on a wide range of entrepreneurial competences. Such competences contribute, on the one hand in forming a competitive scope and, on the other hand, building organizational capabilities, including the capacity to innovate for the enterprise (Man et al., 2002).

Nevertheless, market orientation can be a basis for a competitive advantage. Whether it is a large corporation or a small entrepreneurial enterprise, market orientation facilitates the continuous aggregation of information and development of knowledge

about the customer needs (Slater & Narver, 1995) Innovation ideas coming from external information sources require smaller development times and lower investment compared to initiatives based on internal sources (Mansfield, 1986). When consumers can add their knowledge to the firm by participating in innovation projects, this participation can improve the entire innovation process and the competitiveness of the firm (Vargo & Lusch, 2004).

Both large corporations and small enterprises are facing the common problems of customer satisfaction and competitiveness related to their innovation initiatives. One of the reasons a firm cannot often achieve an innovation breakthrough, is that there is not a definitive set of rules to guide to a successful choice (Von Hippel et al., 1999). A response of the world of business has been to turn to their customer base. This can happen by involving customers in the process. “Listen carefully to what your customers want and then respond with new products that meet or exceed their needs” (Thomke & Hippel, 2002). This phrase has been a driving force for many firms and had led to many innovations. However, it is difficult for a firm to elicit the needs and wants of consumers, because even if consumers are aware of what they need, they cannot imagine how an innovation would look like. Furthermore, firms should not only provide the right environment for the customer participation but they should also change their business model and their management attitude (Galbraith, 1982), as was documented for example in the case of the Dell IdeaStorm online community (Di Gangi & Wasko, 2009). New technologies have intensified and augmented connectivity between producers and customers in cost effective ways and have allowed enterprises to establish new development models for innovative products (Fisher & Fang, 2017).

Innovations can be categorized as incremental (small step), synthetic or discontinuous (radical, quantum-leap) (Boer & Duing, 2001). Radical product or process innovations are often related to inventions and require the development of entirely novel technologies, and new skills, processes, organization and management plans. Synthetic innovations combine existing technologies to establish a new standard class product or a new production process. Finally, slight changes of a product can lead to a competitive advantage, by adding new features or producing improved versions as a response to customer requirements. Likewise, incremental changes to the production process can lower the production costs or improve the product quality (Tushman & Nadler, 1986).

“Idea generator, sponsor or coach, gatekeeper, entrepreneur or champion [and] project leader” are some of the early terms identified in the literature with the innovation activities of individuals (Hax & Majluf, 1982).

Innovation as a process will go through the stages of idea selection, concept development, solution development and testing, construction and validation, preparation for production and implementation and market introduction. This last stage of market introduction involves the phases of commercialization and adoption with possible feed-back loops to the market introduction stage. An innovation will be evaluated for its novelty, usefulness and its market potential (Frederiksen & Knudsen, 2017). Furthermore, the input from idea generators - an important role in achieving innovations, especially a radical one - does not end with the initiation of a project but it can continue with solutions of problems that may arise during all the innovation development stages. Therefore, idea generation need not be exclusively an activity of the Research & Development (R&D) scientific and engineering personnel, but it may also be an activity of the sales, marketing, administration and other company departments (Roberts, 2007).

An important distinction can also be made between physical spaces (Moultrie et al., 2007) associated with the innovation process, such as Innovation Laboratories, e.g. Fablabs, Living Labs and Design Factories (Osorio et al., 2019; Malmberg et al., 2017) and virtual environments using the Internet (Enkel et al., 2020). The customers’ engagement in a virtual environment, as opposed to the traditional physical one, allows for a two-way, continuous and rich interaction, extended from a direct interaction with the current customers to both direct and mediated interactions with potential customers (Sawhney et al., 2005).

Individuals outside the firm involved in innovation projects, apart from the generation of new ideas, may also be involved in actual co-production, testing prototypes and continuing customer support services (Nambisan, 2002). The function of customers can be that of co-ideator, co-designer, co-manufacturer, co-distributor, co-promoter, co-evaluator, co-tester and experience creator (Agrawal & Rahman, 2015). Notable examples include of the Co-Creation Lab of BMW (Bartl et al., 2013), Dell’s Idea Storm (Bayus, 2013), Procter & Gamble Smart Lab (Agafitei & Avasilcai, 2015),

Starbucks' Mystarbucksidea (Hossain & Islam, 2015), Lego Mindstorms (Masril et al., 2019) and Threadless (Piller, 2010). Also, a number of applications of this practice in different domains of economic activity includes, for example, Food & Beverages (Filieri, 2013), the Creative Industries (Quero & Ventura, 2015), platforms and crowdfunding (Fu et al., 2017), as well as the public domain (Kallio & Lappalainen, 2015).

This study focuses on idea generated tasks and as the customer role is central during the innovation processes. The process of engagement of customers in idea generation is further examined.

2.1.2 Open Innovation

Open innovation was introduced as an alternative model of innovation management. Firms should utilize both internal and external sources of ideas and internal and external pathways in forging ahead their innovations to market (Chesbrough, 2003). Generally speaking, open innovation is about the inflow and outflow of knowledge in the efforts of firms to improve their innovation success (Enkel et al., 2009). The focus of the original concept on the firm has also been shifted from a firm centric perspective to include open source software development (Shah, 2006), innovation communities (West & Lakhani, 2008) and users as innovators (Bogers et al., 2010).

Changes in the market including differentiation in customer needs and the entry of the new technologies made it harder to firms to stay competitive relying only on the competences of the R&D departments. Firms should look for knowledge and ideas outside their boundaries to expedite the innovation process (Chesbrough, 2003). A company can adopt an open innovation model in two different ways; outbound or inbound. In the inbound one, as in this thesis, firms are collecting ideas and knowledge from external individuals (e.g. customers, suppliers, competitors). Also firms are not depending any more only on their internal ideas and competences of R&D to achieve a competitive advantage (Chesbrough & Crowther, 2006).

A number of advantages are associated with the adoption of an open innovation policy. These include the reduction, both of costs and risks for new product development and improvement, utilizing the experience and expertise of customers and suppliers, improving the firm's fame and prestige (Gassmann et al., 2010; Wallin & von Krogh, 2010). Keeping in mind the several benefits associated with open innovation, the challenges and potential risks should not be overlooked. For example, it is a challenge finding the customer innovators and creating communication links with them in a cost-effective manner (Nambisan, 2002). Limited financial resources, time availability and the lack of competences of the personnel of small and medium size enterprises are constraining factors in their efforts to make practical use of customer information in design and in evaluation of innovative products and services. Likewise, identified problems are related to the involvement of different user groups, the user participation in the early stage of an innovation development process and the efficient utilization of online collected data (Heiskanen et al., 2010).

Companies might also face risks. It has been documented that companies giving control to a crowd, through an open collaboration platform, may be faced with legitimate, i.e. humorous, provocative, unique, challenging the social norms, but deviant content that can be used in a creative way. But companies may also be faced with violating, i.e. defaming, obscene, malicious deviant content with damaging consequences (Gatzweiler et al., 2017). Therefore, there is a real risk of suffering a social media disaster through parodies and mockeries, a deepening distrust from the consumers or even a "brand identity dilution" (Thompson et al., 2006).

A number of different tools, instruments, techniques and types of activity have been utilized to support a collaborative and open innovation practice. The demanding and complex tasks of an innovation process could be embedded in a game-like environment (gamification) that enhances the enjoyment and the engagement of the participants (Schulz et al., 2015; Patricio et al., 2020). Manufacturers may provide a virtual environment of design and development tools (toolkit) for users to participate. The user participation may only be limited to the articulation of design problems and the suggestion for a possible solution or it may involve the use of the manufacturer capabilities to develop a solution (Piller & Walcher, 2006; Von Hippel & Katz, 2002).

There is a growing practice to integrate the consumers' creative contribution into the innovation process, as opposed to only monitoring and evaluating their opinions, desires and needs. In particular, the engagement of customers in innovation and ideation contests, are highlighted as part of the wider idea of open innovation research and practice (Stanko et al., 2017).

An open innovation process can also be studied by examining the practices followed, i.e. by describing and classifying the actors, the actions and the resources employed and how actors interact, collaborate and integrate their resources in the different phases of the innovation process. Thus, the participation of customers and other partners in open innovation “can be disentangled into several” co-creation practices, i.e. the **co-ideation**, the co-evaluation, the co-design, the co-test and the co-launch practice. In a co-ideation practice, as it would be the case like in the present study, the main actors can be users, experts or fans. In a co-ideation case, the actions of the initiating firm are related to orchestrating, through the mobilization, socialization and networking, the participation of stakeholders, as well as to providing motivational incentives for participation and rewards. The tools employed are texts, documents, drafts, images and videos and the outcomes are the new concepts of a product, of services and promotional initiatives (Russo-Spena & Mele, 2012).

2.1.3 Innovation contests

Innovation contests (or competitions) are an increasingly popular means to engage experts, current and potential customers, as well as the general public, in the process of innovation. Innovation contests have led to an extensive body of research and efforts to systematically describe their common design elements and generic features, both from an economic theory and a management perspective (Adamczyk et al., 2012).

From an economic perspective, an innovation contest can be either between two firms in the same industry that enter the contest by investing in Research & Development (R&D) in the first place and expect their reward through profits following the marketing of their products. An innovation contest can also be between a firm (seeker) in need of a solution to a problem and independent participants (solvers), that, in general, undertake the participation cost as an opportunity cost but the reward is reserved for the

winner. Nevertheless, to attract more solvers proportional prizes are often offered, the reward is divided among the participants according to their achievement or contingent rewards associated with profits or ex ante rewards are offered (Adamczyk et al., 2012).

From a management perspective, research themes include the users' intrinsic and extrinsic motivation to participate in an innovation contest (Zheng et al., 2011). Solvers may also be intrinsically motivated to participate in an innovation contest in order to upgrade their competence skills or because of the satisfaction they may get from a pleasurable activity (Ye & Kankanhalli, 2017). It is a matter of standard practice the ideas generated to be evaluated, by their quantity and the variance in their quality, by a team or individuals working independently (Girotra et al., 2010). Participants with a willingness to challenge prevailing thought, the need for change and attraction to variety are showing a strong preference for the idea generation stage of a creative process (Puccio & Grivas, 2009). Other research issues, for example, are related to the prior knowledge or expertise of the participants (Marsh et al., 1999), to feedback channels (Jiang & Wang, 2019) and the presence of collaborative or competitive conditions (Bullinger et al., 2010).

Innovation contests were popular from the 18th century (Khan, 2017), but current digital communication technologies offer greater opportunities to the firm to integrate customers as a source of innovation. A virtual, real time communication environment, like the internet offers the firm the capability to collaborate with a larger crowd at smaller costs and has made the interaction faster compared to traditional techniques (e.g. focus groups). Also, the internet as a tool for customer engagement has improved the flexibility of interaction, as consumers can choose the time and the level of their involvement (Sawhney et al., 2015). Ideation contests, apart from the actual and immediate outcomes in knowledge and technology acquisition by a firm, are also a mechanism to assist the firm's public relations and to enhance its brand and the fact finding and information gathering (Mortara et al., 2013).

Innovations begin with ideas and their successful development depends to a large extent on the ideas they are based upon, so ideas are central and critical factors of the innovation process, creativity and growth (Kornish & Ulrich, 2014). Idea generation is part of the so-called "fuzzy front end" of the innovation process, a term created in the

domain of engineering research aiming to shorten the product development cycle (Smith & Reinertsen, 1992). Vital elements of an integrating approach to the front end perspective, except the genesis of ideas, are also the process of idea selection from a pool of ideas generated, the (business) opportunity recognition and analysis, and the concept and technology development (Khurana & Rosenthal, 1998; Koen et al, 2001).

Innovation contests depend on the solvers' expertise, their improvement effort and the number of trials and trials they engage during the contest. Innovation contests can be classified as expertise-based, ideation and trial-and-error projects. In case of ideation projects, the seeker mentions a problem and look for novel/creative ideas from the participants. In these projects what the seeker considers as a good idea plays an important role. So, in ideation projects an idea is acceptable when is not only original, but it is in line with the seeker's taste. In an ideation contest solvers are considered, in principle, identical in terms of expertise and they are concentrating all their efforts to improve the quality of their idea proposal. The number of solutions offered and the solvers' effort are mediating the relationship between the reward and the best solution. With a fixed-price reward, for example, as the number of solvers increases, the effort of a solver decrease, but the variety of a larger number of solutions offered outmatches the negative effect of the solvers' decreasing effort (Terwiesch & Xu, 2008).

Participants to ideation contests or to creative generation tasks are often shown examples, together with the participating instructions of what their ideas should conform to. Studies are focused on the influence of these exemplars, like in case of the pasta names provided in the present study (see Methodology section). In an early experiment of creative generation tasks (Smith et al., 1993) participation took place under different conditions, one with instructions to provide designs as different to the examples (divergent) and one with instructions to provide designs as similar to the examples (convergent). Conformity to exemplars increased for the convergent condition group but did not decreased for the divergent condition group, and therefore conformity can be attributed to the unintentional memory of the participants.

Exemplars may vary in number and their distinguishing attributes. Therefore, during the ideation stage, solvers have varying information as regards the nature and the type of ideas that may satisfy the seeker. According to the findings of a recent contest (Koh,

2019) for example, the positive effect of exemplar quantity on the degree of adoption of the exemplars by solvers has been found to be stronger (weaker) when the prize attractiveness is higher (lower) respectively, as a high prize would be encouraging for solvers to increase their search for more reference exemplars. Furthermore, the solvers adoption of exemplars is positively correlated to the solution effectiveness, but is negatively mediated by the solvers' domain of expertise and experience, as knowledgeable and experience solvers need not rely to the same extent on the exemplars. The solution effectiveness in this contest study referred to advertizing and was measured by a Click-Through Rate (CTR) of the campaign.

Research questions related to innovation contests are often examined with the help of ideation experiments, when participants are randomly selected and one or more variables are introduced and/or hypotheses are being articulated and tested. This study focuses on idea generated tasks and therefore is based on an on-line ideation experiment to explore factors that may have an impact on the number and the quality of the generated creative ideas. The exposure of participants to schema (in)consistency and their dispositional need for closure were these factors in the present study.

2.2 Schema Theory

The concept of schema has a long and interesting history and eludes a commonly agreed definition (Wagoner, 2013). Nevertheless, a broad categorization of schemata includes self-perceptions of individuals (self-schemas), and preconceptions of other people, different social roles and settings, characters and professions. Schemas affect what people pay attention to and what they remember (Fiske & Neuberg, 1990). People also evaluate an evoked schema by comparing it to encountered events, actual data or evidence. People react in a positive way if their immediate evaluation of the evoked schema is consistent with the evidence they encounter (Anderson & Cole, 1990). The familiarity, the acceptability, and a basic sense of liking or not are part of such evaluations of the schema congruity with the structure of events (Mandler, 1982).

The response to an evoked schema incongruity or to any given source of inconsistency, starts efforts to comprehend the inconsistency and compensate for the accompanying uneasiness or distress (Proulx et al., 2012). Through a process referred to as assimilation, a person's experience is reinterpreted to agree with the evoked schema.

This is likely the case with schema violations that occur below the threshold of conscious awareness or the absence of the cognitive capacity to process it. Through a process referred to as accommodation, the evoked schema is modified so that it agrees with the experience. This is likely the case when people recognizing the violation, in possession of the cognitive resources required and copious effort can resolve the inconsistency. These concepts were developed by Piaget to describe the cognitive development of children, together with the concept of equilibration, as the phase of balancing the conflict between prior (and expected) experience and new information. Nevertheless, these processes remain adaptive through the individual's lifespan.

There are other compensatory responses to the violations of expected associations between prior knowledge and new information, i.e. when people's understanding is undermined. (Proulx & Inzlicht, 2012). Further to assimilation and/or accommodation response, people may affirm familiar values and beliefs when other, apparently unrelated, values and beliefs are violated by inconsistent experiences. This is referred to as an affirmation response or fluid compensation. For example, the attribution of justice and being treated fairly are central to the foundations of social life. At the same time, an aversive state or condition of personal uncertainty can be caused by an entirely unrelated set of events. Yet, there is experimental evidence that fairness becomes more important under conditions of induced personal uncertainty (Van den Bos, 2001). In other instances of violations of expectations, compensation may lead to abstracting new, meaningful connections. In a series of experiments multiple methods were used to induce a lack of control to the participants. Participants were likely to perceive a variety of illusory, but meaningful patterns, e.g. seeing images in noise, correlations in stock market information, or perceive conspiracies, and develop superstitions. In other words, participants were seeing patterns within events that were not inherently related (Whitson & Galinsky, 2008). Proulx & Inzlicht (2012) also claim that in the face of uncertainty, people will even create an entirely new framework of meaning, connecting compensation efforts directly to creative capacity and the quality of creative work. Such is the case of adaptation (acculturation, adjustment, or integration), where creativity is positively influenced by multicultural experiences (Maddux et al., 2010).

Schema incongruities can also be considered under the general category of diversifying experiences, i.e. highly unusual and unexpected events or experiences that disconfirm

schema and stereotype based expectancies. There are studies that support the view that the exposure to diversifying experiences may, both enhance and have an adverse effect on creativity (Gocłowska et al., 2018). Being a witness to rude behavior and incivility decreases citizenship behaviors, such as cooperation and helpfulness and increases dysfunctional ideation (Porath & Erez, 2009). Abusive supervision in an organizational context, such as “ridiculing, yelling at, intimidating subordinates, taking credit for subordinates’ achievements and attributing undesirable outcomes to subordinates’ personal factors” undermine team member creativity (Liu et al., 2012). A greater number of studies support the idea that exposure to diversifying experiences enhances creativity.

In two experiments (Gocłowska et al., 2013) participants after thinking of counter-stereotypes and counter-stereotypic (vs. stereotypic) category combinations, were asked to generate novel pasta names (a cognitive flexibility task) and to provide ideas for a themed night and prepare an advertising poster (a creative task). Their activated mindsets were characterized by more flexible and more creative ideas.

Participants, in another experiment (Ritter et al., 2012a), were shown film clips of a virtual reality environment violating laws of physics about perspective, velocity, and gravity. They were also shown and actively participated in a simulated version of a natural sequence of actions of a simple activity (the preparation of a sandwich with butter and chocolate chips, a popular breakfast in the Netherlands) and violated versions of this sequence. In the sequel of each of these two experiences, they participated in creative generation tasks. The participants’ experience of complex, unusual and unexpected events increased cognitive flexibility.

As another example, the study of Wan and Chiu (2002) links inconsistent schemata with increased creativity. In their experiments participants were asked to solve ordinary and novel conceptual combination problems, i.e. to name at least one real life and describe in words (or to draw) an imaginary object respectively (Hampton, 1987). As a schema inconsistency can be considered the presence of incompatible attributes of the parent objects in the novel conceptual combination problem. They found that creativity scores, for the performance of a creative task (construction of LEGO models) of people after solving novel conceptual combination problems were higher compared with the

creativity scores of the participants who were engaged in solving ordinary conceptual combination problems. According to the authors, divergent thinking, attributed to the training in novel conceptual combination strategies enhances creative performance.

It is very often the case in an organizational or business environment in real life for people to adopt a paradoxical frame. Paradoxical frames are descriptive templates with apparently contradictory attributes when considered simultaneously, but rational when viewed in isolation (Lewis, 2000). When people adopt a paradoxical frame experience a sense of conflict and discomfort, are becoming more receptive to alternative and more compatible interpretations between contradictory information. They are also trying to refashion their behavior and ways of thinking to adapt to the new context and question and probe new or alternative actions (Smith & Tushman, 2005). The findings of a series of experiments (Miron-Spektor et al., 2011) support the view that people adopting a paradoxical frame rather than any other cognitive frame are more creative. Furthermore, this positive association is mediated by a heightened sense of conflict and a greater integrative complexity, i.e. being tolerant, open minded and flexible.

The resolution of a schema incongruity or the compensation response to a diversifying experience can also be viewed from the perspective of epistemic motivation (Carette & Anseel, 2012). All contents of knowledge, including opinions, beliefs, hypotheses, causal inferences, attitudes, as well as the motives people have to recall and adhere to any of these forms of knowledge constitute what is referred to as lay epistemic (Kruglanski, 1990; Kruglanski et al., 2009; Kruglanski et al., 2010). Furthermore, epistemic motives, such as the need for closure, the fear of invalidity, the openness to experience, the need for structure (PNS) and aversion of ambiguity may correlate positively or negatively with various indicators of creativity.

For example, further on the issue of stereotype thinking, it has been found that prejudice reducing manipulation by encouraging individuals to think counter-stereotypically lead to the generation of more creative ideas only for participants with a low score in the personal need for structure (PNS) scale (Gocłowska & Crisp, 2013). As mentioned above the PNS is considered as an epistemic motive. Likewise, schema inconsistent rather than consistent information for participants with low (high) need for structure

hampers (facilitates) creative performance and increased (decreased) divergent thinking respectively (Gocłowska et al. 2014a).

Further on multicultural experiences, better performance on measures of creative potential (unconventional uses of a common object and occupation exemplar generation task) was predicted only among participants open to experience (Leung & Chiu, 2008).

On the basis of the above evidence it is justifiable to formulate the following hypotheses for this study:

H1: Exposure of participating subjects in an ideation contest to inconsistent schemata leads to a higher number of ideas generated than exposure to consistent schemata, or no exposure to schemata.

H2: Exposure of participating subjects in an ideation contest to inconsistent schemata leads to higher creative idea quality than exposure to consistent, or no exposure to schemata.

The following experiments relate the need for closure to creativity. Creativity of individuals with a heightened need for (non specific) closure (Kruglanski, 2013) may be hindered, because, amongst other reasons, they tend to make fewer hypotheses (Mayseless & Kruglanski, 1987), make efforts to achieve consensus (Kruglanski et al., 1993) and uniformity (De Grada et al., 1999) in groups.

The study of conditions that encourage and enhance the production of innovative, original and also useful and appropriate ideas is just as important for groups (Paulus, 2000) as it is for individuals. In an experiment (Chirumbolo et al, 2005) two groups of participants were selected, composed of individuals with high or low dispositional need for closure (Webster & Kruglanski, 1994). Participants were engaged in copy writing slogans, advertising a given product. It was shown that ideational fluency (the absolute number of unique slogans expressed by the groups) and the degree of elaboration of the proposed ideas and creativity (rated by independent judges) were lower in the high (versus the low) need-for-closure group.

In a series of experiments Leung & Chiu (2010) tested the hypothesis, and found that both the generation of unconventional ideas and the receptiveness of ideas from foreign cultures were positively related to multicultural experiences. However, when participants were put under time pressure and therefore in need for firm answers and increased resistance to ideas from foreign cultures (the need for closure being used as moderator) the effect of the positive effect between receptiveness of ideas and multicultural experiences was reduced.

However, the view that a heightened need for closure may inhibit creativity may not be valid under all circumstances (Kossowska, 2007). This tenet was tested in an experiment with first-year Polish students of Architecture. There were marked and varied differences in the relationships between different levels of abilities to understand and design complex spatial structures, the need for closure and creative aptitude (Wojtowicz & Wojtowicz, 2017).

On the basis of the above evidence it is justifiable to formulate the following hypothesis for this study:

H3: The relationship between the exposure of participating subjects to schema (in)consistency and idea generation in an ideation contest is moderated by the need for closure of the participating subjects

2.3 Conceptual Model

The above articulated hypotheses between the latent variables of schema (In)consistency and the creativity/novelty of generated ideas are represented in the following conceptual model

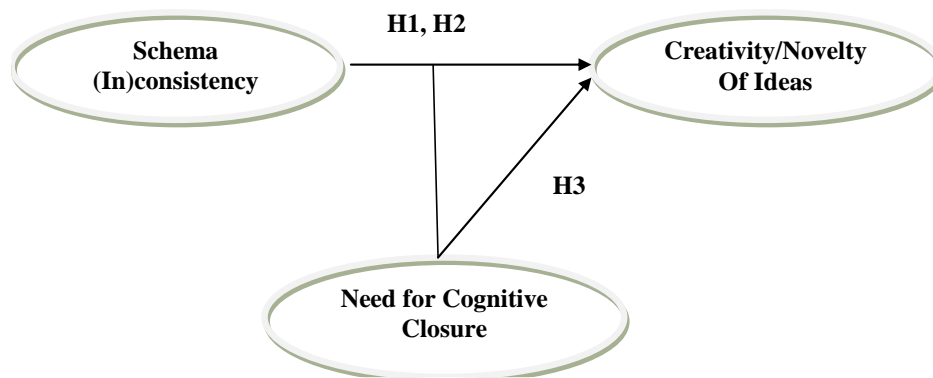


Figure 1: Conceptual Model

3 Methodology

3.1 Research Design

The answer to the research question if schema (in)consistency increases the number and the quality of generated innovative ideas would be best answered under experimental conditions. By weighting the advantages and the disadvantages associated with online ideation experiments, it was considered most appropriate to use an on-line, compared to a laboratory based ideation experiment.

The use of a computer offers a number of advantages, such as “standardized and controlled presentation of stimuli, elimination of missing responses, elimination of transcription [costs and] errors, and accurate measurements of response times” (Musch & Reips, 2000, p.62). On the other hand, the very dependence on the use of a computer and network connectivity precludes the participation of individuals who, with or without their volition, do not use or have access to one. There is limited control over the experiment settings against multiple submissions, the randomization of uncontrolled variables, such as age and sex, high drop-out rates and/or incomplete responses and lacking of direct interaction with the participants (Reips, 2000; Reips, 2002b).

Furthermore, in the case of this study, technical standards, regarding a web based software for the development of the experimental material, clarity of instructions and browser platform compatibility, configuration errors and pretests (Reips, 2002) were ensured by the use of the professional software platform Qualtrics (2020). Also, the

integrity of data was ensured, by the recording of the time and date for uniquely identifying participants.

The experiment of this study involved two tasks. The first task (Task 1) was to elicit the name of a new pasta product and the second task (Task 2) was to suggest a creative concept about a marketing campaign for the new pasta product. The tasks were performed under three different conditions, i.e. in a schema non-violating (consistent), a schema violating (inconsistent) and a non visual (baseline) stimuli environment, by different groups of participants respectively. The experimental conditions were introduced as categories of a dummy (nominal) independent variable of the experiment.

The dependent variables in this experiment were the number and creative quality of generated innovative ideas. The number of ideas was related to the number of pasta names generated by each participant in Task 1 and the number of new ideas of using pasta in a marketing campaign for the new pasta product in Task 2. The creative quality of the generated innovative ideas was related to the number of suggested pasta names deviating from the exemplars, i.e. not ending with an “i” in Task 1, and the creativity and the variety of the categories of the ideas produced (flexibility) by the participants for a marketing campaign for the new pasta product in Task2.

The need for cognitive closure was introduced as a moderating variable in this study. It was considered possible that people’s motivational tendency to attain closure, under schema violating conditions, may have an influence on the number and creative quality of generated innovative ideas. This is because people with a high need for closure prefer order and structure in their lives, favor stable and reliable, i.e. predictable, knowledge, they are likely to arrive at quick decisions, a characteristic of decisiveness, they are uncomfortable with the presence of ambiguities and they are closed-minded when faced with inconsistent evidence (Roets et al., 2015).

3.2 Procedure

The purpose and the content of the experiments were not disclosed beforehand with the invitation note to participate (Appendix I). Before starting the experiment participants had to sign a consent form (Appendix II) and to disclose fair knowledge of the English language. Participants were assigned randomly to follow the steps of the experiment

tasks of each condition (consistent, inconsistent, baseline) by rotation. Therefore, different participants undertook the tasks in each condition, and every participant was exposed only to a single user interface.

3.2.1 Procedure Task 1

Participants assigned to all conditions were presented with a picture that showed a new form of pasta developed by a producer called "Classy Pasta" and the set of the exemplar names. They were asked to list new pasta names. Before they could start listing the new pasta names, only participants assigned to the consistent and the inconsistent conditions, but not the baseline one, were informed that a set of pictures will be presented for one (1) minute, during which they were to think about the new names. Then, according to which condition were assigned to, a set of four (non social) consistent or inconsistent images respectively were shown. When the one (1) minute had passed, the pictures got smaller and ten (10) empty boxes to list the new pasta names appeared. Participants were informed that they had one (1) minute time at their disposal to list as many names as they could think of.

3.2.2 Procedure Task 2

Participants in all conditions, having completed Task 1 were informed that following a short time interval of forty five (45) seconds they would be assigned a new task. For the marketing campaign, the producer "Classy Pasta" was looking for situations in which one can use pasta, except in the context of cooking and eating and participants were shown three pictures, (exemplars) where one could use pasta to make art. Then participants were asked to think about new ways how to use pasta. Before they could start listing the new ways how to use pastas, only participants assigned to the consistent and the inconsistent conditions, but not the baseline one, were informed that a set of pictures will be presented for one (1) minute, during which they were to think about the new ways. Then, according to which condition were assigned to, a set of four (social) consistent or inconsistent images respectively were shown. When the one (1) minute had passed, the pictures got smaller and ten (10) empty boxes to list the new ways how to use pastas appeared. Participants were informed that they had one (1) minute time at their disposal to list as many ways as they could think of how to use pasta.

Participants in all conditions, having completed Task 2 were asked to answer the Need for Cognitive Closure questionnaire (Appendix III).

3.3 Participants

Participants were invited to take part through personal contact networks. A total of 175 participants (66 male (38%), 104 female (59%) and 5 (3%) that declined to share this information) completed the experiment by providing at least one name for the new pasta and at least one marketing idea. There were 56, 57 and 62 participants included in the consistent, the baseline and the inconsistent sample respectively. The majority, i.e. 119 participants, were between 21 and 30 years of age (68%), 13 between 31 and 40 (15%) and 5 between 41 and 50 years of age (3%), 27 under the age of 21 (15%) and 11 over 50 years of age (6%). The participant's overall mean age was 27,5 yrs with a standard deviation of 9,6 yrs. (Appendix IV).

The majority, i.e. 74 participants held a Bachelor's degree (42%), 48 a High school degree or equivalent (28%), 32 a Master's degree (18%), 12 an Associate degree (7%), 7 had not completed High school (4%) and 2 held a Doctoral degree (1%) (Appendix IV).

The majority, i.e. 78 participants declared Dutch as their nationality (45%), 44 as Greek (25%), 32 as Turkish (13) and 31 declared 17 different nationalities (18%).

3.4 Materials

This was an online experiment and the material used was exclusively visual and textual, presented on the screen of participants' monitors. Schema consistent and inconsistent social and non-social images were used from the battery of images used and validated in previous studies (Gocłowska et al., 2014a; Gocłowska et al., 2014b). Likewise, the use of the pasta name generative task has been used in past language production experiments (Dijksterhuis & Meurs, 2006; De Dreu et al., 2013, Study 4).

3.4.1 Material Task 1

The material included a picture of the new pasta product with manifest its shape characteristics and a list of exemplar names for the new pasta product (Lunghi, Tubuli, Cerchi, Piazzzi, and Retani). The material also comprised two sets of social images that included a Bedouin in a desert, an Eskimo on an ice sheet, a football player on a football field, and a pastor in front of a church (consistent) and a set of inconsistent images that included a Bedouin on an ice sheet, an Eskimo in a desert, a football player on an ice hockey field, and a pastor in front of a mosque.

3.4.2 Material Task 2

The material included three pictures of the use of the new pasta product for a marketing concept. The material also comprised two sets of non social images that included a camel standing in a desert, a penguin standing on an ice sheet, a boat in the sea, and a car on land (consistent) and an inconsistent set of images that included a camel standing on an ice sheet, a penguin standing in a desert, a boat on land, and a car in the sea. The material included as well as a set of three exemplar artworks for using pasta in a marketing campaign.

3.5 Measurement

The experimental conditions, i.e. the consistent, the inconsistent and the baseline conditions are introduced as categories of a dummy (nominal) independent variable (x_1).

3.5.1 Innovation Metrics

The aim of the present study was to explore the effects of exposing individuals to schema (in)consistency to quantity and quality of creative ideas in online ideation contests. Therefore metrics for the quantity and quality of creative ideas generated must be introduced.

Quantity of creative ideas can be measured by the total number generated by a participant. The adoption of this, rather obvious measure, is justified as the generation of more ideas increases the probability of better ideas (Kumar et al., 1991). Also, the extended effort (mentioning as many as possible ideas in a specific time frame) to generate a greater number of ideas is related to increased quantity of good ideas of higher quality (Basadur et al., 1986). In psychometric psychology the use the total number of generated ideas is referred to as fluency and as a creativity measure.

Quality of generated ideas is related to the following measures. Even a large number of generated ideas may not necessarily differ significantly and therefore a measure of variety of the generated ideas is introduced related to the number of imagined categories. In cognitive science the variety of imagined categories of ideas is referred to as flexibility and as another creativity measure. Quality of innovative ideas is also a measure both of feasibility or usefulness and how novel or original are compared to other ideas (Shah et al., 2003). These two properties define a measure of creativity.

However, unlike engineering design ideas, where feasibility and originality can be measured quantitatively by reference to a variety of design attributes and performance features (Shah et al., 2000), this may not be the case in general. Therefore, in the case of the present study a consensual assessment technique (Amabile, 1982; Baer et al., 2004) for creative products (Hennessey & Amabile, 2010) is followed.

3.5.2 Measurement Task 1

Two indicators (dependent variables) were used to measure the number and the quality of the generated names for the new pasta product. The number of names (y_1) suggested by each participant and the number of suggested pasta names (y_2) deviating from the exemplars, i.e. not ending with an “i”. Their level of measurement is that of count data, i.e. non negative integers.

3.5.3 Measurement Task 2

Three indicators (dependent variables) were used to measure the number and the quality of generated ideas for a marketing campaign of the new pasta product. The number of ideas (y_3) suggested by each participant. These ideas were tested for their quality using variety and creativity. This implied the exploration of the space of categories of the ideas produced. Two independent raters identified from the experiment data sixteen different categories including an unclassified group (Personal decoration, Games, Home decoration, Food combination, Food related usage, Charity, Art, Construction/making something/repairing, Religion, Sports, Science, Fun, Tool, Measure, Transportation, Other). Each idea of every participant was assigned to a single category by two raters. More than one of the suggested ideas could be assigned to the same category and the total number of categories for every participant was calculated by a straightforward enumeration. The average number of categories the two raters assigned to each participant (y_4) provided the flexibility indicator value for each participant. The inter-rater reliability for the two raters' flexibility variables, Cronbach $\alpha = 0.94$, represents an almost perfect agreement (Baer et al, 2004; Landis & Koch, 1977).

An idea is considered creative, if it can be considered original and useful. Each idea of every participant was assigned a value on a five (5) point Likert scale by two independent raters, where one (1) corresponded to “not at all creative” and five (5) to “extremely creative”. Raters were instructed to interpret the usefulness of the proposed

ideas in terms of the appropriateness of the idea for a marketing campaign and/or its aesthetic appeal. Uniqueness was also to be understood as original in terms of frequency use and/or its considered popularity. The scores for the ideas of each participant were added and the mean scores of the two raters were calculated. This number was divided by the total number of a participant's ideas (q_3) to arrive at a creativity score (c_2) (Ritter et al, 2012b). The inter-rater reliability for the creativity score (y_5), Cronbach $\alpha = 0.76$, represents a substantial agreement (Baer et al, 2004; Landis & Koch, 1977).

3.6 Need for Closure Questionnaire

The self-perception of the participants as regards their Need for Cognitive Closure (NFCC) (Webster & Kruglanski, 1994) was self-assessed by answering fifteen (15) questions of the abridged Need for Cognitive Closure questionnaire (Appendix III; Roets & Van Hiel, 2011) of the revised full NFCC scale (Roets & Van Hiel, 2007). The 15-item scale includes questions from all the five different subscales that measure the need for closure: preference for order and structure (e.g. ‘‘I find that a well ordered life with regular hours suits my temperament’’); discomfort with ambiguity (e.g. ‘‘I dislike it when a person's statement could mean many different things’’); decisiveness (e.g. ‘‘When I have made a decision, I feel relieved’’); predictability (e.g. ‘‘I don't like to be with people who are capable of unexpected actions’’), and closed mindedness (e.g. ‘‘I do not usually consult many different opinions before forming my own view’’). Participants were asked to respond to the verbal (worded) descriptor for the different answers, not numerical ones. A five point Likert scale was chosen for clarity and brevity, because a five point scale is as good as a seven point one for statistical (factor, structural equation) analysis (Dawes, 2008). The participants' score (x_2) was calculated by summing up each of the individual items and was introduced as an independent variable. Questions numbered 7 and 9 (Appendix III) were reversed scored as they were so articulated as to capture the respondents' need to evade closure. Quality criteria, required for self administered questionnaires, such as ease of navigation, clear instructions and consistent use of symbols, such as text boxes, buttons, etc (Lavrakas, 2008: pp.803-4) were satisfied by the high standards formatting of the online surveys software Qualtrics (2020).

3.7 Research Ethics

Ethical principles and the code of conduct in scientific research cover a wide range of issues that depend on the nature of the scientific discipline and the kind of the

undertaken research. Relevant to this study working with human subjects, that is undertaken as a requirement for qualifying for a University Degree are the following issues.

Participation was voluntary, no exclusionary conditions enforced, the informed consent of participants was requested beforehand, and the participants could withdraw at any point during the experiment. The presumption and preservation of anonymity was guaranteed as participants were not asked to provide any kind of personal identity data. Data were kept in protected areas and communicated over secure connections. There is a full and detailed description of appropriate research methods. There was no use of deceptive artefacts, undue intrusion was avoided as the participation could not be interrupted by the researcher and no harm to the participants entailed. There is no conflict of interest between the researcher and the participants and no foreseeable moral hazard entailed either by the conduct of the research or the participation in it. Given the student status of the researcher there is a full disclosure of the funding source (APA, 2002; Vanclay et al, 2013).

4 Analysis of Results

4.1 Demographics

Gender, age, highest level of education and nationality were the demographic variables recorded. These variables should not differ significantly between the samples of the three experimental conditions, so that differences in the results for the three conditions might not be attributed to these variables. Differences in categorical variables are tested with a chi-square test. Chi-square tests were performed to show that the participants' gender ($\chi^2(2, 170) = 4.24$; $p = .12$), age ($\chi^2(2, 146) = 1.07$, $p = .58$) and highest level of education ($\chi^2(4, 154) = 3.04$, $p = .55$ and $\chi^2(2, 19) = 0.05$ $p = .97$) in the three experimental conditions do not differ significantly at .05 significance level (Appendix IV).

4.2 Summary Statistics

Tables in Appendix V summarize the calculations of Means, Standard Deviations, Skeweness, Kurtosis, the minimum and maximum values for all the dependent statistical variables of this study in all condition samples (consistent, inconsistent,

baseline). In Task1 these statistics were the number of names suggested by the participants for the new pasta (y_1) and the number of pasta names (y_2) deviating from the exemplars. In Task 2, the statistics were the number (y_3) (fluency), the variety (y_4) (flexibility)) and the creativity (y_5) of ideas suggested by the participants for a marketing campaign of the new pasta. The Tables in Appendix V also include descriptive statistics for the need for closure score (x_2) of the participants, an independent variable used as a moderating covariate in this study.

All dependent variables, i.e. y_1 , y_2 , y_3 , y_4 and y_5 are positively skewed, with the result most values congregated in the right tail of the corresponding sample distributions in all conditions. Varied values of kurtosis do not allow for a conclusion applying to all variables under the three conditions.

The following Table shows the mean value plus or minus one standard deviation of the dependent variables in all conditions. These numbers show a substantial overlapping of the corresponding interval values.

Table 1 : Dependent Variables - Mean & standard Deviation

Variable	(Mean \pm Std. Deviation)		
	Consistent	Inconsistent	Baseline
x_1			
y_1	(3.8 \pm 1.6)	(3.7 \pm 1.8)	(3.7 \pm 1.9)
y_2	(1.5 \pm 1.6)	(1.5 \pm 1.4)	(1.5 \pm 1.4)
y_3	(3.6 \pm 1.8)	(3.3 \pm 1.8)	(3.2 \pm 1.7)
y_4	(2.8 \pm 1.1)	(2.9 \pm 1.4)	(2.7 \pm 1.3)
y_5	(2.4 \pm 0.6)	(2.4 \pm 0.4)	(2.4 \pm 0.4)

4.3 Preliminary Tests

Internal reliability of scores of the Need for Cognitive Closure Scale in the samples of the three experimental conditions are showing moderate to substantial agreement, i.e. the Cronbach's Alpha was 0.57 for the Consistent, 0.70 for the Inconsistent and 0.63 for the Baseline sample.

In accordance with the model of this study, the question whether multivariate analysis or multiple univariate analyses should be conducted must be answered. A multivariate

analysis is recommended in case of dependent (outcome) variable intercorrelations (Huberty & Morris, 1989).

4.4 Analysis of Results Task 1

Tables in Appendix VI summarize the calculations for the Pearson correlation coefficients between the dependent variables y_1 and y_2 of Task 1. Correlation is significant at the 0.05 significance level (2-tailed) between these two dependent variables. Therefore, a multivariate analysis of variance tests (MAN(C)OVA) were used.

A number of further assumptions must be satisfied for the application of a multivariate analysis of variance with and without a covariate present. In general, experimental data or observations should be classified in two or more categorical groups. In the case of this study there were three samples from the consistent, the inconsistent and the baseline conditions of the experimental design. Likewise, data independence between and within groups was guaranteed by the conditions that the experiment was carried out. Furthermore, the number N of data in every group (56 in the consistent, 62 in the inconsistent and 57 in the baseline condition) (Appendix V) exceeds the suggested range from six to ten times the number of dependent variables, i.e. five in the case of this study (Huberty & Petoskey, 2000).

The Box's M value of 0.673 was associated with a p value of .672, which was interpreted as non-significant based on Huberty and Petoskey's (2000) guideline (i.e., $p > .005$) and therefore the assumption of homogeneity of variances was satisfied.

In place of multivariate normality, the normality of the individual dependent variables of Task 1 was tested using the Shapiro–Wilk test. Normality for y_1 and y_2 was violated in all experimental condition samples (Appendix VII).

We use the Wilks' Λ test statistic for testing the MANOVA omnibus null hypothesis that the means of the three experimental samples on the two outcome measures of the dependent variables of Task 1, i.e. the number of pasta names y_1 and the number of names deviating from the exemplars y_2 , do not differ significantly. The

one-way MANOVA test showed that there was no statistically significant difference between the exposure to consistent schemata, exposure to inconsistent schemata and the baseline conditions (no exposure to images) on the dependent variables without controlling for need for closure $F(4, 342) = 0.55, p = .994$ as well as with controlling for the need for closure $F(4, 340) = 0.44, p = .996$.

4.5 Analysis of Results Task 2

Tables in Appendix VI summarize the calculations for the Pearson correlation coefficients between the dependent variables y_3 , y_4 and y_5 of Task 2. Correlation is significant at the 0.01 level (2-tailed) between y_3 and y_4 of Task 2. Therefore, a multivariate analysis of variance tests (MAN(C)OVA) was recommended. A number of further assumptions, mentioned in the case of Task1 above, were also satisfied as the relevant experimental conditions (data independence, number of groups and group participants) remained the same as in Task 1.

Nevertheless, the Box's M value of 3.905 is associated with a p value of $p < .001$, which was interpreted as significant based on Huberty and Petoskey's (2000) guideline (i.e., $p < .005$) and hence, the assumption of homogeneity of variances was not satisfied. Therefore, multiple univariate analyses of variance and covariance were instead performed. According to Shapiro–Wilk test, normality is violated in all cases of the data with the exception of the creativity variable (y_5) in the inconsistent and the baseline samples (Appendix VII). Although all sample sizes are roughly equal and greater than 25, an equal variance test was run. Levene's tests for each variable at .05 significance level confirmed homogeneity of variances for fluency (y_3), with $F(2, 172) = 0.234, p = .791$, for flexibility (y_4), with $F(2, 172) = 0.851, p = .429$, but homogeneity failed for creativity (y_5), with $F(2, 172) = 3.480, p = .033$.

The results of the on-way tests for the analysis of variance (ANOVA) (Appendix VIII) have produced the following values for the F-Statistic (and Eta squared) for the number (y_3) (fluency), the variety (y_4) (flexibility)) and the creativity (y_5) of ideas suggested by the participants for a marketing campaign of the new pasta in Task 2.

Table 2: ANOVA Tests (Task 2)

Variable	F-Statistic	p-value (Sig.)	Eta squared (η^2)
Fluency (y₃)	F(2, 172) = 0.724	.486	.008
Flexibility (y₄)	F(2, 172) = 0.598	.551	.007
Creativity (y₅)	F(2, 172) = 0.133	.875	.002
There is evidence that the means are significantly different if “Sig.” or $p < .05$			

Therefore, there were no significant differences between the exposure to consistent schemata, exposure to inconsistent schemata and the baseline conditions (no exposure to images) on all three dependent variables (fluency, flexibility, creativity) of Task 2 without controlling for need for closure

The results of the on-way tests for the analysis of covariance (ANCOVA) (Appendix IX) have produced the following values for the F-Statistic (and Eta squared) for the number (y₃) (fluency), the variety (y₄) (flexibility)) and the creativity (y₅) of ideas suggested by the participants for a marketing campaign of the new pasta in Task 2, as dependent variables and the schemas condition (x₁) as an independent variable and the need for closure score (x₂) of the participants, as a moderating covariate.

Table 3: ANCOVA Tests (Task 2)

Variable	F-Statistic	p-value (Sig.)	Eta squared (η^2)
Fluency (y₃)			
Schemas (x₁)	F(2, 171) = 0.206	.814	.002
NFCC (x₂)	F(1, 171) = 2.690	.103	.015
Flexibility (y₄)			
Schemas (x₁)	F(2, 171) = 0.629	.535	.007
NFCC (x₂)	F(1, 171) = 2.702	.102	.016
Creativity (y₅)			
Schemas (x₁)	F(2, 171) = 0.318	.728	.004
NFCC (x₂)	F(1, 171) = 1.159	.283	.007
There is evidence that the means are significantly different if “Sig.” or $p < .05$			

Therefore, there were no significant differences between the exposure to consistent schemata, exposure to inconsistent schemata and the baseline conditions (no exposure

to images) on all three dependent variables (fluency, flexibility, creativity) of Task 2 after controlling for need for closure.

4.6 Analysis of Results Task 2 (Revised Data-No food categories)

The instructions to participants for Task 2 were explicitly asking for marketing ideas about the new pasta product not related to food. This was not observed and two categories, i.e. “Food combination” and “Food related usage” (§3.5.3 Measurement Task 2) were identified. The exclusion of data related to these two categories has lead to a new data set to be analyzed.

Tables in Appendix X summarize the calculations for the Pearson correlation coefficients between the dependent variables y_3 , y_4 and y_5 of Task 2 (Revised Data). Correlation is significant at the 0.01 level (2-tailed) between y_3 and y_4 of Task 2 (Revised Data). Therefore, a multivariate analysis of variance tests (MAN(C)OVA) was recommended. A number of further assumptions, mentioned in the case of Task1 above, were also satisfied as the relevant experimental conditions (data independence, number of groups and the group participants, i.e. the consistent condition sample ($n_1 = 43$), the inconsistent condition sample ($n_2 = 46$) and the baseline sample ($n_3 = 43$)).

Nevertheless, the Box’s M value of 2.802 is associated with a p value of $p = .001$, which was interpreted as significant based on Huberty and Petoskey’s (2000) guideline (i.e., $p < .005$) and hence, the assumption of homogeneity of variances was not satisfied. Therefore, multiple univariate analyses of variance and covariance were instead performed.

The results of the on-way tests for the analysis of variance (ANOVA) (Appendix XI) have produced the following values for the F-Statistic (and Eta squared) for the number (y_3) (fluency), the variety (y_4) (flexibility)) and the creativity (y_5) of ideas suggested by the participants for a marketing campaign of the new pasta in Task 2 (Revised Data).

Table 4: ANOVA Tests (Task 2 Revised Data)

Variable	F-Statistic	p-value (Sig.)	Eta squared (η^2)
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Fluency (y₃)	F(2, 129) = 0.544	p = .576	.009
Flexibility (y₄)	F(2, 129) = 0.306	p = .737	.005
Creativity (y₅)	F(2, 129) = 0.435	p = .648	.007
There is evidence that the means are significantly different if “Sig.” or p < .05			

Therefore, there were no significant differences between the exposure to consistent schemata, exposure to inconsistent schemata and the baseline conditions (no exposure to images) on all three dependent variables (fluency, flexibility, creativity) of Task 2 (Revised Data) without controlling for need for closure

The results of the on-way tests for the analysis of covariance (ANCOVA) (Appendix XII) have produced the following values for the F-Statistic (and Eta squared) for the number (y₃) (fluency), the variety (y₄) (flexibility)) and the creativity (y₅) of ideas suggested by the participants for a marketing campaign of the new pasta in Task 2 (Revised Data), as dependent variables and the schemas condition (x₁) as an independent variable and the need for closure score (x₂) of the participants, as a moderating covariate.

Table 5: ANCOVA Tests (Task 2 Revised Data)

Variable	F-Statistic	p-value (Sig.)	Eta squared (η^2)
Fluency (y₃)			
Schemas (x₁)	F(1, 128) = 3.255	p = .074	$\eta^2 = .025$
NFCC (x₂)	F(2, 128) = .073	p = .929	$\eta^2 = .001$
Flexibility (y₄)			
Schemas (x₁)	F(1, 128) = 2.461	p = .119	$\eta^2 = .019$
NFCC (x₂)	F(2, 128) = .348	p = .707	$\eta^2 = .005$
Creativity (y₅)			
Schemas (x₁)	F(1, 128) = .131	p = .718	$\eta^2 = .001$
NFCC (x₂)	F(2, 128) = .336	p = .715	$\eta^2 = .005$
There is evidence that the means are significantly different if “Sig.” or p < .05			

Therefore, there were no significant differences between the exposure to consistent schemata, exposure to inconsistent schemata and the baseline conditions (no exposure to images) on all three dependent variables (fluency, flexibility, creativity) of Task 2 (Revised Data) after controlling for need for closure

5 Conclusions and Discussion

5.1 Key Findings

The aim of this study was to investigate the effect of schema (in)consistency on the number and the creative quality of ideas generated in online ideation contests. To this purpose a ideation experiment was performed that involved two Tasks. The first task (Task 1) was to elicit the name of a new pasta product and the second task (Task 2) was to suggest a creative concept about a marketing campaign for the new pasta product. The tasks were performed under three different conditions, i.e. in a schema non-violating (consistent), a schema violating (inconsistent) and a non-visual (baseline) stimuli environment, by different groups of participants respectively.

It was found that the numbers of pasta names for the new product in Task 1, and of generated ideas for a marketing campaign of the new pasta product in Task 2, were not significantly different under the three different conditions that the Tasks were performed. Therefore, the Hypothesis H₁ that exposure of participating subjects in a ideation contest to inconsistent schemata leads to a higher number of ideas generated than exposure to consistent schemata, or no exposure to schemata, cannot be accepted.

It was also found the number of pasta names for the new product deviating from the exemplars provided (i.e. names non ending with an “i”) in Task 1, as well as the variety (flexibility) and the creativity of ideas for a marketing campaign of the new pasta product in Task 2 were not significantly different under the three different conditions that the Tasks were performed. Therefore, hypothesis H₂, that exposure of participating subjects in an ideation contest to inconsistent schemata leads to higher creative idea quality than exposure to consistent, or no exposure to schemata, cannot be accepted.

Furthermore, the moderating effect of the self-assessed Need for Cognitive Closure of the participants was investigated. In Task 1, it was found no significant correlation between the need for closure and both, the numbers of pasta names for the new product following and deviating from the exemplars provided. Likewise in Task 2, no significant correlation was found between the need for closure and the number, the variety (flexibility) and the creativity of ideas for a marketing campaign for the new pasta product. Therefore, the Hypothesis H₃, that the relationship between the exposure

of participating subjects to schema (in)consistency and idea generation in an ideation contest is moderated by the need for closure of the participating subjects cannot be accepted.

5.2 Theoretical implications

This study intended to find how schema theory can be linked to innovation. However, this link was not established, as no significant effect was found between exposure to consistent and inconsistent schemata and the number and quality of ideas generated by the participants in the experiment conducted. In previous research, the participants' experience of complex, unusual and unexpected events increased cognitive flexibility (Ritter et al., 2012a; Ritter et al., 2014). Likewise, the activated mindsets of participants after thinking of counter-stereotypic (vs. stereotypic) categories were characterized by more flexible and more creative ideas (Gocłowska et al., 2013). In this study, no significant relationship was found between creativity and ideas generated from exposure to inconsistent images (schemata).

Also, in previous research a negative correlation between the (nonspecific) need for closure and creativity was not confirmed (Kruglanski, 2013), although this may not be the case under all circumstances (Kossowska, 2007). Additionally, to the main effects, in the study of Gocłowska et al (2017) it was found that individuals exposed to a schema violation condition and low in need for structure (or closure - these terms used synonymously by the authors) were more creative compared to individuals exposed to non-violation schemata. However, this is not the case in this study, as the effect of need for closure as a moderator variable was not significantly related, on all three conditions tested, with the creativity of new ideas.

A possible explanation of the inconsistent findings with previous work may be attributed to the experiment settings. The above mentioned experiments were conducted in a lab in which hosts could interact with the participants and could offer further assistance. In this study an online experiment was conducted, and there was not a two-way communication. Therefore, the use of the specific schema violating images and a possible misunderstanding of the instructions of the experiment could explain the incompatible results. For example, the majority of participants were educated men below forty, from different national backgrounds that acknowledged a good command

of the English language. These individuals many not have found particularly intriguing or difficult to accommodate the incongruities present in the images used. A different set of schema violating images could be tested and used in similar experiments. Also, social norms associated with different individuals may be related to different responses to schema inconsistency. For example, an athlete will exhibit a different behavior than a waiter when he/she sees a schema violating picture of a football court or if a religious person sees an inconsistent picture of a pastor than a non-religious one.

Another possible explanation of the inconsistent findings of this study with previous research could be the time pressure participants experienced. Each activity of the two Tasks of the experiment had a time limit which may have had a negative effect of the number and quality of ideas individuals submitted. Although the following study (Hsu & Fan, 2010) addresses the issue of time in an organizational context, it has been found that under reduced time pressure employees demonstrate a high level of creative outcome, provided that they experience a favorable innovation climate.

5.3 Limitations and Future research

The experimental results cannot be generalized beyond the group of the volunteering participants. The participation of the subjects in this experiment was voluntary based on the affiliations of personal contact networks. However, the demographic data suggests that if participants are invited through personal contact networks, they are more likely to reflect a certain profile (Dutch, Greek, Turkish and mostly male between 21 to 30 years old with a Bachelor's or a Master's degree in this study). Nevertheless, if a larger number of participants are involved, a random choice of participants can be utilized. An equal number of participants for some or all the characteristics (gender, nationality, age group and education level) can be used to avoid bias or to form homogeneous samples and compare different samples with different variable characteristics.

Cleaning the data has revealed that in 10% of the responses there were no data recorded, an indication that, perhaps not all the participants fully understood the instructions of the experiment. Regarding further research, the experiments of this study can be improved with the introduction of pre-tests varying the key parameters of the

experiment in an effort to establish significant results in agreement with previous studies. A number of pre-tests can be conducted with different material (exemplars) i.e. the social and nonsocial schema violating and non-violating images (Gocłowska, 2014a; 2014b). Different time limits for participants to view the images and respond to the tasks can also be used during these pre-tests. Participants could also be self-assessed as regards the need for closure by answering the full (and revised) need for cognitive closure (NFCC) questionnaire – rather than the short version, that highlights all five facets, i.e. need/preference for order, need/preference for predictability, decisiveness, intolerance of/discomfort with ambiguity and closed-mindedness (Roets & Van Hiel, 2007; Kruglanski et al, 1993). In case of significant results, post hoc tests can also be carried out for the size of effects of factors associated with the different facets of the scale. Furthermore, this questionnaire could be administered either at the beginning of the experiment or at an early stage and two different groups of participants could be invited to take part in the idea generation task under the schema (in)consistency conditions, on the basis of a low and a high score respectively.

Moreover, the presence of rewards of some kind could contribute in a positive way to the commitment and the attention given by the participants on the experiment. Verleye (2014) in his work about customer experience during, albeit a co creation situation, found that the economic experience (the reward participants take in line with the effort they made) has a positive effect on the overall experience which in turn leads to better individual performance.

Additionally, this study was administered in an online experiment instead of a lab. In online experiments there is a limited control over the experiment settings against multiple submissions, randomization of uncontrolled variables, such as age and sex, high drop-out rates and/or incomplete responses and lack of direct interaction with the participants (Reips, 2000; Reips, 2002b).

Finally, a limitation about the data analysis should be mentioned. In the analysis of the second task we intend to check differences between means and we had multiple independent variables. However, we could not perform one way MANCOVA as the assumption of heterogeneity did not met. Instead, the differences between means was tested with multiple AN(C)OVAs. This can create problem to the research in terms of

controlling the experiment wide Type I error rate. Individuals AN(C)OVAs ignore the correlations among depended variables, the possibility of linear combination and some group differences may stay unexplored (Hair et al., 2013; Huberty & Morris, 1989).

5.4 Managerial implications

Ideation experiments shed light on the assumptions and the conditions that underlie the co-ideation contests. The personality traits of the participants are just as important as their motivation and their exerted effort (Prabhu et al., 2008; Boudreau et al., 2011; Choo et al., 2014). Likewise, previous research has demonstrated the effect of the exemplars provided and the influence of the environment conditions, such the presence of incongruous (schema violating) or attention diverging stimuli. However, managers should be aware that participants exposed to schema incongruities, including images as in this study, do not necessarily generate a greater number of creative ideas of a higher quality. Our results also show no significant differences in creative capacity between individuals with high and low need for cognitive closure. As, co-ideation contests are becoming a current practice in the business world, it is, indeed, challenging for a company to find innovators among the customer base or the population at large, and to conduct these contests efficiently and successfully.

5.5 Concluding statement

The big changes in the marketing environment and the global changes on the online information age questions innovation processes. Management should move closer to a new radical rethinking of the existing research practices. Digital technologies (Urbinati et al., 2018) based approaches should be used and the R&D departments should courage “out of the box” creativeness. In this new era users’ key role has been further upgraded as a source of most valuable knowledge during the innovation activities. In this thesis an attempt was made to provide managers with an insight how to harness users’ knowledge. An experiment was conducted to analyze the effects of schema violation experiences in ideation contests, in order to arrive at a greater number of creative ideas of a higher quality. The benefits that the internet provides were used as this experiment took place as an online ideation contest and individuals from different cultures, different age groups and different backgrounds participated. The hypotheses of the study were not confirmed and further research is needed to investigate if expose schema violations,

under different experimental settings, may have a positive effect on individual creativity.

6 References

- Adamczyk, S., Bullinger, A. C., & Möslin, K. M. (2012). Innovation Contests: A Review, Classification and Outlook. *Creativity and Innovation Management*, 21(4), 335–360. <https://doi.org/10.1111/caim.12003>
- Agafitei, I. G., & Avasilcai, S. (2015). A case study on open innovation on Procter & Gamble. Part II: Co-creation and digital involvement. *IOP Conf. Ser.: Mater. Sci. Eng.* 95, 012150
- Agrawal, A.K., & Rahman, Z. (2015). Roles and Resource Contributions of Customers in Value Co-creation. *International Strategic Management review* 3(1-2), 144-160. <https://doi.org/10.1016/j.ism.2015.03.001>
- Ajitabh, A., & Momaya, K. (2004). Competitiveness of Firms: Review of Theory, Frameworks and Models. *Singapore Management Review*, 26(1), 45-61. <https://ssrn.com/abstract=2146487>
- Amabile, T.M. (1982). Social psychology of creativity: A consensual assessment technique. *Journal of Personality and Social Psychology*, 43(5), 997–1013. <https://doi.org/10.1037/0022-3514.43.5.997>
- Anderson, S.M., & Cole, S.W. (1990). Do I know you? The role of significant others in general social perception. *Journal of Personality and Social Psychology*, 59(3), 384–399. <https://doi.org/10.1037/0022-3514.59.3.384>
- APA (American Psychological Association) (2002). Ethical principles of psychologists and code of conduct. *American Psychologist*, 57(12), 1060-1073. <https://doi.org/10.1037/0003-066X.57.12.1060>
- Baer, J., Kaufman, J.C., & Gentile, C.A. (2004). Extension of the Consensual Assessment Technique to nonparallel creative products. *Creativity Research Journal*. 16(1), 113–17. https://doi.org/10.1207/s15326934crj1601_11

Bartl, M., Jawecki, G., Bilgram, V., & Wiegandt, P. (2013). The BMW Group Co-Creation Lab: From Co-Creation Projects to Programmes. In *Discontinuous Innovation. Learning to Manage the Unexpected, Series on Technology Management* (Vol. 22, pp. 179-203). https://doi.org/10.1142/9781848167810_0008

Basadur, M. S., & Thompson, R. (1986). Usefulness of the ideation principle of extended effort in real world professional and managerial creative problem solving. *Journal of Creative Behavior*, 20(1), 23–34.
<https://doi.org/10.1002/j.2162-6057.1986.tb00414.x>

Bayus, B.L. (2013). Crowdsourcing New Product Ideas Over Time: An Analysis of Dell's Ideastorm Community. *Management Science*. 59(1), 226-244.
<https://doi.org/10.1287/mnsc.1120.1599>

Blindenbach-Driessen, F., van Dalen, J., & van den Ende, J. (2010). Subjective Performance Assessment of Innovation Projects. *Journal of Product Innovation Management*, 27(4), 572-592. <https://doi:10.1111/j.1540-5885.2010.00736.x>

Boer, H., & During, W. E. (2001). Innovation, what innovation? A comparison between product, process and organisational innovation. *International Journal of Technology Management*, 22(1/2/3), 83-107.
<https://doi.org/10.1504/ijtm.2001.002956>

Bogers, M., Afuah, A., & Bastian, B. (2010). Users as Innovators: A Review, Critique, and Future Research Directions. *Journal of Management*, 36 (4), 857–875.
<https://doi.org/10.1177/0149206309353944>

Boudreau, K.J., Lacetera, N., & Lakhani, K.R. (2011). Incentives and Problem Uncertainty in Innovation Contests: An Empirical Analysis. *Management Science* 57(5), 843-863. <https://doi.org/10.1287/mnsc.1110.1322>

Braun-LaTour, K.A., Puccinelli, N.M., & Mast, F.W. (2007). Mood, information congruency, and overload. *Journal of Business Research*, 60, 1109–1116.
<https://doi.org/10.1016/j.jbusres.2007.04.003>

Buckley P.J., Pass C.L., & Prescott K. (1988). Measures of International Competitiveness: A Critical Survey, *Journal of Marketing Management*, 4(2), 175–200. <https://doi.org/10.1080/0267257X.1988.9964068>

Bullinger, A.C., Neyer, A-K., Rass, M., & Möslin, K.M. (2010). Community-Based Innovation Contests: Where Competition Meets Cooperation. *Creativity and Innovation Management*, 19(3), 290–303.
<https://doi.org/10.1111/j.1467-8691.2010.00565.x>

Carette, B., & Anseel, F. (2012). Epistemic Motivation Is What Gets the Learner Started. *Industrial and Organizational Psychology*, 5(03), 306–309.
<https://doi.org/10.1111/j.1754-9434.2012.01451.x>.

Chesbrough, H. (2003). The Logic of Open Innovation. *California Management Review*, 45(3), 33–58. <https://doi.org/10.1177/000812560304500301>

Chesbrough, H., & Crowther, A.K. (2006). Beyond high tech: early adopters of open innovation in other industries. *R&D Management*, 36(3), 229–236.
<https://doi.org/10.1111/j.1467-9310.2006.00428.x>

Chirumbolo, A., Mannetti, L., Pierro, A., Areni, A., & Kruglanski, A. W. (2005). Motivated Closed-Mindedness and Creativity in Small Groups. *Small Group Research*, 36(1), 59–82. <https://doi.org/10.1177/1046496404268535>

Choo, P. K., Lou, Z. N. Camburn, B.A., Wood, K.L, Koo, B. & Grey, F., (2014). *Ideation Methods: A First Study with Measured Outcomes with Personality Type*. Proceedings of the ASME 2014 International Design Engineering Technical Conferences & Computers and Information in Engineering Conference IDETC/CIE 2014 , August 17-20, 2014, Buffalo, New York, USA.
<https://doi.org/10.1115/DETC2014-34954>

Dangelico, R.M., & Pujari, D. (2010). Mainstreaming Green Product Innovation: Why and How Companies Integrate Environmental Sustainability. *Journal of Business Ethics*, 95(3), 471–486. <https://doi.org/10.1007/s10551-010-0434-0>

Dawes, J. (2008). Do data characteristics change according to the number of scale points used? An experiment using 5-point, 7-point and 10-point scales. *International journal of market research*, 50(1), 61-104.
<https://doi.org/10.1177/147078530805000106>

De Dreu, C.K.W., Baas, M., Roskes, M., Sligte, D.J., Ebstein, R.P., Chew, S.H., Tong, T., Jiang, Y., Mayseless, N., & Shamay-Tsoory, S.G. (2013). Oxytonergic circuitry sustains and enables creative cognition in humans. *Social Cognitive and Affective Neuroscience*, 9(8), 1159-1165. <https://doi.org/10.1093/scan/nst094>

De Grada, E., Kruglanski, A. W., Mannetti, L., & Pierro, A., (1999). Motivated cognition and group interaction: Need for closure affects the contents and processes of collective negotiations. *Journal of Experimental Social Psychology*, 35(4), 346–365.
<https://doi.org/10.1006/jesp.1999.1376>

Dess, G.G., & Robinson Jr., R.B., (1984). Measuring organizational performance in the absence of objective measures: the case of the privately-held firm and conglomerate business unit. *Strategic Management Journal* 5 (3), 265–273.
<https://doi.org/10.1002/smj.4250050306>

Di Gangi, P., & Wasko, M. (2009). Steal My Idea! Organizational Adoption of User Innovations from a User Innovation Community: A Case Study of Dell IdeaStorm. *Decision Support Systems*, 48(1), 303-312. <https://doi.org/10.1016/j.dss.2009.04.004>

Dijksterhuis, A., & Meurs, T. (2006). Where creativity resides: The generative power of unconscious thought. *Consciousness and Cognition*, 15(1), 135–146.
<https://doi.org/10.1016/j.concog.2005.04.007>

Ebner, W., Leimeister, J.M., & Krcmar, H. (2009). Community engineering for innovations – the ideas competition as a method to nurture a virtual community for innovations. *R&D Management*, 39(4), 342-e56.

<https://doi.org/10.1111/j.1467-9310.2009.00564.x>

Enkel, E., Gassmann, O., & Chesbrough, H.W. (2009). Open R&D and Open Innovation: Exploring the Phenomenon. *R&D Management*, 39(4), 311-316.

<https://doi.org/10.1111/j.1467-9310.2009.00570.x>

Enkel, E., Bogers, M., & Chesbrough, H. (2020). Exploring open innovation in the digital age: A maturity model and future research directions. *R&D Management*, 50(1), 161-168. <https://doi.org/10.1111/radm.12397>

Filieri, R. (2013). Consumer co-creation and new product development: a case study in the food industry. *Marketing Intelligence & Planning*, 31(1), 40-53.

<https://doi.org/10.1108/02634501311292911>

Filipowicz, A. (2006). From positive affect to creativity: The surprising role of surprise. *Creativity Research Journal*, 18(2), 141–152.

https://doi.org/10.1207/s15326934crj1802_2

Fisher, G. J., & Fang, E. E. (2017). Customer-driven innovation: A conceptual typology, review of theoretical perspectives, and future research directions (pp. 60-80). In P. Golder & D. Mitra (Eds.), *Handbook of new product development research*. Edward Elgar Publishing. <https://doi.org/10.4337/9781784718152.00011>

Fiske, S.T., & Neuberg, S.L. (1990). A continuum of impression formation, from category-based to individuating processes: influences of information and motivation on attention and interpretation. In M.P. Zanna (Ed.), *Advances in Experimental Social Psychology*, Vol. 23 (pp. 1-74). Academic Press.

[https://doi.org/10.1016/S0065-2601\(08\)60317-2](https://doi.org/10.1016/S0065-2601(08)60317-2)

Flaherty, K. E., & Mowen, J. C. (2010). The Role of Schemas in Consumer Behavior Research. In Jagdish N. Sheth & Naresh K. Malhotra (Eds.), *Wiley International Encyclopedia of Marketing*, John Wiley & Sons Lt.
<https://doi.org/10.1002/9781444316568.wiem03055>

Forsman, H., Temel, S., & Uotila, M. (2013). Towards Sustainable Competitiveness: Comparison of the Successful and Unsuccessful Eco-Innovators. *International Journal of Innovation Management*, 17(3), 1340015-1–1340015-26.
<https://doi.org/10.1142/S136391961340015X>

Frederiksen, M. H., & Knudsen, M. P. (2017). From creative ideas to innovation performance: the role of assessment criteria. *Creativity and Innovation Management*, 26(1), 60–74. <https://doi.org/10.1111/caim.12204>

Friesenbichler, K., & Peneder, M. (2016). Innovation, competition and productivity: Firm-level evidence for Eastern Europe and Central Asia. *Economics of Transition*, 24(3), 535-580. <https://doi.org/10.1111/ecot.12100>.

Fu, W., Wang, Q., & Zhao, X. (2017). The influence of platform service innovation on value co-creation activities and the network effect. *Journal of Service Management*, 28(2), 348-388. <https://doi.org/10.1108/JOSM-10-2015-0347>

Füller, J. (2010). Refining virtual co-creation from a consumer perspective. *California Management Review*, 52(2), 98-122.
<https://doi.org/10.1525/cmr.2010.52.2.98>

Galbraith, J.R. (1982). Designing the innovating organization. *Organizational Dynamics*, 10(3), 5 –25. [https://doi.org/10.1016/0090-2616\(82\)90033-X](https://doi.org/10.1016/0090-2616(82)90033-X)

Gassmann, O., Enkel, E., & Chesbrough, H. (2010). The Future of Open Innovation. *R&D Management*, 40(3), 213-221.
<https://doi.org/10.1111/j.1467-9310.2010.00605.x>

Gatzweiler, A., Blazevic, V., & Piller, F.T. (2017). Dark Side or Bright Light: Destructive and Constructive Deviant Content in Consumer Ideation Contests. *Journal of Product Innovation Management*, 34(6), 772–789.
<https://doi.org/10.1111/jpim.12369>

Germine, L., Nakayama, K., Duchaine, B. C., Chabris, C. F., Chatterjee, G., & Wilmer, J. B. (2012). Is the Web as good as the lab? Comparable performance from Web and lab in cognitive/perceptual experiments. *Psychonomic Bulletin & Review*, 19(5), 847–857. <http://doi.org/10.3758/s13423-012-0296-9>

Girotra, K., Terwiesch, C., & Ulrich, K.T. (2010). Idea Generation and the Quality of the Best Idea. *Management Science*, 56(4), 591–605.
<https://doi.org/10.1287/mnsc.1090.1144>

Gocłowska, M. A., & Crisp, R. J. (2013). On counter-stereotypes and creative cognition: When interventions for reducing prejudice can boost divergent thinking. *Thinking Skills and Creativity*, 8, 72–79. <https://doi.org/10.1016/j.tsc.2012.07.001>

Gocłowska, M. A., Crisp, R. J., & Labuschagne, K. (2013). Can counter - stereotypes boost flexible thinking? *Group Processes & Intergroup Relations*, 16(2), 217–231.
<https://doi.org/10.1177/1368430212445076>

Gocłowska, M. A., Baas, M., Crisp, R. J., & De Dreu, C. K. (2014a). Whether social schema violations help or hurt creativity depends on need for structure. *Personality and Social Psychology Bulletin*, 40(8), 959–971.
<https://doi.org/10.1177/0146167214533132>

Gocłowska, M. A., Baas, M., Crisp, R. J., & De Dreu, C. K. W. (2014b). Supplementary online materials for the article “Whether social schema violations help or hurt creativity depends on need for structure”. Retrieved from
<http://psp.sagepub.com/content/suppl/2014/04/29/0146167214533132.DC1/DS_10.1177_0146167214533132.pdf>

Gocłowska, M. A., Baas, M., Elliot, A. J., & De Dreu, C. K. (2017). Why schema-violations are sometimes preferable to schema-consistencies: The role of interest and openness to experience. *Journal of Research in Personality*, 66, 54-69.

<https://doi.org/10.1016/j.jrp.2016.12.005>

Gocłowska, M. A., Damian, R. L., & Mor, S. (2018). The Diversifying Experience Model: Taking a broader conceptual view of the multiculturalism -creativity link. *Journal of Cross-Cultural Psychology* 49(2), 303–322.

<https://doi.org/10.1177/0022022116650258>

Goldenberg, J., Lehmann, D. R., & Mazursky, D. (2001). The idea itself and the circumstances of its emergence as predictors of new product success. *Management Science*, 47(1), 69–84. <https://doi.org/10.1287/mnsc.47.1.69.10670>

Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2013). *Multivariate Data Analysis (7th Edition)*. Pearson Education Limited.

Hampton, J. A. (1987). Inheritance of attributes in natural concept conjunctions. *Memory and Cognition*, 15(1), 55-71. <https://doi.org/10.3758/BF03197712>

Hax, A. C., & Majluf, N. S. (1982). Competitive Cost Dynamics: The Experience Curve. *Interfaces*, 12(5), 50–61. <https://doi.org/10.1287/inte.12.5.50>

Heckler, S.E., & Childers, T.L. (1992). The role of expectancy and relevancy in memory for verbal and visual information: What is incongruency? *Journal of Consumer Research* 18(4), 475–493. <https://doi.org/10.1086/209275>

Heiskanen, E., Hyysalo, S., Kotro, T., & Repo, P. (2010). Constructing innovative users and user-inclusive innovation communities. *Technology Analysis & Strategic Management*, 22(4), 495–511. <https://doi.org/10.1080/09537321003714568>

Heit, E. (2003). Schemas in Psychology. In Nadel L. (Ed.), *Encyclopedia of Cognitive Science*, (pp.4072-4074). John Wiley and Sons, Inc.

Hennessey, B., & Amabile, T. (2010). Creativity. *Annual Review of Psychology*, 61, 569–598. <https://doi.org/10.1146/annurev.psych.093008.100416>

Hossain, M., & Islam, K. M. (2015). Generating Ideas on Online Platforms: A Case Study of “My Starbucks Idea”. *Arab Economic and Business Journal*, 10(2), 102-111. <https://doi.org/10.1016/j.aebj.2015.09.001>

Hsu, M.L.A., & Fan, H.-L. (2010). Organizational Innovation Climate and Creative Outcomes: Exploring the Moderating Effect of Time Pressure. *Creativity Research Journal*, 22(4), 378–386. <https://doi.org/10.1080/10400419.2010.523400>

Hudson - Smith, M., & Smith, D. (2007). Implementing strategically aligned performance measurement in small firms. *International Journal of Production Economics*, 106(2), 393–408. <https://doi.org/10.1016/j.ijpe.2006.07.011>

Huberty, C. J., & Morris, J. D. (1989). Multivariate analysis versus multiple univariate analyses. *Psychological Bulletin*, 105(2), 302-308. <https://doi.org/10.1037/0033-2909.105.2.302>

Huberty, C. J., & Petoskey, M. D. (2000). Multivariate analysis of variance and covariance (pp.184-208). In H. Tinsley and S. Brown (Eds.), *Handbook of applied multivariate statistics and mathematical modeling*. Academic Press.

Jeppesen, L.B., & Lakhani, K.R. (2010). Marginality and Problem-Solving Effectiveness in Broadcast Search. *Organization Science*, 21(5), 1016-1033. <https://doi.org/10.1287/orsc.1090.0491>

Jiang, J., & Wang, Y. (2019). A Theoretical and Empirical Investigation of Feedback in Ideation Contests. *Production and Operations Management*, 29(2), 481-500. <https://doi.org/10.1111/poms.13127>

Kallio, K., & Lappalainen, I. (2015). Organizational learning in an innovation network: Enhancing the agency of public service organizations. *Journal of Service Theory and Practice*, 25(2), 140-161. <https://doi.org/10.1108/JSTP-09-2013-0198>

- Khan, B. Z. (2017). Enterprise and incentives for innovation. *NBERReporter*, 1, 16-20. <https://www.econstor.eu/handle/10419/178743>
- Khurana, A., & Rosenthal, S. R. (1998). Towards holistic “front ends” in new product development. *Journal of Product Innovation Management*, 15(1), 57–74. <https://doi.org/10.1111/1540-5885.1510057>
- Kim, K.H. (2019). Demystifying Creativity: What Creativity Isn’t and Is? *Roeper Review*, 42(2), 119-128. <https://doi.org/10.1080/02783193.2019.1585397>
- Klokgieters, K., & Chu, R. (2013). Creating an environment for successful innovation: A management consultant’s perspective. In Alexander Brem & Éric Viardot (Eds.), *Evolution of innovation management: Trends in an international context* (pp.327-347). Palgrave Macmillan
- Koen, P., Ajamian, G., Burkart, R., Clamen, A., Davidson, J., D’Amore, R., Elkins, C., Herald, K., Incorvia, M., Johnson, A., Karol, R., Seibert, R., Slavejkov, A., & Wagner, K. (2001). Providing Clarity and A Common Language to the “Fuzzy Front End”. *Research -Technology Management*, 44(2), 46–55. <https://doi.org/10.1080/08956308.2001.11671418>
- Koh, T. K. (2019). Adopting Seekers’ Solution Exemplars in Crowdsourcing Ideation Contests: Antecedents and Consequences. *Information Systems Research*, 30(2), 486–506. <https://doi.org/10.1287/isre.2018.0810>
- Kossowska, M. (2007). The role of cognitive inhibition in motivation toward closure. *Personality and Individual Differences*, 42(6), 1117-1126. <https://doi.org/10.1016/j.paid.2006.09.026>
- Kornish, L.J., & Ulrich, K.T. (2014). The Importance of the Raw Idea in Innovation: Testing the Sow’s Ear Hypothesis. *Journal of Marketing Research*, 51(1), 14–26. <https://doi.org/10.1509/jmr.12.0401>
- Kruglanski, A. W. (1990). Lay epistemic theory in social-cognitive psychology.

Psychological Inquiry, 1(3), 181-197. https://doi.org/10.1207/s15327965pli0103_1

Kruglanski, A. W., Webster, D. M., & Klem, A. (1993). Motivated resistance and openness to persuasion in the presence or absence of prior information. *Journal of Personality and Social Psychology*, 65(5), 861-876.
<https://doi.org/10.1037/0022-3514.65.5.861>

Kruglanski, A. W., Dechesne, M., Orehek, E., & Pierro, A. (2009). Three decades of lay epistemics: The why, how, and who of knowledge formation. *European Review of Social Psychology*, 20(1), 146–191. <https://doi.org/10.1080/10463280902860037>

Kruglanski, A., Orehek, E., Dechesne, M., & Pierro, A. (2010). Lay Epistemic Theory: The Motivational, Cognitive, and Social Aspects of Knowledge Formation. *Social and Personality Psychology Compass*. 4(10), 939–950.
<https://doi.org/10.1111/j.1751-9004.2010.00308.x>

Kruglanski, A.W. (2013). *The Psychology of Closed Mindedness*. Psychology Press

Kumar, V.K., Holman, E. R. & Rudegeair, P. (1991). Creativity styles of freshmen students. *Journal of Creative Behavior*, 25(4), 320-323.
<https://doi.org/10.1002/j.2162-6057.1991.tb01144.x>

Landis, R. J., & Koch, G. G. (1977). The measurement of observer agreement for categorical data. *Biometrics*, 33(1), 159–174. <https://www.jstor.org/stable/2529310>

Lavrakas, P. J. (Ed.). (2008). *Encyclopedia of survey research methods*. Sage Publications, Inc. <https://dx.doi.org/10.4135/9781412963947.n522>

Leung, A. K. Y., & Chiu, C. Y. (2008). Interactive effects of multicultural experiences and openness to experience on creative potential. *Creativity Research Journal*, 20(4), 376-382. <https://doi.org/10.1080/10400410802391371>

Leung, A. K. Y., & Chiu, C. Y. (2010). Multicultural experience, idea receptiveness, and creativity. *Journal of Cross - Cultural Psychology*, 41(5-6), 723--741.

<https://doi.org/10.1177/0022022110361707>

Liu, D., Liao, H., & Loi, R. (2012). The dark side of leadership: A three-level investigation of the cascading effect of abusive supervision on employee creativity. *Academy of Management Journal*, 55(5), 1187-1212.
<https://doi.org/10.5465/amj.2010.0400>

Lewis, M. W. (2000). Exploring paradox: Toward a more comprehensive guide. *Academy of Management Review*, 25(4), 760–776.
<https://doi.org/10.5465/amr.2000.3707712>

Man, T. W., Lau, T., & Chan, K.F. (2002). The Competitiveness of Small and Medium Enterprises. A Conceptualization with Focus on Entrepreneurial Competencies. *Journal of Business Venturing*, 17(2), 123–142.
[https://doi.org/10.1016/S0883-9026\(00\)00058-6](https://doi.org/10.1016/S0883-9026(00)00058-6)

McAdam, R., McConvery, T., & Amstrong, G. (2004). Barriers to innovation within small firms in a peripheral location. *International Journal of Entrepreneurial Behaviour & Research*, 10(3), 206–221. <https://doi.org/10.1108/13552550410536780>

Maddux, W.W., Adam, H., & Galinsky, A.D. (2010). When in Rome . . . Learn why the Romans do what they do: How multicultural learning experiences facilitate creativity. *Personality and Social Psychology Bulletin*, 36(6), 731-741.
<https://doi.org/10.1177/0146167210367786>

Majchrzak, A., & Malhotra, A. (2013). Towards an information systems perspective and research agenda on crowdsourcing for innovation. *The Journal of Strategic Information Systems*, 22(4), 257-268. <https://doi.org/10.1016/j.jsis.2013.07.004>

Malmberg, K., Vaittinen, I., Evans, P., Schuurman, D., Ståhlbröst, A., & Vervoort, K. Eds.). (2017). *Living Lab Methodology Handbook*, Zenodo.
<https://doi.org/10.5281/zenodo.1146321>

- Mandler, G. (1982). The structure of value: Accounting for taste. In M.S. Clark & S.T. Fiske (Eds.), *Affect and cognition: The 17th annual Carnegie symposium on cognition*. Psychology Press. <https://doi.org/10.4324/9781315802756>
- Mansfield, E. (1986). Patents and Innovation: An Empirical Study. *Management Science*, 32(2), 173-181. <https://www.jstor.org/stable/2631551>
- Marsh, R.L., Ward, T.B., & Landau, J.D. (1999). The inadvertent use of prior knowledge in a generative cognitive task. *Memory & Cognition*, 27(1), 94–105. <https://doi.org/10.3758/BF03201216>
- Massa, S., & Testa, S. (2011). Innovate or die: Why innovation is the key to business success in a changing world, *Strategic Direction*, 27(7), 12-14. <https://doi.org/10.1108/025805411111137010>
- Masril, M., Hendrik, H., Theozard Fikri, H., Hazidar, Al H., Priambodo, B., Naf'an, E., Handriani, I., Pratama Putra, Z., & Kudr Nseaf, A. (2019, April 26–27). The Effect of Lego Mindstorms as an Innovative Educational Tool to Develop Students' Creativity Skills for a Creative Society. International Conference Computer Science and Engineering (IC2SE), Padang, Indonesia <http://dx.doi.org/10.1088/1742-6596/1339/1/012082>
- Mayseless, O., & Kruglanski, A. K. (1987). What makes you so sure?: Effects of epistemic motivations in judgmental confidence. *Organizational Behavior and Human Decision Processes*, 39(2), 162–183. [https://doi.org/10.1016/0749-5978\(87\)90036-7](https://doi.org/10.1016/0749-5978(87)90036-7)
- Meyers-Levy, J., & Tybout, A. M. (1989). Schema congruity as a basis for product evaluation. *Journal of consumer research*, 16(1), 39-54. <https://doi.org/10.1086/209192>
- Miron-Spektor, E., Gino, F., & Argote, L. (2011). Paradoxical frames and creative sparks: Enhancing individual creativity through conflict and integration.

Organizational Behavior and Human Decision Processes, 116(2), 229-240.

<https://doi.org/10.1016/j.obhdp.2011.03.006>

Momaya, K.S. (2019). The Past and the Future of Competitiveness Research: A Review in an Emerging Context of Innovation and EMNEs. *International Journal of Global Business and Competitiveness*, 14, 1–10.

<https://doi.org/10.1007/s42943-019-00002-3>

Mortara, L., Ford, S. J., & Jaeger, M. (2013). Idea Competitions under scrutiny: Acquisition, intelligence or public relations mechanism? *Technological Forecasting and Social Change*, 80(8), 1563–1578. <https://doi.org/10.1016/j.techfore.2013.01.008>

Moultrie, J., Nilsson, M., Dissel, M., Haner, U.-E., Janssen, S., & Van derLugt, R. (2007). Innovation spaces: Towards a framework for understanding the role of the physical environment in innovation. *Creativity and Innovation Management*, 16(1), 53–65. <https://doi.org/10.1111/j.1467-8691.2007.00419.x>

Musch, J., & Reips, J.-D. (2000). A brief history of Web experimenting. In Michael H. Birnbaum (Ed.), *Psychological experiments on the Internet* (pp. 61-87). Academic Press

Nambisan, S. (2002) Designing Virtual Customer Environments for New Product Development: Toward a Theory. *Academy of Management Review*, 27(3), 392–413. <https://doi.org/10.5465/amr.2002.7389914>

Nambisan, S., & Baron, R.A. (2007). Interactions in Virtual Customer Environments: Implications for Product Support and Customer Relationship Management. *Journal of Interactive Marketing*, 21(2), 42-62. <https://doi.org/10.1002/dir.20077>

Nappi, V., & Kelly, K. (2018). Key Performance Indicators and Dimensions for the Innovation Process. [Paper presentation]. 25th Innovation & Product Development Management Conference (IPDMC 2018). https://www.researchgate.net/publication/333880925_Key_Performance_Indicators_and_Dimensions_for_the_Innovation_Process

Neisser, U. (1967). *Cognitive psychology*. Prentice Hall

Nelson, R. (1992). Recent Writings on Competitiveness: Boxing the Compass. *California Management Review*, 34(2), 127-137. <https://doi.org/10.2307/41166697>

Osorio, F., Dupont, L., Camargo, M., Palominos, P., Peña, J. I., & Alfaro, M. (2019). Design and management of innovation laboratories: Toward a performance assessment tool. *Creativity and Innovation Management*, 28(1), 82-100. <https://doi.org/10.1111/caim.12301>

OECD/Eurostat (2018). *Oslo Manual 2018: Guidelines for Collecting, Reporting and Using Data on Innovation* (4th Edition). The Measurement of Scientific, Technological and Innovation Activities, OECD Publishing. <https://doi.org/10.1787/9789264304604-en>

Patricio, R., Moreira, A., Zurlo, F., & Melazzini, M. (2020). Co-creation of new solutions through gamification: A collaborative innovation practice. *Creativity and Innovation Management*, 29(1), 146-160. <https://doi.org/10.1111/caim.12356>

Paulus, P. B. (2000). Groups, teams, and creativity: The creative potential of idea-generating Groups. *Applied Psychology*, 49(2), 237-262. <https://doi.org/10.1111/1464-0597.00013>

Piller, F.T. (2010). Open Innovation with Customers: Crowdsourcing and Co-Creation at Threadless. *SSRN Electronic Journal*. <https://doi.org/10.2139/ssrn.1688018>.

Piller, F.T., & Walcher, D. (2006). Toolkits for Idea Competitions: A Novel Method to Integrate Users in New Product Development. *R&D Management*, 36(3), 307-318. <https://doi.org/10.1111/j.1467-9310.2006.00432.x>

Proulx, T., Inzlicht, M., & Harmon-Jones, E. (2012). Understanding all inconsistency compensation as a palliative response to violated expectations. *Trends in Cognitive Sciences*, 16 (5), 285-291. <https://doi.org/10.1016/j.tics.2012.04.002>

Proulx, T., & Inzlicht, M. (2012). The five “A”s of meaning maintenance: Finding meaning in the theories of sense-making. *Psychological Inquiry*, 23(4), 317–335. <https://doi.org/10.1080/1047840X.2012.702372>

Poetz M.K., & Schreier M. (2012). The Value of Crowdsourcing: Can Users Really Compete with Professionals in Generating New Product Ideas? *Journal of Product Innovation Management*, 29(2), 245-256. <https://doi.org/10.1111/j.1540-5885.2011.00893.x>

Porath, C. L., & Erez, A. (2009). Overlooked but not untouched: How rudeness reduces onlookers' performance on routine and creative tasks. *Organizational Behavior and Human Decision Processes*, 109(1), 29–44. <https://doi.org/10.1016/j.obhdp.2009.01.003>

Prahalad, C.K., & Ramaswamy, V. (2004). Co-Creation Experiences: The Next Practice in Value Creation. *Journal of Interactive Marketing*, 18(3), 5-14. <https://doi.org/10.1002/dir.20015>

Puccio, G., & Grivas, C. (2009). Examining The Relationship Between Personality Traits And Creativity Styles. *Creativity and Innovation Management*, 18(4), 247-255. <https://doi.org/10.1111/j.1467-8691.2009.00535.x>

Qualtrics, (2020). *Customer Surveys Software*. <https://www.qualtrics.com/uk/customer-experience/surveys/>

Quero, M., & Ventura, R. (2015). The role of balanced centricity in the Spanish creative industries adopting a crowd-funding organisational model. *Journal of Service Theory and Practice*, 25(2), 122-139. <https://doi.org/10.1108/JSTP-09-2013-0182>

Reeves M., & Deimler M. (2011). Adaptability: The New Competitive Advantage. *Harvard Business Review*, 89(7/8), 135–141.

<https://hbr.org/2011/07/adaptability-the-new-competitive-advantage>

Reips, J.-D. (2000). The Web experiment method: Advantages, disadvantages, and solutions. In Michael H. Birnbaum (Ed.), *Psychological experiments on the Internet*, (pp. 89-117). Academic Press

Reips, U.-D. (2002a). Standards for Internet-Based Experimenting. *Experimental Psychology*, 49(4), 243-256. <https://doi.org/10.1026//1618-3169.49.4.243>

Reips, U.-D. (2002b). Internet-based psychological experimenting: Five dos and five don'ts. *Social Science Computer Review*, 20(3), 241-249.

<https://doi.org/10.1177/089443930202000302>

Rietzschel, E.F., De Dreu, C.K.W., & Nijstad, B.A. (2007). Personal Need for Structure and Creative Performance: The Moderating Influence of Fear of Invalidity. *Personality and Social Psychology Bulletin*, 33(6), 855–866.

<https://doi.org/10.1177/0146167207301017>

Rietzschel, E.F., & Ritter, S.M. (2018). Moving From Creativity to Innovation. Individual Creativity in the Workplace. In Reiter-Palmon, R.; Kennel, V.L.; Kaufman, J.C. (Eds.), *Individual creativity in the workplace* (pp. 3-34). Academic Press.

<https://doi.org/10.1016/B978-0-12-813238-8.00001-2>

Ritter, S.M., Damian, R. I., Simonton, D.K., van Baaren, R.B., Strick, M., Derks, J., & Dijksterhuis, A. (2012a). Diversifying experiences enhance cognitive flexibility. *Journal of experimental social psychology*, 48(4), 961-964.

<https://doi.org/10.1016/j.jesp.2012.02.009>

Ritter, S.M., van Baaren, R.B., & Dijksterhuis, A. (2012b). Creativity: The role of unconscious processes in idea generation and idea selection. *Thinking Skills and Creativity*, 7(1), 21–27. <https://doi.org/10.1016/j.tsc.2011.12.002>

- Ritter, S.M., Kuhn, S., Muller, B.C.N., van Baaren, R.B., Brass, M. & Dijksterhuis, A. (2014). The creative brain: Corepresenting schema violations enhances TPJ activity and boosts cognitive flexibility. *Creativity Research Journal* 26(2), 144-150. <https://doi.org/10.1080/10400419.2014.901061>
- Roets, A., & Van Hiel, A. (2007). Separating ability from need: Clarifying the dimensional structure of the need for closure scale. *Personality and Social Psychology Bulletin*, 33(2), 266-280. <https://doi.org/10.1177/0146167206294744>
- Roets, A., & Van Hiel, A. (2011). Item selection and validation of a brief, 15-item version of the need for closure scale. *Personality and Individual Differences*, 50(1), 90-94. <https://doi.org/10.1016/j.paid.2010.09.004>
- Roets, A., Kruglanski, A.W., Kossowska, M., Pierro, A., & Hong, Y. (2015). The Motivated Gatekeeper of Our Minds. *Advances in Experimental Social Psychology*, 52, 221–283. <https://doi.org/10.1016/bs.aesp.2015.01.001>
- Roberts, E.B. (2007). Managing Invention and Innovation. *Research-Technology Management*, 50(1), 35–54. <https://doi.org/10.1080/08956308.2007.11657418>
- Runco, M. A. (2010). Divergent thinking, creativity, and ideation. In J. C. Kaufman & R. J. Sternberg (Eds.), *The Cambridge handbook of creativity* (pp. 413–446). Cambridge University Press. <https://doi.org/10.1017/CBO9780511763205.026>
- Russo-Spena, T., & Mele, C. (2012). “Five Co-s” in innovating: a practice-based view. *Journal of Service Management*, 23(4), 527-553. <https://doi.org/10.1108/09564231211260404>
- Sarasvathy, S.D., Dew, N., Velamuri, S.R., & Venkataraman, S. (2010). Three Views of Entrepreneurial Opportunity. In Zoltan J. Acs, David B. Audretsch (Eds.), *Handbook of Entrepreneurship Research An Interdisciplinary Survey and Introduction (2nd Edition)* (pp.77-96). Springer Science+Business Media, LLC

Sawhney, M., Verona, G., & Prandelli, E. (2005). Collaborating to create: The Internet as a platform for customer engagement in product innovation, *Journal of Interactive Marketing*, 19(4), 4–17. <https://doi.org/10.1002/dir.20046>

Shah, S.K. (2006). Motivation, Governance, and the Viability of Hybrid Forms in Open Source Software Development. *Management Science*, 52(7), 1000–1014. <https://doi.org/10.1287/mnsc.1060.0553.pdf>

Shah, J.J., Kulkarni, S.V., & Vargas-Hernandez, N. (2000). Evaluation of idea generation methods for conceptual design: effectiveness metrics and design of experiments. *Journal of Mechanical Design*, 122(4), 377–384. <https://doi.org/10.1115/1.1315592>

Shah, J.J., Smith, S.M., & Vargas-Hernandez, N. (2003). Metrics For Measuring Ideation Effectiveness. *Design Studies*, 24(2), 111–134. [https://doi.org/10.1016/S0142-694X\(02\)00034-0](https://doi.org/10.1016/S0142-694X(02)00034-0)

Schulz, K.-P., Geithner, S., Woelfel, C., & Krzywinski, J. (2015). Toolkit-Based Modelling and Serious Play as Means to Foster Creativity in Innovation Processes. *Creativity and Innovation Management*, 24(2), 323–340. <https://doi.org/10.1111/caim.12113>

Siudek, T., & Zawojka, A. (2014). Competitiveness in the Economic Concepts, Theories and Empirical Research. *Oeconomia*, 13 (1), 91–108. http://www.oeconomia.actapol.net/pub/13_1_91.pdf

Slater, S.F., & Narver, J.C. (1995). Market Orientation and the Learning Organization. *Journal of Marketing*, 59(3), 63–74. <https://doi.org/10.2307/1252120>

Smith, P.G., & Reinertsen, D.G. (1992). Shortening the product development cycle. *Research -Technology Management*, 35(3), 44–49. <https://doi.org/10.1080/08956308.1992.11670822>

Smith, W. K., & Tushman, M. (2005). Managing Strategic Contradictions: A Top Management Model for Managing Innovation Streams. . *Organization Science*, 16(5), 522–536. <https://doi.org/10.1287/orsc.1050.0134>

Smith, S.M., Ward ,T.B., & Schumacher, J.S. (1993). Constraining effects of examples in a creative generation task. *Memory & Cognition*, 21(6), 837-845. <https://doi.org/10.3758/BF03202751>

Stanko, M. A., Fisher, G. J., & Bogers, M. (2017). Under the Wide Umbrella of Open Innovation. *Journal of Product Innovation Management*, 34(4), 543–558. <https://doi.org/10.1111/jpim.12392>

Stock, R.M., Oliveira, P., & von Hippel, E.(2015). Impacts of Hedonic and Utilitarian Motives on the Novelty and Utility of User-Developed Innovations. *Journal of Product Innovation Management*, 32(3), 389-403. <https://doi.org/10.1111/jpim.12201>

Stock, R.M., von Hippel, E., & Gillert, N.L. (2016). Impacts of personality traits on consumer innovation success. *Research Policy*, 45(4), 757–769. <https://doi.org/10.1016/j.respol.2015.12.002>

Thompson, C. J., Rindfleisch, A., & Arsel. Z. (2006). Emotional branding and the strategic value of the doppelganger brand image. *Journal of Marketing* 70 (1), 50–64. <https://doi.org/10.1509/jmkg.70.1.050.qxd>

Thomke, S., & von Hippel, E. (2002). Customers As Innovators: A New Way to Create Value. *Harvard Business Review*, 80(4), 51-61.

Terwiesch C., & Xu Y. (2008). Innovation Contests, Open Innovation, and Multiagent Problem Solving. *Management Science*, 54(9), 1529-1543. <https://doi.org/10.1287/mnsc.1080.0884>

Tushman, M., & Nadler, D. (1986). Organizing for innovation. *California Management Review*, 28(3), 74–92. <https://doi.org/10.2307/41165203>

Urbinati, A., Chiaroni, D., Chiesa, V., & Frattini, F. (2018). The role of digital technologies in open innovation processes: an exploratory multiple case study analysis. *R&D Management*, 50(1), 136-160. <https://doi.org/10.1111/radm.12313>

Vanclay, F., Baines, J.T., & Taylor, C. N. (2013). Principles for ethical research involving humans: ethical professional practice in impact assessment Part I. *Impact Assessment and Project Appraisal*, 31(4), 243-253.
<https://doi.org/10.1080/14615517.2013.850307>

Van den Bos, K. (2001). Uncertainty management: the influence of uncertainty salience on reactions to perceived procedural fairness. *Journal of Personality and Social Psychology*, 80(6), 931–941. <https://doi.org/10.1037/0022-3514.80.6.931>

Vargo, S., & R. Lusch. (2004). Evolving to a New Dominant Logic for Marketing. *Journal of Marketing*, 68(1), 1–17. <https://doi.org/10.1509/jmkg.68.1.1.24036>.

Vezzali, L., Gocłowska, M.A., Crisp, R.J., & Stathi, S. (2016). On the relationship between cultural diversity and creativity in education: The moderating role of communal versus divisional mindset. *Thinking Skills and Creativity* 21, 152-157.
<https://doi.org/10.1016/j.tsc.2016.07.001>

Vlachvei, A., & Notta, O. (2017). Firm Competitiveness: Theories, Evidence, and Measurement (pp. 1-42). In Vlachvei, A., Notta, O., Karantininis, K., & Tsounis, N. (Eds.), *Factors Affecting Firm Competitiveness and Performance in the Modern Business World*. IGI Global. <http://doi:10.4018/978-1-5225-0843-4.ch001>

Verleye, K. (2015). The co-creation experience from the customer perspective: its measurement and determinants. *Journal of Service Management*, 26(2), 321–342.
<https://doi.org/10.1108/josm-09-2014-0254>

Vlaskovits , P. (August 29, 2011). Henry Ford, Innovation, and That “Faster Horse” Quote. *Harvard Business Review*.

<https://hbr.org/2011/08/henry-ford-never-said-the-fast>

Vogel, P. (2017). From Venture Idea to Venture Opportunity. *Entrepreneurship Theory and Practice*, 41(6), 943–971. <https://doi.org/10.1111/etap.12234>

Von Hippel, E., Thomke, S., & Sonnack, M. (September–October 1999). Creating Breakthroughs at 3M, *Harvard Business Review*, 77(5), 47

Von Hippel, E., & Katz, R. (2002). Shifting innovation to users via toolkits. *Management Science*, 48(7), 821–833. <https://doi.org/10.1287/mnsc.48.7.821.2817>

Wagoner, B. (2013). Bartlett’s concept of schema in reconstruction. *Theory & Psychology*, 23(5), 553–575. <https://doi.org/10.1177/0959354313500166>

Waheeduzzaman, A.N.M., & Ryans J.J., Jr. (1996). Definition, perspectives, and understanding of international competitiveness: a quest for a common ground. *Competitiveness Review*, 6(2), 7–26. <https://doi.org/10.1108/eb046333>

Wallin, M.W., & von Krogh, G. (2010). Organizing for open innovation: Focus on the integration of knowledge. *Organizational Dynamics* 39(2), 145-154. <https://doi.org/10.1016/j.orgdyn.2010.01.010>

Wan, W.W.N., & Chiu, C.-Y. (2002). Effects of novel conceptual combination on creativity. *The Journal of Creative Behavior*, 36(4), 227-240. <https://doi.org/10.1002/j.2162-6057.2002.tb01066.x>

Webster, D.M. & Kruglanski, A.W. (1994). Individual differences in need for cognitive closure. *Journal of Personality and Social Psychology*, 67(6), 1049–1062. <https://doi.org/10.1037/0022-3514.67.6.1049>

- West, J., & Lakhani, K.R. (2008). Getting Clear about Communities in Open Innovation. *Industry and Innovation*, 15 (2), 223–231.
<https://doi.org/10.1080/13662710802033734>
- Whitson, J. A., & Galinsky, A.D. (2008). Lacking control increases illusory pattern perception. *Science*, 322(5898), 115–117. <https://doi.org/10.1126/science.1159845>
- Williams, S. (2001). Increasing Employees' Creativity by Training Their Managers. *Industrial and Commercial Training*, 33, 63-68.
<https://doi.org/10.1108/00197850110385642>
- Wojtowicz, A., & Wojtowicz, B. (2017). The need for cognitive closure and the level of creative behavior in relation to the comprehension and design of complex spatial structures. *Technical Transactions*, Y. 114, vol. 11, 69-83.
<https://doi.org/10.4467/2353737XCT.17.190.7419>
- Wooten, J.O., & Ulrich K.T. (2017). Idea Generation and the Role of Feedback: Evidence from Field Experiments with Innovation Tournaments. *Production and Operations Management*, 26(1), 80-99. <https://doi.org/10.1111/poms.12613>
- Worth, L.T., Smith, J., & Mackie, D.M. (1992). Gender schematicity and preference for gender-types products. *Psychology & Marketing*, 9(1), 17–30.
<https://doi.org/10.1002/mar.4220090104>
- Ye, H., & Kankanhalli, A. (2017). Solvers' participation in crowdsourcing platforms: Examining the impacts of trust, and benefit and cost factors. *The Journal of Strategic Information Systems*, 26(2), 101-117. <https://doi.org/10.1016/j.jsis.2017.02.001>
- Yoon, H.J. (2013). Understanding schema incongruity as a process in advertising: Review and future recommendations. *Journal of Marketing Communications*, 19(5), 360–376. <https://doi.org/10.1080/13527266.2012.671187>

Zheng, H., Li, D., & Hou, W. (2011). Task Design, Motivation, and Participation in Crowdsourcing Contests. *International Journal of Electronic Commerce*, 15(4), 57–88. <https://doi.org/10.2753/JEC1086-4415150402>

7 Appendices

7.1 Appendix I: Invitation Note

Dear participant,

Thank you for participating in our survey. Your participation is vital for us, as it helps us to collect data for our Master thesis project. This survey consists of two tasks and a questionnaire. The tasks will be explained to you in detail. Read the instructions carefully. We would like to ask you to complete the whole survey, which will last about 10 minutes. Many thanks in advance for your collaboration and support in collecting data.

Serdar Hiçyilmaz

Ryon Matton

Evripidis Thymellis

Master students Business Administration (Marketing) at Radboud Univeristy

7.2 Appendix II: Consent Form

Before you start, please fill in this form: Participation in the experiment is voluntarily, it is possible for you to not participate in the experiment. Your participation will be treated confidential, personal information as your name, e-mail address or IP-address will not be saved. When your answers provide any information regarding your identity, this will be anonymized. When you have questions regarding the research you can contact

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7.3 Appendix III: Need for Cognitive Closure Scale

We will now provide you some sentences about your need for closure, please select the answer that is applicable to you.

1 = Completely disagree

2 = Mostly Disagree

3 = Slightly disagree

4 = Slightly agree

5 = Mostly Agree

6 = Completely agree

1	I don't like situations that are uncertain.	1	2	3	4	5	6
2	I dislike questions which could be answered in many different ways.	1	2	3	4	5	6
3	I find that a well ordered life with regular hours suits my temperament.	1	2	3	4	5	6
4	When dining out, I like to go to places where I have been before so that I know what to expect.	1	2	3	4	5	6
5	I feel uncomfortable when I don't understand the reason why an event occurred in my life.	1	2	3	4	5	6
6	I feel irritated when one person disagrees with what everyone else in a group believes.	1	2	3	4	5	6
7	I don't like to go into a situation without knowing what I can expect from it.	1	2	3	4	5	6
8	When I have made a decision, I feel relieved	1	2	3	4	5	6
9	When I am confronted with a problem, I'm dying to reach a solution very quickly.	1	2	3	4	5	6
10	I would quickly become impatient and irritated if I would not find a solution to a problem immediately.	1	2	3	4	5	6
11	I don't like to be with people who are capable of unexpected actions.	1	2	3	4	5	6
12	I find that establishing a consistent routine enables me to enjoy life more.	1	2	3	4	5	6
13	I enjoy having a clear and structured mode of life.	1	2	3	4	5	6
14	I do not usually consult many different opinions before forming my own view.	1	2	3	4	5	6
15	I dislike unpredictable situations.	1	2	3	4	5	6

Note: Questions 7 & 9 will be reversed scored

7.4 Appendix IV: Demographics

The Tables show the observed cell totals (the expected cell totals) and [the chi-square statistic for each cell]

Gender	Consistent	Baseline	Inconsistent	Row Totals
Male	26 (20.96) [1.21]	22 (21.35) [0.02]	18 (23.68) [1.36]	66
Female	28 (33.04) [0.77]	33 (33.65) [0.01]	43 (37.32) [0.87]	104
Column Totals	54	55	54	170
$\chi^2(2, 170) = 4.24, p = .12 (\alpha = .05)$				
I don't want to share	2	2	0	4
Other	0	0	1	1

Age	Consistent	Baseline	Inconsistent	Row Totals
Under 21	9 (8.88) [0.00]	7 (9.06) [0.47]	11 (9.06) [0.41]	27
21-30	39 (39.12) [0.00]	42 (39.94) [0.11]	38 (39.94) [0.09]	119
Column Totals	48	49	49	146
$\chi^2(2, 146) = 1.09, p = .58 (\alpha = .05)$				
31-40	3	3	7	13
41-50	1	1	3	5
51 and older	4	4	3	11

Degree	Consistent	Baseline	Inconsistent	Row Totals
High school degree or equivalent (e.g. GED)	13 (14.65) [0.19]	16 (15.90) [0.00]	19 (17.45) [0.14]	48
Bachelor's degree	22 (22.58) [0.02]	28 (24.51) [0.50]	24 (26.91) [0.31]	74
Master's degree	12 (9.77) [0.51]	7 (10.60) [1.22]	13 (11.64) [0.16]	32
Column Totals	47	51	56	154
$\chi^2(4, 154) = 3.04, p = .55 (\alpha = .05)$				
Less than high school degree	3 (2.95) [0.00]	2 (2.21) [0.02]	2 (1.84) [0.01]	7
Associate degree	5 (5.05) [0.00]	4 (3.79) [0.01]	3 (3.16) [0.01]	12
Column Totals	8	6	5	19
$\chi^2(2, 19) = 0.05 p = .97 (\alpha = .05)$				
Doctoral degree	1	0	1	2
Column Totals				175

7.5 Appendix V: Summary Statistics

Consistent (x₁)

N = 56	x₂	y₁	y₂	y₃	y₄	y₅
Minimum	31	1	0	1	1.0	1.3
Maximum	65	9	6	10	5.0	4.5
Mean	47.8	3.8	1.5	3.6	2.8	2.4
Std. Deviation	7.9	1.6	1.6	1.8	1.1	0.6
Skewness	0.09	0.43	1.03	1.18	0.14	0.99
Kurtosis	-0.48	0.46	0.21	1.91	-0.59	2.41

Inconsistent (x₁)

N = 62	x₂	y₁	y₂	y₃	y₄	y₅
Minimum	31	1	0	1	1.0	1.5
Maximum	70	9	4	10	7.0	3.3
Mean	51.8	3.7	1.5	3.3	2.9	2.4
Std. Deviation	8.1	1.8	1.4	1.8	1.4	0.4
Skewness	-0.19	0.94	0.39	1.21	0.52	0.08
Kurtosis	-0.19	1.15	-1.00	2.48	0.07	-0.64

Baseline (x₁)

N = 57	x₂	y₁	y₂	y₃	y₄	y₅
Minimum	38	1	0	1	1.0	1.7
Maximum	71	10	6	8	6.5	3.9
Mean	54.2	3.7	1.5	3.2	2.7	2.4
Std. Deviation	8.0	1.9	1.4	1.7	1.3	0.4
Skewness	0.03	0.99	1.25	1.02	0.91	0.98
Kurtosis	-0.54	1.15	1.83	1.31	0.87	1.74

7.6 Appendix VI: Correlation Coefficients

Consistent					
	y ₁	y ₂	y ₃	y ₄	y ₅
y ₁	1	0.311*			
y ₂		1			
y ₃			1	0.618**	-0.100
y ₄				1	-0.155
y ₅					1
*Correlation is significant at the 0.05 level (2-tailed).					
**Correlation is significant at the 0.01 level (2-tailed)					

Baseline					
	y ₁	y ₂	y ₃	y ₄	y ₅
y ₁	1	0.459**			
y ₂		1			
y ₃			1	0.882**	-0.026
y ₄				1	-0.029
y ₅					1
*Correlation is significant at the 0.05 level (2-tailed).					
**Correlation is significant at the 0.01 level (2-tailed)					

Inconsistent					
	y ₁	y ₂	y ₃	y ₄	y ₅
y ₁	1	0.350**			
y ₂		1			
y ₃			1	0.911**	0.092
y ₄				1	0.055
y ₅					1
*Correlation is significant at the 0.05 level (2-tailed).					
**Correlation is significant at the 0.01 level (2-tailed)					

7.7 Appendix VII: Normality Test (Shapiro-Wilk)

There is evidence that the data tested are not normally distributed if “Sig.” or $p < .05$

	Shapiro-Wilk ($\alpha = .05$)					
	Consistent		Inconsistent		Baseline	
Variable	Statistic	Sig	Statistic	Sig	Statistic	Sig
y ₁	0.938	0.006	0.899	$p < .001$	0.899	$p < .001$
y ₂	0.839	$p < .001$	0.863	$p < .001$	0.863	$p < .001$
y ₃	0.898	$p < .001$	0.884	$p < .001$	0.884	$p < .001$
y ₄	0.934	0.004	0.938	0.003	0.938	0.004
y ₅	0.921	0.001	0.970	0.128	0.970	0.128

7.8 Appendix VIII: ANOVA Tests (Task 2)

There is evidence that the means are significantly different if “Sig.” or $p < .05$

ANOVA Table		x ₁ : Consistent, Inconsistent, Baseline; y ₃ : Fluency of Ideas				
		Sum of Squares	df	Mean Square	F	Sig.
y ₃ * x ₁	Between Groups (Combined)	4.553	2	2.276	0.724	0.486
	Within Groups	541.024	172	3.145		
	Total	545.577	174			
F(2, 172) = 0.724, p = .486						
Measures of Association						
	Eta	Eta Squared				
y ₃ * x ₁	0.091	0.008				

ANOVA Table		x ₁ : Consistent, Inconsistent, Baseline; y ₄ : Flexibility of Ideas				
		Sum of Squares	df	Mean Square	F	Sig.
y ₄ * x ₁	Between Groups (Combined)	1.960	2	0.980	0.598	0.551
	Within Groups	282.040	172	1.640		
	Total	284.000	174			
F(2, 172) = 0.598, p = .551						
Measures of Association						
	Eta	Eta Squared				
y ₄ * x ₁	0.083	0.007				

ANOVA Table		x ₁ : Consistent, Inconsistent, Baseline; y ₅ : Creativity of Ideas				
		Sum of Squares	df	Mean Square	F	Sig.
y ₅ * x ₁	Between Groups (Combined)	0.064	2	0.032	0.133	0.875
	Within Groups	41.431	172	0.241		
	Total	41.495	174			
F(2, 172) = 0.133, p = .875						
Measures of Association						
	Eta	Eta Squared				
y ₅ * x ₁	0.039	0.002				

7.9 Appendix IX: ANCOVA Tests (Task 2)

There is evidence that the means are significantly different if “Sig.” or $p < .05$

Variable (y ₃)						
Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	12,931 ^a	3	4.310	1.384	0.249	0.024
Intercept	94.532	1	94.532	30.348	0.000	0.151
x₂	8.378	1	8.378	2.690	0.103	0.015
x₁	1.281	2	0.641	0.206	0.814	0.002
Error	532.646	171	3.115			
Total	2555.000	175				
Corrected Total	545.577	174				
a. R Squared = .024 (Adjusted R Squared = .007)						
F(1, 171) = 2.690, p = .103, $\eta^2 = .015$						
F(2, 171) = 0.206, p = .814, $\eta^2 = .002$						

Variable (y ₄)						
Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	6,347 ^a	3	2.116	1.303	0.275	0.022
Intercept	59.724	1	59.724	36.783	0.000	0.177
x₂	4.387	1	4.387	2.702	0.102	0.016
x₁	2.041	2	1.021	0.629	0.535	0.007
Error	277.653	171	1.624			
Total	1656.000	175				
Corrected Total	284.000	174				
a. R Squared = .022 (Adjusted R Squared = .005)						
F(1, 171) = 2.702, p = .102, $\eta^2 = .016$						
F(2, 171) = 0.629, p = .535, $\eta^2 = .007$						

Variable (y ₅)						
Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	.343 ^a	3	0.114	0.475	0.700	0.008
Intercept	29.120	1	29.120	121.005	0.000	0.414
x₂	0.279	1	0.279	1.159	0.283	0.007
x₁	0.153	2	0.077	0.318	0.728	0.004
Error	41.152	171	0.241			
Total	1057.198	175				
Corrected Total	41.495	174				
a. R Squared = .008 (Adjusted R Squared = -.009)						
F(1, 171) = 1.159, p = .283, $\eta^2 = .007$						
F(2, 171) = 0.318, p = .728, $\eta^2 = .004$						

7.10 Appendix X: Correlation Coefficients Task 2 (Revised Data)

Consistent			
	y_3	y_4	y_5
y_3	1	0.706	– 0.118
y_4		1	– 0.286
y_5			1

Baseline			
	y_3	y_4	y_5
y_3	1	0.893	– 0.048
y_4		1	– 0.087
y_5			1

Inconsistent			
	y_3	y_4	y_5
y_3	1	0.899	0.122
y_4		1	0.101
y_5			1

7.11 Appendix XI: ANOVA Tests (Task 2 Revised Data)

There is evidence that the means are significantly different if “Sig.” or $p < .05$

ANOVA Table		x ₁ : Consistent, Inconsistent, Baseline; y ₃ : Fluency of Ideas				
		Sum of Squares	df	Mean Square	F	Sig.
y ₃ * x ₁	Between Groups (Combined)	3.163	2	1.582	0.554	0.576
	Within Groups	368.473	129	2.856		
	Total	371.636	131			
F(2, 129) = 0.544, p = .576						
Measures of Association						
	Eta	Eta Squared				
y ₃ * x ₁	0.092	0.009				

ANOVA Table		x ₁ : Consistent, Inconsistent, Baseline; y ₄ : Flexibility of Ideas				
		Sum of Squares	df	Mean Square	F	Sig.
y ₄ * x ₁	Between Groups (Combined)	0.903	2	0.452	0.306	0.737
	Within Groups	190.233	129	1.475		
	Total	191.136	131			
F(2, 129) = 0.306, p = .737						
Measures of Association						
	Eta	Eta Squared				
y ₄ * x ₁	0.069	0.005				

ANOVA Table		x ₁ : Consistent, Inconsistent, Baseline; y ₅ : Creativity of Ideas				
		Sum of Squares	df	Mean Square	F	Sig.
y ₅ * x ₁	Between Groups (Combined)	0.207	2	0.104	0.435	0.648
	Within Groups	30.680	129	0.238		
	Total	30.887	131			
F(2, 129) = 0.435, p = .648						
Measures of Association						
	Eta	Eta Squared				
y ₅ * x ₁	0.082	0.007				

7.12 Appendix XII: ANCOVA Tests (Task 2 Revised Data)

There is evidence that the means are significantly different if “Sig.” or $p < .05$

Variable (y ₃)						
Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	12,301 ^a	3	4.100	1.461	0.228	0.033
Intercept	69.867	1	69.867	24.887	0.000	0.163
x ₂	9.138	1	9.138	3.255	0.074	0.025
x ₁	0.411	2	0.205	0.073	0.929	0.001
Error	359.335	128	2.807			
Total	1708.000	132				
Corrected Total	371.636	131				
a. R Squared = ,033 (Adjusted R Squared = ,010)						
F(1, 128) = 3.255, p = .074, $\eta^2 = .025$						
F(2, 128) = .073, p = .929, $\eta^2 = .001$						

Variable (y ₄)						
Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	4,492 ^a	3	1.497	1.027	0.383	0.024
Intercept	40.871	1	40.871	28.029	0.000	0.180
x ₂	3.589	1	3.589	2.461	0.119	0.019
x ₁	1.014	2	0.507	0.348	0.707	0.005
Error	186.644	128	1.458			
Total	1140.500	132				
Corrected Total	191.136	131				
a. R Squared = ,024 (Adjusted R Squared = ,001)						
F(1, 128) = 2.461, p = .119, $\eta^2 = .019$						
F(2, 128) = .348, p = .707, $\eta^2 = .005$						

Variable (y ₅)	y ₅					
Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	,238 ^a	3	0.079	0.332	0.802	0.008
Intercept	15.750	1	15.750	65.777	0.000	0.339
x ₂	0.031	1	0.031	0.131	0.718	0.001
x ₁	0.161	2	0.081	0.336	0.715	0.005
Error	30.649	128	0.239			
Total	828.294	132				
Corrected Total	30.887	131				
a. R Squared = ,008 (Adjusted R Squared = -,016)						
F(1, 128) = .131, p = .718, $\eta^2 = .001$						
F(2, 128) = .336, p = .715, $\eta^2 = .005$						