

The antecedents of idea generation;

The role of the employee behavior



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Previous research shows that creative process engagement leads to creativity. Creative process engagement consists of problem identification, information searching & encoding and idea generation. When we get more understanding about the process, it is easier to adapt changes in an organization and to find tools for leaders to manage their organization. The better we understand processes, the more we can influence outcomes. For companies it is of particular interest to get more knowledge about factors that influence idea generation, as enhanced idea generation will result in potentially more innovational power and therefore company growth. In our research we further explained the antecedents of idea generation at employee level. The idea behind our model is that if a company takes care of certain resources, idea generation as a process step will be fostered and therefore untapped creative potential at employee level will be used. Character traits as proactivity, grit and creative potential were tested in this context. Next to those character traits learning possibilities for employees was taken into account. Using survey data from about 750 professional employees working in a high-tech environmental company in The Netherlands, we found that, the mentioned character traits and learning possibilities are important factors that stimulate engagement in generating ideas. We now better understand the construct behind the creative processes step 'idea generation', this implies for management that idea generation can be stimulated and as a consequence competitiveness of the company. For further understanding of the total construct of the creative process engagement, new possibilities for future research are given. Involving personal character traits seems a successful direction in further examining the antecedents of idea generation.

As competition is getting harder; creativity and innovation are crucial factors to survive and grow in the 21st century, especially to lead and adapt change (Amabile, 1988; Woodman, Sawyer & Griffen, 1993). Previous research has proved that employee creativity is a very important factor for organizational innovativeness, the effectiveness of the organization and in the end to survive in highly competitive markets (Amabile, 1996; Shalley, Zhou & Oldham, 2004). Managers today experience more than ever the importance of employees being creative, especially given the fact that technological changes are unpredictable and circumstances to work in are turbulent (Shalley & Gilson, 2004). With emerging markets and opportunities popping up, like double digit growth-numbers in Asia and the incredible influence of social media, it is important to have the capability to adjust fast. Creativity will stimulate companies to adjust (Oldham, 2003; Shalley, Zhou & Oldham, 2004). It is now up to researchers to be creative in finding antecedents of creativity, to understand better how a creative idea is developed. Research from different perspectives in creativity is performed for a long time. This goes from Royce's discussion in 1898 to research in social psychological accounts (e.g. Amabile, 1996). In the years in between creativity was of great interest from different perspectives and delivered many strands of creativity into our knowledge. More recent research was done by Shalley and Zhou (2008) and Zhang & Bartol (2010).

Until the beginning of the 21st century we see that creativity is usually defined as the production of novel ideas that are applicable and useful to the situation (e.g. Amabile, 1983; Mumford & Gustafson, 1988). We clearly see a difference between creativity and innovation. The big difference is in the executive dimension. Creativity-research is performed on an individual or employee level. Innovation, however, is often studied at the team or company-level (Anderson, de Dreu, & Nijstad, 2004; West, 2002). Ideas are novel when *"they are unique compared to other ideas currently available in the organization"* (Shalley, Zhou & Oldham, 2004), and they are useful when *"they have potential for direct or indirect value to the organization, either in the short or long-term"* (Shalley et al., 2004). Ideas can be generated by employees in any function, and are either a part of an individual's job, as is the case with employees in R&D departments, or are viewed as extra-role behavior, for example for production workers. It is crucial for some or potentially all employees to be creative at work to provide the raw material needed for change and innovation (e.g. Amabile, 1988; Kanter, 1983; Woodman, Sawyer & Griffen, 1993). Given this, there has been a steady increase in research examining the individual and contextual factors that may facilitate creative process engagement at employee level.

For creativity there is a strong belief in homogeneity. Regardless of the type of idea, the reason why it was produced or by which reason it was started. This homogeneous view will change by analyzing the process behind creativity and the factors involved (Zhang & Bartol, 2010). A reason for being creative is intrinsic motivation, but from previous research it was concluded that intrinsic motivation is a necessary but not a sufficient factor (Amabile, 1983). Creative process engagement has an equal or more important role in the creative outcome of an employee. Zhang and Bartol, and several scholars before, have suggested research in the processes behind the production of novel and useful ideas. They indicated this as a promising direction. For that reason we focus more on the process-aspects that leads to creativity than creativity itself. With our study we further examine the nature of the creative processes that leads to creativity. The idea that the creative process consists of different sub processes has largely been ignored (Zhang & Bartol, 2010). This study investigated one of these sub processes and factors that are assumed to be important for engaging in that process-step. The process-step we focus on is idea generation.

Various models have been developed over the past years that describe all kinds of specific personal factors which have a certain influence on creativity (e.g. Amabile, 1988; Woodman & Schoenfeldt, 1989; Ford, 1996). Knowledge, divergent thinking (cognitive style), personality, autonomy and intrinsic motivation are recurring factors in each of these models. More understanding of the creative process at work is necessary. It seems interesting to investigate the relationship with different personal factors. The main question for this research is: Why do some individuals engage more in the creative process-step idea generation, compared to others? With regards to this question we investigated three personal factors and one factor in the organizational context. We assume that personal factors or character traits fulfill an important role in the success of engaging in creative processes.

The first personal factor is grit. We use in this research the definition for grit that was defined by Duckworth, Peterson, Matthews and Kelly (2007). In this definition grit is divided in two factors; perseverance and passion for long-term goals. Grit is recently, across several studies, investigated as a personal factor. Main aim was to find out if grit explains further variance in success outcomes. Duckworth et al. (2007) found out that grit significantly contributes in explaining variance. Success in our study is defined as creative process engagement. With this study we want to find out whether grit is influencing the engagement in the creative process.

The second factor we further look into is proactivity. Following the defined standard way of working, is what most employees usually do, in their daily work. The creative way of working is deviating from

the standard and going the unpaved path (Ford, 1996). We expect proactivity to play an important mediating character trait in the process that leads to creativity.

The last personal factor as investigated in this research is creative potential. Over more than 40 years ago an important accent was added in the creativity literature. Hinton (1968) indicated that you have on the one hand creative potential and on the other the realized creative output. Hinton (1968) gave the following definition for creative potential; *“the creative capacity, skills and abilities that the individual possesses”*.

We assume that engagement in the creative process-step idea generation is not only defined by personal factors or character traits. We expect that there is a role for the organization itself to. Learning possibilities is investigated as an enabling factor that raises the chance for an employee to engage in the creative process.

Summarized, creativity is a very complex construct; every piece of the creativity puzzle must be tidily investigated to get the right insights into the creative capacity of an employee (Woodman & Schoenfeldt, 1989; Feldhusen & Goh, 1995). The most costly asset in Western-Europe companies is people. In these days as competition is getting more and more challenging, it is important to reach the maximum performance by using the potential of people. Companies need people to be creative on paving new paths for the future. Creativity is extremely important for innovation. If we take innovation into account and the extreme fast spread of knowledge around the globe; being creative is more and more important. For companies situated in Western-Europe this will count even more. To fully understand which aspects do stimulate this behavior, research in this direct is extremely relevant. With this study we want to add a puzzle piece in the answer on this behavioral question. We added this puzzle piece by doing a web-based survey among approximately 2000 employees of a big technology company based in the south of The Netherlands. With this survey we will measure factors that can explain variance in idea generation amongst employees.

THEORY AND HYPOTHESIS

In this paper we study the process that leads to creativity. The aspect we focus on is creative process engagement. Creativity can be described as an outcome and as a process; in this research we use “creative process engagement” as a process which leads to creativity (Zhang & Bartol, 2010). This is defined as employee involvement in creativity-relevant methods or processes. Creative process engagement is divided in three steps. The first one is problem identification, followed by information searching and encoding, and as a final step idea generation. This is visualized in Figure 1. The definition implies a logical sequence; this is confirmed by previous research (Amabile, 1983; Reiter-Palmon & Illies, 2004). A low level of engagement in this process may not lead to ideas that are novel and useful. The other way around, if the level of engagement is high and individuals are very successful in this process, we expect both novel and useful ideas to be produced. High level means in this case fully understanding of the problem, a maximum search and collection of information and generating numerous ideas and alternative solutions. In other research was found that ideas generated in an early phase tend to be routine and not so creative, this is in line with what we argue regarding the high and low amount of engagement in the process. In our research we introduce new personal- and organizational factors. With this set-up we contribute to the creativity research and literature. Investigating the process is indicated as more and more important by several researchers, who did much research in creativity (e.g. Mainemelis, 2001; Mumford, 2000; Shalley & Gilson, 2004).

Every creative outcome starts with the generation of ideas. To gain focus we will investigate the third step of the process in this research, idea generation. A finer grained investigation in the process steps is necessary. We choose idea generation, because it is the last step before employee creativity. In this study we only consider idea generation as part of the creative process engagement model. New in this study is that we investigate directly the influence of several personal factors and one factor in the organizational context. Engagement in the ‘idea generation’ step is very obvious; generating new ideas is a prerequisite for creative outcomes according to Amabile (1996). Therefore we investigate factors in this research that release the abilities and possibilities to engage in the creative process step ‘idea generation’. Very little research until now has been done in that direction (Binnewies, Ohly & Sonnentag, 2007).

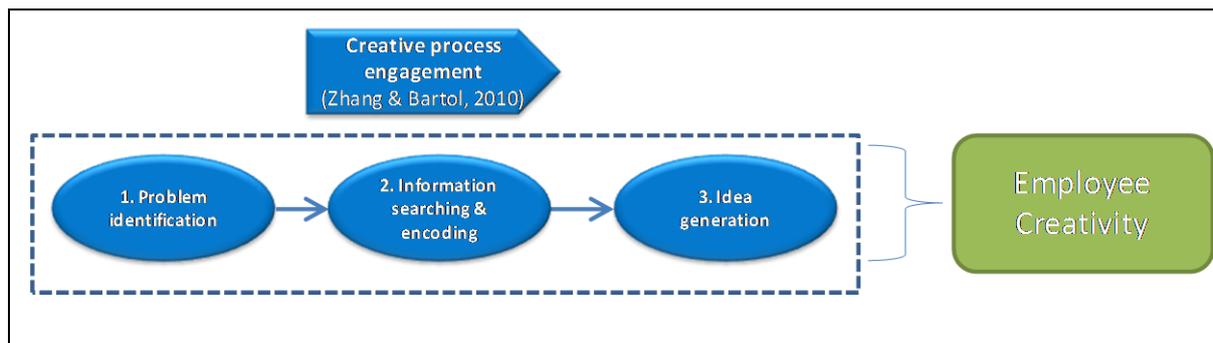


Figure 1.

Creative process engagement leads to employee creativity

In this research we search for factors that influence creative process engagement, especially the generation of ideas. Already for many years researchers study the question why some individuals release their abilities more than others. All individuals have different abilities but some release all their potential and some do not. The question is which factors do stimulate the process of releasing those abilities. An answer on this question is very relevant for companies; if they understand the process of releasing abilities better they can easily manage their organization. In the early 1900's William James also raised this question and the question was reiterated by several researchers in the beginning of 21st century, researchers like Duckworth, Matthews, Peterson and Kelly (2007). By those researchers several high achievement abilities were mentioned; *"e.g. emotional intelligence, vigor, charisma, self-confidence, emotional stability, physical attractiveness and also creativity"* (Duckworth et al., 2007). In this research we focus on innovative companies and therefore creativity. And as a consequence of creativity, creative process engagement, especially the idea generation phase. The main question is which factors explain variance in releasing individual's abilities to engage in the creative processes.

Grit and Creative process engagement

The first factor that we investigate is grit. According to Duckworth, Peterson, Matthews and Kelly (2007) we cite; *"Grit is defined as perseverance and passion for long term goals"*. Engagement in the creative process is not seen as an easy-to-do thing. For example; it is easier to define a solution for a problem and to immediately implement that solution without considering other ideas and therefore possible solutions. Perseverance is about going that extra mile, where some others may stop, we expect grittier employees still continue to search. Creating new ideas and possible solutions is not an easy thing. It takes more effort and it is frustrating for an individual that a lot of ideas or solutions that you have generated; never will be used. Previous research has indicated that people who are

more persevere score better in solving complex problems. Perseverance is found as a dependable factor for difficult or impossible tasks (e.g. Bandura, 1977; Baumeister, Bratslavsky Muraven & Tice, 1998; Elliott & Dweck, 1988; Muraven, Tice & Baumeister, 1998; Seligman & Schulman, 1986). The second aspect of grit is passion for long term goals. In several studies this was also found as a dependable variable in achieving success (Duckworth, 2007). People who stick to their long term goals achieved more with the same abilities. Disappointment is no reason to stop, and therefore we expect that people with passion for long term goals, will generate more ideas. The ability alone is not the only key for success, according to Galton (1892). Lack of “integration towards goals” was found, by Cox (1926), as a trait for predicted lifetime achievements. Therefore we expect passion for long term goals, and as a consequence grit, will be an important factor for engaging in creative processes. In a research at a Military Academy in the U.S. a cadet who scored higher in grit stand out longer than their peers who scored less in grit. The results were compared after controlling for SAT-scores, high school rank and measurement of Big five conscientiousness. Grit is not the same as the traditional measured aspects measured of Big Five conscientiousness. Grit is more a combination of being consistent in effort and holding interest in tasks and projects. Individuals who score high in grit are not per definition making many hours until a project is finished, it is more about keeping and sticking to long-term personal goals. For example people who often switch from job might score high in grit because they stick to their long term goals. On this aspect grit differs from the Big Five conscientiousness. The score in grit is less depending on rewarding; the gritty individuals stick to their long term goals. The conclusion is that grit overlaps but on some aspects differs from the Big Five conscientiousness. We conclude high need for achievement is certainly not the same as grit. With Duckworth (2007) we conclude that grit is an enabling factor for challenging domains. The main question in this research is whether individuals participate in creative processes. Because we expect that individuals who are grittier will still put more time in finding different ideas and better ideas than individuals who are less gritty.

Hypothesis 1: There will be positive relationship between employee grit and idea generation.

Proactivity and Creative process engagement

We see idea generation as a challenging domain. Generating many ideas will depend on how broad individuals look to a problem, when individuals go the unpaved paths, generate many alternatives and whether individuals put significant time in it. Creativity is going unpaved paths and does not follow the standard procedure or following the standardized way of working. We expect people who are very proactive to go earlier on the unpaved paths and for that reason will generate more ideas,

because they take a broader scope into account. Proactive people are also self-starting. We expect that proactive people will trigger themselves to start generating ideas. The concept of proactive personality was developed more than two decades ago (Bateman & Crant, 1993). They defined proactive personality as; *“a relatively stable tendency to effect environmental changes”*. Crant (2000) described a prototypical proactive personality as; *“Individuals who take action to influence their environments, or identify opportunities and act on them, show initiative, take action, and persevere until meaningful change occurs”*. Proactive individuals show willingness and determination to pursue a course of action, characteristics that are central to models of self-development (Antonacopoulou, 2000). Proactive personality has been linked to objective (salary and promotions) and subjective (career satisfaction) indicators of career success (e.g. Erdogan & Bauer, 2005; Rauch & Frese, 2007; Seibert, Crant & Kraimer, 1999). Moreover, proactive personality has been shown to explain additional variance in both objective and subjective career success even after accounting for other predictors such as demographics, motivation, type of organization, and type of industry (Seibert et al., 1999). Proactivity has, like grit, also to do with persistence. People who act proactive stay persistent with respect to set-backs and barriers.

Hypothesis 2: There will be positive relationship between proactive personality and idea generation.

Creative potential and creative process engagement

Creative potential refers to an individual's creative skills and abilities. It is important to note that at the individual level there is a difference between creative potential (Hinton, 1970) and the ability to utilize these skills and abilities as measured by creative performance (Amabile, 1996; Cummings, Hinton & Gobdel, 1975) or creative behavior (Hinton, 1968; Diliello & Houghton, 2008). Hinton (1968) and Diliello and Houghton (2008) investigated the relationship between creative potential and practiced creativity. Diliello and Houghton (2008) found a positive relationship between creative potential and practiced creativity. They concluded that practiced creativity will depend on the creative potential of an individual and secondly that it will depend on several environmental aspects. In this research we do not measure or take practiced creativity into account, but we look at idea generation, we investigate the step before practiced creativity. Based on the findings of Diliello and Houghton (2008) we expect a positive relationship between creative potential and idea generation. It is also likely that employees who see themselves with a high amount of creative potential will join a creative process earlier, than employees who rate themselves with a lower amount of creative potential. So it is of great interest to investigate whether there is positive relationship between creative potential and idea generation. This will give more insight to the total construct of the

relation between creative potential and creativity, according to Hinton (1968). Such a model may be of great benefit to organizations that want to improve the level of creativity and innovational power of their workforce.

Hypothesis 3: There will be a positive relationship between creative potential and idea generation.

Learning possibilities and creative process engagement

Today many training programs are offered to employees in addition to the many types of training offered outside the employment setting. Given this range of choices, employees now have greater opportunities for learning and development, but also have increased responsibility for getting the training that will enhance their career. Indeed, today's workers can be "free agents" in their own careers (Major, Turner & Fletcher, 2006), implying that they must actively pursue training and development opportunities to be successful. Further, several studies have pointed out the importance of training and development activities for the organization and individuals (e.g. Maurer & Tarulli, 1994; Maurer, Weis & barbeite, 2003). In the Encyclopedia of Creativity of Runco and Pritzker (1999) the following was noted:

"Creativity also benefits from so-called "prospective encoding", which consists of setting-up criteria for future acquisition of knowledge that might be relevant to a problem at hand. Careful examination of the problem and its requirements helps us to establish exact criteria of information needed for the continuation of creative problem solving. Such knowledge may not be available at the moment but can be easily acquired upon the appearance of particular learning opportunities. The mental set established due to the prospective encoding induces highly selective acquisition of knowledge; consequently, it enhances the likelihood of sudden and insightful recognition of the possibilities to deal with the problem."

Based on those findings we expect employees who perceive to have many learning possibilities to generate more ideas. The other way around, we expect that employees with limited possibilities to generate less ideas. Training or a course might be a source for new ideas. The minds of the employees will be triggered to think of new ways and to broaden the scope of current thinking. Previous research supports this thought; knowledge was indicated as one of the three major components in the model that influences creative production (Amabile, 1996). Based on this finding we do expect that having more learning possibilities will have a positive effect on idea generation.

Hypothesis 4: There will be a positive relationship between learning possibilities and idea generation.

An overview of the model, as used in this research, is shown in Figure 2.

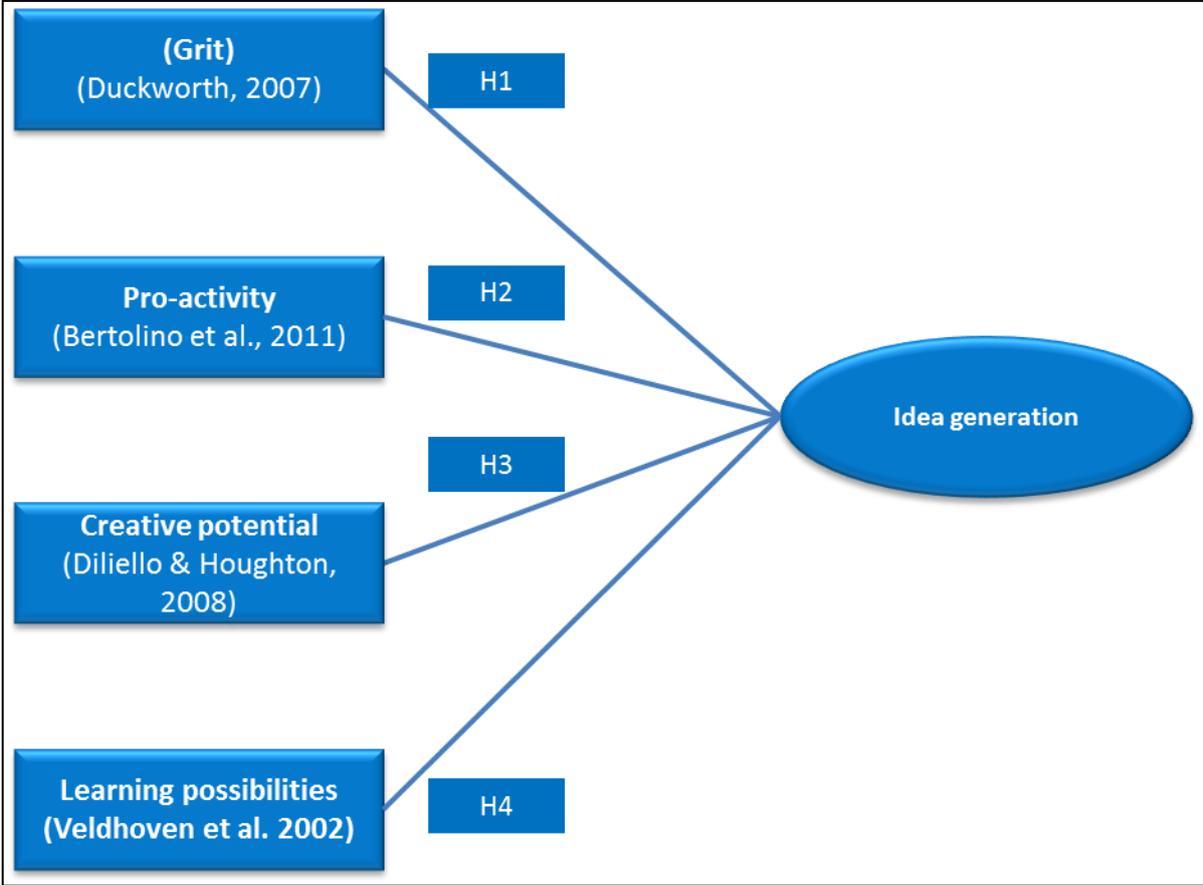


Figure 2.
Hypothesized model

METHODS

Research Setting and Participants

This study was conducted in a major high tech company headquartered in the South of The Netherlands. For the company creative outcomes are of great importance. Competition in high tech companies is extremely relevant; every gained benefit from research is useful. The research was performed in a high tech company, because in this sector the intensity of innovation is very high in combination with high extensive capital investment. This sector is looking for creative employees for all kinds of problem-solving and new challenge's popping up. We used a web-based survey tool to collect the data. The entire survey was translated from English into Dutch. Participants had the possibility to choose a language. The translation was checked by people who speak and write Dutch and have English as their native language. Upfront anonymously was guaranteed to prevent caution when filling in the survey. Participants were professional-level employees, almost 90% had a bachelor degree or higher. All of them work in a research or innovative environment, in this environment creativity plays an important role due to technological challenges and due to complex projects, which need to be finished in short-time but according to high quality-standards. The survey was held in the summer of 2012, the survey was send via an e-mail from top-management. In the e-mail employees and all managers were encouraged to start and complete the survey. In total 2090 employees got an invitation. From the total invited population we got 749 usable responses. This gave us a response rate of 34.1%, about what we aimed for. We did not have a high target due to the fact that this period was close to a holiday period. Table 1 contains all numbers regarding the response rate.

Table 1.

Overview of response rates

	Total Employees (estimated)	Participated		Complete and useful	
Total	2090	1017	46,4%	747	34,1%

Measures

Grit

A two-factor structure was identified by Duckworth and Quinn (2009) for the original 12-item self-report measure of grit (grit-O) (Duckworth, Peterson, Matthews & Kelly, 2007). Grit is a combination of interest and effort. Consistency of interest counts six items and perseverance of effort counts another six items. Items are rated on a five-point Likert-type scale from “1 = not at all like me” to “5 = very much like me”. A sample item is “my interests change from year to year”. Some questions were reversed to be sure that questionnaires were filled in correctly. Details can be found in Appendix 1.

Proactive personality

We measured proactive personality based on five positively worded items of the proactive personality scale (Seibert, Crant & Kraimer, 1999). Although the original scale was composed of 10 items, in this survey we retained only those items that could be meaningfully translated into Dutch and back translated into English. Respondents were asked to assess the extent to which they believed the items described themselves. Responses were on a 5-point Likert-type scale ranging from “1 = strongly disagree” to “5 = strongly agree”. A sample item is “I am constantly on the lookout for new ways to improve my life”.

Creative Potential

To measure creative potential we used the same scale as used by Diliello and Houghton (2008). This scale is a combination of two other scales. The first four items are from Tierney and Farmer (2002) and is about the feeling an employee has about its own ability to be creative, so called creative self-efficacy. The other items, five and six, were developed by Diliello and Houghton (2008) in their research about creative potential and innovation management. These two items are: “*having the talent or expertise to do well in one’s work*” and “*possessing the ability to take risks by trying out new ideas*” (Diliello & Houghton, 2008; Amabile, Burnside & Gryskiewicz, 1999). All items were measured using a five-point Likert-type scale ranging from “1 = strongly disagree” to “5 = strongly agree”. A sample item is “*I feel that I am good at generating novel ideas*”.

Learning possibilities

Three survey items were used for this study on the basis of the conceptual work of the Questionnaire for the Perception and Assessment of Labor, or the so called VBBA (Van Veldhoven, Meijman, Broersen & Fortuin, 2002). Respondents answered on a five- point Likert-type scale ranging from “1 = never” to “5 = very frequently”. A sample item is “my job offers me possibilities for personal growth and development”.

Idea Generation

Five survey items were used for this study, developed and used by Zhang & Bartol (2010). The scale was developed for their study on the basis of the conceptual work of Amabile (1983) and Reiter-Palmon and Illies (2004). Respondents answered on a five-point Likert-type scale ranging from “1 = never” to “5 = very frequently”. A sample item is “I generate a significant number of alternatives to the same problem before I choose the final solution”.

Control variables

We controlled for four demographic variables that have been found to be significantly related to creativity. Age was measured in years and measured psychological coded as “1 = young”, “2 = middle aged” and “3 = old”. Gender was measured as a dichotomous variable coded as “1 = for male”, “2 = for female” and “3 = I do not like to answer”. Company tenure was measured as the number of years that an employee had been in the company. Education was measured as a dichotomous variable coded as “1 = Elementary school”, “2 = Secondary school or equivalent”, “3 = Bachelor degree or equivalent”, “4 = Master's degree or equivalent” and “5 = Doctorate”). Finally we controlled for department.

An overview of the results is shown in Table 2. The group of participants was compared with the total population of the company by several human resource managers. From this analysis we could conclude that the group of participants was comparable with the total population. The comparison was based on response per department, average age, company tenure, education level and gender. For confidential reasons the detailed information of the total company is not shown in the table below. A factor analysis was performed of all factors to check validity. All factors, including reliabilities (Cronbach's alpha), are shown in Appendix 1. The factor Grit scored a Cronbach's alpha of 0.68, but could not be further improved by removing items. Although it is 0.68, it is acceptable for use in this research. No improvement of reliabilities of other factors could be made by removing

items, all other factors scored 0.70 or higher. The hypotheses will be tested by doing a multiple regression analysis.

Table 2.

Overview statistics of independent variables

Parameter	N	Keyfigures		Remarks
Age (chronological)	747	$\bar{X}^{\text{gem}}=46.7$	S=9.8	
Company tenure				
<1 year	54	7,2%		
>1- and <3years	59	7,9%		
>3- and <10years	144	19,3%		
>10- and <20years	154	20,6%		
>20years	356	47,7%		
Age (self perception)				
young:	244	32,7%		
Middle-aged:	472	63,2%		
Old:	31	4,1%		
Gender				
Number of women:	135	18,1%		*15 people did not like to answer this question
Number of men:	597	79,9%		
Education level				
Elementary school	1	0,1%		
Secondary school	88	11,8%		
Bachelor	201	26,9%		
Master	259	34,7%		
Doctorate	198	26,5%		

RESULTS

In Table 3 the results of means, standard deviations and intercorrelations are shown. A review of this table shows that most correlations are significant. It indicates no direct relation between division and pro-active personality ($r=0.05$, ns), nor between division and grit ($r=0.04$, ns). However there is a significant correlation between division and five other factors. It indicates that there is no direct relation between age and creative potential ($r=-0.04$, ns), nor between age and idea generation ($r=-0.09$, ns). However there is a significant correlation between age and five other factors. Age (self-perception) correlates with grit ($r=0.06$) and age (chronological) ($r=-0.07$) significant.

Table 3.
Means, standard deviations, and intercorrelations

	Mean	SD	1	2	3	4	5	6	7	8	9
1. Grit	2.58	.33									
2. Proactive personality	3.73	.56	.21 ^{***}								
3. Creative potential	4.25	.49	.20 ^{***}	.47 ^{***}							
4. Learning possibilities	3.85	.72	.21 ^{***}	.27 ^{***}	.32 ^{***}						
5. Educational level	3.76	.98	.09 [*]	.12 ^{**}	.29 ^{***}	.23 ^{***}					
6. Division	2.45	.65	.04	.05	.18 ^{***}	.11 ^{**}	.31 ^{***}				
7. Idea Generation	3.59	.62	.09 [*]	.50 ^{***}	.48 ^{***}	.29 ^{***}	.28 [*]	.17 ^{***}			
8. Age (chronological)	46.9	9.74	.09 [*]	-.08 [*]	-.04	-.13 ^{***}	-.26 ^{***}	-.16 ^{***}	-.09		
9. Company tenure	3.88	1.22	.04	-.11 ^{**}	-.02	-.16 ^{***}	-.24 ^{***}	-.03 ^{***}	-.11	.70 ^{***}	
10. Age (self-perception)	1.72	.43	.06	-.11 ^{**}	-.06	-.14 ^{***}	-.19 ^{***}	-.11 ^{**}	-.07 [*]	.71 ^{***}	.55 ^{***}

Notes. N = 747

‡ $p < .10$

* $p < .05$

** $p < .01$

*** $p < .001$

We used stepwise regression to test all hypotheses. We tested the effect of proactive personality, creative potential, learning possibilities and grit on idea generation. The results are shown in Table 4. Hypothesis 1 stated that proactive personality has a positive effect on idea generation. This is positively supported by the results. The effect is positive ($B=0.39$) and significant.

Hypothesis 2 stated that employees with a high level of creative potential are more engaged in idea generation compared to employees with a low level of creative potential. This positive effect is significantly supported by the results ($B=0.31$). Hypothesis 3 stated that learning possibilities would positively affect the engagement in idea generation. Hypothesis 3 is supported by the results. The effect ($B=0.07$) of learning possibilities is positive and significant. Hypothesis 4 stated that grittier employees would engage more in idea generation than their less gritty colleagues. The Hypothesis is not supported by the results. On the contrary a significant negative effect was found ($B=-0.09$).

Table 4.
Regression Analysis

Variable	Idea Generation B	Idea Generation B	Idea Generation B
<i>Direct effects</i>			
Grit		-0.10* (0.045)	-0.09* (0.046)
Proactive personality		0.39*** (0.038)	0.39*** (0.038)
Creative potential		0.31*** (0.045)	0.31*** (0.044)
Learning possibilities		0.07** (0.028)	0.07** (0.028)
<i>Control variables</i>			
Education Level	0.15*** (0.024)	0.09*** (0.021)	0.09*** (0.020)
Division	0.10** (0.035)	0.06* (0.030)	0.06* (0.029)
Company tenure	-0.04 (0.024)	-0.02 (0.021)	
Age	0.00 (0.003)	0.00 (0.003)	
<i>Intercept</i>	2.79*** (0.169)	0.36‡ (0.238)	0.40‡ (0.217)
Adjusted R ²	0.087	0.357	0.358
F-value	18.70***	52.79***	70.22***
N	747	747	747

Notes. *p*-values are reported between brackets

‡ $p < .10$

* $p < .05$

** $p < .01$

*** $p < .001$

The factors proactive personality, creative potential, learning possibilities and grit were put together in the regression model. The variance found in idea generation, expressed with R^2 , is explained by 35.8%. Figure 3 shows the results of our model.

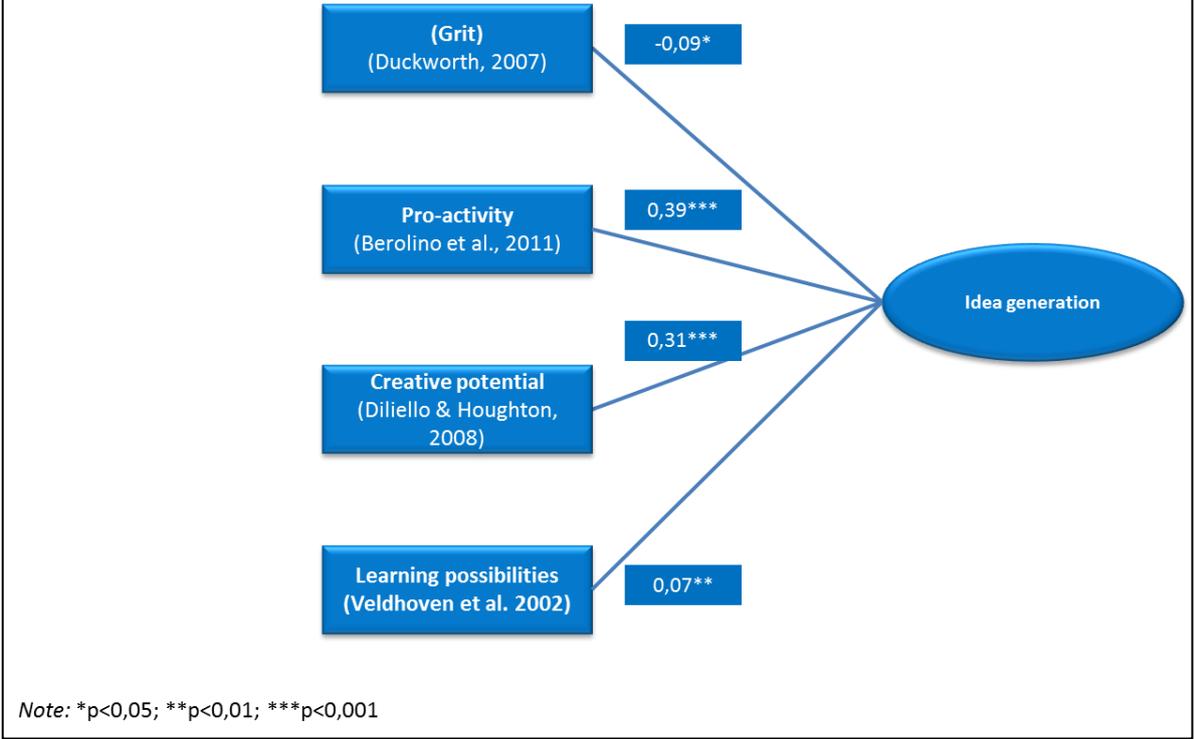


Figure 3.
Model including results

The role of proactivity for idea generation is noteworthy. Proactivity was found as a strong factor fostering engagement in the creative process. The more proactive employees are the more they engage in the process. This is graphically shown in Figure 4.

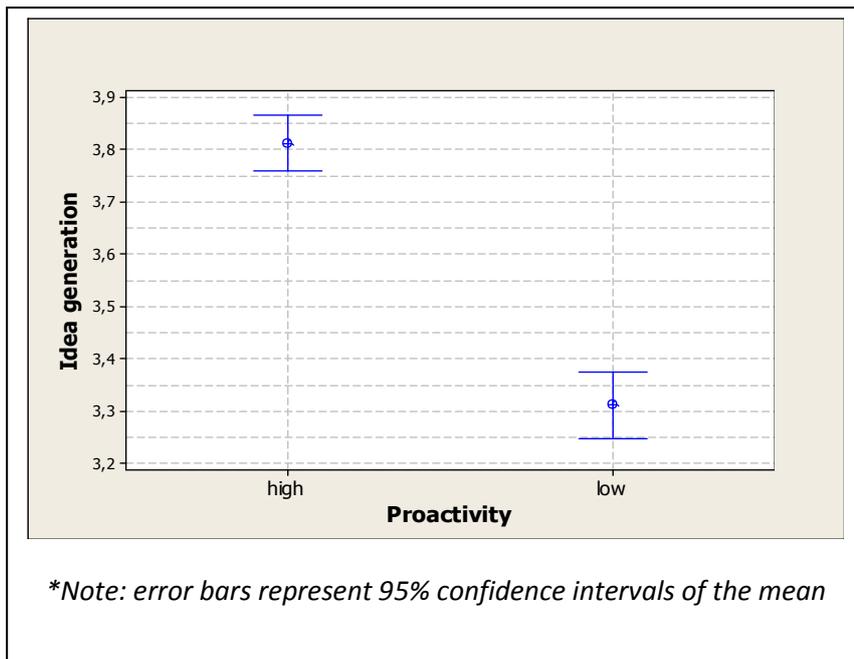


Figure 4.

Idea generation as a function of proactivity

With a factor analysis we found an interesting result. Creative potential and learning possibilities are very close to each other. It implies that there could be a common factor causing the same variance in those two factors. This is graphically shown in Figure 5.

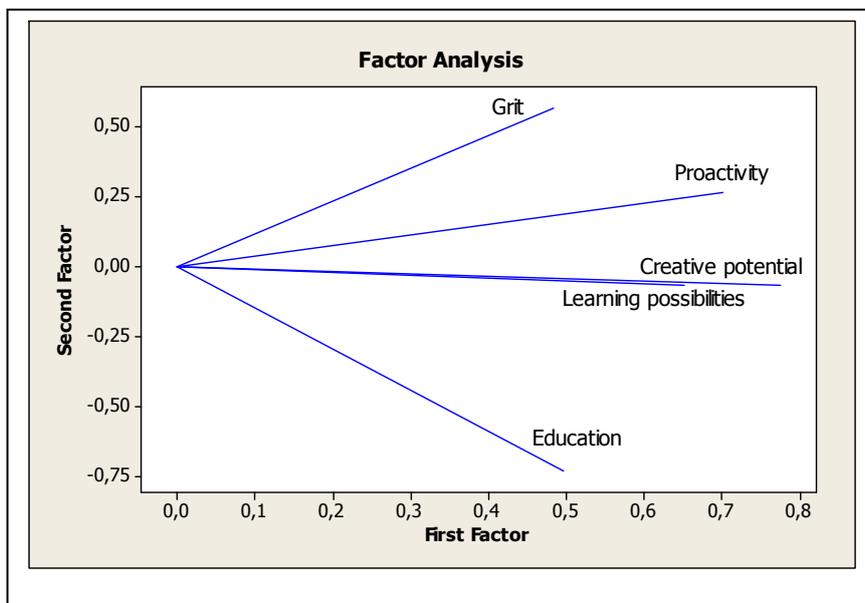


Figure 5.

Factor analysis

DISCUSSION

With this research we contribute to the creativity research and literature. Investigating the process is indicated as more and more important by several researchers (e.g. Mainemelis, 2001; Mumford, 2000; Shalley & Gilson, 2004). The idea that the creative process can be split up in several sub-processes has been ignored for a long time. Binnewies, Ohly and Sonnentag (2007) started to investigate these sub-processes more in depth. They searched for the relationship between factors that are assumed to be important for creativity and the sub-processes. They indicated that it would be a promising direction to further investigate the relationship between these sub-processes and personal or contextual factors. After that moment many research has been done to further investigate creative process engagement, which consists of the three sub-processes (problem identification, information searching & encoding and idea generation). In this research we investigated idea generation as one of the three sub-processes. We defined, validated and found a model that explains the relationship between several factors and idea generation further. Now we have a better understanding about what is important for generating new ideas.

The research was held under a great group of very specific people, working in one company. The benefit is the size of more than 700 employees, working in a specific part of The Netherlands. Almost 90% was educated bachelor degree or higher. Given these facts we can exclude much variance from geographical and or educational nature.

As far as we know, the relationship between grit and engagement in creative processes has formerly never been part of research. In this research grit was found to be a significant character trait that negatively influenced idea generation. For grit, as a factor that influences people performance behavior, very little is known. Duckworth, Peterson, Matthews and Kelly (2007) found that grit was accountable for explaining variance in success outcomes. We did not find the same in our study, where we defined the level of engagement in idea generation as success. The grit scale was developed around 2007. An explanation for this relationship might be that people who score high in grit think less out of box. Where for generating new ideas creative ways of thinking are necessary, gritty people stick to their plans and time-schedule's. Another reason can be that gritty employees realize their long term goals not by generating creative new ideas. Duckworth, Peterson, Matthews and Kelly (2007) found that grit increases over the lifespan. This is confirmed in our study. Both factors, age (chronological) and age (self-perception), correlate positively with grit.

Creative potential has been investigated by Diliello and Houghton (2008). Once you can measure the potential it is easier to define whether an employee also perceives the support in its environment to use it. Support in this research was defined by proactivity, learning possibilities and grit. The model of Diliello and Houghton (2008) supports this thought. The results of this research confirmed the thought, creative potential was positively linked to idea generation. For the management and the company investigated in this research, this implies that employees with more potential will engage more in the creative process step 'idea generation'.

According to Bertolino, Truxillo and Fraccaroli (2011) we can conclude that training or a course is important in identifying new opportunities. In this research we found that learning opportunities has a significant positive impact on engagement in the creative process-step 'idea generation'. Employees, who have more opportunities to learn, or at least experience that, are more likely to engage in the process to generate more ideas. A limitation of our study is that we measured perception. We did not include a measure that exactly measured the number of opportunities and trainings or courses that were followed. This is important to mention because the reasons behind perception can differ from the reasons behind the real number of opportunities. In explaining and using the results of this research this should be taken into account.

The more proactive employees are the more they engage in the process. This is in line with other research being performed in the past. Seibert, Crant and Kraimer (1999) concluded that there was a strong relation between proactivity and career success. Secondly Seibert et al. (1999) found that highly proactive people are more active in identifying new opportunities. Major, Turner and Fletcher (2006) concluded that proactive employees perform better in training outcomes, like the level of training motivation and behavioral intentions (Major et al., 2006). With this research we can now add next to those outcomes, that proactive employees engage significantly better in the creative process step 'idea generation'.

The more detailed and touchable the results are, the better we can understand the construct behind the creative processes, and act on it. Actions are, for companies and management, of great interest to increase the competitive position, in the already very tough environments. It enables employees or companies to do more with less, which is the common heard sound. With this study we further explained the creativity construct. For managers this means that they get a better understanding how to increase the creative capabilities of their department. With this research the management now knows that people should have the perceptions that they have abilities to learn. This implies

that managers should make sure that courses and trainings are easily available. This study has made clear that creative potential and proactivity significantly contributes to engagement in the idea generation process. It is therefore necessary for a manager to hire new employees which do have creative potential and are proactive. The opposite is the case for gritty people. Interesting to see is that age was not found as a significant factor in the model. A big misconception has been taken away as age is not found as a significant factor. With new knowledge found in this study new-hiring processes, coaching and training of employees and human-resource-strategies can be optimized. Creativity is a complex construct, but it is a necessary competency for surviving the 21st century (Amabile, 1988; Woodman, Sawyer & Griffen, 1993).

CONCLUSIONS

In short, creativity is a complex construct that must be carefully assessed in order to create a true and accurate composite of an individual's creative capacity (cf. Woodman & Schoenfeldt, 1989; Feldhusen & Goh, 1995). Previous research demonstrated the relationship between engagement in the creative process step 'idea generation' and creative outcomes (Amabile, 1996). Our research defined, validated and generated a model that explains the relationship between several factors and idea generation. Employees who are very proactive, and who have the creative potential and have learning possibilities engage significantly more in the process of generating new ideas. For grit the opposite was found, grit does not support engagement in the process of generating new ideas.

IMPLICATIONS

In this research we did not find a relation between age and the level of engagement in the creative process. In our literature review we found two directions of conclusions when we look at the relationship between aging and creativity (Simonton, 2000). With the results found in this research this question still remains open. The reason that there is no significant relation could be company specific. If engagement in the creative process drops decreases during the life-span but is compensated with specific company HR-policy, no decrease would be seen in the results. For this reason it would be interesting for future research to do the same research in several other companies in The Netherlands, or to repeat this research in the same company including more factors (eg. hr-policy). Kooij (2010) gave a view on the possibility to measure age in several ways. Not only chronological but to measure it functional or performance-based, psychological or subjective, organizational and according to the life-span concept of age. Our research could be performed again with a different measurement of age. This to answer the question, does age influence engagement in creative processes? The topic is important for The Netherlands in the near future because of the aging workforce and secondly because results in the past were not always consistent (Simonton, 2000).

The research was held in one specific company in the south of The Netherlands, with highly educated employees. The possibility to extrapolate the results to other parts of the world or for employees with another educational level is limited. Engagement in the creative process is a global issue, and further research is necessary (Woodman & Schoenfeldt, 1989; Feldhusen & Goh, 1995). Therefore it would be of great interest to repeat the same research in for example Asia. Or in the same region but at a company with employees who have a lower educational level.

The short grit-S scale is a more efficient way of measuring grit; instead of twelve items the brief grit-S scale contains seven items. The second advantage of a shorter scale is that the results will be more valuable; due to the fact that the management and companies are able to take more specific actions. In this research we used the original full grit-O scale. The aim of this study was not to validate the short grit scale again, but for future research this might be an interesting direction. Grit is a promising factor to predict, for example, achievement in challenging domains. For this reason more research on Grit is necessary.

Learning possibilities was measured with items based on self-perception. The results do not tell anything about the exact number of learning possibilities. Therefore the results in this research cannot be used for comparison with other companies or countries. For future research it would be interesting to investigate learning possibilities more in depth, specifically the kind of learning that can be important. Tierney and Farmer (2002) indicated two sources to increase knowledge; job experience and formal education. Another split is between learning that is domain-specific and learning that is more focused on the improvements of thinking in a defined way. Weisberg (1999) suggests that domain-specific knowledge is important for effective creative functioning. Making a split in the factor learning possibilities could explain further why this is an important factor for generating new ideas. The better we understand the construct behind it, the better management can act on it.

In our results we showed with factor analysis that there is a strong relationship between the variables learning possibilities and creative potential. This is not further investigated in this research, but it is of great interest what the common factor is behind this relationship. An explanation might be found in the selection process of HRM or the management teams. The case in this company could be that new employees will be selected on their creative potential. And secondly it could also be that new employees do get many possibilities to learn. To test this hypothesis further research is necessary. The outcome is of great value for HRM and management teams.

As a last point we want to remark the process aspect of 'idea generation'. The total process which leads to creativity consists of three steps. The other two steps were not taken into account. More research is necessary to validate the sequence of these three steps and the factors that explain success in the several steps or not. With the hints for future research we assume that our current knowledge about creative processes can be increased significantly. This is necessary to increase company competitiveness and beating the market challenges in the future.

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APPENDIX 1: ITEM SCALES

Measure (on a five point Likert-scale)	Cronbach's alpha	Mean	Standard deviation
Creative potential ^a	0.81	4.25	.49
* I have confidence in my ability to solve problems creatively.			
* I have the talent for further developing the ideas of others.			
* I am good at finding creative ways to solve problems.			
* I feel comfortable trying out new ideas.			
* I have the talent and skills to do well in my work.			
* I have confidence in my ability to solve problems creatively.			
Proactive personality ^b	.71	3.73	.56
* I am constantly on the lookout for new ways to improve my life.			
* If I see something I do not like, I fix it.			
* I love being a champion for my ideas, even against others' opposition.			
* I excel at identifying opportunities.			
Learning possibilities ^c	.81	3.85	.72
* I learn new things in my work.			
* My job offers me possibilities for personal growth and development.			
* My job gives me the feeling that I can achieve something with it.			

Grit ^d			
* I have overcome setbacks to conquer an important challenge.	.68	2.58	.33
* New ideas and projects sometimes distract me from previous ones. (R)			
* My interests change from year to year. (R)			
* Setbacks do not discourage me.			
* I have been obsessed with a certain idea or project for a short time but later lost interest. (R)			
* I am a hard worker.			
* I often set a goal but later choose to pursue a different one. (R)			
* I have difficulty maintaining my focus on projects that take more than a few months to complete. (R)			
* I finish whatever I begin.			
* I have achieved a goal that took years of work.			
* I become interested in new pursuits every few months. (R)			
* I am diligent.			
Idea generation ^e	.81	3.59	.62
* I consider diverse sources of information in generating new ideas.			
* I look for connections with solutions used in seeming diverse areas.			
* I generate a significant number of alternatives to the same problem before I choose the final solution.			
* I try to devise potential solutions that move away from established ways of doing things.			
* I spend considerable time shifting through information that helps to generate new ideas.			

Notes:

^a Diliello and Houghton (2008)

^b based on Bertolino, Truxillo and Fraccaroli (2011)

^c based on Van Veldhoven, Meijman, Broersen & Fortuin
(2002)

^d based on Duckworth, Peterson, Matthews & Kelly (2007)

^e based on Zhang & Bartol (2010)

(R) indicates item was reverse coded



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