Age and Creativity on the workfloor.

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In search of ways to optimize Creativity in the light of an aging workforce

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ABSTRACT

To remain competitive in a context of globalizing competition, companies are increasingly in need of innovation and creativity. However they are faced with an aging workforce, due to rising life expectations and a higher pension age. This study tries to identify factors that can help keeping creativity of employees on the level, even at a more advanced age. To find these factors it looks at two important causes of change in people who age: deterioration of fluid intelligence and changes in motivation. After examination of previous research, five possible factors were identified: Support for creativity of coworkers and of superiors, Job Control, a Learning Orientation, and useful Job Experience. A survey was held in the Belgian Ministry of Finance. 154 collaborators scored themselves on the five factors that were identified and their supervisors scored them on their creativity. After carrying out simple as well as hierarchical regression analyses, no significant relation was found between the five chosen factors and the creativity of the employees. There was also no moderation by the five factors on the relation between age and creativity. When splitting up the participants in a male and a female group two, contrary, significant relations were discovered for the female and the male group: for the female group coworker support had a positive influence on creativity, and for the male group it had a negative influence. An important remark to make is that the “age” and “useful Job experience” variables were very skewed.
1. INTRODUCTION
  1.1. Reasons for the study and hypotheses.

Creativity has been defined as “the generation of new and useful products, practices, services or procedures”. Research in the area of management is focused on creativity as a behavior in the workplace that can take place each day (Amabile, 1996; Shalley et al., 2004). Creativity is much needed: innovation is becoming increasingly important in a globalizing World. To remain competitive in the global market, organizations must continuously develop and innovate high quality products and services, and renew their way of operating. At the heart of all innovation lie creative ideas, and it is individual employees who, alone or in groups, generate, promote, discuss, modify and realize these ideas (Scott & Bruce, 1994).

With pension ages and life expectancy rising in many countries, an additional challenge for businesses is presented by the aging work population. While older people do not always perform worse (e.g. McEvoy & Cascio, 1989 and Waldman and Avolio, 1986) a number of performance problems become more prominent and more frequent with age. With this study I hope to identify some factors that have an influence on the creativity of people when they get older. This can be of importance to help fighting prejudices on the lack of creativity of workers of a certain age or to help to identify measures that have to be taken to optimize creativity within the elder working population.

The most important changes in people, concerning their work behavior, that come with advancing age, are changes in cognitive abilities and changes in motivation (Kanfer and Ackerman, 2004).

Concerning the age-related changes in cognitive abilities, Kanfer and Ackerman (2004) identify two broad kinds of cognitive abilities: Fluid intellectual abilities (Gf) and Crystallized intellectual abilities (Gc). Fluid intellectual abilities (Gf) are associated with working memory, abstract reasoning, attention, and processing of novel information, while Crystallized intellectual abilities are associated with general knowledge, extent of vocabulary and verbal comprehension. Gf is usually decreasing with age, while Gc is growing, up to the age of 63 years. It follows that older workers will generally perform better in Gc-heavy jobs than in jobs that require many Gf abilities.

Concerning the age-related changes in motivation, recent reviews of worker age and organizationally relevant outcomes suggest that chronological age has an important effect on work motivation (Kanfer & Ackerman, 2004). The motives of older people shift from gaining information to obtaining affective rewards (Kanfer & Ackerman (2004).
Also people’s career motivation diminishes and gets replaced by a will to help, parent and care for the next generation, including younger colleagues (Kanfer & Ackerman, 2004). Warr (1997, 2001) suggests that, as people get older, they increasingly prefer security, salary and skill utilization through late midlife and their interest in job variety, feedback, and provision of external goal assignments diminishes. The possibility to achieve more positive affective events, for instance by coaching others, or to construct a strengthened sense of identity could compensate for this loss of motivation and keep the motivation of older people up to the mark (Kanfer & Ackerman, 2004).

With age bringing a loss in Gf but a gain in Gc, and with age affecting the motivation of people, it is likely that age also affects the creative potential of employees. An influence seems likely because the changes that occur in the cognitive abilities and motivation of older workers.

Studies on the relationship between age and creativity are rare, and most of them found no relationship between creativity and age (Binnewies, Ohly and Niessen, 2008). A meta-analytic study by Eder and Sawyer (2007) revealed there was no direct relationship between creativity and age. However, according to Eder and Sawyer, the great variability found in studies that examined the relation between age and creativity shows there is a need for research that would reveal the existence of certain moderators of that relationship.

As already mentioned, the main aim of this study is to identify some of the factors that might be regulating or moderating the relationship between age and creativity, or that might help keeping creativity high at all ages, and thus also when people age. Insight into such factors might help to nurture employee creativity in spite of changes that occur when people age, or perhaps to refute existing prejudices concerning the creativity of older people.

Among the factors that could be moderating the relationship between age and creativity, job resources might have their place. Binnewies, Ohly and Niessen (2008) already found Job Control and support for creativity to be factors that regulate the relationship between age and creativity. In their study creativity was measured by asking participants to report and describe an idea they had at work. The idea was then rated by three experts. In the present study I test the same factors again, in another context and with another scoring of creativity. This time creativity is rated by asking supervisors to rate the creativity of their subordinates. Therefore it is more a general behavior of subordinates that is measured while in the study of Binnewies, Ohly and Niessen it was one idea of a person that was being evaluated. Also, for reasons explained further, I chose to split up support in support from supervisors and support from colleagues.
Since I identified changes in cognitive abilities and changes in motivation as important changes concerning the work behavior of aging people, I looked for motivational and cognitive elements to identify other possible moderators or regulators of the relationship between age and creativity, and other factors that could keep creativity on level with older people.

Concerning the motivational aspect, an important element I thought could contribute to maintain creativity in spite of the age-related changes, is the goal orientation of an individual. As I will show, the goal orientation of an employee is important for his creativity and is also possibly influenced by the age of the individual.

Concerning the changing cognitive abilities, since Gf and Gc capacities are changing with age and seem clearly important for people’s competence (including their creativity) at work, I added the Gc capacities as a factor that might be regulating the age-creativity relation. A lot of research has established that Gf declines over the life course (Kanfer and Ackerman, 2004). Motivational elements could compensate for that, so that work performance, and creativity do not deteriorate. But it seems also reasonable to assume that maybe Gc, that grows with age (Kanfer and Ackerman, 2004), could help compensate for the loss of Gf, and help to optimize creativity in middle-aged and older workers. Shalley and Gilson (2004, p.36), where they claim that having depth and breadth of knowledge has been linked to creativity, certainly point in that direction.

Due to the restricted time available for the participants to fill in the survey, I was unable to test Gf, so I chose to examine Gc, which I tried to estimate by “years of experience” (see further), as a possible moderator of the relation between age and creativity.

The overall aim of this research is to examine whether and how age is related to creativity, and what factors may hinder or facilitate that relationship. This study contributes to the JDR model, which specifies that job resources can buffer the negative impact of job demands on outcomes. In my study I investigate which resources may buffer the alleged negative relationship between age and creativity. The overarching research aim is to investigate ways to buffer or strengthen the creativity of older workers. Figure 1 summarizes the hypothesized relationships. In short, I investigate several factors that influence the relationship between age and creativity. I assume a high level of job control, support from colleagues and supervisors, and a Learning orientation are beneficial for creativity in all age groups, but I think that these job resources might be particularly helpful for maintaining the creativity of older workers. I also assume Gc to be a moderator of the relation between age and Creativity, for it helps lessening the negative consequences of the decline of Gf with age.

1.2. Design of the study
The hypothesized relationships were tested on the basis of data gathered from the Belgian Ministry of Finance by means of a survey, whereby subordinates were questioned about their job control, the social support they received, and their Learning Orientation and job experience, and their supervisors were questioned about the creativity of their subordinates. I was able to use data from 155 employees. I received 371 answers from subordinates, but only 75 supervisors rated the creativity of 155 employees.
2. THEORETICAL BACKGROUND AND HYPOTHESES.

2.1. Creativity

The definition of creativity that will be adopted for this study is the one of Amabile (1988). For Amabile the production of new and useful ideas was the definition of creativity (Amabile, 1988). Therefore both novelty and usefulness are necessary conditions for an idea to be considered creative. Ideas must be different from other ideas already used in the organization (Shalley et al, 2004) and they should be, directly or indirectly, valuable to that organization, be it in the near future, or in a distant future (Shalley et al, 2004).
It is a very important element for organizations that have to be flexible in an evolving world with shifting environmental conditions.

There is a difference between individual creativity, and innovation by an organization. The former involves the idea generation stage, whereas the latter includes both the idea generation stage and the implementation stage (Amabile, 1988).

According to Shalley and Gilson (2004, p.36) skills such as problem finding, problem construction, combination and idea evaluation are important for creativity, but, at the individual level, having depth and breadth of knowledge also has been linked to creativity.

While in a study that bears some resemblance to mine (Binnewies, Ohly and Niessen, 2008) the quality of creative ideas was examined, I have chosen to examine the creative output in a more general way, focusing somewhat more on the quantity of ideas. So I chose to use a questionnaire already used by Tierney et al (1999). It is a questionnaire that has been used (with minor variations) regularly in past research.

2.2. Job resources and creativity.

According to two meta-analyses, age and performance are not correlated (McEvoy & Cascio, 1989; Waldman and Avolio, 1986). However, job performance is a much broader concept than creative performance. In the studies mentioned here, creativity was incorporated in the performance measure. Also, meta-analytic research found age to be unrelated to creativity (Eder and Sawyer, 2007). Although uncorrelated in general, the wide variations, found in research, in the relationship between age and performance and between age and creativity suggest that the relationship is moderated by certain conditions (Binnewies, Ohly and Niessen, 2008).

Contextual factors, and especially job resources, have been found to influence performance and creativity (Eder and Sawyer, 2007).

Bakker and Demerouti (2008) suggest a connection between job and personal resources and job demands on the one hand, and job engagement and performance, including creativity, on the other hand. Their reasoning is that job resources (such as social support from colleagues and supervisors, performance feedback, skill variety and autonomy) and personal resources (such as optimism, self-efficacy, resilience,...) can buffer the negative impact of job demands on outcomes, because they augment
motivation which leads to work engagement which in its turn leads to higher performance, including higher creativity.

Previous research thus showed that job control, and support from co-workers and superiors, could benefit creativity, but as we will see these factors could also moderate the relationship between age and creativity.

2.3. Co-workers support and supervisory support: influence on creativity

Having access to many job resources seemS to support creativity, but I chose to take as subject of my tests two job resources of which the combined (meaning: the two taken together as “support”) influence on the relationship between age and creativity has been examined by Binnewies, Ohly and Niessen (2008): co-workers’ support and supervisory support.

Co- workers’ support and helping, especially support for creativity, which refers to the extent to which coworkers and supervisors (see further) encourage employees to develop and refine creative ideas (Binnewies, Ohly & Niessen, 2008) is positively associated with creativity (Zhou & George, 2001). Perceived work group support is also positively related to creativity (Di Liello, 2008; Diliello, Houghton & Dawley, 2011). Not only should receiving support for creativity raise employees’ motivation to develop creative ideas, but receiving supportive feedback also involves sharing knowledge, expertise and resources with others which directly facilitates the development of creative ideas (Binnewies et al., 2008). Amabile et al (1996) found comfortable, frequent communication to be good for creativity. Though not all studies confirm the positive influence of group support, Shalley and Gibson (2004) conclude that, as for contact with other employees, whether individuals are asked to collaborate, or merely come in contact with others, these kinds of interaction can have a significant positive effect on creativity. Perry-Smith (2006) states that weak ties are generally beneficial for creativity and that the number of weak ties is more strongly associated with creativity than the number of strong ties. Fleming et al (2007), state that trust facilitates positive affect, learning and risk taking, all considered to be crucial components of creativity, but cohesive social structure might increase the possibility of groupthink, so that people will generate fewer new ideas. Therefore according to the last mentioned two sources the influence of co-workers’ support which mostly includes stronger ties and a cohesive social structure might lead to less creativity. Thus up to now research isn’t conclusive on whether support for creativity from co-workers is beneficial for creativity or not but it
seems safe to say more arguments have been found suggesting a positive relationship between co-worker support and creativity.

The influence of supervisory support on creativity is also not totally clear. Yang and Wang (2010) state that conscientious people are more creative with less supervisory support, and people with openness to experience are only creative with high supervisory support.

Shalley and Gilson (2004) give an overview of studies that state supervisory support is an important positive factor for creativity: Andrew & Farris (1967) found that scientists’ creativity was higher when managers listened to their concern and asked for their input concerning decisions affecting them. Andrews & Gordon (1970) found that negative feedback from leaders inhibited scientists’ creativity. More studies are cited by Shalley and Gilson (2004). Constructive feedback seems to help intrinsic motivation and creativity. Gruman and Sacks state that supervisory coaching and support are good for employee engagement. Diliello, Houghton and Dawley (2011) also claim that perceived supervisor support has a positive influence on creativity, as do Amabile et al (1996), who state that, with open supervisory actions and perceived supervisory support, people are less likely to experience the fear of negative criticism that can undermine the intrinsic motivation necessary for creativity. Gruman and Sacks (2011) state that supervisory coaching and support have been shown to be positively related to employee engagement.

Although studies aren’t totally clear on the issues, which makes further research useful, it seems safe, in the light of the previously mentioned research, to put forward the two following hypotheses:

**H1:** *The relationship between co-worker support and creativity will be positive.*

**H2:** *The relationship between support from supervisors and creativity will be positive.*

### 2.4. Co-workers’ support and supervisory support: possibly moderating between age and creativity

Self-efficacy augments creativity as it motivates people (Tierney & Farmer (2002); Gong, Huang and Fare (2009)). Since older people suffer from negative age stereotypes, they should have a lower self-efficacy regarding their creativity at work (Binnewies, Ohly and Niessen, 2008). Social support from co-workers and supervisors might help to overcome
this and strengthen self-efficacy. Support for creativity from their colleagues and supervisors strengthens the belief people have in their being able to develop creative solutions and in the belief they have their creative solutions are valuable (Baer and Frese, 2003). Support for creativity from supervisors can help create self-efficacy concerning creativity (Tierney and Farmer, 2002).

Also older people tend to be less outgoing, and less open to new situations (Kanfer & Ackerman, 2004). Therefore, support from colleagues might help them surpass this and thus raise their creativity. When people at work consult one another about problems and creative solutions, older people might get attributed a sort of “expert” status, due to their knowledge and expertise they acquired in their long career (Quinones et al, 1995).

In addition, generativity motives, which put collaboration and sharing information in the first place, are becoming more important with age (Kanfer & Ackerman, 2004). Therefore support of co-workers should enable older employees to fulfill their generativity motives, through contact with co-workers.

Also there is a danger that a long working experience, which comes mostly when people age, leads to routines, habitual behaviors and a preference for doing the job in a conventional, familiar way (Feltovich et al., 1997, Ford and Gioia, 2000, Gilson and Shalley, 2004). Support from co-workers for creativity should help overcome this, and lack of support from co-workers could strengthen the tendency older workers have to do things habitually.

All these findings suggest support from co-workers and supervisors for creativity is extra helpful for the creativity of the work of aging people. Furthermore a lack of support from co-workers and supervisors appeared to be related to exhaustion, with older workers (Peeters & Van Emmerik, 2008).

As I already mentioned, the joint influence of social support from both co-workers and supervisors on the relation between age and creativity has already been tested by Binnewies, Ohly and Niessen (2008). However, I propose to examine the influence of social support from co-workers and from supervisors separately. Another test might affirm or deny the findings of Binnewies, Ohly and Niessen, which suggested a moderating role of age on the relation between social support from co-workers and creativity. When I examine the influence of co-workers and that of supervisors separately, I might complement the findings of Binnewies, Ohly and Niessen, who did not specify which factor had the most influence. For a managing purpose it is interesting to find out to what extent each factor contributes. Hence I chose two hypotheses to find out whether the conclusion of Binnewies, Ohly and Niessen about the positive influence of “support” (of co-workers AND supervisors) on the relationship between age
and creativity is due to support from co-workers (in favor of which we could find many arguments) alone, or perhaps to support from co-workers and supervisors, or maybe to support from supervisors alone.

**H3:** The relationship between age and creativity will be moderated by support from co-workers. It will be positive when support from co-workers is high, and negative when support from co-workers is low.

**H4:** The relationship between age and creativity will be moderated by support from supervisors. It will be positive when support from supervisors is high, and negative when support from supervisors is low.

### 2.5. Job control: influence on creativity

Another Job Resource that is supposed to promote creativity is Job control. Job control describes how much control a person has on the sequence, time frame, and content of the tasks that have to be fulfilled at work (Jackson et al., 1993; Parker and Wall, 1998).

Job control allows people to experiment and to develop their creativity at work (Frese et al., 1999, Ohly et al., 2006). When job control is high, this causes people to develop more creative ideas and thus to solve problems at work and to make their work better. Job control also seems to augment motivation (Hackman and Oldham, 1976) and hence should have a positive influence on creativity at work (Amabile, 1988).

Employees experience Job control in itself as positive. Therefore they get more energy and this supports their work-related behavior (Saavedra and Kwun, 2000). Positive affect is also augmented when job control is high, (Saavedra and Kwun, 2000) and it has been shown to be positively related to the creative solving of problems (Ashby et al, 1999; Isen et al., 1987).

Shalley and Gilson (2004, p. 37-38) found, in a meta-analysis, that “research suggests that for idea exploration and creativity, employees need to feel that they have some autonomy over either how their time is allocated, or in the determination of how their work is to be done”.

In “Managing for creativity” (1996) Amabile states that “freedom what to do, how to do” is among the environmental factors that lead to creativity, but in “How to kill
creativity” (1998), she cites (as a means to kill creativity) “autonomy concerning the means, but not the ends”.

However, although some studies clearly demonstrated that job control is positively related to employee creativity (Ohly et al., 2006, Shally et al., 2004) and even meta-analysis confirmed the positive relationship between job control and employee creativity (Eder and Sawyer, 2007; Harrison et al., 2006), Binnewies, Ohly and Niessen (2008) concluded job control and creativity were in fact unrelated. Zhou (1998) did not find a positive influence of task autonomy on creativity either.

In conclusion, although there seems to be much evidence that Job-control is positively related to creativity, additional research is not obsolete. Since there seem to be far more studies that imply a positive influence of Job control on creativity than the few that suggest a negative influence, I propose there is in fact a positive influence.

**H5: The relationship between Job control and Creativity will be positive.**

### 2.6. Job control: possible moderating effect between age and creativity

Zacher and Frese (2009) state that job control diminishes the disadvantages of age at work. This is because job control is positively related to remaining opportunities and moderates the relationship between age and remaining opportunities in such a way that the relationship becomes weaker with increasing levels of job control. Summarized, they found people with more job control see more opportunities as they age, and see less limitations in the future. Since focus on opportunities enhances work performance (Zacher, e.a., 2011), it is possible that the relationship between age and creativity is strengthened when people have more job control.

Being granted a high level of job control may also indicate to the employee that he is capable of finding the best solution to perform his job, and thus augment his self-confidence. This should matter especially for older employees, for they suffer from negative age stereotypes: older employees are thought to be less able to fulfill their tasks and less effective in solving problems in a creative way (Binnewies, Ohly and Niessen, 2008).

Also job control should be more beneficial to older people because, with their greater knowledge and experience, they have an advantage in deciding how to accomplish the task (Binnewies, Ohly and Niessen, 2008).
Binnewies, Ohly & Niessen (2008) found that age and creativity were positively related when job control was high, and negatively related when job control was low. Their conclusions however were not that clear: it seemed young employees showed much more creativity under conditions of low job control, while the difference in creativity under conditions of high or of low job control among elder employees was rather small. So they certainly recommended additional research. This study might contribute to that additional research in trying to establish in a other working context, and with a different assessment of creativity (Binnewies, Ohly and Niessen let a team of experts judge the creativity of one idea, while I worked, to judge creativity, with a questionnaire that assessed the creative behavior in general) whether their findings could be reproduced.

H6: When job control is low age and creativity will be negatively related, and when job control is high, age and creativity will be positively related.

2.7. Learning orientation of an individual and creativity.

Mostly psychologists have identified two different underlying goals of people in achievement situations (Sujan, Weitz & Kumar, 1994). When they have a learning goal orientation people in the first place want to improve their abilities and master the tasks they must perform. When a task is approached from a learning goal orientation, individuals strive to understand something new or to increase their level of competence in a given activity (Button, Mathieu & Zajac, 1996). A learning goal orientation is also very similar to a mastery orientation (Janssen & Van Yperen, 2004). A performance goal orientation makes people strive for a positive evaluation of their performance from important others (Sujan, Weitz & Kumar, 1994). In a performance goal attitude, people want to demonstrate their competence through task performance or they want to avoid negative judgments of their competence (Button, Mathieu & Zajac, 1996).

A Learning goal orientation is not inherent to an individual. It can be influenced by the characteristics of the situation. Supervisors’ end result orientations and capability have a positive influence on the Learning Goal Orientations of salespersons (Chughtai and Buckley, 2011). All four dimensions of transformational leadership and employees’ Learning Goal Orientation have a positive relation. Also high identification with the organization is positive for Learning Goal Orientation. Positive and negative evaluation feedback raises salespeople’s Learning Goal Orientation (Sujan, Weitz and Kumar, 1994).

Gong, Huang & Farh (2009) found an employee learning goal orientation to be positively related to creativity. They chose employee learning orientation as a predictor of
employee creativity, because it is related to actions intended to improve an individual’s competence and hence leads to learning and learning has been linked to creativity. Weisberg (1999) stated that learning is essential for creativity. Leung, Chen and Chen (2013) state Learning goal orientation is a consistent predictor of creativity.

H7: Learning Goal Orientation is positively related to creativity.

2.8. Age and creativity, and Learning goal orientation

As people grow older and gain additional life experience they may become more concerned with their self-expectations and less concerned with the expectations of others (Button et al., 1996). This should diminish the Performance goal orientation of elder people. Maurer (2001) states that older people might show a decline in self-confidence (or self-efficacy) for career relevant learning and skill development. Consequently, and in contrast to the findings of Button, et al., one might expect a lower learning goal orientation with older people.

Maurer (2010) finds that literature suggests that older workers may be less oriented to learning and development. He also states older workers may experience a decline in training performance with age and moreover show lower learning-relevant abilities.

Therefore, in light of contradictory findings it would be interesting to examine whether a learning orientation is a moderator between age and creativity.

H8: Learning Goal Orientation positively moderates the relationship between age and creativity.

2.9. Gf, Gc, and creativity.

Kanfer & Ackerman (2004) assert that cognitive abilities can be divided in two broad categories: Fluid Intelligence (Gf) and Crystallized intelligence (Gc). Gf is mostly associated with working memory, abstract reasoning, attention and processing of novel information (Kanfer & Ackerman, 2004). It has also been described as the ability to solve new problems (Cattell, 1971, 1977), therefore the link between Gf and creativity seems clear.
Gc is mostly associated with general knowledge, extent of vocabulary, and verbal comprehension. Cattell (1971, 1987) describes it as knowledge and developed skills.

Although Gf is generally well encapsulated and represented in tests of general mental ability, Gc actually represents an extremely wide range of domain knowledge and is less well represented in standard intelligence tests (Ackerman, 1996).

Cameron Ford (1996) clearly sees a relation between Gc and creativity:

“A person’s prior knowledge of a domain is critical to creative performance (Amabile, 1983), and it has been noted as a prerequisite to creative action in a domain (Amabile, 1988; Simon, 1986).

Prior learning, especially when it produces diverse knowledge, improves an individual’s ability to acquire new knowledge and to utilize that knowledge in creative ways (Cohen & Levinthal, 1990). However, expertise that is too narrowly focused and highly organized also can facilitate habitual behavior (Simonton, 1983).”

When abilities are showing progress, for example when people have learned, people’s perceived effort-performance function will augment and this will enforce their engagement (Kanfer & Ackerman, 2004). Since engagement is related to creativity, it seems reasonable to suppose that growing Gc will augment creativity.

Gc is very much correlated with “knowledge” (Kanfer & Ackerman, 2004). Schmidt, Hunter & Outerbridge (1986) found a positive relationship between job experience and job knowledge. According to Mumford and Gustavson (1988) knowledge plays a key role in creative achievement.

Although studies almost exclusively point in the direction of a positive influence of Gc on Creativity, Simonton (1983), cited by Ford (1996, see higher), suggests it could facilitate habitual behavior, which could be expected to diminish creativity.

Thus additional research is not obsolete.

In light of the fact that the vast majority of the previous studies on the subject point in the direction of a positive relationship between Gc and creativity, my next Hypothesis is as follows (as I will explain under 2.10 .Gc, age and creativity, I replaced Gc by “Job Experience”, which I consider to be a fair estimate for Gc):

**H9: Job Experience is positively related to creativity.**

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2.10. Gc, age, and creativity.
Aging is often associated with general decline in cognitive and intellectual abilities. However, a closer look revealed to many researchers that the picture of general decline is incorrect.

What showed a definite decline was particularly Fluid intelligence (Gf). Crystallized intellectual capacities (Gc) seemed to be growing well into middle age and beyond.

Kanfer and Ackerman (2004) posit that an individual’s level of engagement in an activity depends on his perceptions of three functions: the “perceived” effort-performance function, the performance-utility function and the effort-utility function. Gc and Gf have their primary effect on the perceived effort-performance function: the perceived relationship between the effort people put into a job (dependent on their Gc and Gf capabilities; the more capabilities, the less effort) and the perceived results. This function is also influenced by the demands of the job for Gc or Gf capabilities. So work that involves substantial attentional effort (Gf) and comparatively lower levels of Gc, such as the job of an air traffic controller, places very high demands on Gf and also shows the most diminished performance with age (Sells, Dailey & Pickrel, 1984).

Of course Kanfer and Ackerman only predict that engagement will diminish with age, because of diminishing Gf, but it seems reasonable to state creativity would also diminish, since it is related to engagement (Bakker, 2008). However, since Gf has been exhaustively tested and has shown to diminish with age (Kanfer & Ackerman, 2004), we decided it would not be very useful to test it again.

Gc seems to be augmenting with age (Kanfer and Ackerman, 2004), therefore we might expect it to raise creativity when people get older.

However to test Gc is very difficult. Gc is a concept that refers to general knowledge, verbal comprehension, and Cattell (1971/1987) described it as “knowledge and developed skills”. Apart from the difficulties in testing knowledge (availability of scales?, how much time participants are willing to invest to have their “general knowledge” examined?) it is not clear what kind of knowledge should be tested to predict the influence of Gc on people’s specific jobs. It seems, for instance, clear older engineers have acquired Gc while working on their jobs. They have also acquired Gc while living their lives, reading newspapers and talking to people, etc. But to help them do their jobs efficiently, they need specific Gc for engineering activities. Journalists and lawyers will need Gc of another kind, while ICT persons will need Gc of yet another kind, as well as doctors in medicine, etc. It seems safe to predict that for every job there is a special kind of Gc people need to acquire in order to do the job better when they get older. Perhaps it could be called “useful job experience”.
According to Peter Warr (1994), age and performance could be positively related when all age groups could continuously acquire knowledge and skills. However, he supposed the relationship between age and performance was negative when the tasks at hand demanded a high cognitive ability and when experience could not be of help. Again we see “useful job experience” as a mediator for performance, and one that could help annihilate the negative consequences of diminishing Gf (with age) on performance and therefore probably on creativity.

According to studies the relation between job experience and the level of job knowledge is consistent and positive (Schmidt et al., 1986).

Job experience predicts job specific knowledge, skills and abilities that are specific to the job (Avolio et al, 1990, Quinones et al, 1995).

Therefore I propose, if I want to examine the influence of Gc on the relation between age and creativity, to replace Gc by job experience: as argued above job experience should be a fair estimate for Gc in most cases.

Note that job experience and age are not per definition firmly related. One may assume that if you age, you automatically gain job experience. However, employees can switch jobs when they are middle-aged and thus not have the Gc they need to counter the negative influence of the diminishing Gf. I propose this should have a very negative influence on creativity on the job.

Hence the following proposition:

H10: Job Experience is a moderator of the relationship between age and creativity. When job experience is high the relationship between age and creativity will be positive and when job experience is low, that relationship will be negative.

3. METHODOLOGY

3.1. Setting, participants and procedures

I conducted my research in the Belgian Ministry of Finance, Section Direct Taxes, within the so-called “Control centers”, units that are charged with controlling the tax forms of societies and natural persons that have been selected to undergo a more thorough control.
All collaborators, except for supervisors, of those control centers first received a mail inviting them to participate in a survey. A link to the online survey was attached to the mail. The confidentiality of their responses was explained to those who received the survey and was strictly observed.

About 1350 people were questioned, about 320 of them responded and filled in the survey.

The survey contained questions about the perceived Job Control, the support from co-workers and from supervisors, and also questions to appraise the learning orientation of the participants. Furthermore participants were asked after their age, after the number of years of experience they counted in the function they occupied at the time of the survey and after their other relevant experience.

In a second phase all supervisors of the subordinates who had responded were invited to score those subordinates on their creativity. They received a list of the subordinates who had responded, but of course nothing about what the subordinates had answered was revealed. The supervisors filled in the name of the participants-subordinates and scored them on their creativity.

Because not all supervisors filled in the survey, only 155 of the approximately 320 answers given by subordinates were useful. When a subordinate had filled in the survey, but his supervisor failed to score his creativity, the answer of the subordinate could not be used.

3.2. Measures

3.2.1. Work control.

I used the 22 – item work control scale from Dwyer and Ganster (1991). Smith, Tisak, e.a. (1997) mentioned this scale contains a 17-item perceived control scale and a 5-item predictability scale. Participants can express their agreement with the items on a Likert scale that ranges from 1 = “totally agreed” to 7 “not at all agreed”. The scale items are given in appendix A.

3.2.2. Social support from co-workers for creativity
I used the 3 items cited by Madjar et al. (2002) to measure social support from co-workers for creativity. The items were rated on a (1) “totally agree” to a (7) “totally disagree” scale. The scale items are given in appendix B.

### 3.2.3. Social support from supervisors for creativity.

I used the 3 items cited by Madjar et al. (2002) to measure social support from supervisors for creativity. The items were rated on a (1) “totally agree” to a (7) “totally disagree” scale. The scale items are given in appendix C.

### 3.2.4. Learning Orientation

Learning orientation was assessed with 8 items developed by Button et al. (1996). The items were rated on a (1) “totally agree” to a (7) “totally disagree” scale. Strong agreement with these items indicates a strong desire to perform challenging work, learn new skills, and develop alternative strategies when working on a difficult task (i.e., a strong learning goal orientation). Low agreement suggests little concern for mastering tasks or gaining competency (Button et al., 1996). The scale items are given in appendix D.

### 3.2.5. Creativity

Creativity was measured by questioning the supervisors. Tierney et al. (1999) measured creativity the same way and we used the nine items they used. One item was however left out of the survey, because management found it “not suitable”: “Served as a good role model for creativity”. As Tierney et al. (1999) did, a six point scale was used, with possible answers from “totally agree” (1) to “totally disagree” (6). The scale items are given in appendix E.

### 3.2.6. Age, Useful experience
The age of the participants was found in the information available at the Ministry of Finance.

To measure their experience two questions were asked:

- How many years of experience do you have in a function that is, with relation to the content, similar or exactly the same, as the function you occupy now?
- How many years of experience do you have in your current function?

Job experience predicts job specific knowledge, skills and abilities that are specific to the job (Avolio et al, 1990, Quinones et al, 1995). Hence, I considered job experience to be a fair estimate of useful knowledge that had been built up for that particular function (useful knowledge I considered having a similar influence as Gc). I used the answer to the first question as a proxy for Gc.

### 3.3. The respondents

Some characteristics of the people that responded to our survey are summarized in table 1

#### TABLE 1:

**Some characteristics of the respondents**

<table>
<thead>
<tr>
<th>Characterization of the respondents (n = 154)</th>
<th>% of sample</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total experience in same job or related work field:</strong></td>
<td></td>
</tr>
<tr>
<td>40 years or more</td>
<td>3</td>
</tr>
<tr>
<td>30 - 39 years</td>
<td>29</td>
</tr>
<tr>
<td>20 - 30 years</td>
<td>34</td>
</tr>
<tr>
<td>10 - 19 years</td>
<td>26</td>
</tr>
<tr>
<td>0 – 9 years</td>
<td>8</td>
</tr>
<tr>
<td><strong>Age in years</strong></td>
<td></td>
</tr>
<tr>
<td>60 - 69</td>
<td>14</td>
</tr>
<tr>
<td>50 – 59</td>
<td>45</td>
</tr>
<tr>
<td>40 – 49</td>
<td>34</td>
</tr>
<tr>
<td>30 – 39</td>
<td>5</td>
</tr>
<tr>
<td>20 – 29</td>
<td>2</td>
</tr>
</tbody>
</table>
The vast majority (93%) of the respondents is older than 39 years, which accounts for a skewed variable “age”. This is regrettable, since it is precisely the effect of augmenting age on creativity that I wanted to measure. Also there are few respondents with an job experience of 0-9 years. Hence the variable “Total Experience”, which I used as a substitute for Gc, is also skewed. Since I defined Gc in a work context as useful experience which a person builds up and allows him to do his job better, it is clear that after 9 years of experience the difference in useful experience built up with adding further years on that job will be much smaller than for the first nine years. If you want to measure the influence of useful experience on the relationship between age and creativity, it would be better if you had a lot of participants in the 0-9 years category, where the difference in useful experience built up is, intuitively, more important. For some considerations on the implications I refer to point 5.d.: Limitations and directions for further research.
4. **RESULTS**

4.1. **Descriptive statistics and correlations**

Table 2 provides descriptive statistics and correlations between study variables. There was no significant correlation between creativity and any of the control variables I put forward in my model. As a control variable I included gender, but not educational level, since the educational level for the participants did not vary a lot: most people with a higher education were supervisors.

**TABLE 2**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>SD</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Total work experience</td>
<td>25.47</td>
<td>11.48</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Social Support Co-workers</td>
<td>3.31</td>
<td>1.29</td>
<td>0.23**</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Social support supervisors</td>
<td>3.44</td>
<td>1.58</td>
<td>-0.07</td>
<td>0.47**</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Learning Orientation</td>
<td>2.61</td>
<td>1.43</td>
<td>0.04</td>
<td>0.36**</td>
<td>0.38**</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Job Control</td>
<td>2.86</td>
<td>0.51</td>
<td>0.01</td>
<td>-0.16*</td>
<td>-0.28**</td>
<td>-0.13</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Age</td>
<td>50.82</td>
<td>8.02</td>
<td>0.52**</td>
<td>-0.16*</td>
<td>-0.07</td>
<td>-0.01</td>
<td>-0.02</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>7. Creativity</td>
<td>3.60</td>
<td>1.27</td>
<td>-0.02</td>
<td>-0.04</td>
<td>0.05</td>
<td>0.04</td>
<td>0.08</td>
<td>0.05</td>
<td>1.00</td>
</tr>
</tbody>
</table>

*p<0.05; ** p<0.01

Age was significantly correlated with “Social support from co-workers for creativity”, but not with other variables with the exception, of course, of “total work experience”.

When male and female participants were grouped the groups provided similar results: the differences on significance were:

- The significance of the correlation between Job Control an Social Support Co-Workers and Supervisors was only present in the male group.
• Within both the male and the female group there was significance of the correlation between Creativity and Social support from Co-workers. That correlation was negative for men (-0.26) and positive for women (0.24). This means hypothesis 1 was confirmed within the female group.

4.2. Hierarchical regression analysis

I tested my other hypotheses by means of hierarchical regression analysis. First I entered age and the variables I assumed had an influence on the relationship between age and creativity.

Table 3 shows the results of the analysis. None of the $\beta$ of the variables proved significant by far. The lowest p-value was 0.23, for job-control. Thus H1, H2, H5, H7, and H9 were not confirmed: The supposed relationships between co-worker support, support from supervisors, Job Control, Learning Goal Orientation, Job Experience and Creativity were not confirmed by far.

Other aspects of the analysis can be seen in Table 3, as well as the influence of adding interaction terms. None of the coefficients were significant, and adding the interaction terms did not help explaining the variance, or only very marginally. Hence, I did not find confirmation of the hypotheses in the data set.

Hypothesis 3 predicted that support from co-workers would moderate the relationship between age and creativity. However, adding the product term social support coworkers $\times$ age did not augment the fit of the model.

Hypothesis 4 predicted that the relationship between age and creativity would be moderated by support from supervisors. However, this was also not confirmed by adding the product term social support supervisors $\times$ age.

Hypothesis 6 predicted Job control would be a moderator of the relation between age and creativity, but again this hypothesis was not confirmed. When adding the product term age $\times$ job-control no coefficient became significant, and the variance for rated creativity did not change (see Table 4, step 3).

Lastly, hypothesis 10 predicted that job experience would be a moderator between age and creativity. Adding the product term age $\times$ total experience to the regression (step 4, Table 4) showed that the supposed relation was not confirmed.

To summarize none of my hypotheses were confirmed.
<table>
<thead>
<tr>
<th>Step 1</th>
<th>Combined experience</th>
<th>Beta</th>
<th>Δ R²</th>
<th>R²</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>-0,01</td>
<td>0,024</td>
<td>0,614</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Social support co-workers</td>
<td>-0,09</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Social support supervisors</td>
<td>0,08</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Learning orientation</td>
<td>0,05</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Job control</td>
<td>0,26</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Age</td>
<td>0,01</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Step 2</th>
<th>Combined experience</th>
<th>Beta</th>
<th>Δ R²</th>
<th>R²</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>-0,01</td>
<td>0,004</td>
<td>0,028</td>
<td>0,527</td>
</tr>
<tr>
<td></td>
<td>Social support co-workers</td>
<td>0,12</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Social support supervisors</td>
<td>0,25</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Learning orientation</td>
<td>0,05</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Job control</td>
<td>0,24</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Age</td>
<td>0,04</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Social support co-workers x age</td>
<td>-0,00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Social support supervisor x age</td>
<td>-0,00</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Step 3</th>
<th>Combined experience</th>
<th>Beta</th>
<th>Δ R²</th>
<th>R²</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>-0,01</td>
<td>0,000</td>
<td>0,028</td>
<td>0,466</td>
</tr>
<tr>
<td></td>
<td>Social support co-workers</td>
<td>0,12</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Social support supervisors</td>
<td>0,26</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Learning orientation</td>
<td>0,04</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Job control</td>
<td>0,32</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Age</td>
<td>0,46</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Social support co-workers x age</td>
<td>-0,00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Social support supervisor x age</td>
<td>-0,00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Job control x age</td>
<td>-0,00</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### 4.3. Hierarchical regression analysis with one variable at the time

I also did regressions to test the influence of one variable (Support Co-workers, Support Supervisors, Job Control, Learning Goal Orientation, an total Job Experience) at the time on creativity, followed, for each variable, with a test whereby, alongside the variable itself, a second variable consisting of the product of that variable with age, was added. However, when adding the product terms no coefficient became significant and the variance for rated creativity didn’t change, or only very marginally (see Table 4).

<table>
<thead>
<tr>
<th>Step 4</th>
<th>Combined experience</th>
<th>0.01</th>
<th>0.001</th>
<th>0.029</th>
<th>0.433</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Social support co-workers</td>
<td>0.17</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Social support supervisors</td>
<td>0.18</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Learning orientation</td>
<td>0.04</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Job control</td>
<td>0.22</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Age</td>
<td>0.05</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Social support co-workers x age</td>
<td>-0.01</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Social support supervisor x age</td>
<td>-0.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Job control x age</td>
<td>0.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total Experience x age</td>
<td>-0.00</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In every case p > 0.05, by far.
### TABLE 4

Hierarchical regression analysis with one variable at the time, predicting idea creativity

<table>
<thead>
<tr>
<th>Step</th>
<th>Variable</th>
<th>Beta</th>
<th>Δ $R^2$</th>
<th>$R^2$</th>
<th>$F$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1</td>
<td>Co-worker support</td>
<td>-0.04</td>
<td>0.001</td>
<td>0.002</td>
<td>0.635</td>
</tr>
<tr>
<td>Step 2</td>
<td>Co-worker support</td>
<td>-0.07</td>
<td>0.001</td>
<td>0.002</td>
<td>0.126</td>
</tr>
<tr>
<td></td>
<td>Co-worker support x age</td>
<td>0.00</td>
<td>0.003</td>
<td>0.004</td>
<td>0.237</td>
</tr>
<tr>
<td>Step 1</td>
<td>Supervisor support</td>
<td>0.04</td>
<td>0.006</td>
<td>0.009</td>
<td>0.979</td>
</tr>
<tr>
<td>Step 2</td>
<td>Supervisor support</td>
<td>0.04</td>
<td>0.003</td>
<td>0.009</td>
<td>0.678</td>
</tr>
<tr>
<td></td>
<td>Supervisor support x age</td>
<td>0.00</td>
<td>0.002</td>
<td>0.004</td>
<td>0.308</td>
</tr>
<tr>
<td>Step 1</td>
<td>Job control</td>
<td>0.20</td>
<td>0.001</td>
<td>0.002</td>
<td>0.273</td>
</tr>
<tr>
<td>Step 2</td>
<td>Job control</td>
<td>0.08</td>
<td>0.003</td>
<td>0.004</td>
<td>0.308</td>
</tr>
<tr>
<td></td>
<td>Job control x age</td>
<td>0.00</td>
<td>0.001</td>
<td>0.001</td>
<td>0.070</td>
</tr>
<tr>
<td>Step 1</td>
<td>Learning goal orientation</td>
<td>-0.00</td>
<td>0.000</td>
<td>0.000</td>
<td>0.064</td>
</tr>
<tr>
<td>Step 2</td>
<td>Learning goal orientation</td>
<td>-0.08</td>
<td>0.002</td>
<td>0.004</td>
<td>0.308</td>
</tr>
<tr>
<td></td>
<td>Learning goal orientation x age</td>
<td>0.00</td>
<td>0.001</td>
<td>0.001</td>
<td>0.070</td>
</tr>
<tr>
<td>Step 1</td>
<td>Total job experience</td>
<td>-0.00</td>
<td>0.000</td>
<td>0.000</td>
<td>0.064</td>
</tr>
<tr>
<td>Step 2</td>
<td>Total job experience</td>
<td>-0.01</td>
<td>0.001</td>
<td>0.001</td>
<td>0.070</td>
</tr>
<tr>
<td></td>
<td>Total job experience x age</td>
<td>0.00</td>
<td>0.001</td>
<td>0.001</td>
<td>0.070</td>
</tr>
</tbody>
</table>

In every case $p > 0.05$, by far.

#### 4.4. Dividing the participants in a male and a female group

When the participants were divided in two groups according to gender, the supposed relationships, with the exception of hypothesis 1, were not confirmed, nor for the female group nor for the male group. Hypothesis one, however, was confirmed for the female group. A simple regression analysis of the relationship between Social support from coworkers and creativity resulted in a positive Beta (0.234) and a $P$ value of $\leq 0.05$ (0.048). Hypothesis one was not confirmed by a simple regression analysis of the
relationship between Social support from coworkers and creativity in the male group. Although the P value was below 0.05 (0.018) the Beta was negative (-0.269).
5. DISCUSSION AND CONCLUSION

5.1. Discussion

This study examined, among others, the interplay between age, Job Control, support for creativity from co-workers and supervisors, Learning Goal Orientation and relevant work experience as independent variables, and creativity as the dependent variable. None of the independent variables proved to be significantly related to creativity.

In itself this result, though not confirming my hypotheses, shows that creativity is not declining in a significant way when people get older.

Also my results indicate creativity is not negatively influenced by low support from supervisors, at least not in a significant way. Moreover neither Learning Goal orientation nor useful experience or job control has a significant influence on creativity.

Concerning the influence of coworker support on creativity a clear difference was identified between the group of female participants and that of male participants. A simple regression revealed that with more coworker support the creativity of male participants was lowered, while the creativity of female participants was augmented. In a certain sense this was in line with Binnewies, Ohly, and Nielsen (2008), who had 83% female participants in their sample, and who found a positive influence of coworker support on creativity. Zhou and George (2001) however also found a positive relationship between coworker support and creativity, with a sample that consisted mostly of men (74%). The study of Di Liello (2008) also confirmed my findings for female participants and had a sample comprising 60% male participants. It would be interesting to see the results of the aforementioned tests separately for male and for female participants. I could not explain why the creativity of the male participants seemed to be diminished by social support for creativity. Fleming et al (2007), who did not specify the gender of their participants, concluded cohesive social structure might lead to groupthink and thus to less creativity, but why would that only be the case with male participants? It seems my findings call for more research.

I conducted my survey in an environment where people maybe are not used to value creativity. The people who were rated on their creativity are working in a tax office. It is possible that respect of the laws and procedures is so important that there is not much room for creativity in the first place. Maybe supervisors, who rated their subordinates on creativity, are not used to consider the creativity of people who work for them, and
do not have a sharp eye to distinguish the difference in creativity. Mostly people who work in a tax office have to follow strict procedures.

Still if one considers only the results, one must conclude none of the variables I chose, except for Social support from coworkers, when one separates male and female participants in to two groups, has a significant influence on creativity. It is also possible creativity is a trait people either have or haven’t got and that does not evolve much through life.

This study also tried to establish whether Co-worker support, Supervisor Support, Job Control, learning goal orientation and relevant working experience were moderating the relationship between Age and Creativity. Again I could not find any moderating effect of these factors. In this respect I need to mention the fact that my “Age” variable was very skewed (see further, under 5.4.Limitations and Directions for Future Research). This could be the cause I did not find any moderating effect. The “relevant experience” variable was also skewed: only 8 % of the participants had a relevant experience of less than 10 years. One can easily understand the majority of useful experience will be built up in the first nine years 9 years, and the years of extra experience only marginally enlarge the useful Gc. In this light particularly the moderating effect of useful experience on the relation between age and creativity might be totally different with a sample of participants of whom age and useful experience are not skewed.

Another question I asked myself is whether a learning orientation is positively or negatively related with age. I found the question interesting because of the contradictory findings in literature (see higher, under “Learning goal orientation, age and creativity”). Again, no significant relation was found in a simple regression (Beta 0.60). Of course this result could support the assumption that age has no significant influence on a learning orientation, or that a learning orientation is also more a trait that does not evolve much when people get older.

5.2. Theoretical Contributions and implications

My study did corroborate some previous research. In the introduction I stated that meta-analytic research showed no direct relationship between age and creativity. In my study this was confirmed: no relationship could be found between those two variables.
The conclusions of Zhou and George (2001) were not supported: they found that support for creativity from coworkers and supervisors was positively associated with creativity (see also Binnewies et al., 2008, and, for supervisors: Shalley and Gilson (2004)). I did not find a connection between support from supervisors and coworkers and creativity. Therefore the studies that attribute a rather negative influence to group support (Fleming et al. 2007), and Perry-Smith (2006)-see higher) were also not confirmed. However, as already mentioned, when the relationship between support from coworkers and creativity was considered for male and female participants separately, a positive relationship was found for female participants, and a negative relationship for male participants. Binnewies, Ohly and Niessen (2008) suggested a moderating role of age on the relation between social support from co-workers and supervisors and creativity, but this was not confirmed in my study. I examined whether there was an influence of social support from co-workers alone, and whether there was an influence of supervisor support, but in both cases I did not find such an influence, and I did not find a moderating effect of social support from co-worker support and supervisor support when male and female participants were grouped separately. This might of course be due to the very skewed nature of my “age” variable (see also under 5.1. Discussion and further under 5.4. Limitations and directions for future research).

Concerning the influence of job-control on the relationship between age and creativity: Binnewies, Ohly & Niessen found that relationship to be positive when job control was high, and negative when job control was low. Due to the fact that their conditions were not clear, they suggested additional research. However, I did not find any significant influence of job-control on the relationship between age and creativity.

In light of the contradictory findings on the influence of Learning Goal Orientation on the relation between age and creativity (see 2.6. Learning goal orientation, age and creativity), I found it interesting to examine the relations between the three factors. However I did not find a moderating influence of Learning Goal Orientation on the relation between age and creativity. I also did not find any relation between age and Learning Goal Orientation or between Learning Goal Orientation and creativity.

Concerning the influence on creativity of “a person’s prior knowledge of a domain”, of which Cameron Ford (1996), and of which Mumford and Gustavson (1988) assumed it was critical to creative performance, again I did not find any: the number of years of prior experience of the people I questioned was not related to their perceived creativity. Again I have to mention the fact that both my “age” and my “relevant experience” variables are very skewed (see again under a. discussion and further under d. Limitations and directions for future research).
5.3. Practical contributions and implications

Although I did not see any of my hypotheses confirmed, my study still has some, limited, practical implications.

For instance, in the light of my findings, I could say that neither age, nor lack of experience hinder creativity much: therefore one should not pay too much attention to the age and the experience of someone who applies for a new job: chances are he will be as creative as a person half his age, or with more experience...

Also one could deduce from my findings that to provide job control is not always enough to obtain creativity, as I did not find any relationship between job control and creativity.

Support is also not always that important for creativity. For groups consisting of mostly man social support from coworkers might be detrimental for creativity, for groups predominantly consisting of women, it might have a positive influence on creativity.

A Learning Orientation does not seem to be necessary for creativity, and a Learning Orientation does not need no diminish with age. These findings could be of help when judging people an organization wants to hire, and who will have to be creative.

5.4. Limitations and Directions for future research

Firstly, my study has been limited by the population I examined: my respondents are employees of a government organization: the Belgian Ministry of Finance. It is possible their work doesn’t offer many possibilities for creative behavior: rules and procedures have to be followed rigorously, and the civil servants have a reputation of punctuality and need to work rigorously and scrupulously. Many internal controls are installed. So it is possible measuring creativity in such an environment is more difficult than in other working environments. My study could perhaps be repeated in an environment in which it is easier to establish the creativity of a collaborator (see also under 5.1. Discussion, fourth paragraph).

Secondly, I may have a selective sample: only a part of the collaborators (about 25 %) responded to the survey, and only a part of their chefs chose to take part in the survey. Therefore my results may certainly not be valid for the whole population.
Thirdly, my “age” variable is skewed: the vast majority (93%) of the respondents is older than 39 years. This means the population based on which I tested my hypothesis was not representing a normal population consisting of the workforce of a large company. There you would expect a far less skewed age-curve. Since I especially wanted to examine the effect of age on creativity and factors that would moderate this effect, this is limiting my conclusions: I should have changed each hypothesis by adding ‘in a workforce aged forty and up’. Maybe, with a less skewed age variable, I would have gotten results that did confirm one or more hypotheses. A suggestion for further research is thus certainly to test the hypotheses I brought forward with a population that has a far less skewed age distribution. My “relevant experience” variable is also skewed: only 8% of the participants had a relevant experience of less than 10 years. (see higher, under a. discussion). This is off course due to the skewed age distribution, since age and “relevant experience” are highly correlated. Thus with a population with a far less skewed age distribution the “relevant experience” distribution is expected to also be less skewed.

Fourthly, since employees rated Job Control, Coworker-support, Supervisor Support, and their Learning Goal Orientation, it is possible that relations among these constructs were inflated via common method variance. Future research should try to obtain independent assessments of these variables.

Another limitation was perhaps time pressure: due to practical reasons, participants had to fill in the questionnaires in their working time. It is very possible that they felt stressed and did not take enough time to fill in the questionnaires.

Due to the cross-sectional design of my study, it does not permit to draw conclusions about causality. A longitudinal study might show the relationship between age and experience and creativity in a way to rule out reverse causation, or the influence of third variables, in regard to some of the questions I asked in my study.

My findings concerning the influence of coworker support on creativity when participants were divided in an all-female and an all-male group indicate research on the influence of support might benefit if this division were performed in all studies. Also depth interviews might share some light on the reasons female workers seem to gain in creativity with support from coworkers, and on the reasons male workers’ creativity seems to diminish with support from coworkers.
5.5. Conclusion

Creativity is a must in most industries, in a world that is developing fast and where there is more and more competition, between more and more competitors. However, the relation between the age of a person and his creativity is, according to my findings, very weak. I found no influence of age on creativity, and the factors I supposed would moderate the relationship between age and creativity did not. But also the influence of certain factors, which I hoped would be beneficial for creativity apart from the influence of age, was not confirmed. I can only recommend to keep questioning certainties, and to refine definitions. Maybe creativity has its roots in youth, in a period of life in which many reactions and mental schemes are wired. Still we must not believe in personalities and capacities being totally fixed at a certain age, and keep looking for factors that can stimulate creativity. My findings on the different influence of coworker support for female and male collaborators might be an example of the fact such factors exist. I hope investigators keep looking for ways to promote creativity on the work floor. May the results of this study, with all its limitations, encourage others to continue searching.
References


APPENDIX A: Job Control Scale Items
(from Dwyer, D. J. and Ganster, D. C. (1991))

How much control do you have over the variety of methods you use in completing your work?
How much can you choose among a variety of tasks or projects to do?
How much control do you have personally over the quality of your work?
How much can you generally predict the amount of work you will have to do on any given day?
How much control do you have personally over how much work you get done?
How much control do you have over how quickly or slowly you have to work?
How much control do you have over the scheduling and duration of your rest breaks?
How much control do you have over when you come to work and leave?
How much control do you have over when you take vacation or days off?
How much are you able to predict what the results of decisions you make on the job will be?
How much are you able to decorate, rearrange, or personalize your work area?
How much can you control the physical conditions of your work station (lighting, temperature)?
How much control do you have over how you do your work?
How much can you control when and how much you interact with others at work?
How much influence do you have over the policies and procedures in your work unit?
How much control do you have over the sources of information you need to do your job?
How much are things that affect you at work predictable, even if you can’t directly control them?
How much control do you have over the amount of resources (material, software) you get?
How much can you control the number of times you are interrupted while you work?
How much control do you have over the amount you earn at your job?
How much control do you have over how your work is evaluated?
In general, how much overall control do you have over work and work-related matters?

**APPENDIX B: Social support from co-workers for creativity**

My coworkers other than my supervisor are almost always supportive when I come up with a new idea about my job"
My coworkers other than my supervisor give me useful feedback about my ideas concerning the work
My coworkers other than my supervisor are always ready to support me if I introduce an unpopular idea or solution at work.

**APPENDIX C: Social support from supervisors for creativity**

My supervisor discusses with me my work-related ideas in order to improve them
My supervisor gives me useful feedback about my ideas concerning the workplace
My supervisor is always ready to support me if I introduce an unpopular idea or solution at work

**APPENDIX D: Learning Orientation**
(from Button et all, 1996)

The opportunity to do challenging work is important to me.
When I fail to complete a difficult task, I plan to try harder the next time I work on it.
I prefer to work on tasks that force me to learn new things.
The opportunity to learn new things is important to me.
I do my best when I’m working on a fairly difficult task.
I try hard to improve on my past performance.
The opportunity to extend the range of my abilities is important to me.
When I have difficulty solving a problem, I enjoy trying different approaches to see which one will work.
APPENDIX E: Creativity
(from Tierney et al (1999))

- Demonstrated originality in his/her work
- Took risks in terms of producing new ideas in doing job
- Found new uses for existing methods or equipment
- Solved problems that had caused others difficulty
- Tried out new ideas and approaches to problems
- Identified opportunities for new products/processes
- Generated novel, but operable work-related ideas
- Generated ideas revolutionary to our field.