The bright and dark side of creative and innovation

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The Bright and Dark Side of Creativity and Innovation.

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Abstract

In this research, two cross sectional survey studies were held at Royal BAM Group. The first study has examined how job performance can be predicted by means of the Job-Job fit theory and the Person-Job fit theory. Although several researchers studied creativity and innovation as dependent variable, surprisingly little research has examined the influence of creativity and innovation on job performance. Most important obtained results are that creativity and innovation were both related to task performance. Innovation was also related to Counterproductive work behavior. Furthermore it was found that emotional job demands could predict job performance via creativity and innovation. A negative interaction effect between emotional and physical job demands with corresponding job resources could also predict job performance via creativity. Next it was found that cognitive personal resources are a good predictor of job performance via creativity and innovation. If employees with an innovator cognitive style also received (high) cognitive job resources and (high) cognitive job demands, this was related to a higher level of job performance via creativity and innovation.

The second study examined to which extent self- and coworker reports converge with each other. It was found that self- and coworker rated creativity and counterproductive work behavior converge, but self- and coworker rated innovation and task performance did not converge with each other.

Acknowledgement

This report is the result of my Master Thesis project, performed to receive the degree in Master of Science in Innovation Management at the Eindhoven University of Technology. During this study I noticed that the success and failure of innovations are most often caused by psychological decisions of people. This has triggered my interest, and that is why I wanted to conduct my graduation project at the Human Performance Capacity Group. After few brainstorm sessions with my Supervisor, Professor J. de Jonge, I decided to study an interesting topic: The bright and dark Side of creativity and innovation. Creativity and innovation my not always result in beneficial performance outcomes like task performance (bright side), but may also result in less beneficial performance outcomes like counterproductive work behavior (dark side).This study was carried out within BAM Business School of the construction company BAM.

However this project could not have been completed without the support of others. My first Supervisor Professor J. de Jonge had a great contribution in this project due to his friendly support and scientific criticism which made it for me possible to break new boundaries. Furthermore I would like to thank my second supervisor Professor E. Demerouti for her professional contribution.

Special words of thanks also go to my company supervisor Mr. T. Welling for his guidance and pleasant collaboration. He was able to open all the doors that where needed to conduct my research. Next I would like to thank all the participants that took the time to fill in my questionnaire and their valuable feedback.

I am also greatly indebted much gratitude to Sanne van der Burg and Maurice Verheesen for their valuable support during the complete process of my study.

And last but not least, I want to thank my family who followed all the steps of the process of my study and especially during this project with high interest.

Lucas van Luijtelaar

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Management Summary

Background

In the context of a construction company (i.e. Royal BAM Group) it was examined how job performance could be predicted via creativity and innovation. Job performance was conceptualized in a positive performance outcome, task performance, and a negative performance outcome, Counterproductive Work Behavior (CWB). This separation was made, because it is often assumed that creativity and innovations result in beneficial performance outcomes, but this may not always be the case. In this research the Job-Job (J-J) fit theory and the "Person-Job" (P-J) fit theory are described to predict job performance via creativity and innovation. The J-J fit theory can be described as the relation between job resources (e.g. job autonomy) and Job demands (e.g. work pressure). Within the J-J fit theory, several scholars developed their own model, and in this report the Demand-Induced Strain Compensation (DISC) model is applied. The P-J fit can be defined as the relationship between a person's characteristics (e.g. self-efficacy) and those of the job or task that are performed at work. The personal resources, job resources and job demands where each divided in cognitive, emotional and physical dimensions.

Objective

Royal BAM Group (BAM), wanted to enhance the task performance via creativity and innovation by their employees. Currently, BAM has its own creativity course to train employees' creativity, however they were interested if, based on this scientific research, the creativity course could be optimized. The interests of BAM as well as the limited research on this topic, has led to the following key objective of this research.

To gain insight in the personal and work characteristics that can predict job performance via creativity and innovation, and to test the extent to which job incumbent self-report and coworker report of the work outcomes creativity, innovation, task performance and CWB converge.

Based on this objective, the following key research question is defined:

- *Can job performance via creativity and innovation be explained by means of the Person-Job fit theory or the Job-Job fit theory, or even by both?*

This research question can be further divided in the following sub questions:

1. How well can job resources and job demands predict job performance via creativity and innovation?
2. How well can personal resources and job demands predict job performance via creativity and innovation?
3. Do personal and job resources complement each other, or are they competing in predicting job performance via creativity and innovation?
4. To which extent do self reports converge with coworker reports?

Approach of this research

Based on these research questions, a research model was developed which is presented in figure 1. In the model three kinds of job demands (i.e. cognitive, emotional, and physical) are presented in the top of the model. Below the job demands, corresponding resources (i.e. cognitive, emotional, and physical) are presented which are divided in personal- and job resources. The relation between job demands and resources is expected to predict job performance via creativity and innovation. The outcome variables creativity, innovation and job performance are measured by both self- and coworker reports.

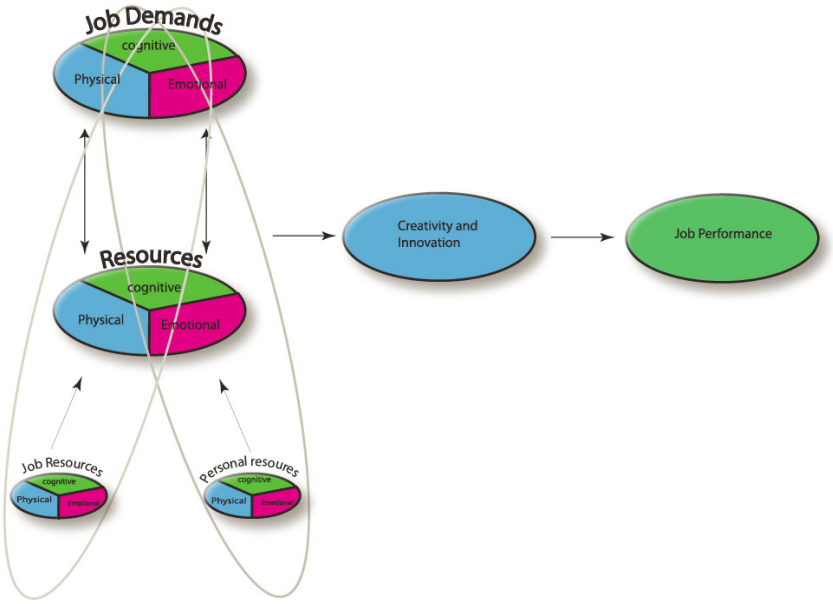

Figure 1 Research Model

The J-J fit theory indicates that creativity and innovations can be best predicted by cognitive job resources and cognitive job demands. However to predict job performance via creativity and innovation, it seems also to be necessary that there is a balance between emotional and physical job resources emotional and physical job demands. Otherwise “negative creativity” may occur which is similar to counterproductive work behavior (CWB) and is not beneficial for an organization.

According to the P-J fit theory it was expected that job performance via creativity and innovation can be best predicted with cognitive job demands (e.g. work pressure) and cognitive personal resources (e.g. self-efficacy). However the influence of physical and emotional job demands may also influence this process. Emotional and physical demands may for example have an indirect effect on performance of cognitive tasks, because it may affect the control of attention.

It was also found that the P-J fit theory and J-J fit theory are likely to complement each other rather than compete with each other. Job demands are first dealt with by attempting to turn to

easily available personal resources. If these resources are depleted, a demand for matching external resources (e.g. job resources) is created, which may be of similar use.
Finally it was expected that self- and coworker reports would converge if employees were familiar with these behaviors. Based on this line of reasoning it was expected that self- and coworker reports of innovation, task performance and CWB would converge. Self- and coworker rated creativity were not expected to converge.
For this research two studies were conducted. The first study existed of an online survey sent by e-mail to 663 employees, from which 322 people filled in the questionnaire (response rate 49%). A correlation and regression analyses were used to test the research model and answer the research questions. Study 2 was conducted to gain insights to which extent self- and coworker reports converge. Employees in this study were given two questionnaires, a self report form and coworker form from which 48 matched surveys were returned (response rate 52%). An independent t-test was conducted to compare the self- and coworker means.

Findings

The results of study 1 show that creativity and innovation are both strongly related to task performance. In this study it was also found that innovation is positive and significantly related to CWB. The results give therefore evidence for the possible dark side of innovation.
The results showed that emotional job demands are a good predictor of creativity and innovation. This result was not expected, but it seems that certain emotional demands trigger employees' creativity. Based on reactions of employees and a few interviews that where conducted, it was found that most emotional demands of BAM employees came through unrealistic goals set by clients or project leaders. In such situations employees have to control their emotions to reach the goal, and to find creative ideas obtain that goal. However, it is likely that employees who receive continuous unrealistic goals, do not perceive these emotional job demands as challenge anymore, but as a threat, and may become exhausted.
Furthermore it was found that a negative interaction effect of emotional or physical job demands and corresponding emotional or physical job resources are positive related to creativity. This negative interaction effect may trigger employees' creativity to regain the balance between job demands and job resources.
Next the results show that employees' cognitive personal resources (i.e. self-efficacy and innovator cognitive style) play an important role in predicting job performance via creativity and innovation. In other words if an employee beliefs that he/she is capable of performing in a certain manner to attain certain goals (self-efficacy), this will result in more creativity and innovations. In addition, if an employee prefers innovative ideas for problems, looks beyond what is given to solve problems and like to do different (innovator cognitive style), this will also strengthen employees' creativity and innovation.
The results also showed that if employees with an innovator cognitive style have cognitive job demands (e.g. complex challenging tasks) and cognitive job resources (e.g. autonomy) this was related to significant more creativity and innovation.

The results of study 2 showed that only self- and coworker rated creativity and CWB converge with each other, but self- and coworker rated task innovation and task performance do not converge with each other.

Implications

To enhance task performance via creativity and innovation, there are several interventions that can be taken by organizations.

First of all organizations should train employees to see (high) emotional job demands (i.e. unrealistic goals) and a negative interaction effect of emotion or physical job demands with corresponding job resources not as a threat, but as a challenge. This will trigger employees to find new work methods or procedures to regain their balance or to obtain the unrealistic goal.

Secondly, the expected relation between cognitive job resources and creativity and innovation was not found, it is possible that employees did not perceive these resources as relevant and did therefore not use these resources. (Van den Tooren & De Jonge, 2010). For organization it is important to not only offer cognitive job resources, but also directing and supporting employees in such a way, that they will activate their cognitive job resources.

Next, it was found that some personal characteristics play an important role in predicting creativity and innovation. Employees' self-efficacy and employees' innovator cognitive style were significantly related to creativity and innovation. If organizations want to enhance their creative potential, they should therefore enhance the self-efficacy of their employees. This can be done by training methods on self-efficacy. An innovator cognitive style is rather stable, personality trait, and cannot, apparently, changed because this is the way people are (Goldsmith & Kerr, 1991). However, the knowledge of an employees' cognitive style maybe used to match employees to appropriate tasks. For example, an employee with an innovator cognitive can be assigned to tasks that require a lot of creativity and innovations. Especially these employees should be challenged with complex job demands and receive sufficient cognitive job resources (e.g. job autonomy), since this was related to extra task performance via creativity and innovation.

Limitations

First, due to the cross-sectional design of this research, no casual effects could be tested. Cognitive job resources were in study for example not related to creativity and innovations, it maybe that employees did not perceive these resources as relevant. For future research it is therefore interesting to conduct a longitudinal study to find causal effects. Furthermore the sample of this research was drawn entirely from one Construction Company, which may have biased the results, and future research should therefore conduct studies in other companies and industries.

Contents

1. Introduction

It is widely assumed that innovations have beneficial influences on the effectiveness and long term survival of organizations (Amabile, 1988; Kanter, 1988; Shalley, Zhou, & Oldham, 2004). An innovation can be seen as the successful implementation of creativity, which is the generation of unique and useful ideas (Amabile, 2000). Organizations rely merely on the creative ideas of employees and employees can therefore be seen as the catalyst of the innovativeness of the organization. For this reason it is not surprising that considerable researchers have studied creativity and innovation as dependent variables, and the role of personal and contextual factors in cognitive and motivational processes underlying creative and innovative behavior. However, it is surprising that little research has systematically investigated the influence of creativity and innovation on the job performance of an employee. It is often expected that creativity and innovation result in job performance that is beneficial for organizations, however it is not by definition that this is always the case. The last few years' researchers mention the possible dark side hat is accompanied with creativity and innovation (e.g. Janssen, 2003; Jones, 2001). If a worker is pushing innovative ideas for change, he will challenge elements of the established framework, of work goals, work methods, task relationships, informal norms, and expectations that actors have of one another in a workplace to the needs of the new situation (Jones, 2001). Co-workers and supervisors may resist these changes, because of the insecurity, uncertainty and stress they may bring (Jones, 2001). The emerging conflicts due to innovative initiatives can cause frustration, antagonism, and animosity by the innovator, and may therefore lead the innovator to have less positive feelings about the relationships with co-workers and supervisors (Janssen, 2003). The demanding nature of creative and innovative behavior may therefore give rise to stress reactions. Two streams that may explain the positive and negative outcomes of creativity and innovation are the Job-Job fit (J-J fit) theory and the Person-Job fit (P-J fit) theory.

A first stream within the psychology that predicts the negative and positive work outcomes of employees is the J-J fit theory. Research in this area has tried to identify job characteristics under the heading of job resources such as job autonomy and support from colleagues that moderate the relation between job demands (e.g. workload or time pressure) and employee health and well being (Van den Tooren & De Jonge, 2010). Within the J-J fit theory, several scholars have developed their own model. A notable model in this area is the "Demand-Control Model" (DCM) of Karasek (1979). One basic premise in the DCM is that employees, who can decide themselves how to meet their job demands, do not experience job strain (e.g. job related anxiety, health complaints, exhaustion, and dissatisfaction). Although this model was widely used by researchers, the model has also been criticized because it overlapped only a small segment of the psychological work situation. A better model was needed, and therefore De Jonge and Dormann (2003) developed the Demand-Induced Strain Compensation (DISC-) Model.

The DISC-model was developed to discover how the demand-resource combination could help improve our understanding of how specific job demands threaten employees and how specific job resources protect employees from developing strain or even enhance their well-being and performance. The central concepts of the DISC-Model can be divided in three categories, namely job demands, job resources and job related strains. Job demands refer to the degree to which a work environment contains stimuli which may require cognitive, emotional or physical effort (De Jonge et al, 2004; Hockey, 2000). Job resources refer to those physical, psychological, social, or organizational aspects of the job that are either: functional in achieving work goals or reduce job demands and the associated psychological and psychological costs and stimulate personal growth, learning, and development (Bakker & Demerouti, 2007). Job strains refer to the health of an employee and employee well being. Based on the DISC model, Noordam (2006) found in her master thesis that creativity arises if employees have both cognitive demands (work pressure) and cognitive resources (e.g. autonomy). Further it was found that there was no relation between creativity and emotional or physical resources. However, how innovative work behavior arises as well as how job performance can be predicted via creativity and innovation has not been studied yet.
The first aim of this study is therefore to explore which environmental conditions are important to predict creativity and innovations, and next to explore if the DISC-model can predict job performance outcomes via creativity and innovation.

A second stream within the psychology which also tries to predict the positive and negative work outcomes of employees is the P-J fit theory. Instead of focusing on job characteristics, this theory focuses on the personal characteristics of an employee. It indicates that people are likely to be more satisfied when what a job supplies (e.g. control) is what a person desires, or where a person's ability meet the demands of the job (e.g. Edwards, 1996; Kristof-Brown, Zimmerman, & Johnson, 2005). Recently, researchers also started to apply this theory to predict creativity and innovation outcomes of employees (e.g. Livingstone, Nelson, & Barr, 1997; Choi, 2004). However these theories focused on the cognitive dimensions of work and therefore focused only on one segment of the psychological work situation. Although the creativity and innovation literature suggest that creativity and innovation have both a cognitive underlying mechanism, it may be that also emotional and physical dimensions influence employees' creativity and innovation. Furthermore, this research also focuses on task performance and CWB, which may be also related by other dimensions than only cognitive dimensions. It is therefore important to focus on a broader perspective of the psychological work situation. Hockey (2000) argued that job demands of a work environment can be divided in three broad categories, namely cognitive, emotional and physical job demands. According to the Triple-Match Principle (TMP) it is proposed that the strongest interactive effects of job demands and resources are observed when demands and resources and strains are based on qualitatively identical dimensions (De Jonge et al. 2006). Personal characteristics under the heading of personal resources are therefore also be divided in cognitive (i.e. Self-efficacy) , emotional (i.e. Emotional stability) and physical (i.e. muscles) personal resources.

The second aim of this research is to investigate how job performance can be predicted via creativity and innovation by means of the P-J fit theory.

The third aim of this research is to investigate if personal resources and job resources complement each other or compete with each other in predicting job performance via creativity and innovation. Literature suggests that the prediction of work outcomes can be improved by taking into account both personal- and job resources, and job demands (e.g. Houkes, Janssen, De Jonge and Nijhuis 2001; Warr, 1994; Oldham & Cummings, 1996). However, it is not yet clear how personal resources and job resources precise influence work outcomes. to investigate how the relation between job resources, personal resources and job demands can predict job performance via creativity and innovation.

This research will also investigate how well coworkers can examine job incumbent's creativity, innovation, task performance and CWB. In the organizational behavior and psychology, most studies relied on single source self report questionnaires (Sackett & larson, 1990). However, these studies can be biased by several reasons like social desirability and common method variance. To control self report biases, it might be helpful to use also coworker reports. Little research has investigated how well coworkers can examine job incumbents work outcomes.
The final and fourth aim of this research is therefore to investigate the extent to which job incumbents self reports and coworker reports of the work outcomes creativity, innovation, task performance and CWB converge.

In this introduction the practical relevance of this research has been indicated. For organizations, it is increasingly important to have creative ideas and innovations for the long time survival of organizations. However recent research has indicated that there is not always a bright side of creativity and innovations. The practical goals of this research are therefore *to understand which interventions should be taken to enhance task performance via creativity and innovation, and to understand which interventions should be taken to avoid CWB via creativity and innovation.* From a scientific point of view, the key objective of this research is *to gain insight in the personal and work characteristics that can predict job performance via creativity and innovation, and to test the extent to which job incumbent self-report and coworker report of the work outcomes creativity, innovation, task performance and CWB converge.*

This research report starts with the literature review, which describes how the J-J fit theory and P-J fit theory may predict job performance via creativity and innovation. Furthermore, in this chapter it will be described if job resources or personal resources complement or compete with each other. This chapter will end with a paragraph that describes the extent to which job incumbents self reports converge with coworker reports. In chapter 3 the methodology for each research question is discussed, after which the results are presented in chapter 4. Finally, in chapter 5 the conclusions, discussion, limitations and managerial implications are described.

2. Literature Review

This literature review will start with a description of the most important definitions. In the second paragraph it is explained how the J-J fit theory can help by predicting job performance via creativity and innovation. The third paragraph describes how the P-J fit theory may predict job performance via creativity and innovation. Next it is discussed whether the two "fit" theories are either complementary or competing in predicting job performance via creativity and innovation. Finally it is the extent to which job incumbent self reports converge with coworker reports is described.

2.1 Definitions

The aim of this research is to predict job performance via creativity and innovation by means of the J-J fit theory and the P-J fit theory. Before explaining how these theories may predict job performance via creativity and innovation, it is described what creativity, innovation and job performance actually mean and how they are defined in this research.

2.1.1 Creativity

There are different approaches to define creativity. One of the earliest definitions of creativity focused on creativity as a process (Amabile, 1996). These definitions were based on the notions that anything resulting from this process was creative. Another approach was to define creativity in terms of a person (Amabile, 1996). According to this approach it was expected that creativity depends on peoples abilities that are most characteristic of creative people. The definitions in both approaches are not very useful to predict job performance via creativity and innovation by means of the J-J fit theory the P-J fit theory. However, there is a third approach that is generally considered as ultimately the most useful for creativity research (Amabile, 1996). This approach defines creativity as a product, and can be defined as:

The development of ideas about products, practices, services or procedures that are (a) novel and (b) potentially useful to the organization (Amabile, 1996; Zhou & Shalley, 2003).

Ideas are considered novel if they are unique relative to other ideas currently available in the organization. Ideas are considered useful if they have the potential for direct or indirect value to the organization, in either the short- or long-term. Given this definition, creativity could range from suggestions for incremental adaptations in procedures to radical, major breakthroughs in the development of new products (Mumford & Gustafson, 1988). Finally, this definition assumes that creative ideas may be generated by employees in any job and at any level of the organization (Madjar, Oldham & Pratt, 2002; Shalley, Gilson, & Blum, 2000).

2.1.2 Innovation

It is important to distinguish creativity from innovation. Creativity and innovation differ in the required degree of idea novelty and social interaction. Creativity is truly novel, whereas innovation can be based on ideas that are adopted from previous experience or from different organizations (Anderson, De Dreu, & Nijstad, 2004). Innovation is primarily an inter-individual

social process, whereas creativity is to some extent an intra-individual cognitive process (Anderson & King, 1993). Although several researchers recently used innovation as a more inclusive two-component concept encompassing both idea generation and application (e.g. De Jong & Den Hartog, 2008), they still emphasize the need to distinguish between creativity and innovation implementation. In this research innovation will be defined as:
The intentional introduction and application within a role, group or organization of ideas, processes or procedures, new to the relevant unit of adoption, designed to significantly benefit the individual, the group, organization or wider society (West & Farr, 1990).

2.1.3 Job performance

The definition of performance can be differentiated between an action (behavioral) and an outcome performance (Campbell, 1990). Only actions which can be scaled, i.e. measured, are considered to constitute performance (Campbell, McCloy, Oppler, & Sager, 1993).
The outcome aspect refers to the consequence or result of the individual's behavior. Outcome aspects of performance depend also on factors other than the individual's performance. For example a tender manager in a construction company who shows only average performance in understanding customer demands (behavioral aspect of performance), but nevertheless achieves a lot of new projects, because a general high demand for new buildings.
Since performance behavior is in control of the employee and outcome performance depends also on other factors, there will be referred, like Campbell et al. (1993), to the behavior aspect of performance.
The conceptualization of behavioral performance has been expanded in recent years to include multiple groups of performance indicators, for example task and citizenship performance (cf. Ng & Feldman, 2009). In this literature review the focus will be on a positive- and negative performance indicators. A positive performance indicator is an indicator that is beneficial to the organization, whereas a negative performance indicator is harmful to the organization.
In this literature review task performance is used as positive performance indicator. *Task performance includes meeting organizational objectives and effective functioning (Behrman & Perreault, 1984).* When employees use technical skills and knowledge to product goods or services through the organization's core technical processes, or when they accomplish specialized tasks that support these core functions, they are engaging in *task performance*. Task performance can be defined as meeting organizational objectives and effective functioning (Behrman & Perreault, 1984).
The negative performance indicator is in the review defined as counterproductive work behavior (CWB). *This refers to any intentional behavior on the part of an organization member viewed by the organization as contrary to its legitimate interest (Sackett & DeVore, 2001).* An example of CWB is blaming a coworker for his own mistakes.

2.2 The Job-Job fit theory

A first theory which may be used to predict job performance via creativity and innovation is the job-job fit (J-J fit) theory. This theory proposes that several psychological outcomes like employee well being, creativity, active learning and CWB can be predicted by the relation between job demands and job resources (e.g. De Jonge et al., 2008; Bakker & Demerouti, 2007). *Job demands* refer to those physical, psychological, social, or organizational aspects of the job that require sustained physical and/or psychological (cognitive and emotional) effort or skills and are therefore associated with certain physiological and/or psychological costs (Bakker et al., 2007). Examples of job demands are the unintended costs from co-workers and supervisors when engaging in creative activities. *Job resources* refer to those physical, psychological, social, or organizational aspects of the job that are either/ or: functional in achieving work goals; reduce job demands and the associated psychological and psychological costs; stimulate personal growth, learning, and development (Bakker et al., 2007). An example of a job resource is the support from colleagues of supervisors.

Within the J-J fit theory, several scholars have developed their own model (e.g. Karasek, 1979; Bakker et al. 2004; De Jonge et al. 2008). Karasek (1979) developed the Demand-Control-Model (DCM), one basic premise in the DCM is that employees who can decide themselves how to meet their job demands, do not experience job strain (e.g. job related anxiety, health complaints, exhaustion, and dissatisfaction) (Bakker & Demerouti, 2007). Although Karasek (1979) found empirical evidence showing that particularly the combination of high job demands and low job control (job resource) is an important predictor or psychological strain and illness. However, it is suggested that job control is only partly able to buffer the impact of job demands on employee well being (De Jonge & Kompier, 1997).

Another model is the Job Demands Resources (JD-R) model, and this is one of the first models which explicitly assumed that work characteristics can be divided into job demands en job resources. The JD-R model also assumes that working characteristics may evoke two psychological different processes. The first process poorly designed jobs or chronic job demands (e.g. work overload, emotional demands) exhaust employees' mental and physical resources and may therefore lead to depletion of energy and to health problems (e.g. Demerouti, Bakker, Nachreiner, & Schaufeli, 2000; 2001). The second process proposed by the JD-R model is motivational in nature, whereby it is assumed that job resources have motivational potential and lead to high work engagement, low cynicism, and excellent performance (Bakker & Demerouti 2007). The JD-R model proposes that job resources can play the role of buffer for several different job demands. Which job demands and resources play a role in a certain organization depends upon the specific job characteristics that prevail (Bakker & Demerouti., 2007). The reason why job resources act as buffers is different for different resources (Bakker & Demerouti, 2007). For example, a high quality relationship with one's supervisor may reduce the influence of job demands (e.g. work overload, emotional and physical demands) on job strain, since leaders' appreciation and support puts demands in another perspective. The final proposition of the JD-R model is that job resources particularly influence motivation of work engagement when job demands are high. This model was originally used to predict health

problems (Bakker & Demerouti. 2007), but this model was also found to be useful in order to predict exhaustion, job performance and innovativeness (e.g. Bakker et al. 2004**;** Huhtala & Parzefall, 2007).

2.2.1 The Demand-Induced Strain Compensation Model

The final model that will be described is Demand-Induced Strain Compensation (DISC) model. This model was developed to discover how the optimal demand-resource combination could help improve our understanding of how specific job demands threaten employees and how specific job resources protect employees from developing strain or even enhance their well-being and performance (De Jonge & Dormann, 2003, 2006). Because this model makes a difference between the different job demands and job resources, the model may be very helpful to predict how job performance can be predicted via creativity and innovation. This model will therefore be used to explain how job performance can be predicted via creativity and innovation by means of the Job-Job fit theory.

De Jonge and Dormann (2003, 2006) developed this model to solve inconsistencies in demonstrating interaction effects between job demands and job resources in the prediction of employee health and performance. The DISC model predicts in general that adverse health effects of high job demands can best be compensated for by matching job resources to the high demands. Furthermore, the model predicts that a well balanced mixture of specific job demands and corresponding job resources will stimulate employee learning, growth, and performance.

The DISC model exists of four principles: The first principle is the multidimensionality principle and suggests that job demands, job resources and job-related strains each contain cognitive, emotional, and physical elements. Job demands can for example be cognitive (high concentration), emotional (confronting with conflicts with co-workers) and physical (lifting heavy boxes). The second principle is the Triple Match Principle (TMP), and proposes that the strongest interactive effects of job demands and job resources are observed when demands and resources and strains are based on qualitative identical dimensions. For example, the emotional support by colleagues is highly likely to moderate the relations between emotional demands and emotional exhaustion. The third principle is the compensation principle: The negative effects of job demands can be counteracted through the availability and activation of job resources. It also predicts that job demands (i.e. cognitive, emotional, or physical) will produce a greater likelihood of counteracting the negative job demands (figure 2.1). The balance principle is the final principle of the DISC model and holds that the optimal conditions for active learning, growth and creativity, and performance exist where a balanced mixture of (high) job demands and corresponding job resources occurs (figure 2.1). For example, employees' creativity may occur if an employee has a lot of cognitive control when facing mental demands (Amabile, 1996).

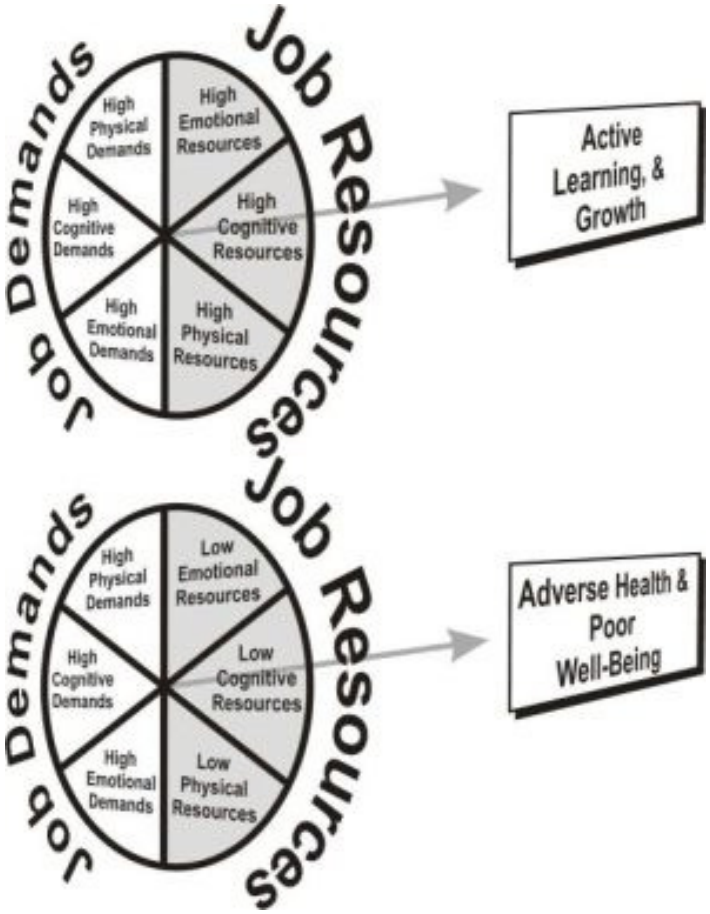

Figure 2.1: The Demand-Induced Strain Compensation (DISC) model (De Jonge, et al., 2008)

Since the introduction of the DISC model, nineteen cross sectional studies were conducted to find empirical evidence for the model (Daniels & De Jonge, 2010). Fifteen out of these nineteen DISC studies showed evidence in support of the TMP. In order to identify a triple match in a regression analysis, the interaction term between similar demands and resources in the prediction of an identical outcome should be significant. Furthermore, thirteen cross-sectional studies support the DISC Model. From these thirteen studies, nine studies reported a significant triple-match interaction of either cognitive or emotional kind. In addition, four cross-sectional studies reported a significant triple match interaction of physical kind. Only four cross-sectional studies were not supportive at all regarding triple match interactions.

In regard to longitudinal studies, two two-wave panel studies among 280 and 267 health care workers, conducted by De Jonge and Dormann (2006), showed a significant interaction between baseline (high) physical demands and (low) physical resources in predicting physical health complaints two years later. They also detected a significant interaction between baseline (high emotional demands and (low) emotional resources in predicting emotional exhaustion two years later. In addition, Chrisopoulos, Dollard, Winefield and Dormann (2010) found empirical evidence for one out of three tested triple match interactions (high cognitive demands and resources in predicting professional efficacy one year later) in their two wave panel study

among 179 police officers. Daniels and De Jonge (2010) also described that the likelihood of finding interaction effects in these studies was nearly linearly related to the degree of match, with 33,3% of all tested interaction becoming significant when there was a triple match, 18,5% significant interaction when testing for double matches (common kind as well as extended kind), and 0,0% significant interactions when there was no match.
Based on these studies, it can be concluded that in general particular combinations of specific job demands and matching job resources have the highest predictive validity with regard to cognitive, emotional, and physical outcomes, which is in line with the core propositions of the DISC model. More specifically, 79% of all DISC studies reported showed evidence in support of the TMP.
Below it is explained how the match between job demands and job resources may result in creativity and innovations, and how well job resources and job demands can predict job performance via creativity and innovation.

2.2.2 Job-Job fit and creativity

The balance principle of the DISC model states that if there is a balanced mixture between (high) job demands and (high) job resources, this will result in active learning, growth, creativity and performance. In this chapter it is described how a balance between job resources and job demands may result in creativity.

In the creativity literature, several researchers have described job demands and job resources which influence creative work behavior (e.g. Amabile, 1996; Oldham & Cummings, 1996). Contextual characteristic affect creativity via its effects on employees' "intrinsic motivation" to perform work assignment (Amabile, 1996). Amabile (1996) argues that the motivation of employees impacts creativity via cognitive mechanisms. Amabile (1996) uses a maze as metaphor to explain these mechanisms. Exiting the maze is equivalent to arriving at a satisfactory solution to the problem or a satisfactory completion to the task. A straightforward algorithmic approach for solving the problem or doing the task is represented by a straight line in the maze going directly from entrance to exit. However, there are a number of alternative exit representing alternative problem solutions; these can only be reached by the more heuristic approach of deviating from the straight path by exploring the maze and by taking the risk of going into a dead end. Amabile (1996) further states that extrinsically motivated individuals, because they are motivated primarily by some task-extrinsic factors, will be more likely to rely on common, well-worked algorithms that they have learned for doing a particular task. The individual will exit the maze as safely and surely as possible, and the result is unlikely to be novel. By contrast, if individuals are intrinsically motivated, they enjoy the task itself and the process of searching for new a solution; they will be more likely to explore the maze attempting to find their way to one of the more novel exits.
Amabile (1996) conducted a study designed to investigate the cognitive mechanisms underlying the effects of intrinsic motivation on task performance (Ruscio, Whitney, & Amabile, 1995). They examined the motivational state on final products and found that several factors, most notably

involvement in the task, served as mediators of the positive influence of intrinsic motivation on creativity. Involvement in the task included an apparent absorption in and focusing on the work itself. This indicates that creativity is mainly influenced by cognitive mechanisms.

By combining the creativity literature with the DISC model, it can be expected that creativity is mainly influenced by the cognitive dimensions of the DISC model, since creativity is mainly influenced by cognitive mechanisms. According to the DISC Model, this means that if employees have (high) cognitive job demands with corresponding (high) cognitive job resources, this will result in creativity. Noordam (2006) found also in her master thesis that cognitive job demands and cognitive job resources are important predictors for creativity.

2.2.3 Job-Job fit and innovation

If creative ideas are generated, an innovation will occur if these ideas are successfully implemented (Amabile, 1996). Therefore, innovativeness requires creativity, but creativity does not always lead to an innovation. Not much research has studied how the relation between job demands and job resources predict the innovativeness of an employee. Huhtala and Parzefall (2007) argue that the concept of work engagement is particular relevant to the promotion and support of innovativeness in organizations. In their study they did not examine the kind of job resources (e.g. emotional, cognitive or physical) and job demands that are most important to predict the innovation of an employee. In this chapter several job resources that are found to be important for the implementation of innovations are described. Based on these findings it will be concluded what kind of job resources and job demands are most important to predict innovations.

A few studies developed a model to understand employees' reaction on technological innovations. These models may also help us to understand employees' reaction on innovative work goals, work methods, task relationships, informal norms, and expectations that actors have of one another in a workplace. One of these models is the technology acceptance model (Davis, 1989) and posits that a person's behavioral intention to use an innovation, and actual usage of that innovation, are determined by two factors: perceived usefulness and perceived ease of use. Perceived usefulness is defined as the degree to which a person believes that using a particular system would enhance his or her job performance. The perceived ease of use in contrast refers to the degree to which a person believes that using a particular system would be free of effort, and is similar to self-efficacy (Davis, 1989).

If an innovation is going to be implemented, it may change the mindset of employees. Employees may perceive the innovation as difficult to use and may perceive the innovation as not useful. This will demand a lot of the cognitive resources of an employee if the innovation has to be implemented. According to the DISC Model, this will result in stress if the employee has not sufficient cognitive job resources to compensate these job demands. Several researchers have revealed some job resources that may important predictors of an innovation. For example, De Dreu and West (2001) mentioned the importance of participation of team members in the decision process. They found in their study that creativity induced by minority dissent would

lead to innovation, only when team members participate in decision process. The cognitive job resource, participation in decision process, makes it possible for employees to share information and insights, and to work together to transform creative ideas into workable methods, products, and services (De Dreu & West, 2001). The participation generates the social support needed for new ideas to be pursued and implemented (Mumford & Gustafson, 1988). Based on these finding it is plausible that also innovations can be best predicted by a match between (high) cognitive job demands and (high) cognitive job resources.

By bringing together the innovation literature with the DISC model, it can be expected that innovations are mainly influenced by the cognitive dimensions of the DISC model, since innovations are mainly influenced by cognitive mechanisms. According to the DISC Model, this means that if employees have (high) cognitive job demands with corresponding (high) cognitive job resources, this will likely result in innovations.

2.2.4 How does creativity and innovation influence job performance?

Most research of creativity and innovation did not consider the outcomes of innovations, and the few exceptions mainly focused on the Person-Environment (P-E) and P-J fit theory (Anderson & Geisteiger, 2007). In this chapter it is argued that job performance via creativity and innovation may also be predicted by means of the J-J fit theory.

In the previous sections it is suggested that cognitive job demands and cognitive job resources are best able to predict creativity and innovation. Although innovations become a regular part of the work process, and thereby influencing job performance, creative ideas and innovations will not always result in beneficial outcomes for an organization.

James, Clark, and Cropanzano (1999) for example found that creative ideas can be both positive and negative for the organization. Positive creativity is expressed in ideas and innovations that are useful for the organization and negative creativity is revealed as theft, sabotage, social attacks, and exploitation, and the undermining of organizational goals and policies. Negative creativity can therefore be seen as counterproductive work behavior (James, et al., 1999), which refers to any intentional behavior on the part of an organization member viewed by the organization as contrary to its legitimate interest (Sackett & DeVore, 2001).

De Jonge and Peeters (2009) used the DISC model to investigate the relation between work related antecedents and CWB. They found that employees who are confronted with high physical job demands and low physical job resources are at risk for CWB. Their findings further suggest that employees who are confronted with high physical demands and have low emotional resources are also at risk for CWB.

This literature indicates that (high) cognitive job demands and (high) cognitive job resources are not sufficient to predict job performance via creativity and innovation. A match between emotional, physical job demands and emotional and physical job resources are likely to be necessarily for beneficial outcomes of an organization like task performance and growth.

2.3 The Person-Job fit theory

A second stream within the psychology that predicts positive and negative work outcomes is the P-J fit theory. This theory can be defined as the relationship between a person's characteristics and those of the job or a task that are performed at work. The P-J fit theory is one type of the person-environment (P-E) fit theory. The P-E fit predicts outcomes based on the fit between person and environment characteristics. Fit refers to the degree of similarity or compatibility between the individual and environmental characteristics. The theories of P-E interaction have been common in the management literature for almost 100 years (Murray, 1938), making it "one of the more venerable lines of psychological theorizing" (Dawis & Lofquist 1992). The P-E fit theories have been used in order to predict different psychological outcomes, like job satisfaction, job performance, turnover, commitment, well being and strains (e.g. Edwards, 1996; Livingstone, 1996; Kristof-Brown, Zimmerman, & Johnson, 2005). In this chapter the history of the P-E fit is first described, secondly it is described how the P-J fit theory predicts creativity and innovativeness. Finally it is explained how job performance via creativity and innovation can be predicted by means the P-J fit.

2.3.1 History of Person-Environment fit

The notion that it is important to assign people to jobs that are congruent with their temperaments and abilities was already emphasized by early philosophers such as Plato (Kaplan, 1950). Plato argues in his book "The State" that the human soul exists of three parts: desire, courage and wisdom. He further argues that a state exists of three types of people (workers, soldiers and rulers) which should correspond to the three human souls. However, the P-E fit theory has not become widely accepted in the organizational psychology until the 1990's (Ostroff & Schulte, 2007).

The P-E fit theory found his origin in the psychological literature in the 1930's, due the work of Murray (1938) with his need-press model. According the need-press model, congruence between individuals' needs and the equivalent characteristics of the environment (press) can produce either need satisfaction or need frustration. Also the work of Goldstein (1939) with his emphasis on the relationship between a person's qualities and the nature of the tasks he or she confronts in the environment, have been credited with early considerations of P-E fit in psychology (Schneider, Smith, & Goldstein, 2000). These theories also began to be used to investigate the dynamics between people and the context, although the term P-E fit did not become widely accepted in the organizational psychology until the 1990's.

In organizational psychology, the preponderance of work focused on the P-J fit theory, which is the fit between characteristics of individuals and characteristics of jobs (Ostroff & Schulte, 2007). For example, fit between individuals' skills and abilities are matched to the requirements of the job (Edwards, 1991). Likewise, the importance of the organization, particularly the job, was discussed in research on job stress (French, Caplan, & Harrison, 1982). After this time also other conceptualizations, and models of fit began to growth with the distinction of different environmental levels, such as job, group, or organization has become largely accepted in the literature (Ostroff & Schulte, 2007).

Accordingly, fit notions can be distinguished as fit to another individual or Person-Individual (P-I) fit, such as the supervisor (Glomb & Welsh, 2005), fit to job or Person-Group (P-G) fit (e.g. Ferris, Youngblood, & Yates, 1985), and fit to the overall organization or P-O fit (e.g. Chatman, 1999). Another approach to distinguish different conceptualizations of the P-E fit is the supplementary and complementary fit (Edwards & Shipp, 2007).

The supplementary fit, concerns the comparison between the person and his or her social environment, such that the environment is defined by the people in the environment (Muchinsky & Monahan, 1987). The complementary fit, "involves the extent to which the person and environment each provide what the other requires" (Edwards & Shipp, 2007), and can be further distinguished in terms of whether requirements are imposed by the environment or the person (Dawis & Lofquist, 1984).

The degree to which the requirements of the environment are fulfilled by the knowledge skills, abilities, and resources of the person signifies the Demand-Ability fit (D-A fit). The D-A fit is graphical presented in figure 2.2. The figure presents a wall that has to be build, and requires certain abilities, skills and resources. It can be expected that a construction worker has the appropriate skills and abilities to build the wall. A strong fit between the demands and the abilities of the construction worker can be expected. The carpenter may also have some skills and abilities to build a wall, however these are less appropriate compared to the construction worker. The fit between the demands and abilities are in this case not very strong. The skills and abilities that are important for a judge don't fit at all with the demands to build a wall.

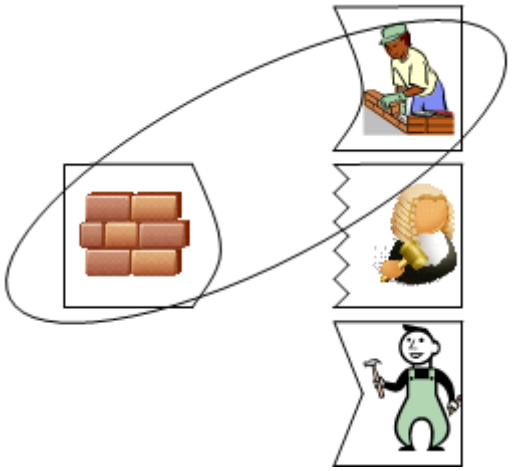

Figure 2.2: Demand-Ability fit

The degrees to which persons' needs are fulfilled by supplies in the environment represent the Supply-Value fit (S-V fit). Muchinsky and Monahan (1987) discussed complementary fit in terms of demands and abilities, while other researchers expanded this concept to include supply-value fit (Cable & DeRue, 2002; Kristof 1996). Although the S-V fit is important to predict certain outcomes, the focus of this research will be on the relation between personal resources and job demands.

A third approach to distinguish conceptualizations of P-E fit involves the content of the dimension on which the person and environment are compared (Edwards & Shipp, 2007). These dimensions can be compared on a continuum ranging from general to specific. Edwards and Shipp (2007) placed three points on this continuum that represent global, domain and facet levels of person and environment dimension. For example the studies of demand-abilities at the global level either collapse across specific demand and ability dimensions (Caldwell & O'Reilly, 1990; Rosman & Burke, 1980) or assess perceptions of overall demands-abilities fit (Cable &

DeRue, 2002). However the facet level examines demand-ability fit for specific tasks or activities, such as generating ideas (Choi, 2004; Livingstone et al., 1997).
The figure below represents a framework (Edwards & Shipp, 2007) that integrates the foregoing three approaches to distinguishing P-E fit. This framework shows how distinctions within each approach can be combined to yield different conceptualizations of P-E fit. The distinctions drawn in the framework have important implications for developing hypotheses regarding the effects of fit on outcomes (Edwards & Shipp, 2007).

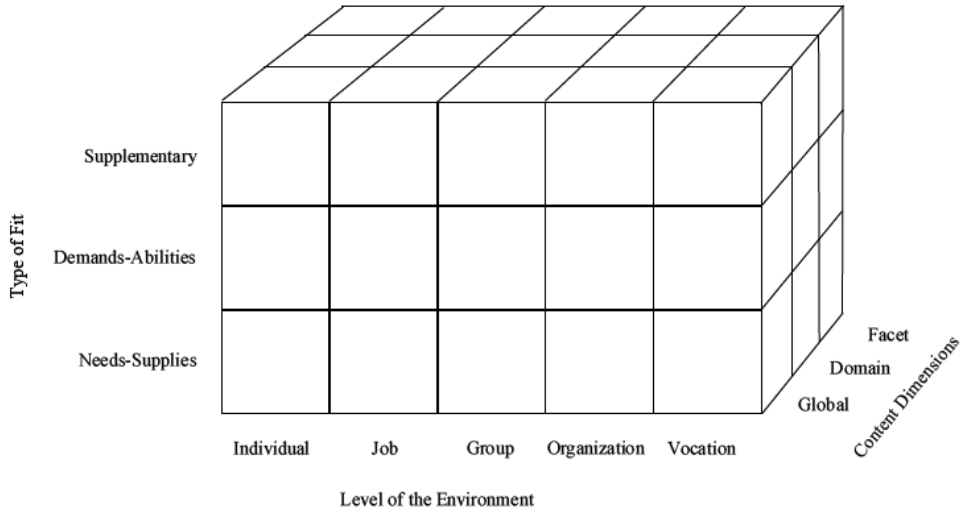

Figure 2.3: Conceptualizations of the Person-Environment Fit (Edwards & Shipp, 2007)

For this research the P-J fit theory will be subordinated to the principles of the DISC Model. This because the final goal of this study is to define the relation between personal resources, job resources and job demands in predicting job performance via creativity and innovation. This research will therefore focus on the match between personal characteristics, under the heading of personal resources, and job demands. In line with the first principle of the DISC-model, it is proposed that job demands, personal resources and, job related strain each contain cognitive, emotional and physical elements. This principle is based on the distinction on the bio-cognitive systems that are challenged by work and environmental events (Hockey, 2000) and is presented in table 2.1. Similarly, personal resources may have cognitive-informational component (e.g. self-efficacy and innovator cognitive style), emotional personal resources (e.g. emotional stability) and physical personal resources (e.g. muscles). Finally, in a similar vein to demands and resources, strains may also comprise cognitive, emotional and physical dimensions (Koslowski, 1998; Le Blanc, De Jonge, & Schaufeli, 2000). For example, employee creativity represent cognitively laden outcomes (e.g. Amabile, 1996), emotional exhaustion (burnout) represents an emotionally laden strain variable (e.g. Maslach & Jackson, 1986), and physical health complaints can be reasonably assumed mainly to reflect bodily sensations.

Table 2.1: Different types of job demands (Hockey, 2000)

Type of demand	Primary system affected	Nature of demands	Examples of jobs
Physical	Musculo-skeletal	Lifting, carrying, physical stress.	Heavy industry, construction.
Cognitive	Information processing	Mental work, memory, planning, decision making	Office work, computer work, finances.
Emotional	Emotion	Caring, concern for self and others, interpersonal conflict	Nursing, social work, counseling.

Like the second principle of the DISC model, it is proposed that the strongest interactive effect of job demands and personal resources are observed when demands and resources and strains are based on qualitative identical dimensions. Similar to the third principle, the compensation principle, it is proposed that the negative effects of job demands can be counteracted through the availability and activation of personal resources. The final principle is the balance principle, and proposes that optimal conditions for active learning, growth, and creativity, and performance exist where a balanced mixture of (high) job demands and corresponding (high) personal resources occurs.
In the next part it is described how the fit between (cognitive, emotional and physical) job demands and (cognitive, emotional and physical) personal resources may predict creativity, innovation and job performance via creativity and innovation.

2.3.2 Person-Job fit and creativity

Numerous studies have demonstrated interaction affects between personal and contextual variables on creative performance (e.g. Oldham & Cummings, 1996), suggesting a positive effect on matching personal and environmental characteristics. However, only a few researchers have explicitly adopted the P-J fit theory in the domain of creativity (e.g. Livingstone et al., 1997; Puccio, 2000; Choi, 2004). The study of Livingstone et al. (1997) examined the S-V fit and D-A fit in the context of creativity. Their dependent variables where limited to a set of affective variables (job satisfaction, strain and commitment) and behavioral variables (job performance). Puccio (2000) included creative performance as the outcome variable. However in their study, the P-E construct was limited to only one aspect of fit (corresponding to most closely to S-V fit). Variable for job-performance were also not included in this study. Choi (2004) study examined both the S-V and D-A fit in the context of creativity. He examined the dependent variable creativity, but also failed to examine how job performance was influenced by creativity and innovation.

These studies have in general investigated the outcomes of creative employees. However, they did not investigate what employees make actually creative. The fit between cognitive, emotional, physical personal resources and cognitive, emotional, physical job demands may help to predict employees' creativity.

Several researchers argued that the cognitive personal resources are an important predictor of employees' creativity (Amabile, 1996; Woodman, Sawyer, & Griffin, 1993; Oldham & Cummings, 1996). Two theories that have received considerable attention in understanding and measuring cognitive personal resources, is the adaptation-innovation theory of Kirton (1976), and more recently creative self-efficacy (e.g. Gong, Huang, & Farh, 2009; Tierney & Farmer, 2002). The relation between creativity and these theories will be further elaborated below.

The first approach is Kirton's Adaption-Innovation theory. This approach proposes that every individual can be located on a continuum ranging from highly adaptive to highly innovative according to their score on the Kirton Adaption-Innovation Inventory (Kirton, 1987). An adaptor (someone with an adaptive cognitive style) is characterized as careful, reliable, efficient, methodological, disciplined, and conforming. Adaptors reduce problems by introducing improvements that increase efficiency and maintain maximal continuity and stability. In addition these individuals are able to maintain a high level of accuracy in detailed work over an extended period of time (Miron, Erez, & Naveh, 2004).
On the other hand, an innovator (someone with an innovator cognitive style) does things differently and prefers breakthroughs to improvement. Innovators are very original but seem to be undisciplined, impractical, unsteady, and incapable of adhering to detailed work (Miron et al., 2004). The innovators cognitive style is comparable with the cognitive style that has been found to be important for the production of creative ideas "new cognitive pathways" (Amabile, 1996) or divergent thinking (Woodman, et al., 1993). Innovators are therefore able to pursue a cognitive style that is important for the production of creative ideas. Empirical evidence also suggests that individuals with an innovative style tend to be more creative than those with an adaptive cognitive style (e.g. Keller, 1986; Lowe & Taylor, 1986).
The second approach, creative self-efficacy, is the belief that one has the knowledge and skills to produce creative outcomes (Tierney & Farmer, 2002). Creative self-efficacy is based on a person's knowledge and skills enabling creativity. Several studies have found a direct effect of self-efficacy on creativity. For example Redmond, Mumford, and Teach, (1993) found that individuals with a stronger sense of efficacy for marketing skills produced significantly more creative work on subsequent marketing tasks. Also the study of Tierney and Farmer (2002) demonstrated similar findings in which employees with a stronger creative self-efficacy engaged in higher levels of creativity in their work.

Several researchers have also investigated the job demands which are most important for creativity. Specifically complex and challenging jobs are expected to support and encourage higher levels of motivation and creativity than are relatively simple, routine jobs (Deci, Conell, &

Ryan, 1989). When jobs are complex and challenging, individuals are likely to be excited about their work activities and interested in completing these activities (Oldham & Cummings, 1996). The level of interest and excitement produced by a job's design is then expected to foster creative achievement at work. In addition complex jobs may actually demand creative outcomes by encouraging employees to focus simultaneously on multiple dimensions of their work, whereas highly simple or routine job may inhibit such a focus. It can therefore be expected that (high) cognitive job demands are important to support creativity.

However, these lines of research essentially ignore the concept of fit and treat cognitive job demands and cognitive personal resources as a standalone-predictor of creativity. According to the P-J fit theory, outcomes will be predicted based on the fit between person environment characteristics. This indicates that a fit between cognitive personal resources and cognitive job demands are a strong predictor of creativity. High cognitive job demands encourage employees to focus simultaneously on multiple dimensions of their work. It is likely that "innovators" and employees with high levels of self-efficacy are best able to focus simultaneously on these multiple dimensions of their work. For example:

Box 1: Example Personal-Job fit and creativity

Maurice is an engineer for a Construction Company and he was challenged to reduce the time for the preparation of a building site (cognitive demands). He found that activities on pipelines where most time consuming, because of the disassembly of the pipelines. Maurice developed a clamp to pinch off a hose, and therefore it wasn't needed to disassembly the pipelines. The innovator cognitive style of Maurice made it possible to make really changes in the process, rather than small incremental improvements.

2.3.3 Person-Job fit and Innovation

Implementing innovation is an important, though challenging and high risk task for many organizations. Most studies of innovation implementation have focused on organizational factors, such as organization structure (Clayton, 1997), support systems (Klein & Sorra, 1886), and leader characteristics (Van de Ven & Grazman, 1997). However, the literature has given little attention to the individual level process of innovation implementation (Choi & Price, 2005). This is surprising, because it has been shown that that employee's reaction to a particular innovation actually determine the ultimate success of implementation efforts (Hartwick & Barki, 1994).

A few studies developed a model to understand employees' reaction on technological innovations. These models may also help us to understand employees' reaction on innovative work goals, work methods, task relationships, informal norms, and expectations that actors have of one another in a workplace.

One of these models is the technology acceptance model (Davis, 1989) and posits that a person's behavioral intention to use an innovation, and actual usage of that innovation, are determined by two factors: perceived usefulness and perceived ease of use. Perceived usefulness is defined as the degree to which a person believes that using a particular system would enhance his or her job performance. The perceived ease of use in contrast refers to the degree to which a person believes that using a particular system would be free of effort, and is similar to self-efficacy (Davis, 1989). Another similar theory is the social cognitive theory (Compeau, Higgins, & Huff, 1999), and proposes that technology self-efficacy and outcome expectation determine innovation use.

This highlights the importance of cognitive personal resources for a successful innovation. These theories have nevertheless not described the importance of the fit between personal resources and the job demands. One of the few studies that investigated the fit between the person and the job in an innovative context is the study of Choi and Price (2005). In their study they draw on the P-E fit literature to explain how people respond to innovations and propose 'person-innovation fit' as a predictor of individual level implementation outcomes. They examined comparable aspects of both the person and the innovation, which is critical for understanding the micro level processes of innovation implementation, because a person's attitude toward and the behavior involving a target represent the results of implicit cognitive comparisons between the self and the target (Edwards, 1996).

In this literature the interest is on the implementation of innovative work goals, work methods, task relationships, informal norms, and expectations that actors have of one another in a workplace and not so much on technology implementation. However, the technology acceptance model of Davis (1989) and social cognitive theory may help us to understand why employees are sometimes willing to innovate and sometimes resist an implementation.

Based on these theoretical findings, it is expected that a strong fit between cognitive personal resources and cognitive job demands may be a good predictor of innovations.

2.3.4 How does creativity and innovation influence job performance

Research that investigated the relation between creativity, innovation and job performance is sparse, and most of the existing studies highlight the positive outcomes of creativity and innovation. A more balanced and critical view of the benefits, costs, and disruptive aspects of any innovation attempt has in fact come into sight only quite recently across the research literatures (Anderson & Gasteiger, 2007). Anderson and Geisteiger (2007) summarized recent findings of both positive and negative outcomes of creativity and innovation. The studies that were executed on the individual level are presented in appendix A, together with some additional findings.

As can be seen from the appendix, any single innovation can have hugely positive outcomes; it can also simultaneously result in potential series of problematic and dysfunctional outcomes. Most of these findings (e.g. Livingstone et al., 1997; Miron et al., 2004; Shalley et al., 2000; Choi, 2004) highlight the importance of a strong fit between the individual and environment to

receive positive outcomes. The study of Livingstone et al. (1997) found for example that a low fit between demands for creativity and abilities for creativity resulted in lower job performance.

In this literature review it is argued that cognitive job demands and cognitive personal resources are good predictors of creativity and innovation. It can therefore be proposed that cognitive job demands and personal cognitive job resources are also important to predict job performance via creativity and innovation. This was also indicated by the study of Gallivan (2003), who examined outcomes associated with differences in software developers' creative style, based on Kirton's adaptation-innovation theory. In this research, a significant relation between innovative creative style and job performance was not found. The researchers concluded that innovators creative style may not fit all job roles or work environments (Gallivan, 2003), which is inline with P-J fit theory. Innovators' creative style may serve as either an asset or a liability, depending on the specific job role, organization culture and work environment. For example employee's innovators may have lower job performance when performing routine jobs compared to adaptors. This study therefore indicates that positive outcomes will occur if employees' cognitive style fits with the job of an employee.
These studies have however not focused on the influence of emotional and physical dimensions on creativity and innovation. Emotional demands for example, may also have an indirect effect on performance in cognitive tasks, because they compete strongly for the control of attention (Oateley & Johnson-Laird, 1987).

Based on these findings it can be proposed that cognitive personal resources and cognitive job demands, are likely the main predictor of job performance via creativity and innovation. Emotional and physical job demands and emotional and physical job resources may also haven influence on this process and more research should be conducted to understand the influence of these dimensions.

2.4 The relation between personal resources and job resources

Previously it is described how the fit between personal resources and job demands and the match between job resources and job demands may predict job performance via creativity and innovation. In addition to examine the relation between personal resources and job demands and the relation between personal resources and job demands, the possibility that job resources and personal resources also combine and interact with one another will be examined.

De Jonge and Dormann (2006) propose that demands are first dealt with by attempting to turn to easily available personal resources. If these resources are depleted, a demand for matching external resources (e.g. job resources) is created, which may be of similar use (cf. Hobfoll, 1989, 2002). For example, if an employee has emotional problems with customers, an emotional self regulation capability is likely to be quite helpful. When individuals lack this personal resource, emotionally supportive colleagues may do an almost similarly effective job. They further propose that if such matching job resources are not available, or if they are depleted, individuals

search for other resources. They will then use even those resources that do not closely correspond to the demand (cf. Vohs, Baumeister, & Ciarocco, 2005).

Besides the coping effect of Job resources on job demands, job resources may also be important to activate personal resources (Luthans, Vey, Avolio, Norman & Combs, 2006). This in line with Conservation of Resources (COR) theory (Hofboll, 2002), and the balance principle of the DISC model (De Jonge and Dorman, 2003, 2006). This means that resources do not exist in isolation, but that the existence of resources may bring additional resources in the long run. On the basis of this proposition, Xanthopoulou, Bakker, Demerouti, and Schaufeli, (2007) hypothesized and found that also personal resources and job resources relate reciprocally. When job resources are available for employees they feel more able in dealing with their work goals (i.e. they have personal resources). Similarly, if employees feel self-efficacious, valuable and optimistic (i.e. they have high levels of personal resources) they may create a resourceful work environment (Xanthopoulou et al., 2007). This study indicates that personal resource neither job resources are most important in predicting job performance via creativity and innovation, because personal resources and job resources are cyclical. This literature shows that personal resources and job resources complement each other and because of their reciprocal nature, they often live together.

However, in literature of creativity, very few researchers have examined the joint contribution of job resources and personal resources to predict creativity and innovation. One of the few studies that examined the joint contribution of job resources, personal resources and job demands is the study of Oldham and Cummings (1996). In their study they found that creativity is maximized if employees have high levels of creative personality scales, supportive and non controlling supervision are present in response to complex jobs. However in this study the interest is in how task performance can be enhanced via creativity and innovation. These creative ideas and innovation are expected to make work methods more efficient and as result enhance employees' task performance. Based on the study of Oldham and Cummings, (1995), it can be expected that if employees have (high) cognitive job resources, (high) cognitive personal resources and (high) cognitive job demands, employees' task performance will be enhanced via creativity and innovation.

However if employees come up with creative ideas and an innovation occurs, resistance for change by coworkers may occur. This resistance can be emotional taxing for the innovator, and innovators have to cope with this emotional demanding nature. Nevertheless, if emotional personal resources are depleted and job resources of similar use are out of reach, this is likely to result in adverse health, poor well being and CWB.

2.5 How well do self reports converge with coworker reports?

A large part of studies in the field of organizational behavior and psychology relied on single source self-report questionnaires (Sackett & larson, 1990). However, these single sources studies have recently become under attack (cf. Edwards, 2008). Self reports can be biased by different reasons, such as item ambiguity, social desirability, different interpretations of response alternatives, and the mood of the employee (De Jonge & Peeters, 2009). In addition,

inferences about correlation and causal relationships may be inflated by the problem of common method variance (Donaldson, Thomas, Graham, Au, & Hansen, 2000). To control for self-serving biases, it might be helpful to use coworker or supervisor ratings (Spector, 2006). However, little research has examined how well coworker ratings or supervisor ratings can examine job incumbents work outcomes. This study will examine how well coworkers can examine the job incumbents work outcomes creativity, innovation, task performance and CWB. As argued by Fox, Spector, and Bruursema (2007), is only the incumbent fully aware of the deviant acts s/he actually does. Other sources, like coworker records, can only privy to the overt behaviors or results of behaviors (De Jonge & Peeters, 2009). Convergence between self-report and coworker report would therefore depend on the other's familiarity with the incumbents behaviors (De Jonge & Peeters, 2009).

Creativity has, as previously described, a cognitive underlying mechanism, and can therefore refer to covert behavior (Sagie & Elizur, 1999). Employees may have very creative ideas, but if they don't express them, they will not be noticed by coworkers. It can therefore be expected that self rated creativity will not converge to a large extent with coworker rated creativity.

On the other hand, innovations have also an underlying cognitive mechanism, but it can be argued that innovations refer to overt behavior. An innovation is the implementation of a creative idea, and is therefore more visible to coworkers. This innovative behavior is likely to be noticed by coworkers and therefore convergence between self rated innovation and coworker rated innovation is expected.

Coworkers often know what the tasks of the job incumbent are, and it can therefore also be expected can also judge how well the job incumbent performs this tasks. For example, a project leader has to organize everything around a project; a coworker within this project will notice how well this project is organized. It therefore expected that self rated task performance converge with coworker rated task performance.

De Jonge and Peeters (2009), argued and found that CWB exists mainly of overt behavior (e.g. aggression or absence), which can be noticed by coworkers. Although CWB also exists of overt behavior (e.g. theft or pretending to work hard), convergence was found between self rated CWB and coworker rated CWB.

Overall, creativity is expected to exist of mainly covert behavior and convergence between coworker rated creativity and self rated creativity is not expected. However, innovation, task performance and CWB exist mainly of overt behavior, and convergence is expected between self reports and coworker reports are expected from these work outcomes.

2.6 Problem definition

Based on the literature review, the goal of the research and the research question can be formulated.

Key objective:
To gain insight in the personal and work characteristics that can predict job performance via creativity and innovation, and to test the extent to which job incumbent self-report and coworker report of the work outcomes creativity, innovation, task performance and CWB converge.

Practical goal:
To give BAM insight in the interventions that should be taken to enhance task performance via creativity and innovation, and to avoid CWB via creativity and innovation.

Key research question:

- *Can job performance via creativity and innovation be explained by means of the Person-job fit theory or the Job-Job fit theory, or even by both?*

This research question can be further divided in the following sub questions:

1. How well can job resources and job demands predict job performance via creativity and innovation?
2. How well can personal resources and job demands predict job performance via creativity and innovation?
3. Do personal and job resources complement each other, or are they competing in predicting job performance via creativity and innovation?
4. To which extent do self reports converge with coworker reports?

Based on these research questions, a research model is developed which is presented in figure 2.4. In the model the three kinds of job demands (i.e. cognitive, emotional, and physical) are presented in the top of the model. Below the job demands the three kinds of resources (i.e. cognitive, emotional, and physical) are presented and can be divided in personal- and job resources. The relation between job demands and resources is expected to predict job performance via creativity and innovation. The outcome variables creativity, innovation and job performance are measured by both self and coworker reports.

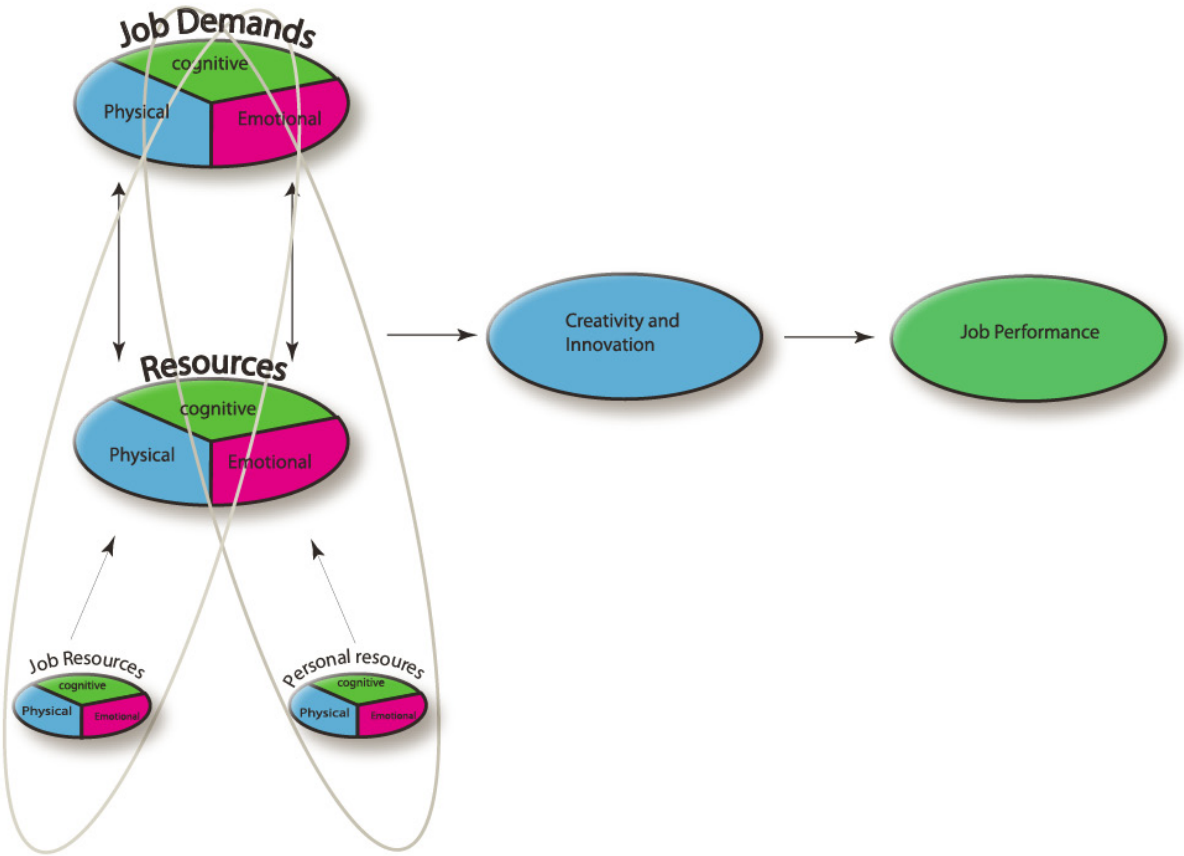

Figure 2.4: Research Model

3. Method

3.1 Introduction

For this research surveys were conducted at the Dutch construction company Royal BAM Group (BAM). BAM is active in the Construction, Property, Civil engineering, Public-private partnerships, Mechanical and electrical contracting and Consultancy and engineering sectors. The research was conducted with permission of BAM.

3.2 Research Design

This research exists of two studies. The first study can be typified as a cross-sectional survey design which is exploratory in nature. The second study can also be typified as a cross-sectional survey, but for this study two different sources were used (self-reports and coworker reports).
A cross sectional survey design means that the survey is once administered to a sample, yielding data on the measured characteristics as they exist at the time of the survey. For example measures of personal characteristics like self-efficacy or emotional stability and measures of outcome variables like creativity and innovation. Next the relation can be defined between personal characteristics and the outcome variables creativity and innovation. A cross sectional survey can also be used to determine the prevalence of aspects of work like the degree of creativity and innovation of employees of BAM.

3.3 Research Population

Study 1

Study 1 existed of an online survey that was sent by e-mail to 663 employees of BAM (i.e. project leaders, project developers, calculators). From this group 322 people filled in the questionnaire (response rate 49%). The e-mail was subscribed by the HR director of the construction company to show the participants that this research was supported by their management. In this e-mail it was communicated that in participation of the research the anonymity was granted, and it was asserted that information obtained from the surveys would be treated as confidential and would not be used or released for other purposes than this study. The questionnaires were in Dutch administered online via the website www.questionpro.com.
An analysis of the demographics of study 1 showed that merely all participants were men (96%). The mean age was 43 years (SD=10,3) and the average working years at BAM was 12, 5 years (SD=11,2). The participants were from the following subsidiary companies: BAM Utility (33,3%) BAM Infra (24,8%), BAM Wegen (15,3%), BAM AM (9,0), BAM Rail (8,7%), BAM Techniek (5,6%).

Study 2

In study 2 a cross sectional survey was conducted among 83 employees of BAM (i.e. staff workers, HR managers, logistic employees and project leaders). From this group 43 people returned the questionnaire (response rate 52 %). In each case, employees were well informed about the survey, and could participate on a voluntary basis. Employees were given two questionnaires, a self report form and a coworker form, which could be returned in a locked

box. The employees got instruction to label both forms with a matching secret code, and to hand over the coworker form to a peer familiar with the employee's work situation. At the end 43 matching surveys of job incumbents and coworkers were returned.
The analysis of demographics of study 2 showed that 60% of the participants were men. The mean age of the participants was 44 years (SD=12,5) and the average working years at BAM was 12 years (SD=12,9). The participants were from the following subsidiary companies: BAM Group (76%), BAM Utility (12%), BAM Material (12%).

To enhance the response rate of the surveys, one employee of both studies was rewarded at a random basis, with the creativity course of the Bam Business School (to the value of € 2700) and five employees were rewarded with the management book "Onze ijsberg smelt!", also at a random basis.

3.4 Measures

Five groups of measures were collected: job demands, job resources, personal resources, creativity, innovation and job performance. The measurements are discussed below.

3.4.1 Job Demands

Cognitive, emotional and physical job demands were measured using the Dutch translation of the DISC Questionnaire (DISQ 2.1) from De Jonge, Dormann, Van Vegchel, Von Nordheim, Dollard, Cotton, and Van den Tooren (2009). This scale measures the cognitive, emotional and physical job demands. The DISC Questionnaire (DISQ 2.1) was particularly developed for testing the demand-induced strain compensation model (e.g. Van de Ven et al., 2008).

Cognitive job demands are assessed with five items, for example: ''Employee X will need to display high levels of concentration and precision at work''. These items were assessed on a 5-point liker scale (1="never", 5="always"), and had a Cronbach's alpha of 0,72.

Emotional job demands are assessed with six items. A sample item is ''Employee X will have to display emotions (e.g., towards clients, colleagues or supervisors) that are inconsistent with his/her current feelings.'' Responses were given at a 5-point response scale (1="never", 5="always"). The scale typically yields internal consistencies between Cronbach's alpha of 0,84.

Physical job demands are measured with five items, like "Employee X will have to perform a lot of physically strenuous tasks to carry out his/her job." These items consist of a 5-point rating scale (1="never", 5="always"). The cronbach's alpha was 0,89.

3.4.2 Job Resources

Cognitive, emotional and physical job resources were measured using the Dutch translation of the DISC Questionnaire (DISQ 2.1) from De Jonge et al. (2009), which measures the cognitive, emotional and physical job resources.

Cognitive job resources are assessed with six items, an example item is:”Employee X would have the opportunity to take a break when tasks require a lot of concentration’’. These items were assessed on a 5-point liker scale (1=”never”, 5=”always”), and had a Cronbach’s alpha of 0,73.

Emotional job resources measured with five items, and an example items is ‘‘other people (e.g., clients, colleagues or supervisors) would be a listening ear for employee X when he/she has faced a threatening situation’’. These items consist of a -point rating scale (1=”never”, 5=”always”), and had a Cronbach’s alpha of 0,78.

To measure Physical job resources, five items are used, an example item is: “employee X will be able to plan his/her work so that physical tasks require no more physical exertion than he/she can manage”. These items consist of a -point rating scale (1=”never”, 5=”always”), and had a Cronbach’s alpha of 0,91.

3.4.3 Personal Resources

To assess the personal resources, the emotional, cognitive and physical resources of an employee were measured. Since there is no questionnaire which examines these three personal resources, a questionnaire is developed that measures each personal resource. Below it is described how each personal resource is examined.

Cognitive personal resources are measured by Kirton’s Adaption-Innovation (KAI) scale (Foxall & Hacket, 1992) and employees’ self-efficacy.
The KAI theory proposes that individuals can be located on a continuum ranging from Adaptation style to Innovation style. The KAI scale measures three different personal characteristics to locate employees on a continuum ranging from adaptation style to innovation style. These personal characteristics are: “Sufficiency of originality”, adaptors typically present a few, usually implementable solutions to a problem, while innovators propose many, possibly impracticable solutions; “Efficiency”, adaptors prefer to progress incrementally towards a defined goal, while innovators avoid painstaking attention to detail; “Rule Governance”, adaptors prefer to restrict their behavior to the socially acceptable, while innovators flout convention, ignoring the rules or inventing their own (Foxall & Hacket, 1992).
The KAI scale originally existed of 32-items, however for this research, the reduced version of the KAI scale is used. This abridged version of the KAI scale, has demonstrated certain advantage over the conventional, 32 items, version. Foxall and Hacket (1992) argue that the shorter version of the scale results in a slightly firmer conclusion, based on the size of the correlation they produced and their statistical significance.

Example items on the KAI scale include “hash fresh perspectives on old problems,” and “never seeks to bend or break the rules.” These items were rated on a 5-point scale (1=”very easy”, 4=”very hard”). Cronbach’s alpha for the personal characteristics Sufficiency of originality,

Efficiency and rule governance were respectively: 0,72, 0,78 and 0,37. Deleting question 15, 18 and 20, Cronbach's alpha of rule governance increased to Cronbach's alpha 0,51. These questions contained a double denial.

Self-efficacy is assessed with the generalized self-efficacy scale from Schwarzer and Jerusalem (1995). This scale was translated to Dutch and to ensure construct validity, these question were translated back to English. This scale consists of 10 items, such as: "I can always manage to solve difficult problems if I try hard enough." Responses were given at a 5-point response scale (1="absolutely wrong" to 4 "absolutely right"). Cronbach's alpha for this scale was 0,83.

The emotional personal resources are examined with the emotional factor of the Big Five factor markers of Goldberg (2002). This scale was translated to Dutch and to ensure construct validity, these question were translated back to English. This scale exists of 50 questions, and in this research the 10 items of emotional stability where used. An example item is "I get stressed out easily". Responses where provided on a 5-point response scale (1=Very inaccurate", 5="Very accurate"). Cronbach's alpha was 0,58.

To measure physical personal resources, employees' vigor was measured. The scale of Karatepe and Olugbade (2009) was used and exists of 3 items. This scale was translated to Dutch and to ensure construct validity, these questions were translated back to English. An example item is "I can continue working for very long periods at a time." This scale is a 5 point rating scale ranging from 1 "never" to 5 "always." Cronbach's alpha for the scale was 0, 69.

3.4.4 *Creativity*

Creativity is assessed with the scale of Noordam (2006), which is a Dutch translation of the original questionnaire of George and Zhou (2001). This scale consists of 12 items which assess creative work behavior on a five point liker scale. An example for the participant is: "In my work I come up with new and practical ideas to perform better". An example for the participant's colleague is: "My colleague comes up with new and practical ideas to perform better." This scale is 5 point rating scale ranging from 1 "not at all characteristic" to 5 "very characteristic". Cronbach's alpha for this scale in study 1 was 0,92 and for study 2 self rated creativity had a Cronbach's alpha of 0,96, and coworker rated creativity has a Cronbach's alpha of 0,93.

3.4.5 *Innovation*

In this research, innovation is defined as the implementation of creative ideas. However, little research has developed items to measure innovation in this way. For this reason a new scale was developed which exists of six items. Two examples of items are: "How often do you implement new ideas to improve your work situation?", and "How often do you implement new ideas that could help you solve work problems more quickly?" Employees could rate this question on a 5 point rating scale ranging from 1 "never" to 5 "always". A principal component analysis was conducted to analyze if there was indeed one underlying structure among the variables. The results in Appendix B, show that only one component exceeds eigenvalue 1, and explains 70,51% of the total variance. This indicates that all variables represent the same

concept. Cronbach's alpha for this scale in study 1 was 0,91 and for study 2 Cronbach's alpha was fore self rated innovation was 0,93 and coworker rated innovation 0,87.

3.4.6 *Performance*

Job performance was assessed with two variables, namely task performance and counterproductive work behavior. Task performance includes meeting organizational objectives and effective functioning (Behrman & Perreault, 1984), while CWB includes harmful behaviors (Fox & Spector, 2006).

Task performance is assessed with a scale of De Jonge and Peeters (2009) and is a Dutch translation of the scale of Goodman and Svyantek (1999) which exists of 9 items. An example item for the participant is "I achieve the objectives of the job". An example item for the participant's colleague is: "My colleague achieves the objectives of the job". This scale is a 7 point rating scale ranging from 0 "not at all characteristic" to 6 "totally characteristic". Cronbach's alpha for this scale was 0,91 and for study 2 Cronbach's alpha was fore self rated task performance was 0,99 and coworker rated task performance 0,91.

Counterproductive wok behavior (CWB) is measured with 10 items from De Jonge and Peeters (2009). This list is based on the list of Kelloway et al. (2002) which is modified from the Robinson and Bennett (1995) list of deviant workplace behavior and is used to measure interpersonal and organizational counterproductive behaviors. Respondents were asked to report how often they engaged in each of the ten listed behaviors in the recent past, with a 5-point frequency scale ranging from 1 "never" to 5 "very often". An example item for the participant is "I intentionally worked slowly". An example item for the participant's colleague is: "My colleague intentionally worked slowly." Cronbach's alpha for this scale was 0,94 and for study 2 Cronbach's alpha was fore self rated CWB was 0,78 and coworker rated CWB 0,82.

3.4.7 *Demographic variables*

Finally, there are also demographic variables adopted in the questionnaire (like age, sex, subsidiary company and the years they have worked for BAM) which may be important for the measurement of creativity, innovation and performance (Chang & Birkett 2004). These variables were measured to take the possible confounding influence of these variables into account in the statistical analysis.

3.5 Data Analyses

This chapter describes the data analyses conducted and how this analysis is performed for each sub question of this research.

3.5.1 Research question 1: How well can job resources and job demands predict job performance via creativity and innovation?

For this research question it was first measured how job resources and job demands predict creativity and innovation. Next it is examined how well job resources and job demands can predict job performance via creativity and innovation.

To measure how job resources and job demands predict creativity and innovation, an analysis of the correlation coefficients and a multiple regression analysis is used. The analysis of the correlation coefficient shows the strength of the association between any two metric variables and the direction of that relationship. With help of this analysis the association and the significance of the association between job demands, job resources and work outcomes creativity, innovation, task performance and CWB can be found.
Because the predictive power of the variables is also in the interest of this research, a regression analysis is conducted. In the regression analysis, a predictive model is fit to the data, and the model is used to predict values of the dependent variables (i.e. creativity and innovation) from one or more independent variables (i.e. cognitive job resources, and cognitive job demands).
It is also expected that the match of job resources and job demands can predict creativity and innovation. This match is measured with the interaction effect of job resources and job demands. With interaction, the total effect of high cognitive job demands and the cognitive job resources is more than the sum of the separate high job demands and job personal resources. In other words, the interaction can be seen as a situation of: 1+1=3 (i.e. synergy), and had therefore extra influence on the combined characteristics that strengthen each other (Vegchel, 2005). The interaction effects between the job demands and job resources are examined by multiplying the job demands and job resources and adding them in the multiple regression analysis. This is calculated with the standardized scores of job demands matching job resources (De Jonge et al., 2004; De Jonge & Dormann, 2003). The independent variables will be imported in the regression equation one after another, (Jaccard, Turrisi, & Wan, 1990). In the first regression the demographic characteristics are imported to control for possible disturbance influences (“forced entry”). In the second step, the three job demands and three job resources are imported as main effects are imported. In the last and third step, the three matching effects are imported, namely cognitive*cognitive, emotional*emotional and physical*physical (“forced entry”) (De Jonge& Demerouti, 2004). These three steps will be conducted in order to predict the dependent variable creativity and the dependent variable innovation.

To analyze how well job performance can be predicted via creativity and innovation by means of the J-J fit, the mediation effect of creativity and innovation was analyzed. There are different approaches to analyze the mediation effect, and the most commonly used approach is the

causal step approach of Baron and Kenny (1986), (MacKinnon, Lockwood, Hoffman, West & Sheets, 2002). Baron and Kenny (1986) described a path diagram as a model for depicting a causal chain. Although this approach is most commonly used, a Monte Carlo study among 14 methods to test the intervening variable effect, found that this method has low Type I error rates and the lowest statistical power among the 14 methods (MacKinnon et al., 2002). In the same Monte Carlo study it was found that the distribution of product coefficients test outperform traditional methods (MacKinnon et al., 2002). This test of the intervening variable effect involves the distribution of the product of two z-statistics, one for the α parameter zα= α/σα and another for the β parameter: zβ= β/σβ. If α and β are assumed to be normal, the zαzβ can be directly tested for significance using critical values based on the theoretical distribution of the product of two normal random variables, P= zαzβ. This test involves converting both the α and the β paths to z scores, multiplying the zs, and using a critical value based on the distribution of the product of random variables, P= zαzβ , from Craig (1936), to determine significance. An example is the critical value to test αβ =0 for the .05 significance level for the P= zαzβ distribution is 2,18, rather than 1,96 for the normal distribution.
A new program called "PRODCLIN" (MacKinnon et al., 2007) has automated computation of the distribution of the product test for mediation so that it is widely accessible. For this program it's only needed to specify the values of α, β, the standard error of α, the standard error of β, and the statistical significance level desired.

3.5.2 Research question 2: How well can Personal resources and job demands predict job performance via creativity and innovation?

To answer this research question, a similar analysis is used as in the previous question, but the focus here is on personal resources and job demands. Therefore there has also been an analysis of correlation coefficients conducted as well as a multiple regression analysis. With the help of the analysis of correlation coefficients the association and the significance of the association between job demands, personal resources and work outcomes creativity, innovation, task performance and CWB can be found.
Because the predictive power of the variables is also in the interest of this research, a regression analysis is conducted. In the regression analysis, a predictive model is fit to the data, and the model is used to predict values of the dependent variables (i.e. creativity and innovation) from one or more independent variables (i.e. cognitive personal resources, and cognitive job demands). For this research question the match between personal resources and job demands is also measured with the interaction effect. This is calculated with standardized scores of job demands matching personal resources (De Jonge et al., 2004; De Jonge & Dormann., 2003). The independent variables where imported in the regression equation one after another, (Jaccard et al., 1990). In the first regression the demographic characteristics were imported to control for possible disturbance influences ("forced entry"). In the second step, the three job demands and three personal resources were imported as main effects. In the third and last step, the three matching effects were imported, namely cognitive*cognitive, emotional*emotional and

physical*physical (“forced entry”) (De Jonge et al., 2004). These three steps were conducted in order to predict the dependent variable creativity and innovation.
To analyze the mediation effect, of creativity and innovation distribution of product test is used; more information can be found in the analysis of research question 1.

3.5.3 Research question 3: Do personal and job resources on job demands complement each other or are the competing in predicting job performance via creativity and innovation?

Although personal and job resources may each predict job performance via creativity and innovation, it was proposed that the combined effect of personal- and job resources can also predict job performance via creativity and innovation. To predict whether personal and job resources on job demands complement each other or compete with each other, the interactive effect of personal resources and job resources are measured. In the first regression the demographic characteristics were imported to control for possible disturbance influences (“forced entry”). In the second regression the interaction effect of three job demands and the combined resources as main effects were imported (i.e. Cognitive personal resources * cognitive job resources). In the last and third step, a three way interaction effect of job resources, personal resources and job demands are imported, namely: Job Demands*Job Resources*personal resources. This interaction can be seen as (1+1+1=4), which means that the combined effect of these characteristics result in extra influence. These three steps will be conducted in order to predict whether personal and job resources on job demands complement each other or are the competing in predicting job performance via creativity and innovation
Also for this research question the mediation effect of creativity and innovation are measured by using the distribution of product test; more information can be found in the analysis of research question 1.

3.5.4 How well do self reports converge coworker reports?

An analysis of the correlation coefficients was used to find if there are significant associations between coworker rated reports and self rated reports. Next, an independent t-test was conducted. The independent t-test compares two means, when those means have come from different groups of people (e.g. self- and coworker reports).
The relation between the outcome variables and its antecedents were analyzed by two hierarchical regression analyses. For the first regression analysis, the demographic variables were included in the first step. In the second step the standardized job characteristics were included (i.e. cognitive, emotional as well as physical job demands and job resources). Finally, the moderating effects were tested by adding multiplicative interaction terms (job demands * job resources) of standardized job demands and job resources (Aiken & West 1991). This regression analysis was used to analyze if job incumbents reports of job demands and job resources will be similarly associate with both job incumbents self reported work outcomes and coworker reported work outcomes.
For the second regression analysis, the same steps were conducted. However, for this analysis personal resources were imported instead of job resources.

4. Results

4.1 Introduction

This chapter presents and interprets the results of study 1 and study 2 of the analysis of each research question. In the next chapter the conclusions of the results are drawn.

4.2 Research question 1: How well can job resources and job demands predict job performance via creativity and innovation?

4.2.1 Means, Standard deviations and Correlations of Study 1

According to the basic principles of the DISC-Model, it was expected that the association of cognitive, emotional and physical resources was in the same direction. In table 4.1 the means, standard deviations and pearson correlation coefficients of the variables are presented. The table indicates that cognitive, emotional and physical job resources are indeed significant and positively associated with each other. The table further indicates that cognitive and emotional job demands as well as emotional and physical job demands are significantly associated with each other. Physical job demands were not associated with cognitive job demands.

It was also expected that cognitive job resources and cognitive job demands were positively associated with creativity and innovation. The results in table 4.1 show that cognitive job demands are indeed associated with creativity and innovation, and this association is significant. However, there is no association between cognitive job resources and creativity and innovation. In the conclusion section this unexpected matter will be further examined. From this analysis it is also found that emotional job demands are significantly associated with creativity and innovation. This association was unexpected, and will be elaborated in the conclusion section. Furthermore there was no significant association between emotional resources and creativity and innovation. There was also no significant association between physical demands and creativity and innovation. A significant association between physical job resources and creativity and innovation was also not detected.

An inspection of the correlations in table 4.1 also indicates that creativity and innovation are both positive and significantly related to task performance. In addition the results show that innovation is positively related to CWB, but creativity is not related to CWB. Furthermore the results show that the means of creativity, innovation are rather high. This shows that on average employees find themselves creative, innovative and perform good. The mean of CWB was very low, indicating that employees find that they work on average not very counterproductive.

Table 4.1 Means, Standarddeviations and pearson correlations, Study 1 (N=322)

		M	*SD*	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*	*14*
1	Cognitive demands	3,94	0,42	1													
2	Cognitive resources	3,65	0,49	0,11	1												
3	Personal cognitive resources 1	3,21	0,32	0,11*	0,19**	1											
4	Personal cognitive resources 2	2,87	0,24	0,00	0,02	0,13	1										
5	Emotional demands	2,80	0,57	0,36**	-0,08	-0,02	0,09	1									
6	Emotional resources	3,37	0,63	-0,02	0,42**	0,22**	-0,10	-0,25**	1								
7	Personal emotional resources	4,04	0,61	-0,02	0,18**	0,41**	-0,05	-0,30**	0,32**	1							
8	Physical demands	1,53	0,59	0,04	-0,06	-0,02	-0,05	0,33**	-0,10	-0,26**	1						
9	Physical resources	3,43	1,04	-0,09	0,24**	0,15**	0,07	-0,13*	0,24**	0,20**	0,02	1					
10	Personal physical resources	4,02	0,49	0,04	0,14*	0,36**	-0,12*	-0,13*	0,26**	0,40**	0,01	0,14*	1				
11	Creativity	3,43	0,49	0,19**	0,06	0,46**	0,37**	0,19**	0,11	0,12*	0,10	0,09	0,36**	1			
12	Innovation	3,26	0,57	0,19**	0,09	0,34**	0,21**	0,21**	0,08	0,05	0,09	0,01	0,30**	0,67**	1		
13	Task performance	5,33	0,91	0,04	0,08	0,52**	0,01	-0,05	0,21**	0,31**	-0,12*	0,04	0,36**	0,42**	0,35**	1	
14	CWB	1,42	0,32	0,02	-0,09	-0,18**	0,10	0,26**	-0,20**	-0,35**	0,18**	0,18**	-0,21	0,08	0,11**	-0,10	1

$p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

4.2.2 Multiple regression analysis of Study 1

The results of the regression analysis with dependent variables creativity and innovation are presented in table 4.2. In the analysis the unstandardized regression coefficients are presented to interpret the standardized variables as good as possible (Aiken & West, 1991).

Table 4.2 Hierarchical multiple regression-analysis of job demands and job resources, Study 1 (N=322)

	Creativity	*Innovation*
Model 1		
Age	0,00	0,00
Sex	-0,02	0,13
Company subsidiary	-0,01	-0,01
Working Years	0,00	0,00
Model 2		
Cognitive demands	0,15*	0,10
Cognitive job resources	0,00	0,04
Emotional demands	0,13*	0,21**
Emotional job resources	0,05	0,04
Physical demands	0,06	0,03
Physical job resources	0,02	0,01
Model 3		
Cognitive demands * Cognitive job resources	0,04	
Emotional demands * Emotional job resources	-0,07**	
Physical demands * Physical job resources	-0,07*	
R^2 change model 1/ df	0,01 df:4	0,01 df:4
R^2 change model 2/ df	0,06** df:6	0,06** df:6
R^2 change model 3/ df	0,05** df:3	
R^2 Total	0,12	0,07
Adjusted R^2	0,08	0,04
F-Statistic Step 3	2,76**	1,98*

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

The regression analysis for creativity in table 4.2 shows that third model significantly better compared to model 1 and model 2. The regression analysis for innovation shows that the second model best fits the results, and therefore, this model is used.

The regression analysis in table 4.2 shows that an increase of cognitive job demands is accompanied with an increase in creativity. However cognitive job demands were not significantly related to innovation. The table also shows that cognitive job resources do not significantly predict creativity and innovation. An increase of cognitive job resources does not result in more creativity and innovation.

An interaction effect between cognitive job demands and cognitive job resources was also expected, but this was not found in the regression analyses. There is therefore no extra influence of the combined characteristics, cognitive job demands and cognitive job resources, which strengthen each other.

The regression analysis further indicates that emotional demands are accompanied with more creativity. The analysis also indicates that an interaction effect of emotional job demands and emotional job resource es negatively predicts creativity, and is presented in figure 4.1 according to the graphical method of Aiken and West, (1991). Values of the predictor variables were chosen one standard deviation below and above the mean. Two simple regression analyses were then generated by entering values in the equation. Finally, a precise test of slope significance was carried out to allow inferences as regards the significance of individual slope (Dawson & Richter, 2006). Figure 4.1 shows that an increase in emotional job demands was related to more creativity when emotional job resources where low (-1SD; simple slope test: t=3,13, p<.01). Emotional demands were not associated with creativity when emotional resources are high (1SD; simple slope test: t=0,98, p=n.s.).

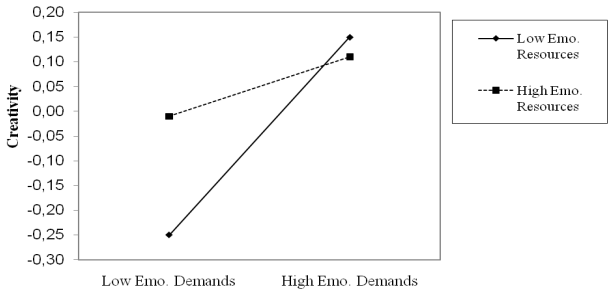

Figure 4.1 Interaction between emotional job demands and Emotional job resources for creativity. Emo.=Emotional

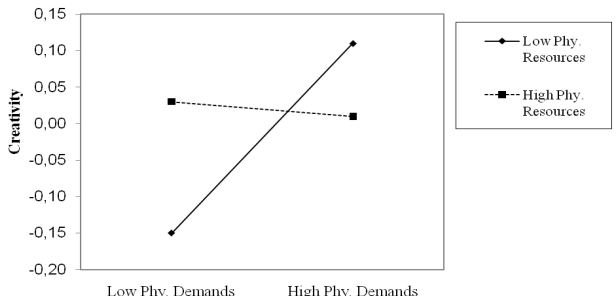

Figure 4.2 Interaction between physical job demands and physical job resources for creativity. Phy=Physical

Finally it was found that an interaction effect of physical job demands and physical job resources was negatively related to creativity. Figure 4.2 shows that that an increase in physical job demands were related to more creativity when physical resources are low (-1SD; simple slope test: t=1,99, p<.05). Physical job demands were not associated with creativity when physical resources are high (+1SD; simple slope test: t=-0,22, p=n.s.).

4.2.3 Mediation analysis study 1

Two regression analyses were also conducted to explore if creativity is related to task performance and CWB. These analyses (Appendix D) show that creativity is significantly related to task performance (β=0,78, p<.001), but not to CWB.

The results of the regression analysis presented in table 4.2, show that cognitive job demands, emotional job demands, and the interaction of emotional job demands and emotional job resources as well as the interaction of physical job demands and physical job resources are accompanied with significant more creativity. From these variables, only the negative interaction of emotional job resources and emotional job demands strengthen the task performance of an employee directly (Appendix C). The other three variables which significantly predicted creativity did not significant significantly task performance directly (Appendix C).

However the mediation analysis presented in the table 4.3, shows that all variables which significantly predicted creativity have a lower and upper 95% confidence limits which did not contain zero, consistent with a statistically significant mediation effect. This indicates that all variables that can predict creativity are also able to predict task performance via creativity.

Table 4.3 Mediation effect of creativity between job demands, job resources and task performance, Study 1

Independent variable	**A**	**SE α**	**β**	**SEβ**	**Mediation effect (α* β)**	**Lower Limit**	**Upper Limit**
Cognitive job demands	0,15	0,07	0,78	0,10	0,11	0,00	0,24
Emotional job demands	0,13	0,06	0,78	0,10	0,10	0,01	0,20
Emo*emo	-0,07	0,02	0,78	0,10	-0,05	-0,09	-0,02
phy*phy	-0,07	0,03	0,78	0,10	-0,05	-0,11	-0,00

Two regression analyses were also conducted to figure out if innovation is also related to task performance and CWB. These analyses (Appendix D) show that innovation is indeed significantly related to task performance (β=0,552, p<.001) and CWB (β=0,063, p<.05).

The regression analysis presented in table 4.2 shows that only the variable emotional job demands is a good predictor of innovation. The mediation analysis (table 4.5 and 4.6) show that emotional job demands are also a good predictor of task performance and CWB via innovation.

Table 4.5 Mediation effect of innovation between job demands, job resources and task performance, Study 1

Independent variable	**α**	**SE α**	**β**	**SEβ**	**Mediation effect (α* β)**	**Lower Limit**	**Upper Limit**
Emotional demands	0,23	0,07	0,55	0,08	0,12	0,045	0,22

Table 4.6 Mediation effect of innovation between job demands, job resources and CWB

Independent variable	**A**	**SE α**	**β**	**SEβ**	***Mediation effect (α* β)***	***Lower Limit***	***Upper Limit***
Emotional demands	0,23	0,07	0,06	0,03	0,01	0,00	0,03

Research question 2: How well can personal resources and job demands predict job performance via creativity and innovation?

4.2.4 Means, Standard deviations and Correlations of Study 1

Like the principles of the DISC model, it was also expected that personal resources were positive associated with each other. Table 4.1 contains the results of the analysis of correlation coefficients. The table shows that personal resource 1 (self-efficacy), personal emotional resources (emotional stability) and physical personal resources (Vigor) are indeed correlated with each other. However, personal resource 2 (innovator cognitive style) is not positive associated with the other personal resources, and is even significant negative associated with physical personal resources.

The analysis proves that cognitive job demands and both cognitive personal resources are as expected positive associated with creativity and innovation. It was already mentioned that emotional job demands are also positive associated with creativity and innovation. The results further indicate that emotional personal resources are positively associated with creativity, but are not associated with innovation. Physical personal resources are positively associated with creativity and innovation. This unexpected result will be further elaborated in the conclusion section. Physical job demands are not associated with creativity neither to innovation.

4.2.5 Multiple regression analysis of Study 1

The results for this regression analysis with dependent variables creativity and innovation are presented in table 4.7. The table contains the result of step 2 of the regression equation. The results showed that for both regression analyses, the third model was not significantly better compared to the second model. In the analysis the not standardized coefficients are presented to interpret the standardized variables as good as possible (Aiken & West, 1991).

The results of the regression analysis in table 4.7 show that cognitive job demands are not significantly accompanied with creativity and innovation. This implies that according to this model cognitive job demands will not strengthen employees' creativity and innovation. However, this analysis indicates that both cognitive resources (self-efficacy and innovator cognitive style) are both accompanied with significant more creativity as well as innovation.

This model also shows that emotional job demands can significantly predict creativity and innovation. However, the significance level is smaller if emotional demands predict innovation compared to creativity.

The analysis also indicates that an increase of physical personal resources will result in significantly more creativity and innovation. This relation was not expected and will be further elaborated in the conclusion.

Finally the regression analysis implies that emotional resources and physical job demands are not good predictors of creativity and innovation.

Table 4.7 Hierarchical multiple regression-analysis of job demands and personal resources (Study 1 N=322)

	Creativity	*Innovation*
Model 1		
Age	0,00	0,00
Sex	0,15	0,29
Working Years	0,00	-0,00
Company subsidiary	-0,00	0,00
Model 2		
Cognitive demands	0,08	0,08
Cognitive personal resources 1(Self-efficacy)	0,45***	0,42***
Cognitive personal resources 2 (Innovator cognitive style)	0,72***	0,47***
Emotional demands	0,11*	0,18**
Emotional personal resources	-0,06	-0,10
Physical demands	0,06	0,02
Physical personal resources	0,38***	0,40***
R^2 change model 1/ df	0,01 df:4	0,01 df:4
R^2 change model 2/ df	0,45*** df: 11	0,29*** df:11
R^2 Total	0,46	0,30
Adjusted R^2	0,44	0,27
F-statistic	21,11***	10,32***

* p < 0.05, ** p < 0.01, *** p < 0.001

4.2.6 Mediation Analysis Study 1

The regression analysis conducted for this research question (table 4.7) shows that cognitive personal resources 1 (self-efficacy) and cognitive personal resources 2 (innovator cognitive style), emotional demands, and physical personal resources were significantly and positive related with creativity as well as innovation. From these variables are only cognitive personal resources 1 (self-efficacy) and physical personal resources significant related to task performance (Appendix C).

The mediation analysis (table 4.8) shows that the variables cognitive personal resources 1, cognitive personal resources 2, emotional demands and physical personal resources are all good predictors of task performance via creativity. In other words, if the value of one of these variables increases, task performance will also increase.

Table 4.8 Mediation effect of creativity between job demands, personal resources and task performance

Independent variable	α	SE α	β	SEβ	Mediation effect (α* β)	Lower Limit	Upper Limit
Cognitive Personal Resources 1	0,25	0,08	0,78	0,10	0,19	0,070	0,33
Cognitive Personal Resources 2	0,74	0,07	0,78	0,10	0,58	0,42	0,76
Emotional job demands	0,11	0,05	0,78	0,10	0,09	0,02	0,16
Physical Personal resources	0,28	0,05	0,78	0,10	0,22	0,13	0,32

The mediation analysis (table 4.9) shows that the variables cognitive personal resources 1, cognitive personal resources 2, emotional demands and physical personal resources are also good predictors of task performance via innovation. Put in another way, if one of these variables increases, task performance will also increase.

Table 4.9 Mediation effect of innovation between job demands, personal resources and Task Performance

Independent variable	α	SE α	β	SEβ	Mediation effect (α* β)	Lower Limit	Upper Limit
Cognitive Personal Resources 1	0,25	0,08	0,55	0,08	0,15	0,048	0,24
Cognitive Personal Resources 2	0,74	0,07	0,55	0,08	0,29	0,27	0,56
Emotional job Demands	0,11	0,05	0,55	0,08	0,09	0,01	0,12
Physical Personal resources	0,28	0,05	0,55	0,08	0,18	0,09	0,23

As presented in Appendix D, innovation is also significant accompanied with CWB. From the variables that were found to significantly influence innovation, only emotional demands were also significantly related to CWB. In the mediation analysis (table 9) it is presented that cognitive personal resources 1 (self-efficacy), cognitive personal resources 2 (innovator cognitive style), emotional demands and physical personal resources (vigor) are good predictors of CWB via innovation.

Table 4.10 Mediation effect of innovation between job demands, personal resources and CWB

Independent variable	α	SE α	β	SEβ	Mediation effect (α* β)	Lower Limit	Upper Limit
Cognitive Personal Resources 1	0,25	0,08	0,06	0,03	0,02	0,00	0,04
Cognitive Personal Resources 2	0,74	0,07	0,06	0,03	0,03	0,00	0,09
Emotional Demands	0,11	0,05	0,06	0,03	0,01	0,00	0,01
Physical Personal resources	0,28	0,05	0,06	0,03	0,02	0,00	0,04

4.3 Research Question 3: Do personal and job resources complement each other, or are they competing in predicting job performance via creativity and innovation?

4.3.1 Regression analysis Study 1

In order to examine whether personal- and job resources complement or compete with each other, in predicting job performance via creativity and innovation, a multiple regression analysis was conducted. The table contains the result of step 3 of the regression equation. As a result of the priory standardization of all variables, unstandardized regression coefficients are presented in table 4.11 (Aiken & West, 1991).

The results in table 4.11 show that cognitive job demands are not accompanied with significant more creativity and innovation. It further shows that the interaction of cognitive job resources and cognitive personal resource 1 (self-efficacy) was not related to creativity and innovation. An interaction of cognitive job resources and cognitive personal resources 2 (innovator cognitive style) was also not significantly related to creativity or innovation.
The three way interaction effect of cognitive job resources and cognitive personal resources (self-efficacy) did not result in significant more creativity and innovation. However, the results indicate that the three way interaction effect of cognitive job resources, cognitive personal resources (innovator cognitive style) and cognitive job demands result in significant more creativity and innovation. This can be seen as a situation of 1+1+1=4, which is a result of the extra influence of the combined effect of these characteristics that strengthen each other.

The regression analysis further shows that emotional demands are significant related to creativity and innovation. An interaction effect of emotional job resources and emotional job demands was significantly related to creativity, but not to innovation. The three way interaction effect of the emotional components did not significantly influence creativity and innovation.
The interaction between physical job resources and physical job demands was significantly related to creativity. In addition, the three way interaction effect of physical job demands, physical job resources and physical personal resources were significantly related with both creativity and innovation.

Table 4.11 Hierarchical multiple regression-analysis of job resources, personal resources and job demands (N=322)

	Creativity	*Innovation*
Model 1		
Age	0,00	0,00
Sex	-0,04	0,13
Working Years	0,00	0,00
Company subsidiary	-0,02	-0,02
Model 2		
Cognitive demands	0,12	0,04
Cognitive job resources * Cognitive personal Resources 1	0,00	-0,03
Cognitive job resources * Cognitive personal Resources 2	-0,02	0,03
Cognitive demands*Cognitive job resources	0,02	-0,00
Cognitive demands*Cognitive personal Resources 1	0,00	0,02
Cognitive demands*Cognitive personal Resources 2	0,03	-0,04
Emotional demands	0,16*	0,24**
Emotional job resources * Emotional pers. Resources	0,02	0,05
Emotional demands*Emotional job Resources	-0,08*	-0,04
Emotional demands*Emotional pers. Resources	-0,00	0,03
Physical demands	0,05	0,03
Physical job resources * Physical personal Resources	0,03	0,07
Physical demands* Physical job resources	-0,08*	-0,04
Physical demands* Physical personal resources	0,04	0,00
Model 3		
Interaction cognitive*cognitive*cognitive 1	-0,01	-0,04
Interaction cognitive*cognitive*cognitive 2	0,06*	0,11***
Interaction emotional*emotional*emotional	-0,03	0,00
Interaction physical*physical*physical	0,08*	0,10*
R^2 change model 1 / df	0,01 /4	0,01
R^2 change model 2 / df	0,14*** /18	0,09* /4
R^2 change model 3 / df	0,04* /22	0,06* /18
R^2 Total	0,18	0,15** /22
Adjusted R^2	0,12	0,08
F-statistic	2,55	2,09

* p < 0.05, ** p < 0.01, *** p < 0.001

4.3.2 Mediation analysis

The regression analysis conducted for this research question (table 4.11) shows that emotional job demands, the interaction of emotional, physical job demands with corresponding job resources, the three way interaction effect of cognitive job demands, cognitive job resources and cognitive personal resources and the three way interaction effect of physical job demands, physical job resources and physical personal resources are a good predictor of creativity. Appendix C shows that these variables are not significantly related to task performance. An inspection of the mediation analysis in table 4.12 indicates that all variables that predict creativity, also predict task performance via creativity.

Table 4.12: Mediation effect of creativity between job demands, job resources, personal resources, and task performance. Emo*emo=Emotional Job demands * Emotional Job resources, Phy*Phy= Physical Job demands * Physical Job resources

Independent variable	**α**	**SE α**	**β**	**SEβ**	**Mediation effect (α* β)**	**Lower Limit**	**Upper Limit**
Emotional demands	0,16	0,06	0,78	0,10	0,12	0,03	0,23
Emo*emo	-0,08	0,03	0,78	0,10	-0,06	-0,11	-0,01
phy*phy	-0,08	0,03	0,78	0,10	-0,06	-0,11	-0,01
Three way interaction cognitive components	0,06	0,02	0,78	0,10	0,04	0,00	0,08
Three way interaction Physical components	0,08	0,04	0,78	0,10	0,06	0,00	0,12

Table 4.13 presents the results of the mediation analysis of mediating effect of innovation between the interaction effect of personal resources and job resources with task performance. The results in appendix C indicate that none of these variables significantly predict task performance. The mediation analysis in table 4.13 shows that all variables that significantly predict innovation, also significantly predict task performance via innovation.

Table 4.13 Mediation effect of innovation between job demands, interaction job resources-personal resources and task performance

Independent variable	**α**	**SE α**	**β**	**SEβ**	**Mediation effect (α* β)**	**Lower Limit**	**Upper Limit**
Emotional demands	0,24	0,08	0,55	0,08	0,13	0,05	0,23
Interaction Cognitive dimensions 2	0,11	0,05	0,55	0,08	0,06	0,00	0,11
Interaction physical dimensions	0,10	0,03	0,55	0,08	0,06	0,02	0,11

From the variables that can predict innovation, only the emotional demands can also significantly predict CWB. However, an inspection of the mediation analysis in table 4.14 indicates that all variables that significantly predict innovation, can also significantly predict CWB via innovation.

Table 4.14 Mediation effect of innovation between job demands, interaction job resources-personal resources and CWB

Independent variable	α	SE α	β	SEβ	Mediation effect (α* β)	Lower Limit	Upper Limit
Emotional demands	0,24	0,08	0,06	0,03	0,01	0,00	0,03
Interaction Cognitive dimensions 2	0,11	0,08	0,06	0,03	0,01	0,00	0,01
Interaction physical person-job 1	0,10	0,05	0,06	0,03	0,00	0,00	0,02

4.4 Research Question 4: Do self rating report differ from coworker rating reports?

To understand if self reports and coworker reports converge with each other, the means, standard deviations and pearson correlations were analyzed (table 4.15). The results show that means and standard deviations of self- and coworker rated creativity are rather similar, respectively M=3,23 SD=0,86 and M=3,22, SD=0,64. However, it could be that this similarity is just by chance, and therefore an independent t-test was conducted. The independent t-test looks at differences between the overall means of the two samples (self- and coworker rated creativity) and compare them to the differences that can be expected to get between the means for the two populations from which the samples come (Field, 2005). The results in table 4.16 show that the difference was not significant t(83)=0,13, p>.05, and therefore convergence between self- and coworker rated creativity was found. Two multiple regression analysis with dependent variables coworker rated creativity and coworker rated innovation were conducted. However, hierarchical regression analysis with matching demand-job resources as well as the hierarchical regression analysis with matching demands-personal resources did not fit the overall data, and these models were therefore not significantly better than using the means as best guess (Field, 2005) This may come due the small sample size (N=43).

Self rated innovation was on average higher (M=3,23, SD=0,68) compared to coworker rated innovation (M=2,88, SD=0,61). Self- and coworker rated innovation did also not correlate with each other. Furthermore, the difference between the means was not significant t(83) 2,46, p<0,05, which implies that self and coworker rated innovation did not converge with each other.

Self- and coworker rated task performance were also expected to converge, however self rated task performance was higher (M=5,30, SD=0,88) compared to coworker rated task performance (M=4,80, SD=0,96). The pearson correlation analysis shows that self and coworker rated innovation do not correlate with each other. The independent t-test shows that the difference is significant t(82)=2,49, p=<0,05. It can therefore be concluded that self and coworker rated task performance do not converge with each other. Self- and coworker rated CWB were expected to converge with each other, but the results show that on average, self rated CWB was lower (M=1,38, SD=0,32) compared to coworker rated CWB (M=1,49, SD=0,44). Although self- and coworker rated CWB did not correlate with each other, the differences between the means was not significant t(83)=-1,32, p>0,05). This shows that there is convergence between self- and coworker rated CWB.

To conclude, Self- and coworker rated creativity and CWB converge with each other, but self- and coworker rated innovation and task performance do not converge with each other.

Table 4.15 Means, Standarddeviations and pearson correlations, Study 2 (n=43)

		M	*SD*	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*	*14*	*15*	*16*	*17*	*18*
1	Cognitive demands	3,54	0,54	1																	
2	Cognitive resources	3,70	0,64	0,47**	1																
3	Personal cognitive resources 1	3,13	0,57	0,27	0,19	1															
4	Personal cognitive resources 2	2,75	0,34	0,42**	0,22	0,25	1														
5	Emotional demands	2,35	0,66	0,52**	-0,02	-0,13	0,11	1													
6	Emotional resources	2,41	0,67	0,22	0,49**	-0,06	0,14	-0,09	1												
7	Personal emotional resources	4,00	0,66	0,11	0,26*	0,42**	0,20	-0,20	0,15	1											
8	Physical demands	1,40	0,62	0,13	0,26	0,01	0,22	0,05	0,20	0,15	1										
9	Physical resources	3,71	1,02	0,34*	0,65**	0,09	0,16	0,05	0,29**	-0,07	0,00	1									
10	Personal physical resources	3,97	0,46	0,21	0,23*	0,15	0,24	0,14	0,19	0,12	-0,02	0,19	1								
11	Creativity	3,23	0,68	0,45**	0,04	0,29	0,73**	0,24	0,01	0,00	0,11	0,06	0,35**	1							
12	Creativity_B	3,22	0,64	0,07	0,10	0,11	0,47**	0,00	0,12	0,15	0,07	-0,04	0,06	0,31	1						
13	Innovation	3,23	0,68	0,54**	0,04	0,40**	0,68**	0,23	-0,08	0,17	0,09	0,07	0,31*	0,84*	0,27	1					
14	Innovation_B	2,88	0,61	-0,06	-0,12	0,19	0,32*	-0,07	0,06	0,29	0,08	-0,26	-0,24	0,12	0,72**	0,13	1				
15	Task performance	5,30	0,88	0,09	-0,16	0,24	0,33*	0,08	-0,02	0,39**	0,06	-0,12	0,35**	0,29	0,15	0,35*	0,36	1			
16	Task performance_B	4,80	0,96	0,06	0,03	0.07	0,17	-0,02	-0,07	-0,02	-0,11	-0,05	-0,07	0,13	0,67**	0,13	0,66**	0,30	1		
17	CWB	1,38	0,32	-0,01	-0,15	-0,31*	0,06	0,04	-0,13	-0,36**	0,08	-0,12	-0,37**	-0,08	-0,07	-0,07	0,12	-0,16	0,24	1	
18	CWB_B	1,49	0,44	0,26	0,04	0,07	0,42**	0,25	0,10	-0,08	-0,05	0,25	0,17	0,35*	-0,11	0,48**	-0,19	0,05	-0,29	0,03	1

* p < 0.05, ** p < 0.01, *** p < 0.001

Table 4.16 Independent t-test

				t-test for equality means		
	Self rated mean	Coworker rated mean	Difference of the means	df	t	Sig. (2-tailed)
Creativity	3,23	3,22	-0,08	83	0,13	0,90
Innovation	3,23	2,88	0,31	83	2,47	0,02
Task performance	5,30	3,80	0,51	82	2,49	0,02
CWB	1,38	1,49	-0,11	83	-1,32	0,19

5. Conclusion & Discussion

5.1 Introduction

In this chapter the conclusions of the research are discussed. Furthermore the limitations and recommendation for future research are given. Finally the managerial implications of this research are presented.

5.2 Conclusion

The objective of this research was to gain insight in the personal and work characteristics that can predict job performance via creativity and innovation, and to test the extent to which job incumbent self- and coworker report of the work outcomes creativity, innovation, task performance and CWB converge. Job performance is in this research divided in a positive performance outcome, task performance, and a negative performance outcome, counterproductive work behavior (CWB).

In the theoretical part of this research a model was developed to explore whether job performance via creativity and innovation can be explained by means of the Person-job fit theory or the Job-Job fit theory, or even by both. In this model were two theories integrated in order to predict job performance via creativity and innovation. These two theories are the Job-job fit (J-J fit) theory, more specifically the DISC-theory, and the Person-Job fit (P-J fit) theory. Furthermore, the extent to which self- and coworker reports converge was researched. Based on this model four research questions emerged, namely:

1. How well can job resources and job demands predict job performance via creativity and innovation?
2. How well can personal resources and job demands predict job performance via creativity and innovation?
3. Do personal and job resources complement each other, or are the competing in predicting job performance via creativity and innovation?
4. To which extent do self reports converge with coworker reports?

The results of these research questions are presented in figure 5.1 and 5.2. Figure 5.1 shows that cognitive personal resources and emotional demands are positively related to innovation. Furthermore it shows that personal cognitive resources, emotional demands, cognitive demands and the negative interaction of emotional job demands, physical job demands with corresponding job resources were related to creativity. The study also found a positive relation between physical personal resources (vigor) and creativity and innovation (grey lines). However, as will be later discussed, vigor refers to motivation rather than physical personal resources. Finally this figure shows that creativity is related to task performance, but not to CWB. Innovation was found to be related to task performance and CWB.

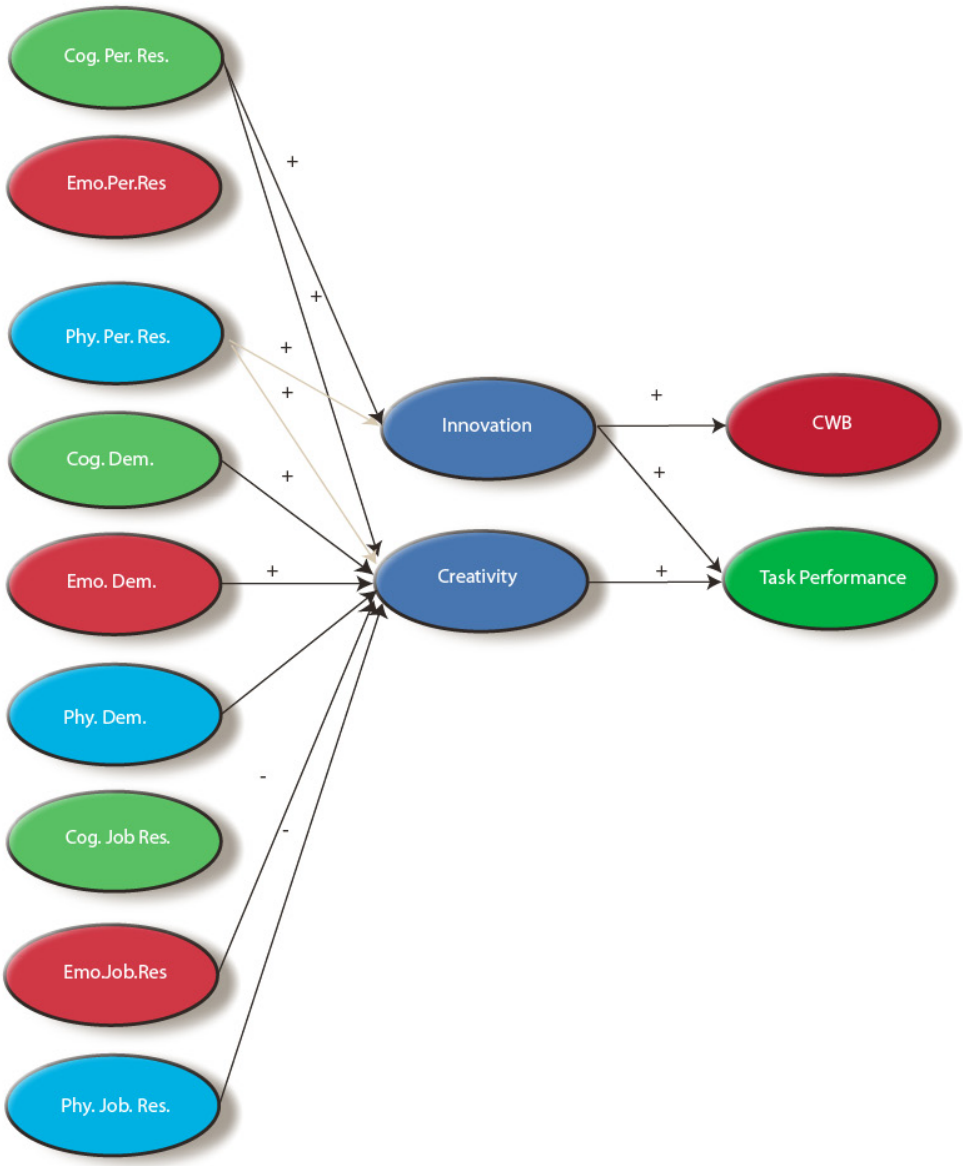

Figure 5.1 Final Research Model. Cog.=Cognitive, Emo.=Emotional, Phys.=Physical, Per.=Personal, Res.=Resources, Dem.=Demands.

Figure 5.2 shows that the three way interaction of cognitive personal resources (innovator cognitive style), cognitive demands and cognitive resources is positively related to creativity as well as to innovation. A three way interaction of physical personal resources, physical demands and physical job resources was also related to creativity and innovation. However this three way interaction may also be biased due to the measure used for personal physical resources (vigor).

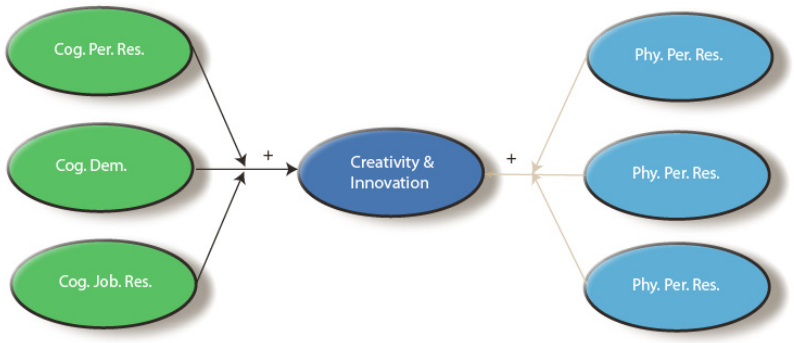

Figure 5.2 Final Research Model. Cog.=Cognitive, Phys.=Physical, Per.=Personal, Res.=Resources, Dem.=Demands.

Before discussing the results of each research questions, the relations between creativity, innovation and job performance will be discussed. First of all it was found that creativity and innovation were both significantly related to task performance. Innovations were also found to be positive and significantly related to CWB. However this research did implicate which specific demands or resources influenced task performance or CWB, since all variables that did influence creativity and innovation also could predict job performance via creativity and innovation.

Task performance could be predicted via creativity and innovation, because creative ideas and innovations of employees may change work goals work methods, procedures, and task relationships of employees to better meet organizational objectives and their effective functioning. This may explain the relation between creativity, innovation and task performance.

The results also showed a significant relation between innovation and CWB. Creative and innovative employees run the risk of conflict with and resistance to change from other actors who want to prevent change (Janssen, 2003). If an employee is pushing innovative ideas for change, he/she is likely to challenge elements of the established framework of work goals, work methods, task relationships, informal norms, and expectations that actors in the workplace have of one another. As such, innovative change implies that new and also often threatening sets of theories and practices have to be developed and adapted to the needs of the new situation. Coworkers and supervisors may resist these changes because of their tendency to avoid the insecurity and stress surrounding change, their habits and preferences for familiar practices and actions, their propensity to avert cognitive dissonance, and their interest and commitment to the established framework of theories and practices (Janssen, 2003; Jones, 2001). Because of the emerging conflicts, taking innovative initiatives can cause frustration, antagonism, and animosity, and may therefore lead the innovator to have less positive feelings about the relationships with co-workers and supervisors (Janssen, 2003). This may cause CWB of employees who implement new creative ideas.

5.2.1 How well can job resources and job demands predict job performance via creativity and innovation?

For the first research question it was expected that task performance via creativity and innovation could be both predicted by means of cognitive job demands and cognitive job resources. The results show that task performance via creativity can indeed be predicted by means of *cognitive job demands*. However task performance via innovations could not be predicted by means of cognitive job demands. A possible explanation is that in this research creativity and innovation are both related to emotional job demands. Hockey (2000) noted that emotional demands may indirect influence performance in cognitive tasks, because they compete strongly for the control of attention**.** Employees may therefore experience more the emotional demands related innovation, and to lesser extent cognitive job demands. The relation between emotional job demands and innovation will be later discussed.

Cognitive job resources could not predict task performance and CWB via creativity and innovation, since cognitive resources were not related to creativity and innovation. The results also show that employees did not opt for other resource to counteract the cognitive job demands related to creativity. De Jonge et al. (2008) namely propose that if matching job resources are not available or they are depleted they will search for other resources. However the mean of the cognitive job resources was relatively high (M=3,65 SD=0,46), indicating that most employees have available cognitive job resources to counteract the high job demands, but do not use these resources for creativity and innovation. Van den Tooren and De Jonge (2010) also noted that in some situation employees will not use their available job resources.

Emotional job demands were also found to predict task performance via creativity and innovation, and to predict CWB via innovation. This finding is not in line with the TMP, which assumes that emotional job demands are less likely to match with cognitive outcomes like creativity and innovation (De Jonge & Dormann, 2006). In the creativity and innovation literature there is some evidence that emotional job demands may influence creativity and innovation. Literature on mood has demonstrated that both positive and negative mood affect can influence creativity. However, in a recent meta analysis (Baas, De Dreu, & Nijstad, 2008) it was proposed that the hedonic tone is far less important than is often assumed. Instead of hedonic tone, it appears that a combination of promotion focus with high levels of activation drives mood effects on creativity. Therefore, this literature does not give a clear explanation for the high emotional job demands related to creativity and innovation found in this study. A few interviews have therefore been conducted with employees from BAM, to understand what kind of emotional job demands employees perceive. Based form these interviews it was found that employees sometimes receive tasks with a high urgency, which employees perceive as unrealistic goals. A planning engineer said: “Sometimes you get an order of your project leader to finish a task in a very, almost unrealistic, short time, in such situations you have to take risks to accomplish the task in time.” Employees cannot rely on their standard work methods and procedures, and have to find creative ideas to obtain the goal. It indicates that employees who perceive unrealistic goals from their project leader or client are challenged to find creative ideas to obtain the unrealistic goal. They have to control their emotions, and to find creative ideas to

reach that goal. However, it can be expected that employees who receive continuous unrealistic goals, and have to control their emotions do not perceive these emotional job demands as challenge anymore, but as a threat, and they may become emotional exhausted.

Emotional job resources may play an important role in this process, since leader's emotional intelligence to counteract the emotional demanding nature of creativity and innovation (Zhou & George, 2003). Zhou and George (2003) propose that leaders who score high on emotional intelligence will be able to sense this frustration and importantly to create favorable conditions to channel it into creative problem solving. It was further proposed that leaders with high emotional intelligence are able to shift frustrations related to creativity and innovation to enthusiasm and excitement. This relation was not found in this study.

The results also showed a negative interaction effect (1+1=-3) between emotional job demands and emotional job resources. This finding is the opposite of the balance principle of the DISC model, which assumes that optimal condition for active learning, growth, creativity and performance exist where a balanced mixture of (high) job demands and corresponding job resources occurs (De Jonge et al., 2004). According to the DISC-model will employees become in a survival mode if they perceive a high job demands with low corresponding job resources, and therefore he/she will use limited job resources to combat high job demands (De Jonge et al., 2008). It may be that employees, who become in a survival mode, search for creative ideas to regain their balance. However, if employees are not able to regain their imbalance, it can be expected that employees become emotional exhausted and are not motivated to find creative ideas. Since no support was found in the literature for this finding, it is interesting for future research to study how an imbalance between emotional job demands and emotional job resources can foster employees' creativity.

Physical job demands (demands related to the musculoskeletal system) and *physical job resources* (instrumental support from colleagues and supervisors, or ergonomic aids at work) were in this study not related to creativity or innovation. This is also in line with the TMP, which assumes that physical job demands or physical job resources cannot match with cognitive outcomes like creativity and innovation (De Jonge & Dormann, 2006). Nevertheless, a negative interaction effect between physical job demands and physical job resources was found to predict job performance via creativity and innovation. If employees have an imbalance between physical job demands and physical job resources they may be challenged to search for creative solutions to regain their balance. If employees are able to regain their balance between physical job demands and physical job resources they are expected to enhance their task performance. This may explain why a negative interaction effect between physical job demands and physical job resources increases task performance via creativity. However, it should be noted that if there is an imbalance between physical job demands and physical job resources for a long period, this may result adverse health, and poor well being. In other words, an imbalance between physical job demands and physical job resources may result in creativity, however if this imbalance continues for a long period employees may get physical health complaints, which may reduce the motivation to find creative solutions. Nevertheless, more research should be

conducted to understand the relation between an imbalance between job demands and job resources and the relation to creativity.

5.2.2 How well can personal resources and job demands predict job performance via creativity and innovation?

For the second research question it was proposed that job performance via creativity and innovation can be best predicted by cognitive personal resources and cognitive job demands.
The results showed that job performance via creativity and innovation can both be predicted by the *cognitive personal resources* "self-efficacy" and "innovator cognitive style". If an employee beliefs that he/she is capable of performing in a certain manner to attain certain goals (self-efficacy), this will result in more creativity and innovations. In addition, if an employee prefers innovative ideas for problems, looks beyond what is given to solve problems and like to do different (innovator cognitive style), this will also strengthen employee's creativity and innovation. The results showed that self-efficacy is a good direct predictor of task performance, and an innovator cognitive style was not directly related to task performance. Nevertheless, the mediation analysis proves that self-efficacy as well as an innovator cognitive style can both predict task performance via creativity and innovation. CWB via creativity could not be predicted by means of cognitive personal resources, since creativity was not significantly related to CWB. However, the cognitive personal resources self-efficacy and innovator cognitive style are both a good predictor of CWB via innovation.
Cognitive job demands could in both studies not predict task performance via creativity and innovation and also not CWB via creativity and innovation. Cognitive job demands were namely not related creativity and innovation. Since employees perceived rather high cognitive job demands (M: 3,54, SD: 0,54), it maybe, that from a certain level of cognitive job demands, personal cognitive resources are more important in predicting creativity and innovation. A combination of cognitive job demands and personal cognitive resource did in both studies not result in significant more creativity or innovation. The interaction effect (1+1=3) between cognitive job demands and cognitive personal resources was not found.
Like the results in research question one, the results of this research question also show that emotional job demands are related creativity and innovation. This is not in line with the TMP, which assumes that emotional job demands cannot match with cognitive outcomes like creativity and innovation (De Jonge & Dormann, 2006). An explanation of the relation between high emotional job demands and creativity and innovation, was already given in the previous research question, and will therefore not be elaborated here.
Emotional personal resources and *physical job demands* were, as expected, not related to creativity or innovation. They were therefore also not able to predict task performance or CWB via creativity and innovation.
The Personal physical resource (Vigor) was positive and significantly related to creativity and innovation. This is not in line with the TMP, which assumes that emotional job demands cannot match with cognitive outcomes like creativity and innovation (De Jonge & Dormann, 2006). A possible explanation for this finding is that vigor refers to motivation (Shirom, 2004), and

motivation in turn has been found to be essential for creativity (Amabile, 1996). Future research should use measures that measure for example back troubles, and the strength of the body.

5.2.3 Do personal and job resources complement each other, or are the competing in predicting job performance via creativity and innovation?

For this research question is was proposed that job performance via creativity and innovation was strengthen if employees have both (high) cognitive job demands as well as both (high) cognitive job resources and (high) cognitive personal resources. The results show that cognitive job demands did not predict creativity and innovation. This is surprising, since most literature in the field of creativity and innovation highlight the importance of complex and challenging task to be creative (e.g. Amabile, 1996; Oldham & Cummings, 1996). A possible explanation is that in this research creativity and innovation are both related to emotional job demands. Hockey (2000) noted that emotional demands may indirect influence performance in cognitive tasks, because they compete strongly for the control of attention**.** Employees may therefore experience more the emotional demands related to creativity and innovation, and to lesser extent cognitive job demands. The relation between emotional job demands and creativity and innovation will be later discussed.

The interaction between self-efficacy and cognitive job resources did not result in significant more creativity and innovation. Van den Tooren and De Jonge (2010) advice to study whether self-efficacy might either strengthen or even inhibit the moderating effect of job resources. This study indicates that self-efficacy does not moderate the effect of job resources to predict the work outcomes creativity and innovation.

The interaction effect of the personal resource (innovator cognitive style) and cognitive job resources did also not result in significant more creativity and innovation. However, the three way interaction effect of personal resource 2, cognitive job resources and cognitive job demands did result in extra creativity and innovation. These results show that if these three variables score high, this will result in significant more creativity and innovation. This is in line with the findings of Oldham and Cummings (1996).

Like prior regression analyses, also in this regression analysis it was found that emotional job demands are a good predictor of creativity and innovation. This result is previously discussed, and will therefore not be discussed here. The negative interaction effect between emotional and physical job demands and corresponding job resources was also found in this regression analysis, and is previously discussed. The three way interaction effect between emotional job demands, emotional job resources and emotional personal resources was not found.

A three way interaction effect of physical job demands, physical job resources and physical personal resources was found in this regression analysis. This may be caused, due the personal resource (vigor), which is, as previous mentioned, more related to motivation. In turn, motivation is strongly related to creativity and innovation (Amabile, 1996). This may have biased the results, and for future research it is recommended to measure variables that are more related to physical personal resources like back troubles, and the strength of the body.

5.2.4 Do self rating reports differ from coworker rating reports?

In the literature review it was expected that convergence between self- and coworker reports depend on other's familiarity with the incumbent's behaviors. According to this line of reasoning it was argued that self- and coworker rated creativity did not converge, since creativity is mainly a covert behavior. Furthermore it was hypothesized that innovation, task performance and CWB each exist of mainly overt behavior and self- and coworker reports of these variables were expected to converge with each other. However the results indicated that creativity and CWB converge with each other. Thus, only the expected convergence of self- and coworker reports of CWB was supported by the results. In the below it is discussed why the other expected results were not supported.

Self- and coworker rated creativity were found to converge with other, while this was not expected. A possible explanation is that employees, who are creative, often express their ideas to their colleagues. As a result, coworker become familiar with the incumbents' behavior and this may explain why self- and coworker reports of creativity converge with each other.

It was also proposed that colleagues would be familiar with job incumbent's innovativeness, since the implementation of an idea is expected to be visible for other employees. For this reason it was expected that self- and coworker rated innovation would converge. The results did not support this hypothesis. A possible explanation for this finding, are the divergent types of innovations. Some innovations are done by individuals while others are carried out in groups, and some innovations are executed in an hour while other innovations take months (West, 2002). It might be that job incumbent's small individual innovations are not noticed by coworkers. This may cause that no convergence was found between self- and coworker rated innovation.

Finally, self- and coworker rated task performance was not found to converge, while this was expected in the literature review. It is possible that coworkers are more familiar with job incumbent's work outcomes rather than job incumbent's behavior performance, and therefore rate job incumbent's task performance based on this knowledge. However, outcome aspects of performance depend also on factors other than the individual's performance. This could be the reason that self- and coworker rated task performance did not converge.

Overall, these results show that the convergence of coworker and self reports not only depends on the type of behavior (e.g. overt and covert). Future research should therefore deepen this research topic, since this may hinder the development of theories of organizational behavior.

5.3 Limitation and implications for future research

The results and implications of his study should be interpreted in terms of its limitations. First of all, due to the cross-sectional design of this research, causal effects could not be firmly tested. By using only survey techniques, the issue of match is merely determined by statistical program, in which employees merely report on whether job resources are available or not (De Jonge & Dormann, 2008). However, employees may also decide whether job resources are relevant to counteract job demands an whether to use these job resources or not (De Jonge & Dormann, 2008). As described in the conclusion, this maybe a reason that the supposed propositions were

not found in the studies. For future research it is therefore recommended to employ a longitudinal study.

Second, common method variance may have occurred because self-report questionnaires were used in study 1. The results of study 2 show that task performance and innovation do not converge with each other, which may indicate self-report bias. Although, Spector (2006) indicates that self-report measures may not limit internal consistency as much as is often assumed, these results should be interpreted with prudence.

A third limitation is the external validity of this research. It is not possible to generalize the results found in this research. With respect to external validity, it has to be taken into consideration that the sample was drawn entirely from one construction company (Royal BAM Group). Although subsidiary companies from BAM diverged highly from each other, contextual factors like standard methodologies used within BAM and organizational culture might have influenced outcomes. This might have biased the results.

Another limitation is that the measures in study 1 were all based on self-reports, which may have lead to common-method bias (Donaldson et al.,2000). Although Spector (2006) indicates that self-report measures may not limit internal consistency as much as is often assumed, study 2 of this research indicates that this may depend on the kind of measures. Future research should therefore investigate why some measures result in common-method bias, whereas others don't.

A fifth limitation within the research design is that existing scales were used to make cognitive, emotional and physical personal resources operational. It maybe, that these measures did not perfectly represent the different personal resources. For example it was found that the measurement scale vigor was more related to motivation and not so much to physical personal resources. It is therefore recommended for future research to develop a special questionnaire for a P-J fit model that is subordinated to the DISC Model.

A final limitation is the small sample size of study 2 (N=43). This may have influenced the statistical power to find the expected convergence between self- and coworker rated work outcomes. It might be interesting for future research to examine the convergence of these work outcomes in a larger sample.

5.4 Practical implications

It is for organizations increasingly important to have innovations for their effectiveness and long time survival (Shalley et al., 2004). Innovations can be seen as the implementation of creative ideas, which is the generation of unique and useful ideas. Organizations rely on the creative ideas of employees, and employees can therefore be seen as the catalyst of the innovativeness of employees. Past research often assumed that creativity and innovations are by definitions beneficial to organizations. However this research showed that this is not always the case. The results of this study showed that creativity and innovation are both related to an increase in task performance. Innovation was also found to be related to CWB. However this research did implicate which specific demands or resources influenced task performance or CWB via creativity and innovation, since all variables that predicted creativity and innovation also could

predict job performance via creativity and innovation. The relation between CWB and innovation may be explained by the fact that coworkers and supervisors may resist the changes that are accompanied with innovation, because of the insecurity, uncertainty, and stress they may bring (Jones, 2001). The resistance is likely to be higher if employees engage in innovative activities, because this is the implementation of creative ideas, and supervisors and coworkers are more likely to experience the insecurity and uncertainty. This may explain why CWB was related to innovation and not to creativity.
CWB via innovation may be avoided if employees haven a manager who has a high level emotional intelligence (Zhou & George, 2003). They propose that leaders with a high level of emotional intelligence will be able to sense this frustration and importantly to create favorable conditions to channel it into creative problem solving. It was further proposed that leaders with high emotional intelligence are able to shift frustrations related to creativity and innovation to enthusiasm and excitement.

In the next part the work- and personal characteristics will be described that were found to predict job performance via creativity and innovation.
First of all it was found that emotional job demands were a good predictor of job performance via creativity and innovation. It was found that emotional demands from BAM employees came mainly from unrealistic goals that were set by clients or project leaders. In such situations employees' have to search for creative solutions to deal with this demanding nature. For the BAM business school it is therefore important to teach employees to see these unrealistic goals as a challenge, because it is expected that in such situations creative ideas will occur. However, managers should be aware from the fact that this imbalance may in the long run result in poor well-being.
The results also presented that a negative interaction effect of emotional demands and emotional job resources was related to more creativity. A negative interaction effect of physical demands and physical job resources was also related to creativity. If job resources increase the demands, stress is likely to occur (De Jonge & Dormann, 2006). However, stress may be appraised as either challenge or threat (Drach-Zahavy, Erez, 2002). Challenge is experienced when there is an opportunity for self-growth with available coping strategies, whereas threat is experienced when the situation is perceived as leading to failure with no available strategies to cope with it (Drach-Zahavy, Erez, 2002). If stress is appraised as a challenge, it is expected that employees become creative and as a result will increase their task performance. Employees should therefore be trained to appraise stress as a challenge and not as a threat. However, managers should be aware from the fact that this imbalance may in the long run result in poor well-being.
Cognitive job resources were also expected to be an important predictor of creativity and innovation. Employees had on average a lot of available cognitive job resources, but they were not related to creativity. Van den Tooren and De Jonge (2010) found that employees may not always perceive their job resources as relevant and are therefore unlikely to use them. It may

therefore for BAM important to not only offering cognitive job resources, but also directing and supporting employees in such a way, that they will activate their cognitive job resources.
The results showed that cognitive personal resources (self-efficacy and innovator cognitive style) are very important in predicting task performance via creativity and innovation. If an employee belief that he is able capable of performing in a certain manner to attain certain goals, this will enhance job performance via creativity and innovation. The strong relation between self-efficacy beliefs may be useful to managers in selection, placement, and training decisions in which creativity and innovation are integral.
An innovator cognitive style is a personal trait and is therefore rather stable, and can apparently not be changed, because this is the way people are (Goldsmith & Kerr, 1991). However, the knowledge of an employees' cognitive style maybe used to match employees to appropriate tasks. For example, an employee with an innovator cognitive can be assigned to tasks that require a lot of creativity and innovations.
If employees with a cognitive style also have high cognitive job demands and high cognitive job resources, this resulted in significantly more innovation. In other words if employees have complex and challenging tasks, have the possibility to control their own work, and are willing to break the rules, and like to find original solutions, this will result in significant an increase of job performance via innovations. Interventions should therefore not only focus on assigning employees with an innovator cognitive style to tasks that require innovations, but also to give employees' the possibility to control their own work and challenge the employees with complex tasks.

In Conclusion the results show that work characteristics play an important role in predicting job performance via creativity and innovation, because they may trigger employees to be creative and innovative. If Job demands exceed employees' job resources this may result in stress, and to regain the balance employees are challenged if an opportunity for self-growth with available coping strategies is present.
The cognitive personal characteristics were also found to be a good predictor of creativity and innovation.
Furthermore it was found that if employees with an innovator cognitive style also perceived high cognitive job demands (e.g. complex tasks), and high cognitive job resources (e.g. autonomy), this was related to extra creativity and innovation.

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Appendix A

Table 1 Summary of studies of both positive and negative outcomes of creativity and innovation (Anderson & Geisteiger, 2007).

Author(s)	Research Object	Dimensions	Level of Analysis			Key Findings or Proposed Outcomes of Innovation	
			Individual	Group team	Organi-zation	Positive outcomes	Negative outcomes
Livingstone, Nelson, & Barr (1997)	Creativity and person-environment fit; examining supply value and demand ability versions of fit	Creativity, person-environment fit, strain, job satisfaction, performance	x		x	A fit between demands for creativity and abilities for creativity was related to lower strain and higher job satisfaction.	Discontentment, and low job performance as consequence of a lack of fit between creativity demands, individual skills and organizational conditions.
Miron, Erez, & Naveh (2004)	Personal and organizational factors that enhance or hinder innovation; factors that contribute to quality and efficiency	Cognitive styles, initiative, innovative culture	x	x	x	Creativity positively affected innovation at the implementation stage given high initiative and an organizational culture that supports innovation.	Creativity was found to have a significant negative effect on performance quality when the task required accuracy, and adherence to rules.

James, Clark, & Cropanzano (1999)	Antecedents and outcomes of positive and negative creativity in organizations.	Positive and negative creativity.	x			Positive creativity may result in e.g., job improvement, reduced health costs, adaptability to change in environment, product creation, and marketing ideas.	Negative creativity may result in e.g., theft, sabotage, harmful behavior to other employees, and undermining of organizational goals, and policies.
Shalley, Gilson, & Blum (2000)	Work environment characteristics facilitating or inhibiting	Creativity, work environment, satisfaction, intention to leave	x			Individuals were more satisfied and reported lower intentions to leave when their work environments complemented the creativity requirements of their jobs.Job-required creativity, job-environment (J-E) fit or complementarity had a significant effect on employee's affective outcomes.	
Zhou & George (2001)	Creativity as consequence of job dissatisfaction depending on conditions conducive to the expression of voice	Creativity, job dissatisfaction, continuance commitment		x		If new ideas proposed by the employees are accepted and subsequently implemented by the organization, it is likely that employees' job dissatisfaction decreases.	If new ideas proposed by the employees are not accepted and implemented by the organization, employees' may become even more dissatisfied with their job.
Janssen (2003)	Conflict and less satisfactory relations with co-workers as consequence of innovative behavior and job involvement	Conflict, job involvement, satisfaction wih co-worker relations	x	x		A workers innovative initiatives may contribute to organizational effectiveness.	A worker's innovative behavior interacts with job involvement in providing conflict and less satisfactory relations with co workers.

Janssen, Van de Vliert & West (2004)	The bright and dark sides of individual and Group innovation	Conflict, performance, success, failure, job attitudes, well being.		x		Constructive conflict, innovation success, performance improvement, positive job attitudes, well being.	Destructive conflict, innovation failure, lowered performance, negative job attitudes, stress.
Miron, Erez, Naveh (2004)	Personal and organizational factors that enhance or hinder innovation: factors that contribute to quality and efficiency	Cognitive styles, initiative, innovative culture	x		x	Creativity positively affected innovation at the implementation stage given high initiative and an organizational culture that supports innovation.	Creativity was found to have a significant negative effect on performance quality when the task required accuracy, and adherence to rules.
Townsend, De marie, & Hendrickson (2004)	Implementation of virtual team work	Stress, trust, and cohesion issues, and structural resistance	x	x	x	Synergy of teamwork and use of information and communication technology.	Employees' being assigned to more teams, working in a more complex environment may experience more stress, and are more likely to suffer from burnout.
Choi & Price, 2004	Innovation and person-environment fit	Person-Innovation fit, commitment to implementation, implementation behavior	x		x	Congruence between innovation values and personal values is more strongly related to employees' commitment to implementation and congruence between required abilities and current abilities is more strongly associated with implementation behavior.	

Appendix B

Table 1 One-factor structure (PCA) of the innovation scale (N=322)

	Innovation
How often do you implement new ideas that could improve your work performance?	0,826
How often do you implement new ideas that could help you deal with difficult issues more efficiently?	0,876
How often do you implement new ideas that could help you solve work problems more quickly?	0,873
How often do you implement new technologies, techniques or ideas in your work?	0,745
How often do you implement new way to improve the quality of your work?	0,849
How often do you implement new ideas to reach your workgoals?	0,862
Eigen value	**4,231**
% Variance explained	**70,51%**

Appendix C

Table 2 Hierarchical multiple regression-analysis of job demands and job resources (Study 1 N=322)

	Task perf	*CWB*
Model 1		
Age	0,00	-0,00
Sex	0,25	0,02
Company subsidiary	-0,06	0,01
Working Years	-0,01	0,00
Model 2		
Cognitive demands	0,13	-0,12
Cognitive job resources	-0,07	0,04
Emotional demands	0,05	0,14***
Emotional job resources	0,24*	-0,04
Physical demands	-0,16	0,05
Physical job resources	0,03	-0,05*
Model 3		
Interaction Cog-Cog	0,03	0,01
Interaction Emo-Emo	-0,11*	-0,01
Interaction Phy-Phy	0,10	0,02
R^2 change model 1	0,02	0,01
R^2 change model 2	0,04	0,12
R^2 change model 3	0,02	0,01
R^2 Total	0,08	0,14
Adjusted R^2	0,04	0,10
F-Statistic	1,77*	3,16***

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 3 Hierarchical multiple regression-analysis of job demands and personal resources(Study 1 N=322)

	Task perf	*CWB*
Model 1		
Age	-0,00	-0,00
Sex	0,20	0,10
Company subsidiary	-0,02	0,00
Working Years	-0,01	0,00
Model 2		
Cognitive demands	-0,08	-0,07
Cognitive personal resources 1	1,19***	-0,04
Cognitive personal resources 2	-0,12	0,13
Emotional demands	0,13	0,10**
Emotional personal resources	0,05	-0,11**
Physical demands	-0,14	0,03
Physical personal resources	0,47***	-0,06
Model 3		
Interaction Cog-PerCog1	0,03	0,02
Interaction Cog-PerCog2	0,03	0,01
Interaction Emo-PerEmo	-0,04	0,03
Interaction Phy-PerPhy	0,12**	-0,05**
R^2 change model 1	0,03	0,01
R^2 change model 2	0,33***	0,18***
R^2 change model 3	0,02	0,03*
R^2 Total	0,38	0,22
Adjusted R^2	0,35	0,17
F-statistic	10,97***	4,86***

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 4 Hierarchical multiple regression-analysis of job resources, personal resources and job demands (Study 1 N=322)

	Task perf	*CWB*
Model 1		
Age	0,00	-0,00
Sex	0,15	0,03
Working Years	-0,01	0,00
Company subsidiary	-0,06	0,01
Model 2		
Cognitive demands	0,10	-0,10*
Cognitive job resources * Cognitive personal Resources 1	-0,09	0,01
Cognitive job resources * Cognitive personal Resources 2	-0,05	0,03
Cognitive demands*Cognitive job resources	0,05	0,00
Cognitive demands*Cognitive personal Resources 1	-0,02	0,01
Cognitive demands*Cognitive personal Resources 2	0,06	0,00
Emotional demands	0,04	0,17***
Emotional job resources * Emotional pers. Resources	0,11	0,02
Emotional demands*Emotional job Resources	-0,10	0,01
Emotional demands*Emotional pers. Resources	0,11	0,03
Physical demands	-0,11	0,04
Physical job resources * Physical personal Resources	-0,01	0,00
Physical demands* Physical job resources	0,06	0,01
Physical demands* Physical personal resources	0,15**	-0,05**
R^2 change model 1 / df	0,03	0,01
R^2 change model 2 / df	0,10*	0,15***
R^2 change model 3 / df	0,03	0,01
R^2 Total	0,16	0,17
Adjusted R^2	0,08	0,09
F-statistic	1,95	2,53

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Appendix D

This appendix contains a regression analysis to discover if creativity and innovation influence the performance indicators “task performance” and “CWB”. As expected, an increase in creativity was accompanied with an increase of task performance. Creativity did not influence CWB.
An increase in innovation was significantly accompanied with an increase in task performance as well as CWB.

Study 1

Table 5 Hierarchical multiple regression-analysis of creativity, task performance and CWB (N=316)

	Task Performance	***CWB***
Creativity	0,76***	0,06
R^2 change model	0,16	0,01

* p < 0.05, ** p < 0.01, *** p < 0.001

Table 6 Hierarchical multiple regression-analysis of innovation, task performance and CWB (N=316)

	Task Performance	***CWB***
Innovation	0,54***	0,07*
R^2 change model	0,10	0,01

* p < 0.05, ** p < 0.01, *** p < 0.001