



MASTER THESIS

The new normal: The impact of COVID-19 on  
the future work environment

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## **Abstract**

With the advent of the COVID-19 pandemic, different preferences have arisen with regard to the work environment. Therefore, organizations are concerned with different ways of working in the near-term future, where working from home will be more prevalent than ever. However, from literature it is suggested that working from home may have a negative effect on innovative work behavior. This study therefore, examined the impact of COVID-19 on the future work environment and innovative work behavior. Additionally, it is generally thought that innovative work behavior increases when employees experience compatibility with their work environment, meaning that there is a fit between a person and his environment (P-E fit). Therefore, specifically an attempt will be made to examine whether personal characteristics influence innovative work behavior, while also examining whether the work environment moderates that relationship. Based on theory, it is assumed that preferences toward the work environment have changed, leading to more hybrid work in the future (H1). Second, we hypothesized that innovative work behavior, consisting of idea generation, idea promotion and idea realization has decreased as a result of the work-at-home behavior (H2). Additionally, the relationship between personal characteristics and innovative work behavior is tested (H3). Finally, we hypothesized that the work environment has a moderating effect on the relationship between personal characteristics and innovative work behavior (H4). To test the hypotheses, a quantitative study was conducted in which 225 respondents participated. The results show that preferences have changed due to the pandemic and that hybrid work is becoming more popular. Furthermore, there appear to be some differences in innovative work behavior pre and during adversity. There is a small increase in idea generation, which contradicts the expectation. However, this difference is not significant. Both idea promotion and idea realization decreased significantly. When taking a closer look at innovative work behavior, it appears that there are hardly any significant differences in innovative work behavior between the different work environments. Furthermore, looking at the personal characteristics, there is a weak positive significant relationship between personal characteristics and innovative work behavior in almost all cases. Moreover, when looking at the work environment as moderating variable, especially a shared-room office and a home office show moderating effects on the relationship between personal characteristics and innovative work behavior. This study contributes to both the practical and theoretical aspect, in which this study helps to better understand how future offices can be designed, where innovative work behavior can still flourish.

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## 1. Introduction

The COVID-19 pandemic, in which stringent conditions were the norm, forced organizations to adopt new ways of doing business (de Lucas Ancillo, del Val Núñez, & Gavrilá, 2021). A far-reaching measure resulting from this exogenous stressor was the coercive advice to work from home, in which daily work routines were discontinued to limit contact (Carnevale & Hatak, 2020; Kniffin et al., 2021). Working from home can be characterized as a mass experiment (Gratton & Stern, 2020), because working in that context was not a common practice prior to the global pandemic (Kossek & Lautsch, 2017; Wang, Liu, Qian, & Parker, 2021). Besides, neither employers nor employees could prepare for these sudden practices (Wang et al., 2021). This unexpected and unforeseen situation necessitates new solutions to the ever-new challenges of continuing business activities, resulting in an unprecedented change in the work environment (Carnevale & Hatak, 2020).

With the changing nature of the work environment during the pandemic, the perceived benefits of working from home laid a foundation for working in a new context post-adversity (de Lucas Ancillo et al., 2021). This is agreed by Blanchard (2021) as he argues that a more positive attitude towards working from home had emerged. As a consequence, employees will no longer strictly adhere to the idea of working in an office. Health2Work (2020) identifies that 66% of the employees want to work more at home in the near-term future. In that event, 72% of global organizations want to introduce a hybrid model to some degree - meaning individuals work both in the office and at home (Steelcase, 2021a).

According to Amabile (1996), a work environment should promote creativity and innovation, as these aspects contribute to an organization's performance and the long-term survival. De Jong and Den Hartog (2008) argues that creativity and innovation can be established when individuals possesses a certain innovative work behavior. Innovative work behavior, hereinafter referred to as IWB, can be defined as: "the behavior of an individual aimed at initiating and intentionally introducing (within a work role, group or organization) new and useful ideas, processes, products or procedures" (De Jong & Den Hartog, 2008, p. 5). According to Olsthoorn (2021) working from home can have a negative effect on the innovative capacity of individuals, since creativity and innovation are best generated when people are physically together. With this, Olsthoorn (2021) suggest that individuals exhibit IWB to a lesser extent while working at home. Therefore, it will be a challenge to organize creative processes once the crisis is overcome and employees continue to work hybrid (Olsthoorn, 2021).

## **Purpose**

Being in survival mode for some time caused us to cling to practices learned from the lockdown. Therefore, the aim of this study is to learn from the situation during the pandemic, which can be used to gain insights about a future adversarial work environment in which IWB can still flourish. To gain insights, first the work environment will be examined pre, during and post adversity in order to identify what different preferences have emerged with respect to a work environment. Danielsson and Bodin (2008, 2009) describe seven variants of a work environment, distinguishing between architectural features (relates to physical features) and functional features (relate to work that takes place). These different working environments will form the basis for this study. Second, IWB pre and during adversity will be examined to uncover possible discrepancies, where it may be plausible that IWB has declined because of the predominance of remote work (Olsthoorn, 2021). Besides, according to Mufti, Pudjiarti, and Darmanto (2019), IWB increases when employees experience compatibility with their work environment, meaning that there is a fit between a person and his environment. Edwards and Billsberry (2010) argues that the degree to which personal characteristics are consistent with the characteristics of a work environment addresses the person-environment fit (hereinafter P-E fit). Therefore, specifically an attempt will be made to examine whether personal characteristics influence IWB, while also examining whether the work environment moderates that relationship. This relationship will be tested in the context of the P-E fit. The above can be captured in four concrete goals, which are:

- I. Identifying changing preferences toward the work environment.
- II. Uncover possible discrepancies of IWB between the situation pre and during adversity.
- III. Investigating the relationship between personal characteristics and IWB, taking into account the work environment as moderating variable.
- IV. Learning from the situation in lockdown, which can be used to gain insights about a future adversity-proof work environment in which innovative work behavior can still flourish.

To gain insight into the four goals of this study, there will be a prominent focus on the work environment of the future in relation to IWB and personal characteristics. The relationship between personal characteristics and IWB has been repeatedly evidenced. However,

understanding this relationship is necessary in order to understand how a future work environment can be innovatively designed in the near-term future.

### **Research question**

The above four goals are captured in one general question, leading to the following research question:

*What is the impact of COVID-19 on the future work environment and innovative work behavior, taking into account personal characteristics?*

### **Practical contribution**

During this crisis, the work environment has been largely confined to the home environment. The inspiration for this research therefore, comes from several empirical studies that suggest that a new normal is emerging (e.g. de Lucas Ancillo et al., 2021; Health2Work, 2020; Steelcase, 2021a). As abovementioned a new standard however, may have a negative effect on IWB, while innovation and creativity are becoming increasingly important. Haner (2005) and Meinel, Maier, Wagner, and Voigt (2017) argues that the work environment in particular is an important factor in stimulating these aspects.

This research therefore, contributes to results on how a work environment influence the relationship between personal characteristics and IWB, in light of adversity. By testing this relationship, lessons can be learned about the period during adversity, which can be used to shape future offices. This is relevant to the organization concerned, namely an innovation hub in the eastern part of the Netherlands. The organization involved is engaged in consulting, designing and furnishing work environments. This study reflects the changing nature of a work environment in which new demands of the future office become apparent. In addition, insights into the work environment where IWB is best expressed are essential to design the future office. These findings are used to determine the context in which IWB can best flourish to mitigate the loss of innovativeness. This research is of interest to both the innovation hub and other stakeholders interested in the future office.

### **Theoretical contribution**

This research contributes to the existing literature in at least four different ways. First, it contributes to knowledge about the work environment pre, during and post adversity. It is novel to include three situations in one study, which contributes to the knowledge of changing

preferences toward a work environment due to the prolonged crisis. Second, this study takes a closer look at IWB of workers pre and during the pandemic, in order to discover possible discrepancies. It is plausible that IWB decreased, due to the mandatory nature of working from home. To date, little or no interest has been shown in the existing literature in the changing nature of IWB due to COVID-19.

Third, in addition to the relevance of the work environment and IWB in their own right, the relationship between them, taking in account personal characteristics is also being investigated. A gap was identified a few years ago, regarding the relationship of P-E fit on IWB (Afsar, Badir, & Khan, 2015). Therefore, several studies have been published in recent years that have investigated this relationship, showing that P-E fit has a positive effect on IWB. Since a positive link between the two has already been established in the past, it deserves to be examined again, but in the light of adversity. No studies have yet been devoted to examining this specific relationship during a crisis, therefore this research contributes to new literature of the changing work environment and innovative behavior, taking in account personal characteristics.

Fourth, the different office types of Danielsson and Bodin (2008) are prominent in this research. In previous research, they have examined these office types in relation to health, well-being and job satisfaction. This study contributes to more knowledge about the office type in relation to the IWB of employees, in light of adversity. Also, the office type defined by Danielsson and Bodin (2008) are outdated. This study can contribute to adding relevant future offices such as a hybrid model or a home office.

## **Preview**

The remaining chapters of this study describe the following. Chapter 2 describes the theoretical framework, which includes relevant and state of the art literature related to the core concepts of this study. Following that, Chapter 3 describes the methodology, which outlines how this study was conducted. Chapter 4 presents the results obtained during this research. Following that, Chapter 5 describes how to interpret the results in this study. Also described in that chapter are the limitations of the study, its contribution, and recommendations for future research. Finally, Chapter 6 provides an answer to the main research question.



## 2. Theoretical framework

### **Person-environment fit**

The degree to which personal characteristics match the characteristics of a work environment relates to the P-E fit (Edwards & Billsberry, 2010). Mufti et al. (2019) argue that the P-E fit is typified by the match between expectation and reality, where a gap between the two results in undesirable consequences, stress and discomfort in a work environment. Su, Murdock, and Rounds (2015, p. 83) state the following, with providing a general assumption of the P-E fit theory: “People seek out and create environments that allow them to behaviorally manifest their traits (e.g. dominant individuals seek leadership positions); the extent to which people fit their work environments has significant consequences (e.g., satisfaction, performance, stress, productivity, turnover), with better fit associated with better outcomes; and P-E fit is a reciprocal and ongoing process whereby people shape their environments and environments shape people”. In particular, this definition indicates that a better fit between person and environment leads to better outcomes. This is confirmed by several studies, with research already conducted on P-E fit in relation to attitudes, job satisfaction, organizational commitment, mental and physical well-being, performance (Edwards & Shipp, 2007) and more recently IWB (Afsar et al., 2015; Mufti et al., 2019). Therefore, this theoretical framework will be written from a P-E fit lens, which includes both personal characteristics and the work environment in relation to IWB.

### **Adversity**

Adversities can occur in several forms, such as internal adversities that for example disrupt company's core operations (Alexander, Greenbaum, Shani, Mitki, & Horesh, 2021), an economic crisis which affects an entire country (Graham, Chattopadhyay, & Picon, 2010), or in a broader sense a global pandemic that we are currently facing (Kaushik & Guleria, 2020). Since March 2020, measures are in place to reduce infection rates. This has significant implications for organizations and more broadly, the global economy. In addition, the pandemic is accompanied by social consequences, including individual well-being, stress and anxiety (Snel, Boom, van Bochove, & Engbersen, 2021).

To limit the spread of the virus, a lockdown was introduced, temporarily suspending all economic and social activities. As a result, organizations tried to continue their business activities by allowing employees to work from home. This was a new way of working for a large proportion of organizations, as many sectors were reluctant to do this prior to COVID-19.

Due to the measures and the new way of working, this pandemic has led to a huge disruption in businesses, which had major consequences for the working environment, among other things. In this study, the term adversity will therefore be used to refer to the adversity that has taken place in the work environment.

### **Work environment**

Today's organizations operate in a turbulent environment, in which complexity, competitive pressures and changing customer and employee demands are encountered (King, Newman, & Luthans, 2015). As more organizations face an increasingly dynamic and competitive environment, a critical factor is to harness the full potential of the workforce (Raziq & Maulabakhsh, 2015). Therefore, organizations must provide a work environment where the workforce is satisfied and where work can be accomplished without hindrance (Raziq & Maulabakhsh, 2015). However, the work environment, according to Danielsson and Bodin (2008) can be described as complex, as multiple environmental factors can affect an individual. Previous research shows that environmental factors in an environment can influence for example job satisfaction, employee health and productivity (e.g. Becker & Steele, 1995; Papierska, 2018; Sundstrom, Town, Rice, Osborn & Brill, 1994).

Danielsson and Bodin (2008, 2009) describe the office environment as complex, but managed to identify seven variants of a work environment, distinguishing between architectural features (relates to physical features) and functional features (relates to the work that takes place). The following describes the seven office types based on research by Danielsson and Bodin (2008, 2009).

- I. *Cell office* - this office is intended for 1 person, in which all equipment is available in the room. This type of office is characterized by the long corridor systems and individual windows that are present in each cell office. Mainly independent and concentrated tasks are performed in this type of office.
- II. *Shared-room office* - in this type of office, 2 to 3 people work in a shared space. Implementing this office type in an organization can have two different motivations. First, the introduction of this type may be due to lack of space, with employees being forced to work in a shared space. This often involves putting employees with similarities in the task together. The equipment is often available outside the room. Second, this office can be a godsend for team-based work, in

which interaction among employees is encouraged. In the latter, the equipment is often present in the room.

#### *Traditional Open Plan offices*

These types of offices are characterized by their communal nature and can occur in different sizes (small, medium and large). Often routine work is performed and little interaction is needed between workers. There is also relatively little privacy as there are no walls between the workstations. To create privacy and reduce nuisance, screens are often placed between the workstations. The advantage of this type of office is that it can be used flexibly to accommodate organizational changes. The above characteristics apply to all three open plan offices and in the following the different sizes are given.

- III. *Small open plan* – in this office, 4 – 9 employees work in a common area.
- IV. *Medium open plan* - in this office, 10 – 24 employees work in a common area.
- V. *Large open plan* – in this office, more than 24 employees work in a common area.

#### *Office types for activity-oriented and flexible purposes*

These types of offices are characterized by their flexible nature that can handle changes in the work environment well. The two types are described below.

- VI. *Flex office* – in this office type, the work is done flexibly - meaning that there is mainly an open layout, with no personal workstations. Employees have the choice of where they work in the organization, and work may be carried out elsewhere. ICT resources are of great importance in this type of office, as everyone must be able to perform their tasks on any computer. The choice that employees can work elsewhere and the disease absorption ensure that 70% of all staff can be present in the office at the same time.
- VII. *Combi-office* – the spatial definition of this office type has not been determined. In this type of office, more than 25% of the work is not performed at the own workplace, but elsewhere in the organization. The combi office is characterized by working in teams and sharing common facilities. There are therefore spare spaces for meetings, brainstorming sessions and teamwork. In this office, both interactivity and independence are central.

## **Adversity and work environment**

Remote working has been a hotly debated topic in both practice and scholarship (Bailey & Kurland, 2002; Messenger & Gschwind, 2016). Although it was assumed that remote working would play a major role, it did not appear to be a dominant way of working in practice (van Veldhoven & van Gelder, 2020). However, due to the pandemic a hybrid model will be preferred in the future, where tasks are performed both at home and in the office in which employees can arrange their hours flexibly (Steelcase, 2021a; Verwimp, Boets, & Daenen, 2021). Additionally, due to the ease of digitalization employees are increasingly able to perform work in other ways (e.g. working remotely), meaning that workplaces are changing and taking on new forms (Cijan, Jenič, Lamovšek, & Stemberger, 2019). As a result, work processes have been redesigned forever, creating new job roles. Work conditions have changed, in which more requirements arose concerning psychological, physical and environmental aspects. In addition, terms of employment (e.g. conditions concerning social and contractual aspects) are changed. Moreover, thanks to digitization, relationships are maintained differently (Cijan et al., 2019). These changes create a different way of working since digitalization is widely deployed.

However, due to the fact that new technologies offer opportunities to work remotely, many employees still worked in the office prior to the pandemic. But during the pandemic, both employers and employees were forced to find solutions for continuing business activities, some of which were traditionally thought to be precluded from being conducted online (Skountridaki, Zschomler, Marks, & Mallett, 2020). As a consequence, employees become more experienced in remote working in which employees began to recognize the benefits (Kniffin et al., 2021). A study carried out by Oude Hengel, Bouwens, Zoomer, Vroome, and Hooftman (2021), argues that the main reason for working from home is the nature of work, as several tasks can be easily performed at home. In addition, a significant reduction in travel time, followed by productivity is cited as an important reason. Furthermore, a relatively large group considers working from home as practical (e.g. technical resources and quality home workplace), work-life balance and having social contacts with friends and family. Moretti, Menna, Aulicino, Paoletta, Liguori, and Iolascon (2020) add increased autonomy, time flexibility and intensified focus.

On the contrary, the main reasons that emerged for not working from home are social contacts with colleagues, bonding with the company and cooperation between colleagues. Subsequently, work-life balance, the nature of the work (e.g. direct contact with customers and machines/materials) practical aspects and productivity are mentioned. The lowest scoring reason to work on location is to be more visible, which allows better career prospects to emerge

(Oude Hengel et al., 2021). Moretti et al. (2020) add difficulties in planning and technical failures.

Despite the disadvantages, people still appear positive about working from home, which is why the majority want to continue in the future. These developments imply that employees expect more room for flexibility in the future from the organization (Steelcase, 2021a). Therefore, 72% of global organizations want to introduce a hybrid model to some degree - meaning colleagues are not working in the same place (e.g. some at home and some at the office) (Steelcase, 2021a). As a result of the development of the new normal, a hybrid model is considered in the future. However, when taking in account the seven office types of Danielsson and Bodin (2008, 2009), the aspect of working at home or elsewhere appears to be hardly included. Only in the activity-based and flexible office type has it received minimal attention. This can be explained by the outdated literature and the speed of digitization in recent years. Therefore, the hybrid model has emerged, which is described below.

VIII *Hybrid model* - In this model, work is done partly in the office (in one of the forms mentioned by Danielsson and Bodin (2008, 2009) and partly at home.

Additionally, Steelcase (2021a) identified that 5% want to work exclusively from home in the near-term future. Therefore, the following office type is described:

IX *Home office* - in this model, people work exclusively from home, without being physically present in the office.

These above forms of work will always be in combination with the previously mentioned forms of Danielsson and Bodin (2008, 2009) and therefore they are not stand-alone variants.

### **The advent of a home-based office**

According to several studies, people see the future office changing and prefer to work from home more often. Additionally, Kniffin et al. (2021) states that COVID-19 has accelerated trends related to the work environment, with remote working as a key factor. Therefore, Steelcase (2021a) identifies 4 types of home offices, which are described in the following:

- I. *Home office* – this is an existing, enclosed space that existed before adversity. When working from home became mandatory, this primary space was used to perform work tasks.
- II. *Work zone* – this is a created space in an already existing space. In order to make the workspace as functional as possible, new furniture was purchased. This is a non-enclosed space.
- III. *Multipurpose area* – to create a workplace, existing space and furniture were used to support work activities. The workstation is defined as a fixed place, where tools and technology are not removed. As a result, the original purpose of the space was changed to a workspace.
- IV. *Temporary set-up* – this is a temporary workspace, where there is also use of existing space and furniture. However, the tools and equipment are removed here, so that the original purpose is created again.

Despite the growing interest in a home office that has emerged from adversity, there is still a large number of workers who long for better physical working conditions at home. This implies that there must be a good fit between an individual and the work-from-home environment in the near-term future. According to Oude Hengel et al. (2021), it appears that more people are satisfied with their own physical workplace, but that half of the home workers do not yet have all the means to create an ergonomically responsible workplace (Oude Hengel et al., 2021). Additionally, Moretti et al. (2020) state that as a result of using non-ergonomic equipment, employees are confronted with increasing musculoskeletal issues. Therefore, a home-based office must be designed in an ergonomically responsible manner (Reznik, Hungerford, Kornhaber, & Cleary, 2021). According to Reznik et al. (2021), a workplace should include the following: screen (e.g. laptop, computer), table, chair, telephone and internet. However, when a workplace meets the necessary tools, there is still a lack of proper use (Davis, Kotowski, Daniel, Gerding, Naylor, & Syck, 2020). Moreover, it is common to find no suitable place in the home to set up an office, since space will probably have to be shared with others in the house (Kniffin et al., 2021). Given the above information about new preferences related to a work environment, the hypothesis below was developed:

*H<sub>1</sub>: Preferences toward a work environment are changing, leading to more hybrid work post adversity.*

### **Tasks in an work environment**

The nature of work is a determining factor for the work environment in which a person performs work tasks, because not every employee can easily perform tasks remotely. A distinction is made between blue collar and white collar workers, in which blue collar workers perform manual labor (non-office setting) and white collar workers perform tasks in the office (Hopp, Irvani, & Liu, 2009). To stimulate innovation and creativity for white collar workers in a work environment, activities must be facilitated that can enable creative processes, where convergent and divergent thinking can occur (Haner, 2005). Activities that should be facilitated at the team level are brainstorming and decision making. Activities that should be facilitated at the individual level are browsing and analyzing. During brainstorming and browsing activities, a certain openness and multi-focus is required, which requires divergent thinking. Deciding and analyzing, on the other hand, is single-focused, which requires convergent thinking.

The above argues that working at the team level is a requirement for certain activities, to encourage creativity and innovation. According to Olsthoorn (2021) working from home can have a negative effect on the innovative capacity of individuals, since creativity and innovation are best generated when people are physically together. Therefore, working through a hybrid model where people want to work flexibly can affect creativity levels, as these forms of work are more likely to be interrupted (Oldham, Kulik, & Stepina, 1991; Perlow, 1999). Vithayathawornwong, Danko, and Tolbert (2003) agrees, as they argue that the social-psychological aspect supported by the work environment positively influences creativity. Specifically, dynamics (exchange of ideas, peer interaction and communication) an element of social-psychological aspect, affects the creative level. This implies that working in a physical work environment with others stimulates creativity. To that end, working according to a new standard is therefore an interesting but precarious matter, because creative processes are better established when there are no interruptions to the free flow of thought (Olsthoorn, 2021).

### **Personal characteristics**

The following describes autonomy, self-efficacy, and positive affect, which will be referred to as personal characteristics in this study. The three characteristics were chosen because they have been found in previous research to have a relationship with IWB. Therefore, they deserve to be re-examined with an additional variable, namely the work environment. Additionally, these personal characteristics in relation to IWB have not yet been examined in light of adversity.

## Autonomy

Work autonomy is defined as “the degree to which an individual is given freedom and discretion in carrying out a task” (Sia & Appu, 2015, p. 774). Since autonomy has been repeatedly studied in relation to IWB (e.g. De Spiegelaere, van Gyes & van Hootegeem, 2016; Theurer, Tumasjan, & Welp, 2018), it is worth re-examining it in light of adversity. Besides, it will be re-examined with work environment as additional variable. According to Amabile (1996) and Oldham and Cummings (1996), work environment autonomy is an important aspect in boosting the creativeness of employees. A high task autonomy will lead to the generation of new ideas in task performance. Additionally, Oldham and Cummings (1996) argues that creative task performance decreases as the work environment has a controlling character. In this regard, Sia and Appu (2015) name that a work environment always affects the task performance of employees, because their perceptual and affective attitude are determined by the conditions present at work.

In light of adversity, Anicich, Foulk, Osborne, Gale, and Schaerer (2020) propose that autonomy is threatened due to the ongoing pandemic. Therefore, employees want to restore this matter. Here, it is implied that there is no perfect match between the P-E fit, since autonomy is threatened. To test autonomy, the following statements in table 1 can be used, which are based on Engle et al. (2010).

*Table 1. Scale to measure autonomy based on Engle et al. (2010)*

<b>Autonomy</b>	
<b>1</b>	Making your own decisions about work goals and methods
<b>2</b>	Personal freedom Regulating your own time
<b>3</b>	Having direct responsibility for decisions and results
<b>4</b>	Being able to express my own personality and creativity
<b>5</b>	Being in charge and in control of my work

## Self-efficacy

Self-efficacy refers to the belief to perform a task creatively (Wang & Wang, 2018), which implies that there may be an relationship between self-efficacy and IWB. When employees possess capabilities they need for a specific task performance or problem solving, or while they even exceed the requirements set, they believe they can creatively solve a task or a problem (Wang & Wang, 2018). However, when an individual experiences that they cannot, there appears to be a lesser degree of confidence (Wang & Wang, 2018). If it appears that there is



confidence to a lesser degree to perform a particular task, this may indicate a P-E fit to a lesser degree. To measure self-efficacy, the following statements in table 2 are used, based on research by Carmeli, Friedman, and Tishler (2013).

*Table 2. Scale to measure self-efficacy based on Carmeli et al. (2013)*

<b>Self-efficacy</b>	
1.	When facing difficult tasks, I am certain that I will accomplish them
2.	I will be able to successfully overcome many challenges
3.	Even when things are tough, I can perform quite well

#### Positive affect

To measure affective states, positive and negative aspects (PANAS) are mainly considered. This is developed by Watson, Clark, and Tellegen (1988), which focuses on 10 positive and 10 negative emotions. If people score high on positive affect, there is an "reflecting pleasurable engagement with one's environment" (Tuccitto, Giacobbi, & Leite, 2009, p. 126). With negative affect, it is the other way around, meaning "reflecting subjective distress and unpleasant engagement with one's environment". When stress and unpleasantness is experienced in a work environment, this may indicate a lesser degree of P-E fit, because there is not a perfect match between the person and the environment. According to Li, Liu, Liu, and Wang (2016) both positive and negative affect have been tested in different ways in relation to IWB. In this study, we will only focus on positive affect in relation to IWB and the additional variable, which is the work environment. To test positive affect, the following statements in table 3 can be used.

*Table 3. Scale to measure positive affect based on Watson et al. (1988)*

<b>Positive affect</b>	
1.	Attentive
2.	Interested
3.	Alert
4.	Excited
5.	Enthusiastic
6.	Inspired
7.	Proud
8.	Determined
9.	Strong

**Innovative work behavior**

In the current environment, despite the pandemic, there are increasing risks in doing business, with rapid change in particular bringing uncertainty (Mufti et al., 2019). In this era, much emphasis is placed on innovation to achieve certain results, such as the arrival of new services and products. Innovation capacity is therefore increasingly important to deal with new competition and state of the art technologies. Innovation is unavoidable in today's age and is frequently reflected in an organization's mission, vision and strategies (Kahn, 2018). In order to be innovative, it is important that people exhibit a certain IWB.

According to De Jong and Den Hartog (2008), IWB can be divided into four dimensions, including opportunity exploration, idea generation, idea propagation, and implementation. The first element is the identification of a new opportunity by an individual. This is followed by the generation of new ideas, which involves combining information and reorganization to improve processes. The third element relates to selling the idea. At this stage it is still uncertain whether the benefits outweigh the costs. And the final step is to implement the idea (De Jong & Den Hartog, 2008). In contrast, Janssen (2000) argued that there are three main categories that covers IWB in its totality, namely idea generation, idea promotion and idea realization. Here an explanation is given that has similarities with De Jong and Den Hartog (2008), where Janssen (2000) summarizes opportunity exploration and idea generation into only idea generation. To test the IWB in this study, the following statements in table 4 will be used, based on research by Janssen (2000).

*Table 4. Scale to measure Innovative Work Behavior based on Janssen (2000)*

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<b>Innovative Work Behavior</b>
1. create new ideas for improvements – idea generation
2. search out new working methods, techniques, or instruments – idea generation
3. generate original solutions to problems – idea generation
4. mobilize support for innovative ideas – idea promotion
5. acquire approval for innovative ideas – idea promotion
6. make important individual organizational members enthusiastic for innovative ideas – idea promotion
7. transform innovative ideas into useful applications – idea realization

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- 
8. introduce innovative ideas into the work environment in a systemic way – idea realization
  9. evaluate the utility of innovative ideas – idea realization
- 

### **Adversity and innovative work behavior**

The literature on IWB in relation to COVID-19, or more broadly adversity, is scarce. Therefore, this study builds on the assumption of Prof. Dr. de Dreu who states in an article that the innovative capacity of individuals will most likely decrease compared to the innovative capacity prior to the pandemic (Olsthoorn, 2021). According to de Dreu, due to the home-working behavior during the pandemic, fewer innovative ideas were generated and fewer patents were filed. This is because there is little opportunity for collaboration among colleagues. According to de Dreu, it works better to go directly to a colleague and present an idea, rather than calling someone. This is also confirmed by Vithayathawornwong et al. (2003), who states that communication in a physical work environment is particularly important during a creative process.

Furthermore, Steelcase (2021b) appears to be addressing this issue as well and states the following about the consequences of the pandemic in which hybrid work was predominant: “Inhibiting innovation – Generating new ideas is the most difficult type of collaboration. Being active can help people be more engaged and creative — that’s tough on video” (Steelcase, 2021b). This implies that less innovation is created on video, resulting in a declining IWB. Additionally, Steelcase (2021a) asked in an webinar, in which 1100 people participated the following question: What is your organization’s biggest worry about hybrid work? Here, 12% answered and argued that it is harder to innovate and grow. Despite the fact that no one has explicitly researched changing IWB in relation to COVID-19, the following hypothesis is established:

*H2: There is a significant difference between innovative work behavior (IWB) pre and during adversity.*

### **Work environment and innovative work behavior**

Since little has been written about IWB and the work environment, creativity will be side-lined. According to Amabile (1988) and Yuan and Woodman (2010), creative behavior is a relative of IWB, which also involves trying to generate new ideas. Yuan and Woodman (2010, pp. 324-

325) explain: “Creative behavior can be considered as one type of innovative behavior because innovative behavior includes not only generating novel ideas by oneself but also adopting others' ideas that are new to one's organization or work unit”.

According to Ma Prieto and Pilar Pérez-Santana (2014) individuals can express themselves innovatively at work in a variety of ways, for example by coming up with new approaches to perform work, by generating new/novel ideas, or coming up with new procedures and/or alternatives. Despite assigning different labels to IWB, it primarily relates to future-oriented action that is self-initiated, which often seeks to improve or change a particular situation (Ma Prieto & Pilar Pérez-Santana, 2014). Creativity can best be established, when there are no interruptions to the free flow of thought (Olsthoorn, 2021). When taking a closer look to the work environment in relation to creativity, working remotely, the use of open spaces and the desire to work flexible can influence the creativity level, as these forms of work have a higher probability of interruptions (Oldham et al., 1991; Perlow, 1999). However, Amabile (1996) states “There is almost no empirical research on the effects of work environments on creativity” (p. 210), meaning that there is lack of knowledge on how spaces should be designed to create creativity and innovation (Kristensen, 2004). Therefore, this study can provide insights into the moderating effects of a work environment on IWB.

### **Personal characteristics and innovative work behavior**

To gain a broader understanding about the intended relationships in this study, the personal characteristics autonomy, self-efficacy and positive affect are described and related to IWB.

#### **Autonomy**

Autonomy can be described as the degree to which freedom, independence, and discretion are provided to individuals when performing tasks. According to De Spiegelare et al. (2016) autonomy is an important facilitator of IWB. Janz, et al. (1997) even argue that autonomy does not only affect IWB, but the overall performance of a firm. Therefore, providing autonomy can be seen as important, as innovativeness is crucial to the effectiveness of an organization. Even individuals are considered more important in an organization if they contribute new ideas from the workplace (De Spiegelare et al., 2016). By providing autonomy, room is offered to individuals, inspiring them to experiment with work methods and procedures. Also, providing discretion is a predictor of innovative performance (Grant, Fried, & Juillerat, 2011) By providing higher discretion, individuals are encouraged to think about how work can be

organized and optimized differently. Moreover, Van der Vegt and Janssen (2003) argue that the innovativeness and thus the performance of an organization does depend on its employees. If employees exceed standard work behavior by showing IWB, for example, an organization will be more successful than if employees merely meet the requirements to perform a particular job.

Nasution, Siregar, and Pristiyono (2021) argue that providing autonomy should not be confused with giving absolute autonomy. Giving autonomy is meant to make employees feel as comfortable as possible while performing work. Looking back at the P-E fit literature, the right amount of autonomy and the right work environment that fits an individual would result in an optimal P-E fit, because there is a match between personal characteristics and the work environment. However, because of the requirement to work from home, employees were forced to perform work practices in different ways than fit their preferences and needs. This can lead to an imbalance in the P-E fit, because there is no match between the work environment and autonomy. Several studies have already demonstrated the relationship between autonomy and IWB (e.g. De Spiegelaere et al., 2016; Theurer, et al., 2018). The higher the freedom, independence and discretion in performing tasks, the higher the level of innovativeness. In this study, this relationship will also be examined, which has led to the following hypothesis:

*H<sub>3a</sub>: Autonomy positively influences innovative work behavior.*

### Self-efficacy

Self-efficacy can be referred to as the belief an individual has in their own ability to perform certain tasks. Self-efficacy is a broad concept and analyzed from different perspectives, as it is known in social learning theory as cognitive theory (Siregar, Suryana, & Senen, 2019). According to Siregar et al. (2019), the belief to complete a task can encourage an individual to perform certain tasks. Also, Bandura (1997) argues that mastery experiences can contribute to a higher level of self-efficacy, because success has been experienced in the past. In particular, a higher level of self-efficacy occurs primarily when there are similarities in previous tasks that an individual has performed. In doing so, social persuasion can also influence self-efficacy. Influential individuals can convey information, making individuals more capable of performing certain tasks well. Additionally, if an individual experiences stress and anxiety while doing a task, it feels like a failure, so emotional and physiological states affect self-efficacy. Previous studies show that there is a relationship between self-efficacy and IWB (Hsiao, Chang, Tu, & Chen, 2011). In that study, it appears the higher the level of self-efficacy the higher the innovative level. Therefore, in this study we put forward the following hypothesis:

*H<sub>3b</sub>: Self-efficacy positively influences innovative work behavior.*

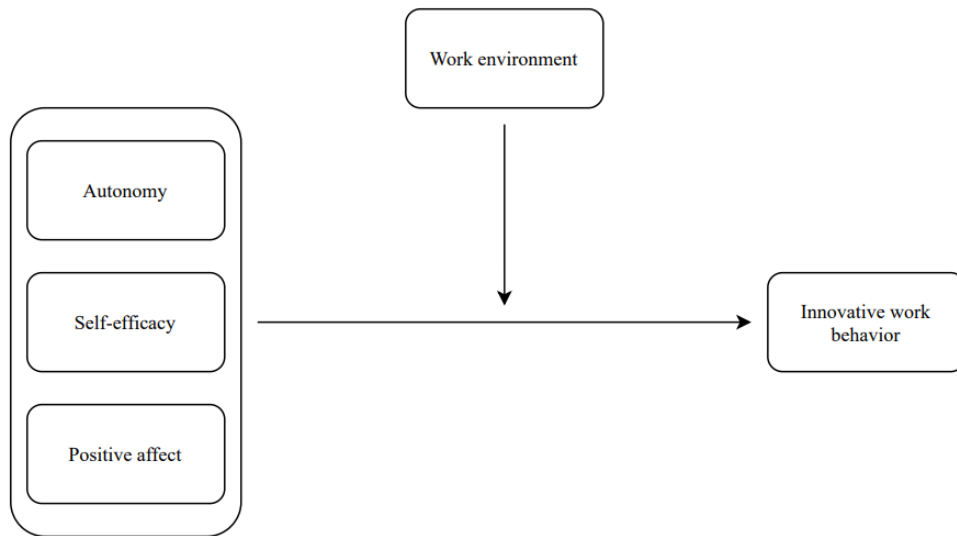
#### Positive affect

IWB has been found to have a positive relationship with organizational success (Li, Liu, Liu, & Wang, 2016). Therefore, several studies have devoted themselves to investigating IWB including testing the relationship between IWB and affects (both positive and negative) (e.g. Madrid, Patterson, Birdi, Leiva, & Kausel, 2013). Based on previous studies, Fredrickson (2001) argued that positive emotions affect one's cognitive ability and Isen, Daubman, and Nowicki (1987) linked creative problem solving to positive affect. Besides, researchers argue that positive affect may not only increase cognitive flexibility but may also contribute to the motivation to express innovation (Li et al., 2016). According to de Dreu, Baas, and Nijstad, (2008) it is therefore plausible that positive affect have a greater effect on IWB than neutral or negative affects do. However, de Dreu et al. (2008) explains that in some cases, negative affect can also contribute to IWB, because people with a negative mood tend to do better in generating innovation. However, some studies have not found a relationship between the two variables, so it remains contradictory. Besides, according to Li et al. (2016) the relationship between positive affect and IWB has been shown more often, so in this study we made the following hypothesis:

*H<sub>3c</sub>: Positive affect positively influences innovative work behavior.*

#### **Innovative work behavior, work environment and personal characteristics**

Considering the abovementioned the following relationship will be measured, which is presented in figure 1.



*Figure 1. Conceptual model*

From the above, it is clear that the relationship between personal characteristics and IWB has been demonstrated several times. In addition, IWB has been associated with the work environment several times. However, a direct relationship between the work environment and IWB has never been demonstrated. Therefore, the work environment is used as a moderating variable in this study, in order to examine if the type of office strengthen or weaken the relationship between personal characteristics and IWB. However, at this point in time, no unambiguous answer can be given to the question which work environment weakens or strengthens the relationship between personal characteristics and IWB. It is assumed that the work-at-home behavior has a negative effect on the IWB. Therefore, it could be hypothesized that the home work environment has a negative effect on the relationship between personal characteristics and IWB. Looking at the other work environments in this study, no direction can yet be given to the hypothesis. Hence, the following hypothesis has been established:

*H<sub>4</sub>: The work environment has a moderating effect on the relationship between personal characteristics and innovative work behavior.*

### 3. Methodology

#### **Method**

The aim of this study is to investigate the relationship between personal characteristics and IWB, along with the moderating effect of the work environment, in the context of P-E fit literature. Considering the intended relationship, this research will be quantitative in nature. Applying a quantitative way, provides according to Saunders, Lewis, Thornhill, Booij, and Verckens (2011) reliable results due to the repetitive character. In doing so, it is possible to test a specific relation between certain variables, allowing the relationship to be uncovered in this study (Saunders et al., 2011). Additionally, in contrast with a qualitative way, the results of a quantitative study are statistically representative (Saunders et al., 2011; Verhoeven, 2011).

#### **Case company**

This study will be conducted at an innovation hub in the eastern part of the Netherlands, which consists of a number of companies, most of which are active in the construction/engineering sector. This study will be conducted primarily for one company, which is involved in advising, designing and furnishing work environments. The company advises which design and which layout best suits a particular company and visualizes this with their own designers. In doing so, they supply and assemble the physical elements in a work environment (e.g. flooring, desks, chairs, blinds). Their focus is only on the physical infrastructure, leaving out the digital infrastructure. Sectors they mainly focus on are healthcare institutions, educational institutions and the government. Particularly, this study attempts to gain knowledge regarding the relationship between personal characteristics and IWB, with work environment as a moderating variable in light of adversity. With the outcomes, knowledge is gained about a future-proof work environment that can accommodate future adversities. This gives the company insight into the future work environment, allowing the company to formulate future-proof design recommendations for their clients that ensure IWB.

#### **Research instrument**

This study will be conducted through a survey to collect data, which can be used to test the intended relationships. Both Verhoeven (2011) and Saunders et al. (2011) argues that questionnaire construction should be considered as a cautious practice, since it can affect respondent numbers, reliability and validity. Therefore, the survey questions were carefully prepared, being clear, readable, mutually exclusive and neutral without pushing respondents in



any particular direction (Verhoeven, 2011). In addition, a clear layout and sequence of questions is essential (Saunders et al., 2011; Verhoeven, 2011), which was taken into account in the survey. Besides, the purpose of the survey should be clearly described to respondents before they take the survey (Saunders et al., 2011). This condition was met as there was an introductory text describing the purpose of the study before respondents began the questionnaire. Moreover, according to Verhoeven (2011) starting with general and simple questions is important, in which confrontational questions should be avoided in the beginning. After that, more in-depth questions can be asked that address the goal, with which it is best to close again with a general or simple question. This structure was maintained in the questionnaire. Additionally, Verhoeven (2011) argues that it is best to place questions with the same response options together. These criteria have also been taken into account.

Furthermore, Saunders et al. (2011) and Verhoeven (2011) point out that surveys can be administered in different ways (e.g. written, personal, internet and telephone). In this study, internet surveys will be used, because it is a quick way to distribute a questionnaire. Additionally, self-selection can take place because respondents can find out for themselves if they are suitable for the survey by means of an introductory text. Moreover, electronic surveys are automatically placed into a data set, which saves considerable time (Verhoeven, 2011).

## **Variables**

In this study, there is one dependent variable and several independent variables. The variables tested in this study are explained below.

### **Dependent variable**

*Innovative work behavior.* IWB is treated as the only dependent variable. IWB is tested using a 9-item scale, in which respondents can answer based on a 7 point Likert-scale (from never (0) to always (7)). The first three questions cover idea generation, questions four through six cover idea promotion and questions seven through nine cover idea realization and in totality IWB is measured. The scale to measure IWB was developed by Janssen (2000). IWB will be asked at two times in the same survey, pre adversity and during adversity, to detect possible discrepancies.

## Independent variables

*Autonomy.* Autonomy is treated as an independent variable, which is believed to be directly connected to IWB. Engle et al. (2010) developed a 5-item scale, in which respondents can give answers based on a 5 point Likert-scale, ranging from strongly disagree to strongly agree. Autonomy will be asked twice in the same survey (pre and during adversity), as it is assumed that autonomy is increased during adversity (Oude Hengel et al., 2021).

*Self-efficacy.* Self-efficacy is treated as an independent variable, which is also believed to be directly connected to IWB. This variable is tested using a 3-item scale, in which respondents can answer based on a 7 point Likert-scale. Ranging from strongly disagree to strongly agree. This 3-item scale is developed by Carmeli et al. (2013).

*Positive affect.* Positive affect is treated as an independent variable, which is assumed to have a direct relationship with IWB. These 10 positive emotions/feelings are developed by Watson et al. (1988), based on Zevon and Tellegen (1982). These positive affect will be asked once in the survey, because it is about how a person feels about their work in general.

*Work environment.* Work environment is treated as an independent variable, which may have an moderating effect on the relation between personal characteristics and IWB. Based on Danielsson and Bodin (2008), taxonomies were developed for eight office types. In the questionnaire, respondents were asked to indicate which office type they work in. To detect differences in the work environment, respondents were asked three times (pre, during, and post adversity) which office type a person works in. If respondents indicated that they work hybrid, an additional question asked which office type they work in if they do not work from home. The office types used in this study are cell office, shared-room office, small open plan office, medium open plan office, large open plan office, flex office, hybrid and home office. The taxonomies of the different office types are included in Appendix I. In addition, based on research by Steelcase (2021a) taxonomies of four different home offices were created to gather information about the spaces in which respondents perform work at home. The four home office spaces are home office, work zone, multipurpose area and temporary set-up. The taxonomies of these are shown in Appendix II.

## Sample

Data will be collected through a select sample, where there is no equal chance of participating in a survey. The innovation hub compiles and provides a list of companies that can participate in the survey (mainly their customers). Furthermore, the survey can be distributed to other companies in the Netherlands to gain more knowledge on the subject. Companies in different

branches will be approached to participate in this survey. In addition, the questionnaire will be distributed on social media, resulting in a larger reach among potential respondents. In this way self-selection can take place by means of an introductory story, in which individuals can decide for themselves if they are suitable for the questionnaire (Verhoeven, 2011).

It is assumed that there is a broad audience for this survey and will be able to fill out the survey, since everyone has faced COVID-19 and there is a large proportion of society who are working. However, the survey does focus on white collar workers, i.e. people who work in an office setting, rather than people who need to be physically present at work regardless of any situation. In addition, another requirement is that respondents have approximately the same job at the same company as of December 2019. By sticking to this requirement, a more realistic picture of office differences and IWB can be drawn.

### **Analyses**

To make raw data from the administered survey usable, data needs to be analysed in a statistical program (Saunders et al., 2011; Verhoeven, 2011). For this study, SPSS will be used. During the analysis process, an overview of the sample size and the reliability estimates were first created. Additionally, univariate, bivariate and multivariate analyses were applied.

#### Overview sample size

In this study 225 respondents participated of which 47.6% were men and 52.4% were women. Of these, most fall in the 20-30 age group (40.4%) and most reside in Overijssel (64%). Participants in this survey are mainly employed in the trade and services (25.3%) and engineering, production and construction industry (22.7%). The size of the organization where the respondents work is evenly distributed, although few work in a micro organization (6.7%). Furthermore, most respondents work 33 – 40 hours (48.4%) or 17 – 32 hours (32.4%). In addition, respondents can be differentiated regarding their position, as 66.7% are employees/team members, 24.9% are managers and 8.4% are CEO's or owners. Moreover, most people lived with their partner (38,7%) or together with their partner and children (36,4%). A table with more insights into demographic data is provided in Appendix III.

#### Cronbach's alpha

Prior to the analysis process, the reliability estimate for each separate variable was examined. To ensure validity in this study, the internal consistency of several scales is measured prior to

the analysis process. This measure is expressed as Cronbach's Alpha and indicates the degree of consistency between items. According to Verhoeven (2011), this method, a reliability estimate, indicates the degree of measurement error. This means that as the Cronbach's Alpha increases, the probability of measurement error decreases. Also, the Cronbach's Alpha increases when items correlate with each other in a test and thus decreases when it correlates with each other to a lesser degree. Cortina (1993) indicates that an alpha greater than 0.7 is sufficient, which is true in all cases. The scores are shown below in table 5.

*Table 5. Cronbach's Alpha*

<i>Reliability Statistics</i>		
<i>Variables</i>	<i>Cronbach's Alpha</i>	<i>N of Items</i>
Innovative Work Behavior 1	,942	9
Innovative Work Behavior 2	,931	9
Autonomy 1	,848	3
Autonomy 2	,819	3
Self-efficacy	,807	3
Positive affect	,799	10

#### Univariate

After the sample overview and reliability estimates were established, the univariate analyses continued. When conducting univariate analyses, only one variable is involved where relationships are not sought. The univariate analysis technique was primarily used for hypothesis 1 and 2. To answer the first hypothesis, information was primarily provided on preferences regarding a work environment such as difference in office types pre, during and post adversity, preferences for a home work place, the desired number of hours working at home, what respondents consider important in a home work environment etc. Obtaining this global information does not require establishing relationships among multiple variables.

To answer the second hypothesis, the difference in mean of 2 separate variables, IWB pre and during adversity, is examined. Since it is not necessary to test the relationship between two different variables, univariate analyses is used for testing hypotheses 2.

#### Bivariate

To test hypothesis 3, bivariate analyses are applied, which means testing a relationship between two variables. Two bivariate analyses techniques are appropriate for testing this relationship, namely the Pearson's R and multiple regression. Furthermore, to provide a more complete answer to hypothesis 1 and 2, bivariate analyses are used to examine whether there are

differences in IWB, for example, between different office types, different home workplaces, age, education, living situation, etc.

#### Multivariate

Multivariate analyses involve testing a relationship between 3 or more variables. To answer hypothesis 4, a multiple regression is performed in order to investigate the relationship between personal characteristics and IWB, along with the moderating effect of the work environment. By applying multivariate analyses, the intended model can be tested in its entirety.

## 4. Results

The following section presents the results of the quantitative study, addressing each hypothesis. A list of relevant variable names used in the section below is explained in Appendix IV.

### Preferences work environment

*H<sub>1</sub>: Preferences toward a work environment are changing, leading to more hybrid work post adversity.*

Looking at the situation pre, during and post COVID-19, it appears that 42.2% want to work hybrid in the near-term future, compared to 5.8% who worked hybrid prior to COVID-19. If hybrid working is not preferred, most respondents indicated that they would like to work in an office with shared rooms. The remaining insights into the differences between pre, during, and post COVID-19 with respect to the work environment are shown below in table 6.

*Table 6. Preferences regarding the work environment pre, during and post COVID-19*

	Pre	During	Post
Valid Cell office	16,0	5,8	7,6
Shared-room office	23,1	11,6	15,1
Small open plan office	17,8	5,3	9,3
Medium open plan office	14,2	5,8	7,6
Big open plan office	9,3	4,9	4,9
Flex office	12,9	4,0	9,8
Hybrid model	5,8	22,7	42,2
Home office	,9	40,0	3,6
Total	100,0	100,0	100,0

Of the 5.8% who worked hybrid before COVID-19, most want to be employed in a flex office when not working from home. This preference continues, as post pandemic 32.6% of the 42.2% want to work in a flex office when not working from home. Additionally, there is also a strong preferences for a shared-room office (22.8%) and cell office (18.5%) when not working from home. Further insights are shown in the table 7.

*Table 7. Office preference for hybrid workers*

		Pre	During	Post
Total hybrid workers		5.8	22.7	42.2
Valid	Cell office	7,7	37,3	18,5
	Shared-room office	7,7	15,7	22,8
	Small open plan office	7,7	23,5	12,0
	Medium open plan office	7,7	9,8	12,0
	Big open plan office		3,9	2,2
	Flex office	69,2	9,8	32,6
	Total	100,0	100,0	100,0

Furthermore, the questionnaire asked whether respondents would like to work at home for at least 4 hours per week in the future. Here, 87.6% indicated that they would like to do so. The results reveal that most of the 87.6% want to work 8 hours (26,9%) or 16 hours (31%) a week at home and the remaining hours at the office. In addition, the questionnaire asked if respondents worked from home during adversity and 86.7% indicated they did. Overall, respondents were satisfied with the home workspace they were working in during COVID-19. The results show that during the pandemic most respondents worked in an enclosed space. Post COVID-19, this also appears to be the dominant choice, as 70.6% indicate they want to work in a home office. Table 8 provides further results regarding the space in which work was done at home.

*Table 8. Preferences regarding workspace at home*

		During	Post
Valid	Home office	41,0	70,6
	Work zone	15,4	11,7
	Multipurpose area	24,6	12,2
	Temporary set-up	19,0	4,6
	Different		0,9
	Total	100,0	100,0

Additionally, we looked at whether there is a relationship between a person's gender and their preference for the office. This was also done for the variables age, education, function and living situation through a crosstabs analysis. This analysis was done three times, namely pre, during and post COVID-19. This analysis showed some significant differences. Prior to COVID-19, there appeared to be a relationship between function and office type. During

COVID-19 there appears to be a relationship between education, function, living situation and office type. Post pandemic, there appears to be a relationship between education and office type preference. Additionally, a significant difference was found between living situation and the choice of a home work place. However, none of the results can be confirmed with certainty because the assumptions were not met.

Looking only at the home environment, people find a stable internet most important, followed by an ergonomic workstation, ergonomic office chair and an enclosed space where they can work. Further aspects that people consider slightly less important are shown in the table 9.

*Table 9. Important aspects in home office*

	Percent	Valid percent
Valid Stable internet connection	76,4	100,0
Ergonomic workstation (including 2 monitors, keyboard and mouse)	63,6	100,0
An enclosed room where you can work in a concentrated manner	56,9	100,0
Ergonomic office chair	61,8	100,0
Cell phone (business)	50,2	100,0
Good lighting	45,8	100,0
External access to documents	40,9	100,0
Ergonomic desk (adjustable)	40,0	100,0
Printer	25,3	100,0
Decorating	17,3	100,0
Extension cords	13,8	100,0
Storage cabinet	10,2	100,0

### **Difference in level of innovative work behavior**

H2: *There is a significant difference between innovative work behavior (IWB) pre and during adversity.*

#### **Overall IWB**

Looking at the overall IWB, it appears that there is no significant difference in IWB1\_average and IWB2\_average. Based on the paired sample t-test 1,419, df 224, p 0,157, before adversity participants had a higher overall IWB (mean = 4,2573, SD 1,18659) than during adversity, but



the difference is not significant since  $p = 0.157$ . The main view of the paired sample t-test is shown below in table 10.

*Table 10. Differences in IWB average*  
*Paired Samples Test*

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Average IWB prior to pandemic - Average IWB during pandemic	,07062	,74625	,04975	-,02742	,16865	1,419	224	,157

### Idea generation

Looking at the first category, idea generation, it appears that there is no significant difference in IWB1\_ideageneration and IWB2\_ideageneration. Based on the paired sample t-test -1,688, df 224,  $p = 0,93$ , before adversity participants had a lower idea generation (mean = 4,4104, SD 1,22965) than during adversity. This difference is not significant as  $p = 0.093$ . The main view of the paired sample t-test is shown in table 11.

*Table 11. Differences in IWB idea generation*  
*Paired Samples Test*

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Average IWB idea generation prior to pandemic - Average IWB idea generation during pandemic	-,09630	,85572	,05705	-,20872	,01612	-1,688	224	,093

### Idea promotion

When taking a closer look to idea promotion, it can be stated that a significant difference has been observed pre and during COVID-19. Based on the paired sample t-test = 3,190, df 224,  $p = 0,002$ , participants had a higher idea promotion (mean = 4,4098, SD 1,28434) before adversity and this difference is significant since  $p = 0.002$ . The main view of the paired sample t-test is shown below in table 12.

*Table 12. Differences in IWB idea promotion*  
*Paired Samples Test*

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Average IWB idea promotion prior to pandemic - Average IWB idea promotion during pandemic	,19259	,90548	,06037	,07364	,31155	3,190	224	,002

### Idea realization

Looking at the last category of IWB, idea realization, it can be stated that a significant difference was found here too. Based on the paired sample t-test 2,094, df 224, p 0,37, participants had a higher idea realization (mean = 4,0489, SD 1,34300) before adversity and the difference between pre and during adversity is significant since p = 0.037. The main view of the paired sample t-test is shown below in table 13.

*Table 13. Differences in IWB idea realization*  
*Paired Samples Test*

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Average IWB idea realization prior to pandemic - Average IWB idea realization during pandemic	,11556	,82765	,05518	,00682	,22429	2,094	224	,037

### Work environment and innovative work behavior

Now that both the work environment and IWB are included as separate variables, we examine whether differences in IWB exist between different work environments. To uncover possible differences, the one-way ANOVA was performed.

Following the results, prior to the pandemic, the innovative work behavior (IWB1\_average, IWB1\_ideageneration, IWB1\_ideapromotion and IWB1\_idearealization) did not differ significantly between the different office types (pre\_officetype). Also during the pandemic, the innovative work behavior (IWB2\_average, IWB2\_ideageneration,

IWB2\_ideapromotion, IWB2\_idearealization) did not differ significantly between the different office types (during\_officetype), even though 42,2% worked hybrid.

Since there are many office types, this number was reduced to see if a significant difference then exists. All open plan offices were made into one variable, as these office types have the same characteristics, but occur in different sizes (Danielsson & Bodin, 2008, 2009). The analysis were performed again and showed one significant different. Based on the one-way ANOVA, a significant difference was found in the mean of IWB2\_ideageneration between the different work environments when employees work hybrid ( $F(3.47) = 2.871$ ;  $p = 0,046$ ). Based on the Posthoc Bonferroni test, people who perform work in a cell office in combination with hybrid work, score significantly higher on idea generation than people in a flex office (in combination with hybrid work).

In addition, we examined whether there were any differences in IWB between the four different home workplaces (home office, work zone, multipurpose area and temporary set-up). This analysis shows no significant differences. Additionally, the variable home office was further reduced to a dummy in which 0 is an enclosed space and 1 covers the other types of home offices. This also shows no significant difference in IWB.

Furthermore, some other notable results were observed, since a number of significant differences were found between the mean of IWB and function. In general, managers and CEO/owner possess higher IWB than team members. Additionally, they also score higher on autonomy1\_average and autonomy2\_average. These results are presented in Appendix V

### **Work environment and personal characteristics**

In the section below, we check whether there is a difference in personal characteristics (autonomy, self-efficacy and positive affect) between the different reduced work environments. To uncover possible differences, the one-way ANOVA was performed. Based on the one-way ANOVA, a significant difference was found in the mean of autonomy1\_average between the different work environments (Rec\_pre\_officetype) ( $F(5.219) = 7,740$ ;  $p = < 0,001$ ). Based on the Posthoc test (Bonferroni) people who perform work in a cell office, shared-room office or hybrid possess a significantly higher autonomy than people in an open plan office. Additionally, during the pandemic this results continues, as based on the one-way ANOVA, a significant difference was found in the mean of autonomy2\_average between the different work environment ( $F(5.219) = 3.017$ ;  $p = 0.012$ ). Based on the Bonferroni test, people who perform work in an hybrid way or in a home office possesses a higher autonomy than people who work in an open plan offices. Besides, based on the one-way ANOVA, a significant difference was

found in the mean of self-efficacy between the different work environments (Rec\_during\_officetype) ( $F(5,219) = 2,716; p = 0,021$ ). Based on the Bonferroni test, people who work in a home office have more self-efficacy than people in an open plan office. Furthermore, there was a check between the personal characteristics and the 4 home workplaces. Here, no significant differences were observed.

### **Personal characteristics and innovative work behavior**

*H<sub>3a</sub>: Autonomy positively influences innovative work behavior*

*H<sub>3b</sub>: Self-efficacy positively influences innovative work behavior*

*H<sub>3c</sub>: Positive affect positively influences innovative work behavior*

To examine whether personal characteristics have an effect on IWB, two analysis techniques were used. First, the Pearson's R is performed, looking for a correlation. A correlation is sought between the independent variables (autonomy, self-efficacy and positive affect) and the dependent variable (IWB1\_average, IWB1\_ideageneration, IWB1\_ideapromotion and IWB1\_idearealization). The results show that there is in all cases a significant positive weak correlation between personal characteristics and IWB. In addition, we examined whether a correlation could be exposed between IWB and the three independent variables during adversity. A correlation was sought between IWB2\_average, IWB2\_ideageneration, IWB2\_ideapromotion and IWB2\_idearealization and autonomy, self-efficacy and positive affect. This gives similar results, as there is still a significant positive weak correlation between the two variables. Only between autonomy and IWB\_ideageneration and IWB\_idearealization no significant correlation was found.

Second, a regression analysis was performed. A regression analysis determines whether one or more independent variables (in this study autonomy, self-efficacy, and positive affect) has an effect on a dependent variable (IWB). Below, two models are given. In the first, IWB1\_average is the dependent variable and in the second, IWB2\_average is the dependent variable. While performing the regression analysis, the assumptions (linear relation, independence, equal variance and normal population) were checked and found to be fulfilled. The assumptions and the outputs are shown in Appendix VI.

The results of the first model show that 13% of the variation in IWB1\_average can be explained by the independent variables (autonomy, self-efficacy and positive affect) together. The model is significant  $F(3,221) = 10.977, p = <.001$ . While Selfeff\_average is not significant ( $B = .283$ ,

p = 0.076), Autonomy1\_average (B = .331, p = 0.002) and Positiveaff\_average (B = .492, p = 0.012) are. The total predictive model is as follows:

$$\text{IWB1\_average} = -.123 + (.331 * \text{Autonomy1\_average}) + (.283 * \text{Selfeff\_average}) + 0.492 * \text{Positiveaff\_average}$$

The results of the second model, in which IWB2\_average is the dependent variable, show that 9% of the variation in IWB2\_average can be explained by the independent variables (autonomy, self-efficacy and positive affect) together. The model is significant  $F(3,221) = 7,313$ ,  $p < .001$ . While Autonomy2\_average is not significant (B = .192, p = 0.076), Selfeff\_average (B = .340, p = 0.029) and Positiveaff\_average (B = .371, p = 0.050) are. The total predictive model is as follows:

$$\text{IWB2\_average} = .587 + (.192 * \text{Autonomy2\_average}) + (.340 * \text{Selfeff\_average}) + 0.371 * \text{Positiveaff\_average}$$

In the above models, only IWB in its totality is taken as the dependent variables. Since IWB has three categories, multiple regressions with IWB1\_ideageneration, IWB1\_ideapromotion, IWB1\_idearealization, IWB2\_ideageneration, IWB2\_ideapromotion and IWB2\_idearealization as dependent variables were also performed. These are shown in Appendix VII.

Furthermore, looking only at the independent variable autonomy, results show that autonomy increased significantly. Based on the paired sample t-test -2,686, df 224, p 0,008, participants had a lower Autonomy (mean = 3,954, SD 0,7240) before adversity, and the difference is significant since p = 0.008. The main view is shown below in table 14.

*Table 14. Differences in autonomy pre and during adversity*  
*Paired Samples Test*

		Paired Differences							
		Mean	Std. Deviation	Std. Error	95% Confidence Interval of the Difference		t	df	Sig. (2-tailed)
					Lower	Upper			
Pair 1	Average autonomy prior to pandemic - Average autonomy during pandemic	-.08148	.45511	.03034	-.14127	-.02169	-2,686	224	.008

### **The moderating effect of the work environment**

*H4: The work environment has a moderating effect on the relationship between personal characteristics and innovative work behavior.*

To examine whether the work environment has a moderating effect on the relationship between personal characteristics and IWB, again a multiple regression was performed adding the variable work environment. This regression uses dummy's (e.g., cell office yes or no) to see if a particular type of office affects the relationship. This multiple regression was first conducted with the offices types prior to the pandemic in relation to IWB1\_average, IWB1\_ideageneration, IWB1\_ideapromotion, IWB1\_idearealization as dependent and autonomy1\_average, self-efficacy and positive affect as independent variables. In addition, the multiple regression was run again with the offices types during adversity in relation to IWB2\_average, IWB2\_ideageneration, IWB2\_ideapromotion, IWB2\_idearealization as dependent and autonomy2\_average, self-efficacy and positive affect as independent variables. Below the office types that moderate the relationship are explained.

#### Prior to adversity

In the regression analyses, there is an positive interaction effect between self-efficacy\*medium open office on IWB1\_average. When looking at the main effects, there is an significant main effect from medium open office on IWB average, but there is no significant main effect from self-efficacy.

#### During adversity

In the regression analyses, there is an negative interaction effect between self-efficacy\*shared-room office on IWB2\_average. When looking at the main effects, there is an significant main effect from self-efficacy on IWB2\_average, but there is no significant main effect from a shared-room office on IWB2\_average.

There is an positive interaction effect between positive affect\*home office on IWB2\_average. However, the main effects, home office and positive affect are not significant in the model.

Furthermore, there is an positive interaction effect between positive affect\*home office on IWB2\_idea promotion. However, the main effects, home office and positive affect are not significant in the model.

Further, there is a negative interaction effect between self-efficacy\*shared-room office on IWB2\_idearealization. There is a significant main effect from self-efficacy on IWB2\_idearealization, but there is no significant main effect from a shared-room office.

There is a positive interaction effect between positive affect\*home office on IWB2\_idearealization. There is no significant main effect from positive affect on IWB2\_idearealization, but there is a significant main effect from home office.

#### Home environments during adversity

There is a negative interaction effect between positive affect\*temporary set-up on IWB2\_idearealization. There is a significant main effect from positive affect on IWB2\_idearealization. But, there is no significant main effect from temporary set-up on IWB2\_idearealization.

#### **Future office**

To shed new light on the future office, an open-ended question was used in the survey. This information showed that respondents addressed five themes regarding the future office. The overall themes are: the office in general (I), the workplace (II), facilities (III), experiences offices (IV) and working from home (V).

One of the most important aspects of the office in general is physically meeting each other, with one respondent stating, “especially important to work with colleagues again after two years of only working at home”. In addition, short lines of communication are labelled as important in the future office, allowing for quick consultations with colleagues. Furthermore, space and light are raised as an important aspect.

Looking at the future office type, the majority indicated that they would like to work hybrid. At the same time, there was also a preference for open spaces, shared-room offices and flex spaces, which is consistent with previous results. Zooming in on the workplace itself, there appears to be a strong preference for private workspaces in a quiet environment, without many stimuli. Here, some indicated that the group size in an office/space should be around 2 to 4 people. Besides, respondents mentioned the importance of diversity in spaces. For example, respondents named the following: “diversity in workstations”, “the ability to choose which workstation is appropriate for that day” and “diversity in types of spaces appropriate for my activities”. Spaces that respondents consider important are spaces for connection, spaces for isolation, spaces for phone calls, spaces for meetings and quiet areas.

When looking at facilities, it is mainly mentioned that ergonomic working is important, with people preferring a sit/stand desk, an ergonomic office chair and screens. Furthermore, equipment for meetings and stable internet is important. In addition, the right temperature and ventilation were also mentioned as important aspects. Besides, a number of people mentioned facilities relating to health, such as a gym in the building and healthy food in the canteen.

Furthermore, looking at experiences of office types, it turns out that a small group mentions something about an office garden and a small group mentions something about working from home. The first group indicates that an office garden is too restless, in which one respondent states the following: "I worked prior to COVID-19 in an office garden which was already very restless at the time, but after the long period of working at home I don't think we can get used to that again". In addition, the second group indicated that working at home was very pleasant, as there were far fewer stimuli. One respondent experienced working from home as follows: "working from home has made me experience that there are far fewer stimuli at home than when you work in a room with 5 colleagues. I enjoyed that peace and quiet, the days were more productive and less intensive".

Looking at the theme working from home, it was mainly mentioned that people expect flexibility in the future with regard to working from home, such as flexible opening hours and freedom in determining when to work from home.



## 5. Discussion

### **Interpretation**

In this study, a number of goals were established at the beginning. This section focuses on interpreting these goals based on theory and results.

### **Purpose I**

*The first goal is to identify changing preferences toward the work environment.*

From literature, there is a presumption that a different way of working will emerge after the pandemic (e.g. de Lucas Ancillo et al., 2021; Health2Work, 2020; Kniffin et al., 2021, Steelcase, 2021a). This assumption is supported by this quantitative study, as 42% prefer hybrid working at the expense of other office types in the near-term future. Besides, 88% indicated that they would like to work at home for at least 4 hours per week post pandemic, meaning a form of hybrid work. However, this is contrary to the results mentioned earlier. Since literature shows that working from home is a whole new way of working, people may not necessarily see at least 4 hours of working from home per week as hybrid work yet, which may explain the gap. Also, 87% indicated that they had worked at home during the pandemic. Again, this percentage does not match the earlier results, as only 23% (hybrid) and 40% (home office) indicated that they had worked at home during the pandemic. One explanation could be that individuals who worked at home for only a few days during COVID-19 did not report this as hybrid work.

Despite some contradictory results, it can be concluded that working from home will be more prevalent than ever. According to the results, when people are not working from home, most prefer to work in a flex office, cell office or shared-room office. When taking a closer look to the home-based work environment only, during the crisis, 74% were satisfied or very satisfied with their home office. Of these, 40% reported working in an enclosed space. Post adversity, this is also the preferred choice, as no less than 71% indicate that they want to work in an enclosed space. However, according to Kniffin et al. (2021) due to lack of space, an enclosed space cannot always be created at home. As a result, individuals are often forced to settle for a different place in the house. This does have a detrimental effect on the P-E fit, as individuals are forced to perform their work somewhere else due to lack of space. In this way, there is no ideal fit between the environment and the individual, which can lead to innovation to a lesser extent. Furthermore, as more individuals start working from home, it is important

that the home office is ergonomically designed (Moretti et al., 2020). According to Reznik et al. (2021) the following must be present: a screen, desk (adjustable in height), chair (ergonomic), telephone and internet. The results show that people also indicate this as important. Of the 225 respondents, 76% indicated that stable internet is important, 64% indicated an ergonomic workstation (screen, keyboard and mouse), 60% an enclosed space, 62% an ergonomic chair, 50% a telephone and 40% indicated an adjustable desk as important. However, according to Davis et al. (2020), when a workplace meets the necessary tools, there is still a lack of proper use. Therefore, additional instructions will need to be provided to enable employees to work ergonomically to reduce musculoskeletal issues.

When looking at the theory in combination with the results, we can state that the preferences of the work environment are changed due to COVID-19. Post-pandemic, hybrid work is preferred, whereas before COVID-19, it was barely heard of. In addition, home offices are becoming increasingly important, in which ergonomic work must be taken seriously.

## **Purpose 2**

*The second goal is to uncover possible discrepancies of IWB between the situation pre and during adversity.*

This study uncovered a number of discrepancies in IWB pre and during adversity. To begin with, the results of this study indicate a very slight decrease in the total of IWB. Before the pandemic, the average IWB was 4.26. During the pandemic, IWB decreased by 0.07 to 4.19. With this decrease, the difference is not significant. When taking a closer look to the theory, according to Janssen (2000) IWB as a whole covers three aspects, including: idea generation, idea promotion and idea realization.

From the findings, there appears to be a difference in idea generation pre and during COVID-19. Prior to adversity, the average of idea generation was 4,31. During adversity, the average of idea generation is 4,41. This difference is not significant as  $p = 0.093$ . However, this result contradicts the expectation as it was assumed that IWB will decrease during the pandemic. According to Janssen (2000), ideas arise precisely when discontinuities occur, for example. By experiencing discontinuities, individuals tend to seek a solution to the problem. Carnevale and Hatak (2020) argue that the unexpected pandemic requires new solutions to continue business activities. Since new solutions were required during the pandemic, this may be an explanation why idea generation actually increased instead of decreased. However, when taking a closer look to the research of Sterken (2021), he shows that it is precisely the generation

of ideas that is difficult in times of a crisis and demonstrates that it has declined. In particular, Sterken (2021) states that the organization in question found it difficult to give time to employees to generate and share ideas/solutions. Although the research focused on the innovation process and not necessarily on the innovative work behavior of individuals, the results of Sterken (2021) does not support the results in this study. However, Sterken (2021) argues that the organization in question responded well to the crisis, where new technologies were introduced to enable remote working. According to Janssen (2000), individuals feel more innovative when they devise solutions to discontinuities. Again, this may explain why idea generation actually increased in times of crisis. On the other hand, if this is the correct explanation, the increased idea generation does not say much about the innovation process in which, for example, new products and services are introduced.

Looking at the next aspect, idea promotion, it appears that idea promotion has decreased significantly. According to Janssen (2000), at this stage it is important to engage in social activities, looking for sponsors, supporters, friends and/or donors who can help build strength behind an idea. Looking back at the pandemic, there was much less social contact between individuals and there was great financial uncertainty for many companies and individuals during the severe lockdown. This could explain why idea promotion decreased during adversity.

The last aspect, idea realization, also decreased significantly. According to Janssen (2000), this phase involves the creation of a prototype or model. However, if there is no idea promotion it becomes difficult to actually realize an idea.

Looking back at both the theory and the results, it can be interpreted that idea generation is reasonably successful, but that idea promotion and idea realization prove to be more difficult in times of crisis, when people mainly work at home. This means that the innovativeness decreases because, according to the literature, it starts with coming up with an idea, but if it is not supported and implemented there is little new innovation. In addition, it is difficult to discern whether the loss of innovativeness was caused by working from home or by the great uncertainty caused by the pandemic, which prevented ideas from being promoted, for example.

### **Purpose 3**

*The third goal of this study is to investigate the relationship between personal characteristics and IWB, taking into account the work environment as moderating variable.*

To provide insight into the third goal, we first look back at the direct relationship between personal characteristics and IWB. Based on the Pearson's R, it can be stated that there is in

almost all cases a weak but positive correlation between personal characteristics and IWB in both situations (pre and during adversity). According to the multiple regression analyses, prior to the pandemic autonomy and positive affect were significant in the model where IWB1\_average served as the dependent variable. This means that autonomy and positive affect are significant predictors of IWB. Therefore, we can interpret these results as follows: individuals who possess higher autonomy and individuals who score higher on positive affect are innovative to a higher degree. When taking a closer look to the situation during adversity, not autonomy but self-efficacy and positive affect has an positive effect on the dependent variable (IWB2). The same is true for these results. People who possess higher self-efficacy and positive affect score higher on IWB. Returning to the goal, an attempt in this study was made to find a moderating effect of the work environment on this direct relationship. As described in the previous section, some moderating effects were found especially during adversity. The following describes how these results can be interpreted.

*IWB average.* The results show that a shared-room office moderates the relationship between self-efficacy and IWB average. Looking at the separate variables in the model, self-efficacy ( $\beta = .472$ ) and shared-room office ( $\beta = 3,581$ ) contributes positively to IWB average, since the Beta coefficient is in both cases positive. However, when a shared-room office interact with self-efficacy it has an negative influence on IWB average, since  $\beta = -.995$ . This implies that the relationship between self-efficacy and IWB weakens when working in a shared-room office.

Furthermore, the home office appears to moderate the relationship between positive affect and IWB. We can interpret these results as follows: when working in a home office ( $\beta = -3.312$ ), it contributes negatively to IWB average. Looking only at positive affect ( $\beta = .022$ ), it contributes positively to IWB average. When a home office interact with positive affect it has an positive influence on IWB average, since  $\beta = .995$ . Meaning, when someone possess higher positive affect and work in a home office, this individual possess higher IWB average. Therefore, a home office strengthens the relationship between positive affect and IWB average.

*IWB idea promotion.* The home office also appears to moderate the relationship between positive affect and idea promotion. Looking at the separate variables, positive affect ( $\beta = .102$ ) positively contributes to idea promotion, while a home office ( $\beta = -3.568$ ) negatively contributes to idea promotion. However, when these separate variables interact, it contributes positively to idea promotion, since  $\beta = 1.019$ . This means that the relationship between positive affect and idea promotion strengthened when working in a home office.

*IWB idea realization.* Looking at the third category, it appears that an shared-room office moderates the relationship between self-efficacy and idea realization. The separate variables, self-efficacy ( $\beta = .528$ ) and shared-room office ( $\beta = 2.054$ ) contributes both positive to idea realization. However, when a shared-room office interact with self-efficacy it has a negative influence on idea realization, since  $\beta = -1,128$ . We can interpret this as follows: a shared-room office negatively moderates the relationship between self-efficacy and idea realization. This means that the relationship between self-efficacy and idea realization weakens, when working in an shared-room office.

The results also show that a home office moderates the relationship between positive affect and idea realization. Looking at the separate variables in the model, positive affect ( $\beta = -.130$ ) and home office ( $\beta = -4,648$ ) contributes negative to idea realization, since the Beta coefficient is in both cases negative. However, when a home office interact with positive affect it has an positive influence on idea realization, since  $\beta = 1.240$ . This implies that the relationship between positive affect and idea realization strengthens when working in a home office.

*The four home-based workspaces.* It appears that an temporary set up moderates the relationship between positive affect and idea realization. The separate variables, positive affect ( $\beta = .507$ ) and temporary set up ( $\beta = 4.468$ ) contributes both positive to idea realization. However, when a temporary set up interact with positive affect it has a negative influence on idea realization, since  $\beta = -1.226$ . We can interpret this as follows: when working in an temporary set up, it weakens the relationship between positive affect and idea realization.

Given the above interpretations, it appears that working in a shared-room office weakens the relationship between self-efficacy and IWB average and idea realization. In contrast, a home office combined with positive affect is conducive to higher total IWB, higher idea promotion, and higher idea realization. In addition, a temporary set up in combination with positive affect, appears to weaken idea realization. Thus, for the process of idea realization, based on these results, it is better to avoid a temporary set up.

#### **Purpose 4**

*The fourth goal is to learn from the situation in the lockdown, which can be used to gain insights about a future adversity-proof work environment in which innovative work behavior can still flourish.*

An assumption in this study was the declining IWB due to the work-at-home behavior. This assumption is partially supported in the study, as a slight decrease was observed in IWB with

the exception of idea generation. However, in this study there is no evidence that the work-at-home behavior during the pandemic is the cause. The study examined whether differences in IWB existed between different work environments. One significant difference is found. Individuals who work hybrid and work in a cell office when they are physically present in the office have a significantly higher idea generation than individuals who work hybrid and work in a flex office when they are not working at home. This means that in conjunction with hybrid working, individuals are better off working in a cell office rather than a flex office when they want to generate ideas. Furthermore, no significant differences were found, so it can be stated that there are barely office types where individuals are actually more or less innovative. This also means that a direct relationship between IWB and office type is excluded in this study. Further, we examined whether there was a difference in IWB among the four home-based workplaces. Here, no significant effects are found. Thus, in this study, no evidence was found that people are more innovative in a particular workplace at home.

When we relate the above to the P-E fit, an argument can be made as to why the IWB is not lower in a home environment compared to other work environments. According to the P-E fit literature, each individual has their own preferences regarding the office. While one individual may possess high innovative work in a home office, another may possess low innovative work behavior in a home office. This can be explained by the fact that an individual with the low innovative work behavior does not feel comfortable in that type of office, thus there is not a perfect match between person and environment. Moreover, if possible, individuals will look for spaces where they feel most comfortable. Preferences toward a space will be different for each individual, so there is no type of office where higher innovative work behavior is exhibited, because the innovative work behavior for each individual excels in a different work environment. This may also explain why there is no direct relationship between IWB and the different types of work environments. Based on these results, we learned that the continuation of hybrid working has no negative effect on IWB. This is positive, as the majority want to continue working hybrid in the future. Therefore, organizations should not be reluctant to adopt a hybrid policy, as the office type does not affect the innovativeness of individuals. With these results collected in times of crisis, lessons have been learned about the future office in relation to innovative work behavior.

When taking an closer look to the office types as moderating variable, it can be argued that the home office types have a positive effect on the relationship between personal characteristics and IWB. Specifically, individuals who score high on positive affect may work best in a home office, as this contributes to higher overall innovativeness, idea promotion and

idea realization. Moreover, individuals who score high on self-efficacy are better off not working in a shared-room office when ideas need to be realized, as this office weakens the relationship between self-efficacy and idea realization. Also, looking at innovative work behavior in general, people who possess high self-efficacy should not work in a shared-room office, as this office type also weakens the relationship between self-efficacy and IWB average. Furthermore, individuals should not work in a temporary set up when ideas need to be realized, as that office type negatively affects the relationship between positive affect and idea realization. These results demonstrates that a home office exerts a moderating effect relatively often. An explanation for this could be that there are fewer stimuli while working at home, which makes it possible to work more productively. This implies that necessary adjustments may need to be made in the home environment to ensure the well-being of individuals.

In addition, to gain more insight into the future office, we reflect on the open question in the survey. When looking at the office in general, it appears that peace, space, physically meeting each other, facilities and ergonomic work are found to be important. Additionally, specifically looking at the workplace, individuals value having their own workspace. Moreover, it is indicated that in addition to a private workspace, there should be diversity in spaces that fit the activities that employees perform. Spaces that respondents consider important are spaces for connection, spaces for isolation, spaces for phone calls, spaces for meetings and quiet areas. In addition, it is indicated that the group size in the office should not be too large, because working with little stimuli is perceived as pleasant.

## **Contributions and limitations**

### Theoretical contributions

This research contributes to the existing literature in a number of ways. First, it provides insight into the new ways of working that is emerging. Although several studies have already been conducted on the changing preferences towards the office, this study focused on the office pre, during and post pandemic. This allows the differences in preferences to be clearly displayed. In addition, this research focused on the different home-based offices, based on literature from Steelcase (2021a). This revealed which type of home-based office was preferred. Moreover, it exposed what aspects are important while working from home. Further, in particular, the different work environments, based on literature from Danielsson and Bodin (2008, 2009) and the four home-based workplaces, based on literature from Steelcase (2021a) are related to IWB.

These insights contribute to existing literature, because the different work environment used in this study have not been previously related to IWB. Moreover, when looking back at the theoretical framework, literature on IWB in relation to the pandemic was scarce. Therefore, this study contributes to the knowledge of IWB in the specific context of COVID-19. This study found that IWB declined, except for idea generation, but no evidence was found that this was due to work-at-home behavior. Therefore, this study contributes to the knowledge of IWB in relation to adversity. This literature may be relevant for future adversities. Additionally, the relationship between personal characteristics and IWB was tested. Mainly, more interestingly, the work environment was used as a moderating variable on this relationship. This study shows that mainly the home office has a positive moderating effect on the relationship between positive affect and IWB, while it was initially thought that working at home will have a negative effect on IWB. This adds to the knowledge of the work environment as a moderating variable. Perhaps the work environment also exerts a moderating effect on other relationships. In addition, this study contributes to literature by Danielsson and Bodin (2008, 2009), who have already examined the work environment in relation to health, well-being, and job satisfaction. This research shows that there is no evidence for a direct relationship between IWB and the work environment, but that the work environment may exert a moderating effect.

### Practical contributions

With the advent of the pandemic, many organizations allowed their employees to work from home during the pandemic. The perceived benefits during this period laid the foundation for a different way of working post-adversity. As a result, organizations are looking for new ways to work in the near-term future, which should include working from home. However, according to Olsthoorn (2021), working in a hybrid fashion has implications for the innovativeness of individuals. Therefore, this study shed new light on this issue and contribute to new insights about a future work environment, where IWB can still flourish.

The results of the quantitative study contribute to knowledge about changing preferences regarding the work environment. Here, it is important that organizations understand that the changing preferences has implications for office design. For instance, fewer people will be present in the office as hybrid work continues. Besides, it becomes important to consider the design of a home office. Additionally, individuals have experienced peace while performing tasks in a home office. This calmness is addressed as an important aspect in the future office. Moreover, since employees want to continue working hybrid, it is crucial to look at IWB between the different office types, as it is thought that working in a home office is associated



with a lower IWB. This study found that during the pandemic, there were no significant differences in IWB between the different office types – meaning that employees who worked only in the office during the pandemic were no more innovative than those who worked only at home. In terms of practical contribution, it is important for organizations to be able to respond to a new way of working with this knowledge, which demonstrates that working from home does not have a negative impact on the IWB. Therefore, organizations should not be concerned about allowing people to work from home. Also, reflecting on the P-E fit, it is important to create a match between the person and environment. When a person feels most comfortable in a home office, it leads to a better P-E fit. In particular, a better fit between person and environment leads to better outcomes, such as higher IWB. Furthermore, when taking a closer look at the aspect of IWB, this study identified whether the IWB actually decreased. This study shows that IWB is decreased, except for idea generation, but no evidence was found that this is due to the work-at-home behavior. This shows that individuals are not well able to maintain the same level of IWB during an adversity, potentially leading to less innovation. Mainly interesting for practical contributions is the realization that due to an adversity the IWB of employees decreases. Therefore, it is important that organizations continue to encourage IWB during potentially upcoming adversities. Moreover, this study focuses on the moderating effect of the work environment on the direct relationship between personal characteristics and IWB. These results show that especially a home office positively influences the relationship between positive affect and IWB. With respect to practical contribution, these observed results contribute to a wise choice in which office a particular person can work best. For instance, an individual who scores high on positive affect may work best in a home office, as this strengthens the relationship resulting in a higher IWB. In short, for the organization concerned, lessons were learned during the pandemic about the future office. Therefore, this study provides direction for the future office, where IWB can still thrive.

### Limitations

First of all, the advent of the pandemic has consequences at both the economic and social levels, which has given rise to several studies that seek to reveal the difference between the situation prior, during and post adversity (Hipp, Bünning, Munnes, and Sauermann, 2020). In order to understand a particular situation during or after the pandemic, there must be a starting point, which means that information about the situation prior to the pandemic must be collected in order to make a comparison. According to Pearson, Ross, and Dawes (1992) asking

retrospective questions is a possible approach to identify an situation in the past, or in this case prior to adversity. However, individuals have been found to have difficulty answering questions that relate to the past, resulting in less accurate answers (Schnell, 2019). The paper by Hipp et al. (2020) highlight several arguments for the occurrence of measurement error when asking retrospective questions. First, detail in memory is often blurred, especially when respondents label a particular situation that has taken place in the past as unimportant. Second, respondents often have the urge to relate feelings experienced in the past to the current situation. Third, high demands are placed on the cognitive abilities of individuals when asking questions about the past. Therefore, minimal effort should be required when asking retrospective questions (Stull, Leidy, Parasuraman, & Chassany, 2009). To reduce measurement error, the questions are formulated in an understandable (e.g. short and clear) way. Also, according to Schnell (2019) it can help to use introductory texts before asking a question, which give the respondent time to activate their memory. Therefore, in the questionnaire introduction texts were used. Moreover, to minimize the critical issue of time span, it is important to use anchor points in the question, which can increase recall accuracy (Hipp et al., 2020). In this study, three anchor points were used, namely pre, during and post adversity. This allows the respondent to know exactly what period a particular question is about. Despite minimizing the limitations, the accuracy of IWB prior to COVID-19 must be considered, as asking retrospective questions has an increased chance of measurement error.

Second, this research was conducted for an innovation hub in the eastern part of the Netherlands. In this study, there was no specific focus on a particular setting. The questionnaire was shared publicly and individuals holding the same office job as of December 2019 could participate in this survey. The results showed that mainly persons between 20 and 30 years living in Overijssel participated in this study. Furthermore, respondents were found to be mainly employed in the trade and service or engineering, production and construction industry. In addition, mainly team members participated in this study and fewer managers and CEO/owners. Despite some differences in group size, there was a broad focus, creating a general picture of the future office in relation to IWB and personal characteristics. Because of the broad interest, no statements can be made about a specific setting. Nevertheless, it can be argued to some extent that the results are generalizable, because everyone in society, without exception, was exposed to COVID-19. Everyone was subjected to strict homework advice, which meant that everyone had to deal with a changing work environment with all its consequences. Therefore, it can be said that this study is to some extent generalizable.

Third, which has already been briefly mentioned above, is the inequality in groups during the analysis process. For example, there were 19 CEOs/owner, 56 managers, and 150 team members participating in the study. During the analysis, we looked at whether there was a relationship between the type of job one held and the preference for the type of office. Due to the large differences in groups, the results can be considered less accurate. In addition, analyses were also done to examine whether there were differences in IWB between different work environments. The literature showed that 6 office types can be distinguished. Two office types were added, namely a hybrid model and a home office. This results in a total of 8 office types. During the analysis it appeared that there were large differences in the group size which makes some results less accurate. To minimize this limitation, a number of offices have been merged. The small, medium and large open plan offices have been merged into one variable, namely open plan offices. For both examples, if more data had been collected, more accurate results could have been obtained. However, the assumptions of the different tests were taken into account during the analysis process.

Finally, statements about a future office are primarily based on quantitative data. Additional interviews following the quantitative results could have led to broader and detailed insights into the future office. In addition, the answers to the open-ended questions were sometimes difficult to interpret. Most results were somewhat superficial and do not go into depth, which may cause the answers to be misinterpreted.

### **Recommendations for future research**

From the theory, it was suggested that IWB will decrease during the pandemic as a result of working from home. This decrease is confirmed in this study, with the exception of idea generation. However, if we look at the different office type in this study, no significant difference in innovativeness can be observed between the different types of offices. Therefore, it can be argued that when an individual works from home they are not necessarily less innovative than someone who does not work from home. However, the IWB has decreased and the work environment as a cause does not appear to be correct. Therefore, the main recommendation is to conduct further research into the cause of the decline in IWB. In doing so, other factors should be sought that could explain a decrease, so that a decrease in the future can be excluded. It is also important to do post pandemic measurements to see if the old level of IWB is reached again. Therefore, future research can shed new light on what causes the decline in IWB.

Further, respondents indicate that short lines of communication and physically meeting each other are important aspects in the future office, increasing productivity and effectiveness. However, if people are going to work hybrid, this can become complex. If people with whom an individual needs short lines of communication are home on a different day, it is still difficult to maintain short lines of communication. Also, if people from the same team work from home on different days, this can be detrimental to team innovativeness in which this study did not focus. As a result, it is then difficult to work together. Therefore, further research is needed on team innovativeness and team effectiveness when working hybrid. Also, hybrid conferencing should be taken into account.

In addition, superficial results were received about the future office through the open-ended question. Many people indicated that space is important. However, it is not easy to interpret what is meant by space. Space in the broad sense or just space at your own workplace. A more thorough investigation will need to be conducted as to what one expects when they are in the office. In addition, if employees want their own workspace, but also want to continue working from home for 3 days, it is difficult as the workplace can hardly remain unused for 3 days. Therefore, there should be more insight into how hybrid working will be organized.

## 6. Conclusion

The purpose of this study was to ultimately answer the following research question: *What is the impact of COVID-19 on the future work environment and innovative work behavior, taking into account personal characteristics.* To begin with, because of COVID-19, other preferences have emerged towards the office, creating a new normal. While hybrid work was hardly considered prior to the pandemic, it appears to be more prevalent in the future than ever. This is due to the fact that many individuals experienced its many benefits. In addition, both employers and employees have found that business activities can continue as usual, whereas it was initially thought that business activities could not be conducted online. Additionally, when looking at IWB, the pandemic did cause a decline in IWB. However, from this study, no evidence was found as to what caused that decline. Initially, it was thought that home-based work behavior would be the cause, but this cannot be confirmed in this study. This means that, based on this study, work can continue to be done at home in the future without affecting IWB, since IWB is not significantly lower in this office type than in other office types. Furthermore, no direct relationship was found between the work environment and IWB, but it appears that the work environment is a moderating factor in some cases. The home office in particular was found to have a positive moderating effect on the relationship between positive affect and IWB. In conclusion, this study sought to learn about the office in times of crisis and provide direction to the future office.

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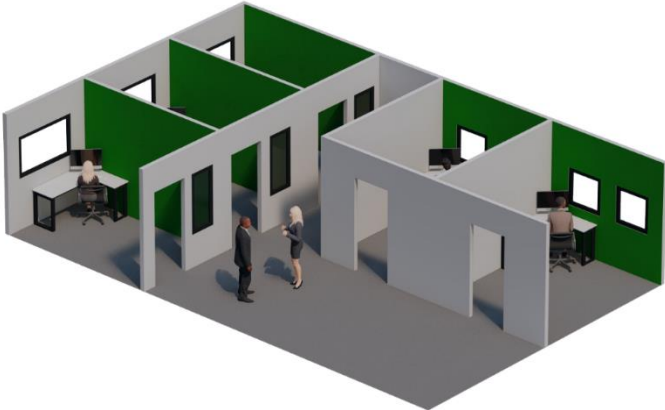


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Appendices

**Appendix I – Taxonomy office types**

The figures below show the taxonomies of the office types used in this study, based on research by Danielsson and Bodin (2008).



*Figure 2.1. Cell office (1 person)*



*Figure 2.2. Shared-room (2- 3 persons)*



*Figure 2.3. Small open plan office*



*Figure 2.4 Medium open plan office*



*Figure 2.5. Big open plan office*



*Figure 2.6. Flex office*



*Figure 2.7. Hybrid model*



*Figure 2.8. Home-office*

**Appendix II – Taxonomy work-at-home spaces**

The figures below show the taxonomies of the work-at-home spaces used in this study, based on research by Steelcase (2021a).



*Figure 3.1. Home office*



*Figure 3.2. Work zone*



*Figure 3.3. Multipurpose area*



*Figure 3.4. Temporary set-up*

### Appendix III - Demographic data

Table 15. Demographic data

<b>Variable</b>	<b>Values</b>	<b>Percent %</b>	<b>Frequency</b>
<b>Gender</b>	Men	47,6	107
	Women	52,4	118
<b>Age</b>	<20	40,4	91
	20 – 30	13,8	31
	31 – 40	24	54
	41 – 50	17,3	39
	51 – 60	4,4	10
	>60	-	0
<b>Education</b>	High school or primary	3,1	7
	MBO	25,3	57
	HBO	47,1	106
	WO or higher	24,4	55
<b>Industry</b>	Healthcare	8,9	20
	Education, culture and science	10,2	23
	Government	10,7	24
	ICT	3,6	8
	Agriculture, nature and fisheries	4,0	9
	Media and communication	7,1	16
	Trade and services	25,3	57
	Engineering, production and construction	22,7	51
	Tourism, recreation and hospitality	2,7	6
	Transportation and logistics	1,8	4
	Other	3,1	7
<b>Province</b>	Friesland	2,7	6
	Groningen	3,6	8
	Drenthe	0,9	2
	Flevoland	2,2	5
	Overijssel	64,0	144
	Gelderland	12,0	27

	Utrecht	4,9	11
	Noord-holland	5,8	13
	Zuid-holland	1,3	3
	Brabant	1,8	4
	Limburg	0,9	2
<b>Size</b>	Micro	6,7	15
<b>company</b>	Small	27,1	61
	Medium	33,8	76
	Big	32,4	73
<b>Weekly</b>	0 – 16	5,8	13
<b>working</b>	17 – 32	32,4	73
<b>hours</b>	33 – 40	48,4	109
	>41	13,3	30
<b>Position</b>	Owner/CEO	8,4	19
	Manager	24,9	56
	Employee/team member	66,7	150
<b>Living</b>	Living alone	12,4	28
<b>situation</b>	Living alone with children	4,0	9
	Living together with partner	38,7	87
	Living with partner and children	36,4	82
	Living at home with parent(s)	6,2	14
	Living with roommate	2,2	5

## Appendix IV – List of variable names

Table 16. Variables names

Name	Meaning
Pre_officetype	The office type (8 choices) in which the respondent worked prior to adversity
Pre_combi	The office type (6 choices) combined with hybrid working prior to adversity
During_officetype	The office type (8 choices) in which the respondent worked during adversity
During_combi	The office type (6 choices) combined with hybrid working during adversity
Post_officetype	The office type (8 choices) in which the respondent want to work post adversity
Post_combi	The office type (6 choices) combined with hybrid working post adversity
During_homeoffice	The home office (4 choices) in which the respondent worked during adversity
IWB1_average	The overall average of innovative work behavior (based on 9 statements) prior to adversity
IWB1_ideageneration	Overall average of idea generation (based on 3 statements) prior to adversity
IWB1_ideapromotion	Overall average of idea promotion (based on 3 statements) prior to adversity
IWB1_idearealization	Overall average of idea realization (based on 3 statements) prior to adversity
IWB2_average	The overall average of innovative work behavior (based on 9 statements) during adversity
IWB2_ideageneration	Overall average of idea generation (based on 3 statements) during adversity
IWB2_idearealization	Overall average of idea promotion (based on 3 statements) during adversity
IWB2_ideapromotion	Overall average of idea realization (based on 3 statements) during adversity
Autonomy1_average	Overall average of autonomy (based on 3 statements) prior to adversity
Autonomy2_average	Overall average of autonomy (based on 3 statements) during adversity
Selfeff_average	Overall average of self-efficacy (based on 3 statements)
Positiveaff_average	Overall average of positive affect (based on 10 statements)
Pre_cell_office	Dummy cell office yes or no prior to adversity
Pre_shared_room	Dummy shared-room office yes or no prior to adversity
Pre_small_open_office	Dummy small open office yes or no prior to adversity

Pre_medium_open_office	Dummy medium open office yes or no prior to adversity
Pre_big_open_office	Dummy big open office yes or no prior to adversity
Pre_flex	Dummy flex office yes or no prior to adversity
Pre_hybride	Dummy hybrid work yes or no prior to adversity
Pre_homeoffice	Dummy home office yes or no prior to adversity
During_cell_office	Dummy cell office yes or no during adversity
During_shared_room	Dummy shared-room office yes or no during adversity
During_small_open_office	Dummy small open office yes or no during adversity
During_medium_open_office	Dummy medium open office yes or no during adversity
During_big_open_office	Dummy big open office yes or no during adversity
During_flex_office	Dummy flex office yes or no during adversity
During_hybrid	Dummy hybrid work yes or no during adversity
During_home	Dummy home office yes or no during adversity
Post_cell_office	Dummy cell office yes or no post adversity
Post_shared_room	Dummy shared-room office yes or no post adversity
Post_small_open_office	Dummy small open office yes or no post adversity
Post_medium_open_office	Dummy medium open office yes or no post adversity
Post_big_open_office	Dummy big open office yes or no post adversity
Post_flex	Dummy flex office yes or no post adversity
Post_hybride	Dummy hybrid work yes or no post adversity
Post_home	Dummy home office yes or no post adversity
Rec_Pre_officetype	Office type prior to adversity reduced to 6 instead of 8. Small open plan, medium open plan and big open plan to open plan office
Rec_pre_combi	The office type (6 choices) combined with hybrid working pre adversity reduced to 4. Open plan as one variable instead of 3.
Rec_during_officetype	Office type during adversity reduced to 6 instead of 8. Small open plan, medium open plan and big open plan to open plan office
Rec_during_combi	The office type (6 choices) combined with hybrid working during adversity reduced to 4. Open plan as one variable instead of 3.
Rec_post_office	Office type post adversity reduced to 6 instead of 8. Small open plan, medium open plan and big open plan to open plan office
Rec_post_combi	The office type (6 choices) combined with hybrid working post adversity reduced to 4. Open plan as one variable instead of 3.
Rec_homeenvironment	Dummy enclosed work place at home yes or no



## **Appendix V – IWB and function**

Based on the one-way ANOVA, a significant difference was found in the mean of IWB1\_average among the function that someone holds ( $F(2,222) = 4,668$ ;  $p = 0,010$ ). Based on the Posthoc test (Games Howell, because no equal variance), managers possess higher IWB1\_average than team members, as  $p = 0.010$ . A significant difference was also found between IWB1\_ideapromotion and the position a person holds ( $F(2,222) = 4.984$ ;  $p = 0.008$ ). An owner/CEO ( $p = 0.037$ ) and a manager ( $p = 0.011$ ) have significantly higher scores on IWB1\_ideapromotion. The difference in IWB1\_ideapromotion between manager and owner/CEO is not significant. Also, a difference was observed in the mean of IWB1\_idearealization and function ( $F(2,222) = 4.107$ ;  $p = 0.018$ ). A manager possess a higher IWB1\_idearealization than a team member since  $p = 0.011$ . A difference was also observed in the mean of IWB2\_average and function ( $F(2,222) = 3.710$ ;  $p = 0.026$ ). A manager has a higher IWB2\_average than a team member since  $p = 0.049$ . Finally, it was observed that there is difference in the mean of IWB2\_idearealization and function ( $F(2,222) = 3.920$ ;  $p = 0.021$ ). Based on Games Howel, managers have a higher IWB2\_idealization than team members since  $p = 0.036$ . Moreover, the above can be explained by the fact that owners/CEOs also score significantly higher on autonomy. The results in this study show that autonomy has a weak positive relationship with IWB.

## Appendix VI – Regression models I

Table 17. Regression model with IWB1\_average as dependent variable and autonomy, self-efficacy and positive affect as independent variables

### Model Summary<sup>b</sup>

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,360 <sup>a</sup>	,130	,118	1,11447

### ANOVA<sup>a</sup>

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	40,900	3	13,633	10,977	,000 <sup>b</sup>
	Residual	274,490	221	1,242		
	Total	315,390	224			

### Coefficients<sup>a</sup>

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-,123	,805		-,153	,878
	Autonomy_average	,331	,107	,202	3,088	,002
	Selfeff_average	,283	,159	,125	1,783	,076
	Postiveaff_average	,492	,194	,174	2,541	,012

a. Dependent Variable: Average IWB prior to pandemic

The figures below show the assumptions associated with the regression model.

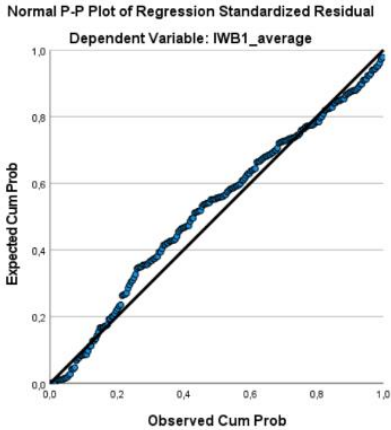


Figure 4.1. P-P plot

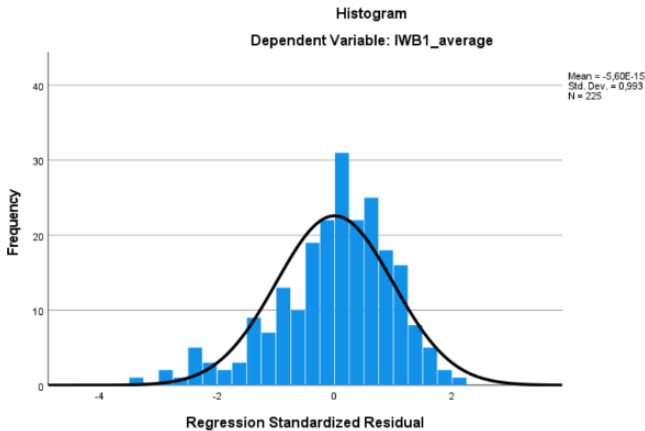


Figure 4.2. Histogram

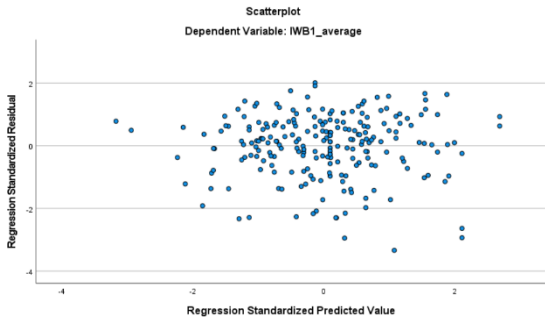


Figure 4.3. Scatterplot

Table 18. Regression model with IWB2\_average as dependent variable and autonomy, self-efficacy and positive affect as independent variables

*Model Summary<sup>b</sup>*

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,301 <sup>a</sup>	,090	,078	1,08737

*ANOVA<sup>a</sup>*

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	25,940	3	8,647	7,313	,000 <sup>b</sup>
	Residual	261,307	221	1,182		
	Total	287,246	224			

*Coefficients<sup>a</sup>*

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	,587	,794		,740	,460
	Average autonomy during pandemic	,192	,106	,121	1,812	,071
	Average self-efficacy in general	,340	,155	,157	2,192	,029
	Average positive affect in general	,371	,189	,137	1,968	,050

a. Dependent Variable: Average IWB during pandemic

The figures below show the assumptions associated with the regression model.

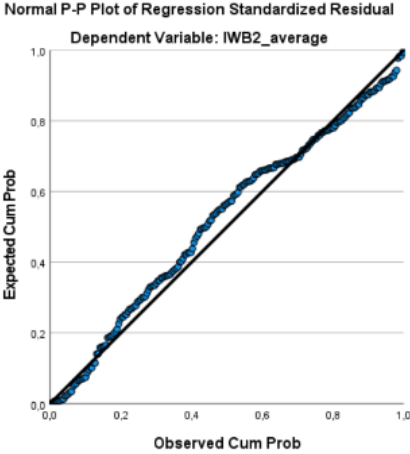


Figure 5.1. P-P plot

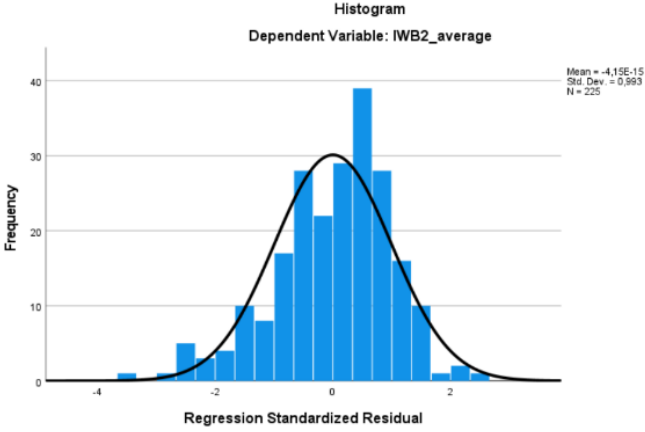


Figure 5.2. Histogram

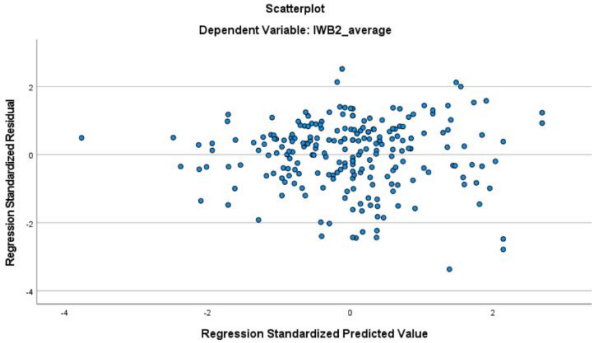


Figure 5.3. Scatterplot

## Appendix VII – Regression models II

Table 19. Regression model with IWB1\_ideageneration as dependent variable and autonomy, self-efficacy and positive affect as independent variables

*Model Summary<sup>b</sup>*

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,341 <sup>a</sup>	,116	,104	1,16390

*ANOVA<sup>a</sup>*

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	39,312	3	13,104	9,673	,000 <sup>b</sup>
	Residual	299,382	221	1,355		
	Total	338,694	224			

*Coefficients<sup>a</sup>*

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-,067	,841		-,080	,936
	Autonomy1_average	,298	,112	,175	2,661	,008
	Selfeff_average	,224	,166	,095	1,351	,178
	Positiveaff_average	,586	,202	,200	2,896	,004

a. Dependent Variable: Average IWB idea generation prior to pandemic

The results of the model show that 11,6% of the variation in IWB1\_ideageneration can be explained by the independent variables (autonomy, self-efficacy and positive affect) together. The total model is significant  $F(3,221) = 9,673$ ,  $p = <.001$ . While Selfeff\_average is not significant ( $B = ,224$ ,  $p = 0.178$ ), Autonomy1\_average ( $B = .298$ ,  $p = 0.008$ ) and Positiveaff\_average ( $B = .586$ ,  $p = 0.004$ ) are. The total predictive model is as follows:

$$\text{IWB1\_ideageneration} = -,067 + (,298 * \text{Autonomy1\_average}) + (,224 * \text{Selfeff\_average}) + ,586 * \text{Positiveaff\_average}$$

Table 20. Regression model with IWB1\_ideapromotion as dependent variable and autonomy, self-efficacy and positive affect as independent variables

*Model Summary<sup>b</sup>*

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,347 <sup>a</sup>	,121	,109	1,21251

*ANOVA<sup>a</sup>*

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	44,583	3	14,861	10,108	,000 <sup>b</sup>
	Residual	324,910	221	1,470		
	Total	369,493	224			

*Coefficients<sup>a</sup>*

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-,064	,876		-,073	,942
	Autonomy1_average	,387	,117	,218	3,319	,001
	Selfeff_average	,222	,173	,090	1,285	,200
	Positiveaff_average	,521	,211	,170	2,475	,014

a. Dependent Variable: Average IWB idea promotion prior to pandemic

The results of the model show that 12,1% of the variation in IWB1\_ideapromotion can be explained by the independent variables (autonomy, self-efficacy and positive affect) together. The total model is significant  $F(3,221) = 10,108$ ,  $p = <.001$ . While Selfeff\_average is not significant ( $B = ,222$ ,  $p = 0.200$ ), Autonomy1\_average ( $B = .387$ ,  $p = 0.001$ ) and Positiveaff\_average ( $B = .521$ ,  $p = 0.014$ ) are. The total predictive model is as follows:

$$\text{IWB1\_ideapromotion} = -,064 + (,387 * \text{Autonomy1\_average}) + (,222 * \text{Selfeff\_average}) + ,521 * \text{Positiveaff\_average}$$

Table 21. Regression model with IWB1\_idearealization as dependent variable and autonomy, self-efficacy and positive affect as independent variables

*Model Summary<sup>b</sup>*

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,317 <sup>a</sup>	,101	,088	1,28225

*ANOVA<sup>a</sup>*

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	40,658	3	13,553	8,243	,000 <sup>b</sup>
	Residual	363,359	221	1,644		
	Total	404,018	224			

*Coefficients<sup>a</sup>*

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-,239	,926		-,258	,797
	Autonomy_average	,308	,123	,166	2,497	,013
	Selfeff_average	,403	,182	,157	2,209	,028
	Positiveaff_average	,369	,223	,115	1,657	,099

a. Dependent Variable: Average IWB idea realization prior to pandemic

The results of the model show that 10,1% of the variation in IWB1\_idearealization can be explained by the independent variables (autonomy, self-efficacy and positive affect) together. The total model is significant  $F(3,221) = 8,243, p = <.001$ . While Positiveaff\_average ( $B = .369, p = 0.099$ ) is not significant, Autonomy1\_average ( $B = .308, p = 0.013$ ) and Selfeff\_average ( $B = .403, p = 0.028$ ) are. The total predictive model is as follows:

$$\text{IWB1\_ideapromotion} = -,239 + (.308 * \text{Autonomy1\_average}) + (.403 * \text{Selfeff\_average}) + .369 * \text{Positiveaff\_average}$$



Table 22. Regression model with IWB2\_ideageneration as dependent variable and autonomy, self-efficacy and positive affect as independent variables

*Model Summary<sup>b</sup>*

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,236 <sup>a</sup>	,056	,043	1,15093

*ANOVA<sup>a</sup>*

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	17,252	3	5,751	4,341	,005 <sup>b</sup>
	Residual	292,746	221	1,325		
	Total	309,998	224			

*Coefficients<sup>a</sup>*

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1,456	,840		1,733	,085
	Autonomy2_average	,093	,112	,056	,828	,408
	Selfeff_average	,300	,164	,133	1,829	,069
	Positiveaff_average	,349	,200	,124	1,751	,081

a. Dependent Variable: Average IWB idea generation during pandemic

The results of the model show that 5,6% of the variation in IWB2\_ideageneration can be explained by the independent variables (autonomy, self-efficacy and positive affect) together. The total model is significant  $F(3,221) = 4,341$ ,  $p = ,005$ . However, Autonomy2\_average ( $B = ,093$ ,  $p = 0,408$ ), Selfeff\_average ( $B = ,300$ ,  $p = 0,069$ ) and Positiveaff\_average ( $B = ,349$ ,  $p = 0,081$ ) are not significant. The total predictive model is as follows:

$$\text{IWB2\_idearealization} = 1,456 + (.093 * \text{Autonomy2\_average}) + (.300 * \text{Selfeff\_average}) + .349 * \text{Positiveaff\_average}$$

Table 23. Regression model with IWB2\_ideapromotion as dependent variable and autonomy, self-efficacy and positive affect as independent variables

*Model Summary<sup>b</sup>*

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,323 <sup>a</sup>	,104	,092	1,21953

*ANOVA<sup>a</sup>*

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	38,346	3	12,782	8,594	,000 <sup>b</sup>
	Residual	328,683	221	1,487		
	Total	367,029	224			

*Coefficients<sup>a</sup>*

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-,147	,890		-,165	,869
	Autonomy2_average	,275	,119	,153	2,312	,022
	Selfeff_average	,364	,174	,149	2,095	,037
	Positiveaff_average	,455	,211	,149	2,153	,032

a. Dependent Variable: Average IWB idea promotion during pandemic

The results of the model show that 10,4% of the variation in IWB2\_ideapromotion can be explained by the independent variables (autonomy, self-efficacy and positive affect) together. The total model is significant  $F(3,221) = 8,594$ ,  $p = <.001$ . Also, Autonomy2\_average ( $B = .275$ ,  $p = 0.022$ ) and Selfeff\_average ( $B = .364$ ,  $p = 0.037$ ) and Positiveaff\_average ( $B = .455$ ,  $p = 0.032$ ) are significant. The total predictive model is as follows:

$$\text{IWB2\_ideapromotion} = -.064 + (.275 * \text{Autonomy2\_average}) + (.364 * \text{Selfeff\_average}) + .455 * \text{Positiveaff\_average}$$

Table 24. Regression model with IWB2\_idearealization as dependent variable and autonomy, self-efficacy and positive affect as independent variables

*Model Summary<sup>b</sup>*

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,258 <sup>a</sup>	,067	,054	1,26693

*ANOVA<sup>a</sup>*

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	25,271	3	8,424	5,248	,002 <sup>b</sup>
	Residual	354,729	221	1,605		
	Total	380,000	224			

*Coefficients<sup>a</sup>*

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	,453	,925		,490	,625
	Autonomy2_average	,209	,124	,114	1,687	,093
	Selfeff_average	,355	,181	,142	1,965	,051
	Positiveaff_average	,309	,220	,099	1,405	,161

a. Dependent Variable: Average IWB idea realization during pandemic

The results of the model show that 6,7% of the variation in IWB2\_idearealization can be explained by the independent variables (autonomy, self-efficacy and positive affect) together. The total model is significant  $F(3,221) = 5,248$ ,  $p = ,002$ . However, Autonomy2\_average ( $B = ,209$ ,  $p = 0,093$ ), Selfeff\_average ( $B = ,355$ ,  $p = 0,051$ ) and Positiveaff\_average ( $B = ,309$ ,  $p = 0,161$ ) are not significant. The total predictive model is as follows:

$$\text{IWB2\_idearealization} = ,453 + (,209 * \text{Autonomy1\_average}) + (,355 * \text{Selfeff\_average}) + ,309 * \text{Positiveaff\_average}$$