INFLUENCE OF ACTIVITY-BASED OFFICE ENVIRONMENTS ON PERCEIVED INDIVIDUAL AND GROUP CREATIVITY

A Ph.D. Dissertation

by

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INFLUENCE OF ACTIVITY-BASED OFFICE ENVIRONMENTS ON PERCEIVED INDIVIDUAL AND GROUP CREATIVITY

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THE DEPARTMENT OF INTERIOR ARCHITECTURE AND ENVIRONMENTAL DESIGN
İHSAN DOĞRAMACI BİLKENT UNIVERSITY
ANKARA
August 2021

I certify that I have read this thesis and have found that it is fully adequate, in scope and in quality, as a thesis for the degree of Master of Fine Arts in Interior Architecture and Environmental Design.
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Supervisor

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ABSTRACT

INFLUENCE OF ACTIVITY-BASED OFFICE ENVIRONMENTS
ON PERCEIVED INDIVIDUAL AND GROUP CREATIVITY

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This study examined the impact of activity-based offices (ABOs) on individual and group creativity from the employees' perspective. The study was investigated in two stages to find the link between ABOs and the concept of creative spaces, and also to identify and examine mediating variables in this relationship. In the first stage, a qualitative approach was adopted and the critical incident technique was used to collect data from 50 knowledge workers through interviews. Participant observation methods were also conducted for the case studies of three ABOs. In the second stage, a quantitative approach was adopted to collect data from a total of 186 knowledge workers in two international companies based in Sweden. The mixed methods approach was used to triangulate the data from the two stages. The two sets of data were merged by combining the different findings in the section on practical relevance and suggestions for improving environmental designers' and facility managers' understanding to manipulate ABO spaces to promote creativity in the workplace.

The results showed that privacy, noise levels, and distraction-free environments were the most important factors in fostering individual employee creativity, as were open spaces with zones for different noise levels and private enclosed spaces. For group creativity, the importance of providing appropriate equipment and furniture in ABOs was observed - collaborative and disengaged spaces were found to be the most

recurring spaces for group creativity. In addition, employee preferences were found to be an important component to consider when looking at environmental features, space types, and types of creative activities in creativity-enhancing ABOs. Using regression with bootstrapping for quantitative data, it is found that job autonomy and organizational commitment serially mediate this relationship. Study results suggest that organizations with ABOs exert on employees a sense of control over their work, leading them to feel more committed to their organization and consequently improving creativity in the group.

Keywords: Activity-Based Offices (ABOs), Creative Spaces, Employee Creativity, Office Interior Design

ÖZET

AKTİVİTEYE DAYALI OFİS ORTAMLARININ ALGILANAN BİREYSEL VE GRUP YARATICILIĞI ÜZERİNE ETKİLERİ

Yekanialibeiglou, Sepideh
Doktora, İç Mimarlık ve Çevre Tasarımı Bölümü
Tez Danışmanı: Prof. Dr. Halime Demirkan

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Bu çalışma, aktiviteye dayalı ofislerin (ADO'lar) bireysel ve grup yaratıcılığı üzerindeki etkisi çalışanların bakış açısından incelemiştir. ADO'lar ile yaratıcı alanlar kavramı arasındaki bağlantıyı bulmak ve ayrıca bu ilişkideki aracı değişkenleri belirlemek ve incelemek için çalışma iki aşamada yürütülmüştür. İlk aşamada nitel bir yaklaşım benimsenmiş ve 50 bilgi çalışanından görüşmeler yoluyla veri toplamak için kritik olay tekniği kullanılmıştır. Üç ADO'nun vaka çalışmaları için de, katılımcı gözlem yöntemleri uygulanmıştır. İkinci aşamada, bu çalışmaya katılan uluslararası İsveç merkezli iki şirketten toplam 186 bilgi çalışanından veri toplamak için nicel bir yaklaşım benimsenmiştir. İki aşamadan elde edilen verilerin analizi için de karma yöntemler yaklaşımı kullanılmıştır. Çevre tasarımcılarının ve işyeri yöneticilerinin ofislerde yaratıcılığı teşvik etmek için ADO alanlarını yeniden düzenleme anlayışlarını geliştirmek için, pratik uygunluk ve öneriler bölümündeki farklı bulgular içeren iki veri seti birleştirilmiştir.

Sonuçlar, mahremiyet, gürültü seviyeleri ve dikkat dağıtıcı olmayan ortamların, farklı gürültü seviyeleri için bölgelere sahip açık alanlar ve özel kapalı alanlar gibi bireysel çalışan yaratıcılığını teşvik etmede en önemli faktörler olduğunu göstermiştir. Grup yaratıcılığı için ADO'larda uygun donanım ve mobilya sağlamanın önemi gözlemlenmiştir-işbirlikçi ve bağımsız alanların grup yaratıcılığı için en çok

tekrarlanan alanlar olduğu tespit edilmiştir. Ayrıca yaratıcılığı artıran ADO'larda çevresel özelliklere, alan türlerine ve yaratıcı faaliyet türlerine bakıldığında, çalışan tercihlerinin dikkate alınması gereken önemli bir bileşen olduğu bulunmuştur. Nicel veriler için önyükleme ile regresyon kullanılarak, iş özerkliği ve örgütsel bağlılığın bu ilişkiye seri olarak aracılık ettiği bulunmuştur. Çalışma sonuçları, ADO'ları olan kuruluşların, çalışanlarına işleri üzerinde bir kontrol duygusu sağladığını, bu da onların kuruluşlarına daha bağlı hissetmelerini ve sonuç olarak ekipteki yaratıcılığı geliştirdiğini göstermektedir.

Anahtar Kelimeler: Aktiviteye Dayalı Ofisler (ADO'lar), Çalışan Yaratıcılığı, Ofis İç Mekan Tasarımı, Yaratıcı Alanlar

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LIST OF ABBREVIATIONS

A-FOs: Activity-Based Flexible Offices

ABO: Activity-Based Office

CAT: Consensual Assessment Technique

CEO: Chief Executive Officer

CIT: Critical Incident Technique

ICT: Information and Communication Technology

IEQ: Interior Environment Quality

IT: Information Technology

NewWoW: New Way of Working

OCQ: Organizational Commitment Questionnaire

OPO: Open Plan Office

OSIQ: Organizational Support for Innovation Questionnaire

WFH: Work from Home

CHAPTER 1

INTRODUCTION

The ability to generate original ideas and be creative is critical for organizations to remain competitive in global markets (e.g., Agars et al., 2008; Anderson et al., 2004). With rapid technological development, the life cycle of products and services is becoming shorter and shorter, while customers demand novelty (Tidd and Bessant, 2009). In view of this market environment, an organization must consider creativity as a key skill to be developed and find ways to support and encourage employee creativity.

The formerly prevailing view of 'creative' was a trait that one either had or did not have. In the traditional view, artists, designers, and advertising professionals were the 'creatives' but not those who were knowledge workers. Nowadays, creativity is considered very important, especially for knowledge workers (also called 'the creative class') whose work often involves multi-part tasks and projects that require

solving different problems using multiple sources of knowledge (Dul et al., 2011). Knowledge workers are considered important members for a company's competitiveness in a knowledge-intensive economy (Florida, 2005). In the process of creating, sharing or implementing knowledge, knowledge workers are actively involved (e.g., in finance, technology or HR) (Davenport et al., 2002). This study focuses primarily on the creativity of knowledge workers in knowledge-intensive organizations, mainly from IT, marketing, finance, and management. The arts-oriented companies and industries (such as design, architecture, music, film, and advertising companies) were not examined in this study.

The function of creativity in the workplace is often to solve novel and ambiguous problems, called creative problem solving (Mumford et al., 2002). Thus, creativity can be viewed as the ability to generate novel and useful ideas that function as answers to such problems (Amabile et al., 1996; Brophy, 1998; Feist, 1998; Hemlin et al., 2008). Group creativity is a collaborative effort that involves coordination and interaction with another individual or group engaged in creative problem-solving activities (Paulus et al., 2012). This study agrees with the mentioned definition of creativity and ensured that the entire study, including participants' perceptions of creativity, followed this definition.

With digital advancements and development of mobile communication technology, the spatial structure of knowledge-intensive organizations has changed, and alternatives to traditional ways of working have emerged, such as New Way of Working (also known as NewWoW) (Blok et al., 2012). NewWoW, including time

and location flexibility, are a relatively new phenomenon enabled by advanced information and communication technology (ICT) (Gerards et al., 2018). The most important characteristics of this type of work are exploration, collaboration, freedom, and creativity. To meet these characteristics, a more flexible style of work was required, which was made possible by a different office setup than in traditional offices (Greene and Myerson, 2011). Over the years, several new office concepts have been developed, often supporting the idea of NewWoW. One of these office concepts is the Activity-Based Office (ABO). Central to this concept is the idea that different activities create different needs and therefore require different spaces (Appel-Meulenbroek et al., 2011). In ABOs work is no longer time and place dependent and the quality of work becomes more important. American architect Robert Luchetti from the late 1970s was the first reference to an activity-based work mode. In 1993, he helped invent the new office concept as a set of 'activity settings'. In these activity-based environments, several spaces are designed in such a way that their technical and physical features support the different types of activities performed by employees in the office. The term 'work setting' encompasses different types of spaces and workstations, provided to enhance a particular type of work activity, such as spaces for concentration, communication, teamwork, creativity, privacy, and relaxation (Harris, 2015). This concept is applied to improve efficiency, employee interaction, satisfaction and productivity as highlighted in several studies (Appel-Meulenbroek et al., 2011; Van der Voordt, 2004). The ABO differs from other types of work environments in that it changes fixed work routines and is no longer seen as a central office, but as a set of spaces and tools that enable employees' daily work activities and thereby influence their work performance (Eismann et al., 2021). ABOs are innovations in office interior design that are being adopted by an

increasing number of organizations worldwide (Hoendervanger et al., 2021). As a currently trending office concept, how ABOs affect employee outcomes is an important issue for organizations.

Early research found that the physical environment affects the creativity of employees (Oldham et al., 1995); however, few studies have examined the impact on employee creativity in office environments (Hoff and Öberg, 2015; Meinel et al., 2017; Oldham and Baer, 2012). While fostering creativity in flexible offices with new ways of working is important for organizational success, to our knowledge, there are no studies that focus on the common domain of creativity and ABO design (Nanayakkara et al., 2021). Despite their importance, knowledge-intensive organizations have not sufficiently explored how to adapt the flexible work environment to employees' activities (van den Berg et al., 2020). Therefore, more in-depth contextualized studies of ABOs are needed to fill this important gap by investigating how the environment of ABOs influences employee creativity and identifying supporting and hindering interior features. Therefore, to reduce the existing gap in the context of office interior design and creativity, the main research question of this study is:

RQ: How does the environment of ABOs influence individual and group creativity from the employees' point of view?

Some recent studies in the present literature showed that certain types of spaces and their features enhance creativity that is named as the ‘creative spaces’ (Lee, 2016; Paoli et al., 2017; Thoring et al., 2018). In this study, a space is considered ‘creative’ if it facilitates creative activities (Thoring et al., 2018) for knowledge workers in an office environment. This is a point of concern for many organizations as they aim to create spaces that cultivate employee creativity through physical and social environments that have the potential to stimulate creativity (Meinel et al., 2017). However, there is a gap in the current understanding of whether ABOs facilitate employee creativity and can be classified as creative spaces. In addition, according to Paoli and Ropo (2017), one of the most significant gaps in the context of creative spaces is that they are constructed based on the information acquired from consultants, architects, and designers rather than users of these spaces. Therefore, there is a need to reflect the actual users’ opinions about these spaces. Also, according to Thoring et al. (2018)’s literature review, many studies do not provide examples and hence typology of creative spaces remains unclear. Therefore, there is a shortcoming related to creative spaces in the creativity literature. ABOs are good cases for studying creative spaces since they comprise a set of spaces designed to support different types of activities and needs. This study aimed to contribute to literature by considering a real case study and reflecting the actual users' feedback about the ABO spaces. Therefore, to fill this gap, it is needed to analyze ABOs spaces’ potential to foster creativity and find its link to creative spaces.

In investigating the level of creativity also, it is important to distinguish this research from previous studies that have examined the effects of interior features of offices (e.g., color, texture, furniture, equipment, etc.) on employees’ creativity at work. In

the office context, most studies that have examined the creative potential of interior features of offices have only focused on individual creativity (e.g., Dul and Ceylan, 2011, 2014; Dul et al., 2011; Haner, 2005). Few studies consider both individual and group creativity in office environments (Haner, 2005; Magadley and Birdi, 2009). On the other hand, organizations put less emphasis on individual needs (such as providing private spaces for concentration) when designing their office spaces. Also, due to the limited study on contextual job conditions that may mediate between ABOs and creativity, this is considered worthy of further attention. Therefore, understanding the role of the physical environment in ABOs as flexible workplaces with a multilevel (individual and group) analysis of creativity and the role of potential mediators of this link, which has not been addressed in previous studies, is a valuable contribution to theory and practice.

The current time when the whole world is dealing with the pandemic COVID -19 has forced and accelerated many organizations and employees to implement NewWoW. Many organizations around the world have migrated to a NewWoW that even the most extreme business continuity plans had not intended (Nanayakkara et al., 2021). This migration from the office to the home has shown that such decentralization of office work is possible and, in some situations, useful. In the future, this desire to work from home will highlight the need for organizations to adopt more flexibility, and digitization and rethinking the way employees are working through COVID - 19 could be a strong catalyst for the adoption of ABO-style office arrangements. Therefore, considering the above research gaps and the importance of ABOs in the current and future work environment, there is a need to conduct an exploratory and inductive study to investigate the relationship between the physical environment and

employees' creative activities in ABOs. This study aims to contribute to theory to understand the role of the physical environment in ABOs as knowledge-intensive and flexible workplaces with a multilevel (individual and group) analysis of creativity, which has not been addressed in previous studies. The practical relevance relates to optimizing the creativity-enhancing aspects of ABOs by identifying supporting and hindering spaces and features. The findings of this study can improve the understanding of environmental designers, planners, and facility managers of organizations so that they can manipulate ABO spaces to promote creativity in the workplace.

1.1. Aim of the Study

The main aims of this study are: (i) to determine the types of spaces and interior features of ABOs that are important for the four types of creative activities and how these features support and/or hinder these activities; (ii) to find out whether the spaces of ABO can be classified as creative spaces; (iii) to measure the effect of ABOs on creativity; and (iv) to identify and measure the effect of any mediator/moderator of some additional work or organizational variables in the ABO-creativity relationship.

The overall research design process of the study consists of two stages. The first stage is a qualitative approach that includes interviews and observations to collect data. The second stage is a quantitative approach through the design and use of a questionnaire to collect data. The mixed methods approach is used to triangulate the data from the two stages. The two sets of data were merged by combining the

different findings in the discussion section to interpret the results. Further details on the research questions, hypotheses and research methods are discussed in later chapters.

1.2. The General Structure of the Thesis

This thesis comprises of eight chapters. After the first introductory chapter, the following three chapters discuss the relevant literature. In the second chapter, definitions, concepts and relevant theories about organizational creativity are provided. In addition, various measurements of creativity are presented. The heuristic framework for measuring creativity is presented to show the level, measurement approach and focus of analysis of this study on the framework. In chapter three, different creative activity types in the office environment are defined and related to flexible office environments. The four activity types presented are formal-individual, informal-individual, formal-group and informal-group creative activities.

The fourth chapter provides information on the physical environment of the office and the history of change in office interior design from cellular and open plan offices to flexible offices. This chapter then separately discusses the role of the physical office environment, space types, and interior design on creativity. At the end of the chapter and immediately before the methodology, the research questions and hypotheses of the study are presented. The fifth chapter describes the study with its methodology. The methodology of the study includes detailed information about the study design, participants and study setting, procedure, instruments and data analysis

of the study. The sixth chapter presents the qualitative findings from the observations and Critical Incident Technique (CIT) interviews and the quantitative findings. In the seventh chapter, the discussion section is presented. In this chapter, the qualitative and quantitative results of the study are discussed and in the last part, these results are triangulated. The eighth chapter is the conclusion. Theoretical contributions and practical implications based on the triangulation framework, limitations, and future research are included in this chapter. Sample visual and written materials, including additional photographs from the case studies, interview questions, literature questionnaires, and study procedures are included in the appendices.

CHAPTER 2

CREATIVITY RESEARCH IN OFFICE CONTEXT

Creativity is generally defined in the literature as the ability to generate ideas that are novel/original and useful/adaptive (Amabile et al., 1996; Feist, 1998). Table 1 lists various definitions found in the creativity literature. While some of these definitions defined creativity as production of novel and useful products, services, or processes, (Mumford, 2003) others focused explicitly on the novel and valuable 'ideas' as products of creativity (Udwadia, 1990). According to Feist's (1998) proposal, a creative idea must be adaptable and useful even if it has no real and practical use. The ideas can also be considered creative simply because of their aesthetic or intellectual value (Feist, 1998). According to Amabile (1988), employee creativity consists of coming up with original, novel, and useful ideas to solve problems and produce new products, processes, services, and ways of working.

Table 1. Definition of employee creativity in the office context in the literature

Creativity definition in the office context	Author and Year
"The production of novel or original ideas of useful value."	Udwadia (1990, p. 66)
"The creation of a valuable, useful new product, service, idea, procedure, or process by individuals working together in a complex social system."	Woodman et al. (1993, p. 293)
"Creativity involves the production of novel, useful products"	Mumford (2003, p. 110)
"Creativity is the interaction among aptitude, process, and environment by which an individual or group produces a perceptible product that is both novel and useful as defined within a social context."	Plucker et al. (2004, p. 90)
"The production of new and useful ideas or solutions by one or more individual within a work environment."	Klijin and Tomic (2010, p. 323)
"The production of novel and useful ideas concerning products, services, processes, and procedures by employee."	Shin et al. (2012, p. 198)

Creativity is considered an antecedent of innovation because "all innovation begins with creative ideas" (Amabile et al., 1996, p. 1154). Innovation is a concept used interchangeably with creativity in some disciplines (Kahl et al., 2009). The innovation concept develops the definition of creativity to include the implementation of an idea (Björk, 2011). However, the differences between creativity and innovation in research are not clear (Denti and Hemlin, 2012). In this study, the definition of creativity was adopted as the ability to generate novel and

useful ideas that serve as answers to solve novel and ill-defined problems (Amabile et al., 1996; Brophy, 1998; Feist, 1998; Hemlin et al., 2008).

Creativity in organizations should be considered by focusing both on the creativity of individuals, group and in long term organizational level. “Creativity is almost never a solitary activity but that it is fundamentally social and collaborative” (Sawyer, 2006, p. 259). Individuals develop their ideas and present them to the group. They learn from the group and then work individually on the problems. Later they return to the group to improve their ideas again. Creativity in the group, with its iterative, interactive character, requires that the individual first become creative on the individual level (Drazin et al., 1999).

Hargadon and Bechky (2006) described group creativity as a situation in which individuals with different perspectives and training work together to find and generate new solutions in solving problems that employees working alone would not have been able to implement as quickly. Dong et al. (2017) also described group creativity as a process of developing and combining innovative and valuable ideas by a group. Original ideas and views of the group are collected to foster a possible creative outcome. Similarly, Parjanen (2012) stated that group creativity is the result of collaboration between individuals that leads to novel and original thinking and explanation of an assumed concept or problem. Table 2 summarizes some related works from the literature that define group creativity.

Table 2. Definition of employee group creativity in the office context in the literature

Definition	Authors
Creativity arising from the collective memory of communities of practices, artifacts, and technologies around such groups.	Nakakoji et al. (2000)
Result of collaboration, interaction and of ideas exchange.	Paulus and Brown (2003)
Synergistic integration of results from the knowledge bases of individuals and those within your network.	Haslet and Molineux (2007)
Creative processes leading to creative products, as a result of interaction between two or more people.	Parjanen et al. (2010)
Intentional set of processes, activities, and mechanisms established by individuals within an organization who are part of a larger social and professional network through which a new idea, product, or process is generated.	Cirella et al. (2012)
Creative synthesis as a result of integrating the perspectives of the members, in a common understanding, and that is unique to the collective.	Harvey (2014)
Developing and combining innovative and valuable ideas through a team to develop a possible creative outcome.	Dong et al. (2017)

2.1. Theoretical Background

There are several ways for studying creativity, each approach requires their own creative focus, methods, and analysis. However, there are four factors that are commonly understood to characterize creativity and are referred to as the 4Ps, namely person, process, product, and press (e.g., Barron, 1969; Cropley, 2015; Kaufman, 2016; Kozbelt et al., 2010; Rhodes, 1961) (see Figure 1). Research on

creative person focuses primarily on the personality traits of creative individuals, such as: confidence; elaboration; motivation; flexibility; self-esteem; imagination; originality; fluency; persistence; curiosity; independence; an open mind (Carson, 1999; Davis, 1999; Plucker and Zabelina, 2009).

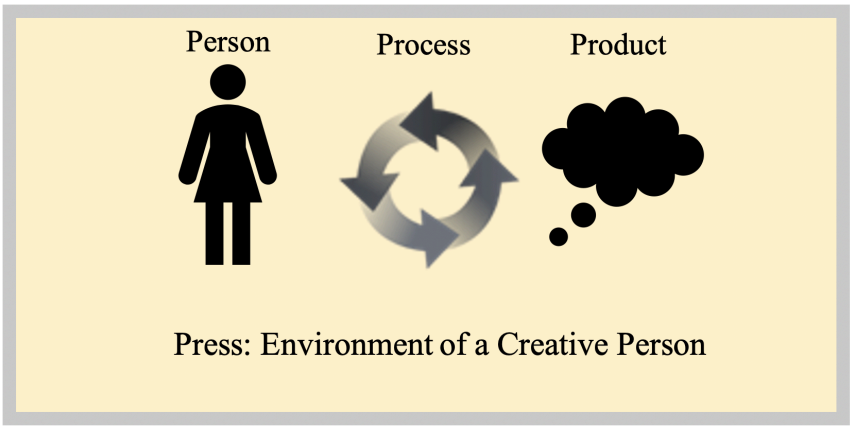


Figure 1. Relationships among the Elements of a Creative Person.
Model adopted from Ellinger (1966, p. 493)

Process describes the cognitive or thinking processes underlying the generation of novel ideas (Cropley and Oppert, 2018). *Product* describes the results or solutions that emerge from the uncertain, creative front of innovation. There is widespread agreement in creativity research that a creative product (usually an intangible idea) must be at least new and original, and in some way relevant or appropriate to the task at hand. Researchers have mostly used creative products to study the creativity (Demirkan and Hasırcı, 2009; Hasırcı and Demirkan, 2007). *Press* (environment) refers to: (i) the place where the subject takes place; (ii) the place where the product

is produced; or (iii) the place where the creative process is located (Scritchfield, 1999). Indeed, two environments define and characterize the press. In a more general sense, there is a social environment and a physical environment surrounding innovation processes. Soliman (2005) said that the press must be seen as the relationship between individuals and their environment, this is important to evaluate the environmental conditions that hinder or support creativity. Hasirci and Demirkan (2003) studied the interaction between the creative person, the process and the product within a creative environment in a design process.

Based on the early interactionist perspective of organizational creativity, Woodman et al. (1993) in their model integrated the creative person, process, product, and contextual and social situation, and the multilevel structure of organizational creativity (individual, group, and organization, including cross-level interactions) in their model of organizational creativity (see Figure 2). The model of interactionist perspective on creative behavior assumes that creativity is the complex product of a person's behavior in a given situation. The situation is characterized by physical and social influences that either support or hinder creative performance (Woodman et al., 1993). Creativity at the individual level is the result of antecedent conditions, cognitive styles and abilities, personality (e.g., locus of control), motivation, social inspirations (e.g., rewards), relevant knowledge, and contextual impacts (e.g., physical and social environment) (Anderson et al., 2014). Woodman et al. (1993) argued that this interaction between an individual and a situation is repeated at every level of analysis, such as at the group level. The interactions between individual creative behavior, group members (e.g., group composition), group characteristics (e.g., norms and size), group processes, and contextual influences lead to group

creativity (Anderson et al., 2014). The present study took an interactionist view of human organization, which implies that one must consider the interplay between the individual/group-environment to fully understand creativity. Early research found that physical environment affects the interaction patterns and creativity of employees (Oldham et al., 1995); however, few studies have investigated its impact on employee creativity in office settings (Hoff and Öberg, 2015; Meinel et al., 2017; Oldham and Baer, 2012). Moreover, among these, even fewer have adopted an interactionist perspective to investigate the interaction between employees and their physical environment and its impact on their creativity (e.g., Dul et al., 2011). Therefore, further research on the effects of the physical work environment on employee creativity is necessary (Oldham and Baer, 2012)—for this, adopting an interactionist perspective is important, as a full understanding of environmental contexts' effects on creativity is incomplete without it (Zhou and Hoever, 2014).

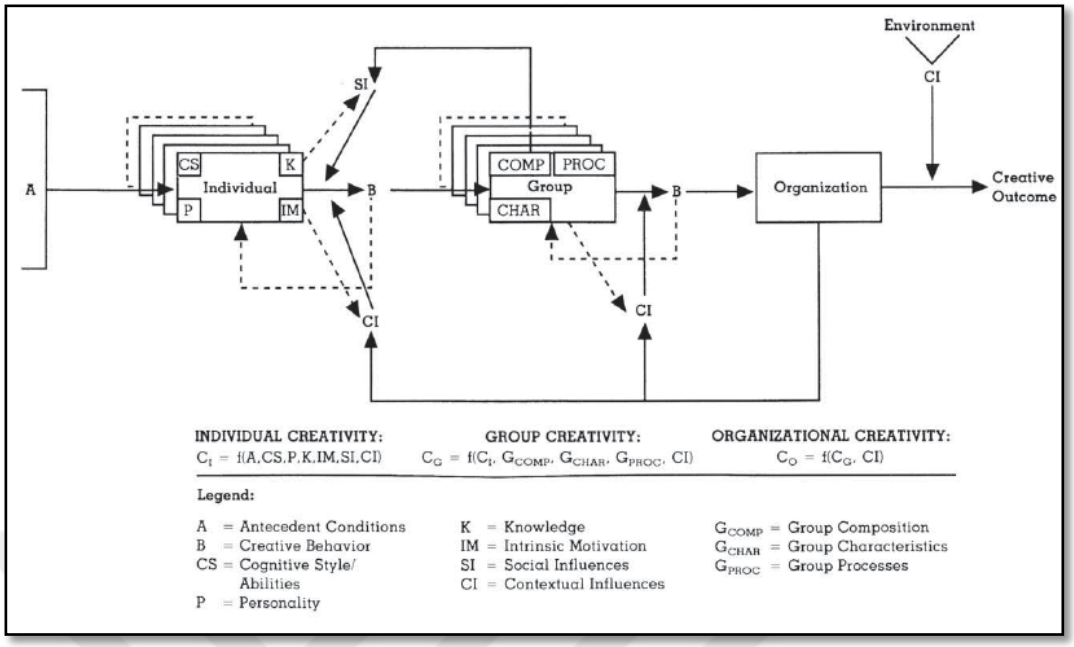


Figure 2. An interactionist model of Organizational Creativity (Woodman et al., 1993, p. 295)

The present study of creativity in the office is situated in knowledge-intensive workplaces—the theoretical framework of creative knowledge environments (CKEs) developed by Hemlin et al. (2008) was chosen as it fits well into the interactionist perspective and is better suited to study knowledge workers' creativity. Hemlin et al. (2008) suggested that the study of creativity in the workplace should integrate factors at the micro, meso, and macro levels of organizations, besides contextual factors (which was the focus of the present study in the micro level). These factors interact in predicting individual, group, organizational, and interorganizational creativity. CKEs suggest that creativity should be studied in multiple disciplines and organizational levels, and that creative individuals should be studied in their social and physical work environments rather than in isolation (Olsson, 2012). In short,

both frameworks posit that creativity results from complex person-situation interactions.

2.2. The Measurement of Creativity

Various creativity indicators are used to measure creativity in research. In the office, creativity is mainly considered as the result of a creative problem solving or a creative work process and consequently as a creative product (Amabile et al., 1996). Creativity can also be assessed from a subjective perspective. Self-assessments and evaluations of creativity by supervisors are some of the common subjective measures of creativity. Based on defined subjective criteria, a group of experts can also provide valid measures of creativity (Consensual Assessment Technique (CAT)), (Amabile et al., 1996). A subjective measurement could be from the perspective of the individual or the group. The individual would make a self-assessment or a perception of creativity. Furthermore, measurement can also be subjective and outside the focus of analysis (e.g., judges). Also, measurement may be made objectively (e.g., hard data). This study focuses on employees' subjective experience of creativity in the workplace rather than on others' ratings of their job performance. In this study, Critical Incident Technique (CIT) is used in stage 1 to ask employees to describe their recent experiences with creativity, and in stage 2, a questionnaire was developed to measure participants' perceptions of support for creativity in their ABO.

The heuristic framework for measuring creativity, as proposed by Batey (2012), is shown in Figure 3. This framework is about the level of creativity to be assessed, which should be the focus of the analysis. This is divided into four categories: the individual, the team, the organization, and the culture. This study focuses on the individual and group levels of perceived creativity in stage 1 and the group level of perceived creativity in stage 2.

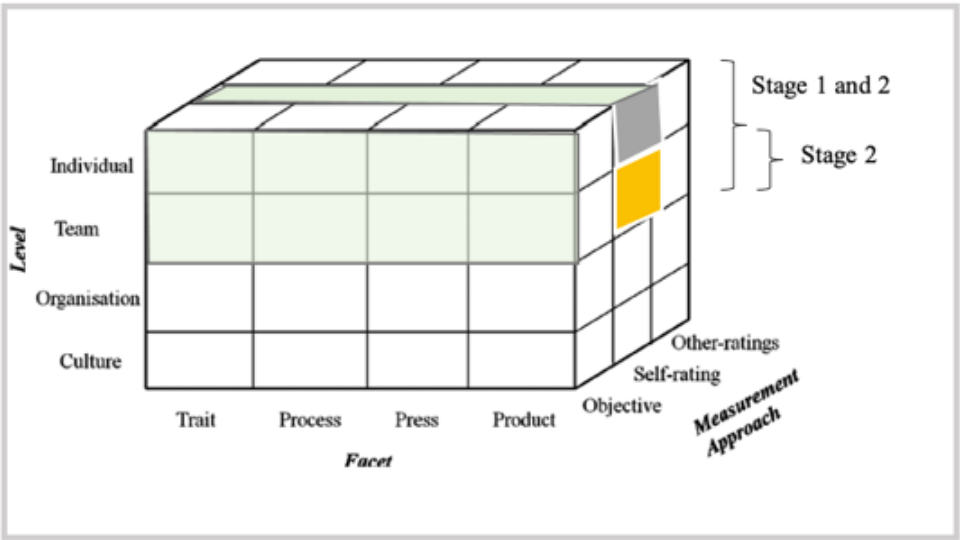


Figure 3. The heuristic framework for creativity measurement

The next chapter looks at the different types of creative activities that take place in work environments. These activities are divided into individual and group creative activities. In addition, further details about the nature of these activities (e.g., formal and informal, work-related vs. non-work-related) are provided.

CHAPTER 3

EMPLOYEE CREATIVE ACTIVITY TYPES

New ways of working, such as flexible and agile work practices, have triggered a change in the working styles and activities of knowledge workers. Therefore, to determine the creativity-enhancing/hindering features of ABOs, it is necessary to first understand the different types of creative activities that take place in this environment. Daniellou (2005) distinguishes between tasks and activities by what is to be done (tasks) and what employees actually do (activities) in offices. In addition to completing tasks, employees take part in various other activities, such as individual or involvement in social relationships (Daniellou, 2005). The core of ABO design, as the name suggests, is human work activity. The focus on activity, which is the core of all tasks in organizations to produce the added value for the system (Karltun et al., 2017), is also evident in ABO design. In other words, the environment of ABO should be designed for the work activities performed by employees, and employees should choose the environment according to the work

activity (Appel-Meulenbroek et al., 2011). Therefore, it is necessary to consider the work activity of employees in these environments to invest in ABO's space types for in-depth study.

A large number of activities are distinguished in the literature. Van Susante (2014) and Liebregts (2013) use the 21 activities distinguished by the Leesman index. Leesman Index is the largest employee experience database in the world. The Index e-survey captures employee feedback on how well the workplace environments support their important activities. Other researchers use less number of activities, while combining several of them (e.g., Tabak, 2009; Vos and Van der Voordt, 2002). Activities of employees are categorized in many different ways, such as whether an activity is done individually or by a group, whether it is planned or not, according to its confidentiality level, or whether it is job-related or more social or physiological. Some activities are very similar and can therefore be combined with others, such as individual concentrated work and reading. Tabak (2009) attempted to create a taxonomy of employees' activities. He distinguished three different categories to differentiate activities:

1) Individual or group activity level
2) Nature of the activity (e.g., social, physiological or job-related)
3) Planned or unplanned activities.

It should be noticed that activities can be of a non-work nature, such as social/psychological activities, as well as of a work-related nature. Moreover, activities both could be planned or happen unexpectedly (Appel-Meulenbroek et al.,

2011). As supportive office environments, ABOs spaces and features need to support employees' daily activities. Creative space types are also categorized based on employee's creative activity types (e.g., high focus and concentrating, heads down reading and writing, meeting and collaboration, relaxing and chill out, disengaged, and break spaces). Employee creativity is considered as an ongoing process that is not limited to a specific time and specific space (Paoli and Ropo, 2017). Regarding the office activity types, and based on the type of creative spaces, it is assumed creativity is happening during the daily activities of employees.

While creativity is the generation of novel and useful ideas, often to solve problems, creative activities are the behavioral aspects of idea generation in the form of daily activities that occur in the workplace (Brophy, 1998; Ward, 2012). This study focuses only on creative activities; therefore, some adjustments were made to Tabak's (2009) model to generate categories that focus on daily creative activities. The activities are divided into two main groups as individual and group activities considering their nature. The nature of the activities is divided into work related and non-work related and respectively named as formal and informal. Based on the creativity literature, a psychological activity is also added to the category, e.g., relaxation or chill-out (Hoff and Öberg, 2015). Table 3 shows the generated model for all types of creative activities that usually take place in the flexible offices such as ABO and specifically creative spaces are included in the study.

Table 3. Creative activity types and levels

Activity types/Level	Formal	Informal
Individual	(I) • **Mostly work-related content** • **Planned or unplanned** e.g., concentration on individual thoughts, heads down work like reading, writing, or researching	(I) • **Mostly non-work-related content** • **Planned or unplanned** e.g., relaxation, break out, taking naps
Group	(We) • **Mostly work-related content** • **Planned or unplanned** e.g., meeting, presenting	(We) • **Mostly non-work-related content** (Social or/and physiological activity) • **Planned or unplanned** e.g., informal talk, lunch visit, coffee break

3.1. Formal-Individual Creative Activities

Creative formal-individual activities in ABOs are performed during work-related activities because an individual is in the process of creativity in a formal environment (e.g., generating a new idea or solving a problem). There are periods in the creativity process when individuals need to be alone to perform individual activities, such as focusing on individual thoughts, heads down work, or researching (Suckley and Nicholson, 2018). Improving concentration leads to “Eureka!”-like

discoveries, enables an individual to come up with multiple solutions during problem solving, and cultivates creativity (Canestrari and Marlowe, 2018). Employee concentration on activities is necessary for individual creativity and the office environment should support this (Stokols et al., 2002). Employees' creativity can be limited by environmental distractions at work (Stokols et al., 2002). Therefore, it is important to support employees' concentration on their job related (formal) activities to enhance their creativity (Figure 4).

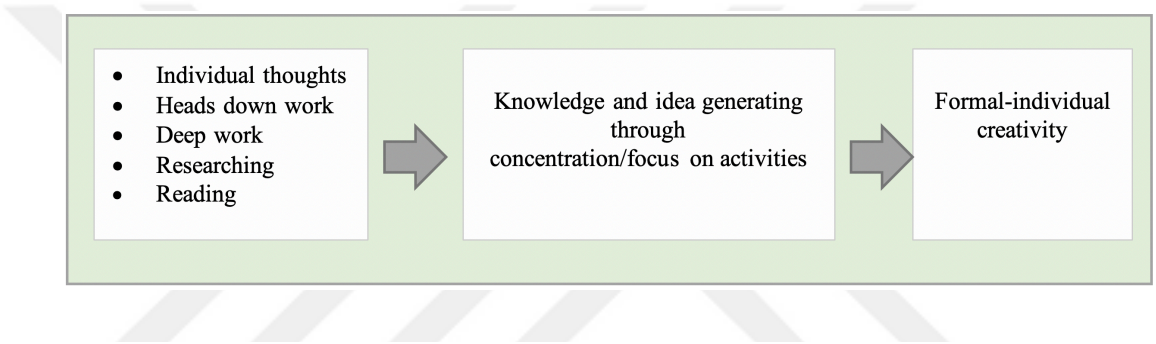


Figure 4. Formal-individual creative activities

According to Blok et al. (2009) and Van der Voordt (2004), concentration is increased and distraction is decreased after a traditional office is moved to ABO. However, based on a systematic literature review, Engelen et al. (2019) found that working in ABOs has a negative effect on concentration (Appel-Meulenbroek et al., 2011; Brunia et al., 2016; Candido et al., 2016; De Been and Beijer, 2014; De Been et al., 2015; Kim et al., 2016; Seddigh et al., 2014; Ten Brummelhuis et al., 2012). Ten Brummelhuis et al. (2012) pointed out that working in ABOs leads to increased interruptions and fatigue as more emails and calls come in. Keeling et al. (2015) found that ABOs were rated better than open-plan offices and equivalent to cellular offices for working without visual and auditory distractions, but less so for

concentration. Candido et al. (2016) found that there were higher levels of unwanted interruptions in the environment of ABOs than in cellular offices. Respondents around combi-offices and ABOs rated their ability to concentrate lower than respondents in single and shared offices (De Been and Beijer, 2014; De Been et al., 2015). Therefore, ABOs seem to have the potential to support individuals' need to concentrate on individual creativity. Nevertheless, there is a need to investigate this issue in further studies.

3.2. Informal-Individual Creative Activities

Informal-individual creative activities in ABOs are usually non-work-related activities in an informal setting while an individual is in the process of creativity. In the process of creativity, there are times for the brain to rest, for thoughts to wander and form new connections, and for spontaneous thoughts to be accessed (see Figure 5). Pausing and taking a break from work-related activities, such as resting, napping, or relaxing, could lower stress levels and promote idea generation (Hoff and Öberg, 2015). Relaxation could take place during working hours when the employee needs some informal furniture such as a sofa in the home-like concept to be more relaxed and reduce the pressure of the formal working style. This is usually done on an individual basis and requires a high level of acoustic and visual privacy.

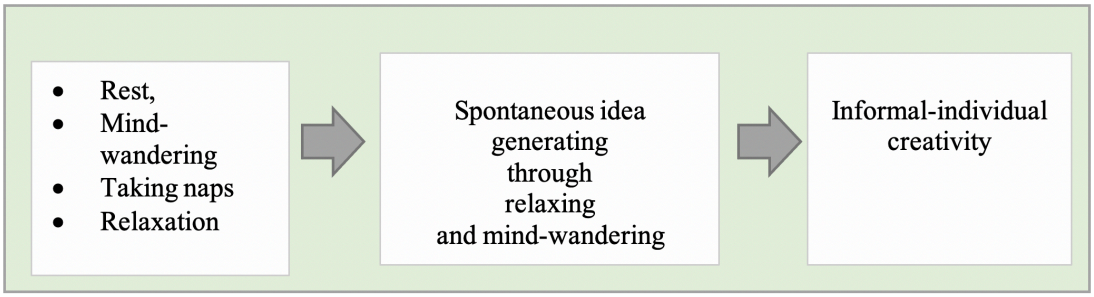


Figure 5. Informal-individual creative activities

3.3. Formal-Group Creative Activities

Formal-group activities in ABOs involve participating in planned or unplanned group activities with work-related content while sharing knowledge in a formal setting. Formal group level creativity happens when individuals collaborate in groups to investigate and examine thoughts or ideas. It happens during formal meetings, virtual meetings, collaborations, seminars, workshops, or unplanned work-related meetings. Since the core product of creative activities is knowledge, and this knowledge could only be created through interaction between employees, the main part of group creative activities is communication (Kratzer et al., 2004). Raymond and Cunliffe (1997) stated that communication is the type of activity that links all other ones and help to share new ideas for creativity (see Figure 6). Communication is necessary to support interaction and knowledge sharing for improving group creativity. Research has revealed that the importance of team communications for creativity (e.g., Hoegl and Parboteeah, 2007; Sundgren et al., 2005).

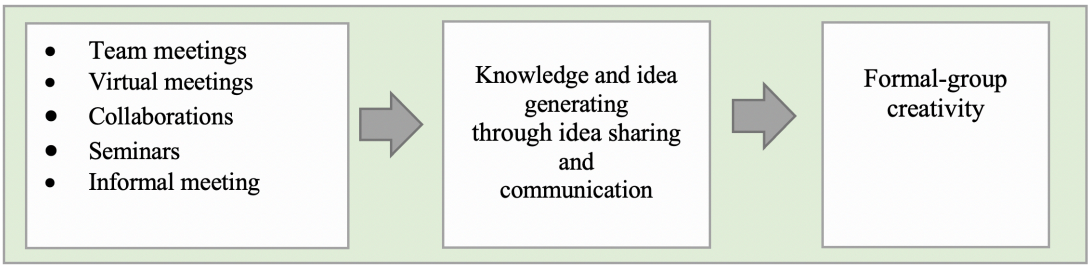


Figure 6. Formal-group creative activities

Systematic literature review in Engelen et al.'s (2019) study about the impacts of ABOs on health, work performance and perception of offices identified five studies that ABO environment leads to increase in communication (Blok et al., 2012; Brunia et al., 2016; De Been et al., 2015; Robertson et al., 2008; Ten Brummelhuis et al., 2012) and one study found no increase in communication (De Been and Beijer, 2014). Robertson et al (2008) uncovered that communication between employees in the flexible office improved over time in both experimental groups compared to the control group. Research results are inconsistent regarding whether ABO concept supports communication or not.

De Been et al (2015) found from the results of the interviews that ABO environment, communication and knowledge sharing are positively related. The results showed that employees interact and communicate with a greater variety of colleagues and consequently more knowledge sharing occurs due to the openness of the office. Employees reported difficulty talking about confidential data and private matters in open spaces as well as decreasing in communication opportunities with their

teammates and colleagues. In contrast, the findings of De Been et al. (2015) showed that employees' satisfaction with communication opportunities improved. According to Babapour Chafi and Rolfö (2019) in ABO's environment, team communication decreased and employees experienced difficulties in conversing confident data and private issues in open spaces. Two studies found a positive association between ABO and collaboration (Blok et al., 2012; Robertson et al., 2008). Collaboration was defined as "a process through which parties who see different aspects of a problem can constructively explore their differences and search for solutions that go beyond their own limited vision of what is possible" (Gray, 1989, p. 5). Robertson et al. (2008) found that collaboration was significantly higher after moving to an ABO environment for the experimental group as compared with the control group. Based on above-mentioned literature, ABOs seem to have a potential to support group creativity of employees through enhancing team communications.

3.4. Informal-Group Creative Activities

Informal-group activities in ABOs involve social gathering of individuals for non-work-related activities in informal settings as a group that could lead to new ideas capturing. Social activities like playing billiards, hangout during coffee break or lunch with colleagues enhance employee bonding, improve informal interactions, and improve creativity (Hoff and Öberg, 2015) (see Figure 7). Informal interaction has shown to transfer a lot of knowledge and information (Brill and Weidemann, 2001). According to Engelen et al. (2019), some studies reported that working in ABOs have a positive influence on employees' interactions (Gorgievski et al., 2010; Keeling et al., 2015; Kim et al., 2016). Gorgievski et al. (2010) found that an ABO is

perceived to increase possibility to meet and informal talks. De Been and Beijer (2014) reported that employees who works at ABOs and not having allocated desks were not satisfied with the opportunities for communication and social interaction in their office, compared to people who were working at combi-offices with allocated desks. These outcomes also go along with Babapour Chafi and Rolfö (2019) findings about the negative effects of desk-sharing policies of ABOs on team resources. Desk-sharing policies caused some difficulties in locating and gathering colleagues due to not having a fix workstation and consequently it resulted in less number of interactions among group members.

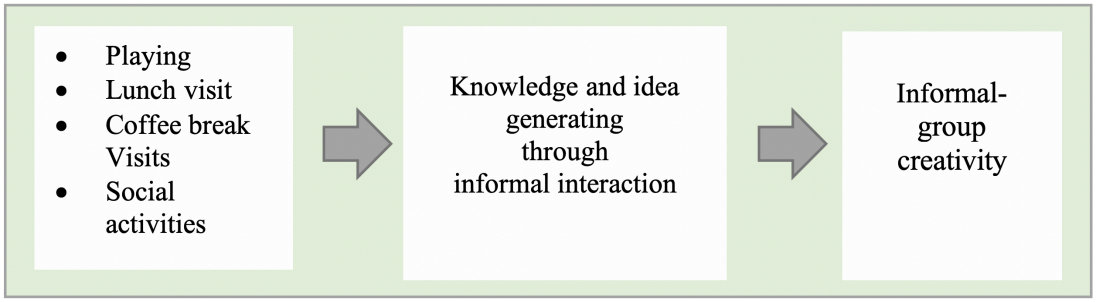


Figure 7. Informal-group creative activities

In the next chapter, the effect of the physical environment of the office on creativity is discussed in more detail. The different types of offices are presented. It also discusses the role of space types and ABO interiors in fostering creativity.

CHAPTER 4

PHYSICAL ENVIRONMENT OF THE OFFICE INTERIORS AND CREATIVITY

Since the early uses of office buildings, new ideas about the work environment have led to changes in office interior design. Spatial organization is the main interior design feature that determines the differences in office types, such as cell (private), shared room, open plan, combi- and activity-based offices (Ahlin and Westlander, 1991; Duffy and Powell, 1997). The office type definitions used in this study are adapted from the work of Danielsson and Bodin (2008). In their study, unique combinations of interior and functional characteristics were introduced to define the different office types as is summarized in Table 4.

Table 4. Office types defined by different interior features and working condition adopted from Danielsson and Bodin (2008, p. 642-643).

Office Type	Characteristics
1. **Cellular office**	Single **(private)** room office
• **Interior features**	Where private spaces are enclosed by physical barriers such as walls that give each room access to a window, long corridors connecting small offices dominate the floor plan.
• **Working conditions**	The office work is described by independence and is of **concentrated** nature.
2. **Shared room**	Single room shared by 2 or 3 people
• **Interior features**	Workstations are often freely arranged around the room, sometimes with screens or other dividers to provide privacy at the individual workstation. Roommates share a window or windows.
• **Working conditions**	The shared-space office for **team-based work** often has in-room work options. People who share a room usually have similar work tasks. The **team-based shared space** office is characterized by interactive project work.
3. **Open plan office (OPO)**	Small-sized 4 to 9 persons/room Medium-sized 10 to 24 persons/room. Large >24 persons/room.
• **Interior features**	A shared space with workstations often freely arranged in groups. Partitions between individual workstations reduce noise and provide some privacy at individual workstations. There are no individual windows.
• **Working conditions**	Employees mainly **work individually**, with **routine-based work** and **low levels of interaction.**
4. **Combi-office**	Employees spend >20% of their time at workstations other than their own, team-based work.
• **Interior features**	No strict spatial definition, but the combi- office contains individual workstations in a single room or in an open-plan office. There is access to backup space that allows work activities that cannot take place in the personal workspace, such as specific work functions, full-time project rooms, meeting rooms, etc.
• **Working conditions**	**Teamwork and the sharing of amenities** define this type of office. Office work has **both independent character and interaction** with colleagues in teamwork. Teams move around the office as needed to use a variety of shared amenities. Shared work facilities in common spaces.
5. Activity-based office (ABO)	No fixed and allocated workstation
• **Interior features**	Often an open-plan office, though not the defining feature, the flex office includes backup spaces that allow for concentrated work, private phone calls, meetings, etc. Sized for 70% of the workforce to be present at the same time; based on expected illness, work outside the office, etc.
• **Working conditions**	Depends on **good information technology** to allow employees to choose where they work - both in and out of the office. Shared amenities in common areas. **No ability to personalize** the workplace.

The office arrangement could be designed to support the activities performed in the environment. However, designing offices that best support the needs of employees is a challenging process. Employees need privacy to focus on tasks that require creativity, and they need opportunity and facility to interact and communicate with their colleagues to solve problems and be creative at a group level (Davenport, 2013; Hua et al., 2010). Nowadays, the biggest challenge in office interior design is how designers can achieve a balance between privacy and collaboration in offices by providing a range of work environments while supporting creativity in the office.

After the World War, II cellular offices emerged due to the demand of supervisors and managers for individual space in offices. The size of the office and the furniture that could be placed in it represented the status of the executive, with senior managers having space not only for a large desk but also for a conference table and coffee table (Suckley and Nicholson, 2018). The literature on office interior design shows that a cellular office can promote employee concentration and privacy (Danielsson and Bodin, 2008; Seddigh et al., 2014), while limiting communication and interaction between employees.

In the 1960s, the open-plan office was introduced in addition to the cellular offices. This meant an irregular arrangement of desks in an open space and more openness and a free flow of information, as well as equality (Sundstrom and Altman, 1989). The elimination of walls and physical barriers led to more opportunities for interaction and communication. In the 1960s and 1970s, this layout enjoyed

increasing popularity throughout Europe and at North America, aided by the development of flexible furniture. However, it also led to an increase in unwanted and uncontrolled interactions (Kim and de Dear, 2013; Sundstrom et al., 1980) and an increase in background noise (Smith-Jackson and Klein, 2009; Zalesny and Farace, 1987). It also led to a reduction in privacy and concentration (Brookes and Kaplan, 1972; Sundstrom et al., 1980) and dissatisfaction with work and the office (Kim and de Dear, 2013; Oldham and Brass, 1979), resulting in lower employee performance. Furthermore, this office layout did not fit well with a hierarchical culture and traditional management in cellular offices (Price and Fortune, 2008).

In the literature, office types that support both individual and group activities are called combi-offices. In this type of office, employees are assigned workstations either in a single room or in an open-plan office. In combi-offices, glass walls are usually used instead of solid walls to allow acoustic privacy but maintain visual connectivity (Van der Voordt, 2004). However, combi-offices are expensive for companies as they incur rental and operating costs for individual rooms as well as team and group areas that are often unused and vacant (Van Meel, 2011).

Activity-based offices (ABO) offer interesting multipurpose spaces that are similar to combi-offices in terms of their spatial organization and equipment. The organizational goals behind the implementation of ABO range from making better use of space and resources, optimizing the corporate image and the physical and social working environment, to promoting performance and creativity, knowledge sharing, communication and employee satisfaction in the office (Bodin Danielsson et

al., 2014; De Been and Beijer, 2014; Van der Voordt, 2004). In traditional offices with fixed workstations, a significant number of workstations remain unoccupied because employees are frequently absent due to illness, annual leave, meetings outside the office and attendance at training courses (Johnston, 2009; Laing, 1990). This problem is also a consequence of organizations using modern work patterns of NewWoW and full-time, part-time, or job-sharing work. In addition, employees may use places other than the office for non-standard work, such as at home, or in other locations (Hugh Fawcett, 2009). In recent decades, flexible offices and specifically ABO have been designed in response to the concept of NewWoW. ABOs are usually designed for 70% of employees (Danielsson and Bodin, 2008) to avoid unused workstations. The basis of ABO is flexibility, which is expressed in the possibility to change the workplace with each new activity and even to work from home.

The origins of the concept ABO date back to the 1970s (Van Meel, 2011). A famous early experiment with unassigned workstations in what was called a "non-territorial office, where employees could be at any location and at different times during a day" was conducted at IBM (Allen and Gerstberger, 1973, p. 487). In 1985, Stone and Luchetti (1985, p. 106) introduced the idea that workers should switch to different specialized activity settings as their tasks change because it would "resolve the dilemma of providing both privacy and participation." In addition, providing dedicated spaces for collaborative and individual work to avoid distractions is one of the main features of ABOs (Van Meel, 2019).

The idea of designing offices with a variety of spaces to support specific work activities dates back to the 1960s and 1970s, and these environments were only used by early adopters (Van Meel, 2011). The concept of ABO is also referred to as multi-space offices, flexible offices, hot-desking offices, non-territorial offices and activity-based flexible offices (A-FOs) in the related literature (Brunia et al., 2016; Kim et al., 2016; Knight and Haslam, 2010; Rolfö, 2018; Ruohomäki et al., 2015). For improving employee satisfaction, the concept of ABO was related with modern interior design, high aesthetics and independence (Rolfö et al., 2018). To design a supportive ABO, it is important to first identify the nature of daily activities and the needs of the users.

In the 1990s, an increasing number of ABO (pilot) projects were carried out by companies and public organizations, which received more and more attention from the media, workplace experts and researchers (Van der Voordt and Van Meel, 2000). At the time, ABO was not considered a proven concept, and many early adopters struggled with resistance to change and disappointing ICT solutions (Van Meel, 2019). In the first decades of the 21st century, as the concept ABO became more widely accepted around the world, it seemed to grow up and even become typical (Cushman and Wakefield, 2013; Leesman, 2017; Wohlers and Hertel, 2017; Van Meel, 2019). At first glance, this development seems to be rooted in a good match between the ABO environment and important features of contemporary knowledge work. Nevertheless, the mixed results seem to indicate that ABO is not a one-size-fits-all solution and that there are a number of features that may explain why some ABOs support employees and others do not.

4.1. Creativity in Activity-Based Offices (ABOs)

Activities in an office span in a wide range, such as focused work with privacy needs as well as more social work with greater interactions and group discussions. In addition, recent changes in digital technology are enabling new ways of working, such as flexible, virtual or mobile working. ABO is a type of office design that offers a variety of space types that can be shared by employees (Chafi, 2019) and is characterized by employees not having assigned workstations (Brunia et al., 2016; Kim et al., 2016; Rolfö, 2018; Ruohomäki et al., 2015).

According to Babapour Chafi and Rolfö (2019), everyday activities in ABOs require some rules, such as desk sharing and speech policies, which are either explicit or implicit. They described these rules as policies or codes of conduct that modify the use of spaces in ABOs. Other purposes of offices based on the ABO concept could be increasing organizational creativity, employee satisfaction and image, and better use of physical space (De Been and Beijer, 2014; Van der Voordt, 2004). In their study Rolfö et al. (2018) conducted a mixed-methods approach that included pre- and post-move focus groups, individual interviews, and observations to collect and triangulate data in a large Swedish insurance company. They found that satisfaction with furniture functionality, temperature, air quality, aesthetics, lighting, visual comfort, and outdoor views were improved significantly after participants moved to ABO environments.

According to Appel-Meulenbroek et al. (2011), individuals working in ABOs can choose from various spaces and workstations depending on their situational task and needs. ABOs have different space types and interior features (Danielsson and Bodin, 2008), but typically have an open space (De Been and Beijer, 2014) to support collaboration and communication, with additional semi-open workstations and closed spaces for activities requiring concentration, phone calls, planned and unplanned meetings, (Danielsson and Bodin, 2008; Wohlers and Hertel, 2017).

In the ABO context, where employees have a flexible workstation, the interaction between individuals and their work environment is different. This is because employee preferences play a more important role in flexible workplaces than in traditional offices with fixed workstations. Some studies have suggested that diverse office spaces and work environments could increase creativity in terms of promoting interactions between employees and their environment (Ilozor et al., 2002). However, the effectiveness of ABO environments on employee work outcomes and, specifically, creative activities is not evident (Hoendervanger et al., 2018; Nanayakkara et al., 2021). Given the importance of creativity in organizations, it is necessary to examine from an interactionist perspective the physical environment's role in supporting or hindering creativity in ABOs. More details about ABOs and the types of spaces in these knowledge-intensive workplaces have been provided in the subsequent sections.

4.1.1. Space Types for Supporting Creativity

Architects and builders create the physical space, but the space that occupants' use is based on what they perceive (Kristensen, 2004). Physical space is the basis for perceived space, which provides opportunities for occupants to engage in their activities. Physical space is the objective space and perceived space is the subjective aspect of the same space. Thoring et al. (2018) defined a type of space as "a dedicated space for a specific activity at a specific time" (p. 64). Each space has an inherent affordance (Norman, 1999, Norman, 2002) that indicates the type of activity for which the space is primarily intended by its configuration (Thoring et al., 2018). 'Creative spaces' are certain types of spaces and their interior features in an office that promote creativity (Lee, 2016; Paoli et al., 2017; Thoring et al., 2018). Based on Thoring et al.'s (2018) definition of creative space, in this study, a space is categorized in ABOs as creative if it supports employees' creative activities. Creative spaces are categorized in the literature as private spaces (Thoring et al., 2018), collaboration spaces (Hoff and Öberg, 2015; Lee, 2016; Meinel et al., 2017; Thoring et al., 2018), relaxation spaces (Hoff and Öberg, 2015; Lee, 2016), and disengaged spaces (Hoff and Öberg, 2015; Lee, 2016; Meinel et al., 2017; Thoring et al., 2018)—all these are also existing in ABOs, but their potential to be classified as 'creative' spaces in ABOs is unknown.

Private Spaces are small rooms used for individual work (or a maximum of two people) for conversations, such as phone calls or video calls. They also allow employees to do highly concentrated work and "head-down" work, such as thinking

and writing (see Figure 8). Spaces for focused work require reduced stimulation to be free from distraction (Thoring et al., 2018), and the use of colors, lighting, partitions and furniture that encourage the development of ideas and access to the information and facilities needed (Suckley and Nicholson, 2018). Private space types are also envisaged as back up spaces in the concept of ABO.

Figure 8. Private space as a type of creative spaces
(Source: Author)

Relaxation spaces and homelike environments enhance well-being and reduce stress through relaxation as well as promoting creativity (Hoff and Öberg, 2015). Creative work requires many brain states, including the need to balance active group work with individual thinking time. A relaxation space provides a place where the brain can rest, form new connections, and access spontaneous thoughts. The most important element for a comfortable, home-like space is privacy, with the ability to switch between interaction and solitude as desired (see Figure 9). Researchers have

also shown that aesthetical features can stimulus creativity because they evoke feelings of physical and emotional transformation and relaxation (Rafaeli and Vilnai-Yavetz, 2004). In terms of creating such relaxation, research has shown that a natural or nature-based environment is most effective, such as using plants and looking out the window to the outdoors (Dul and Ceylan, 2011; Ceylan et al., 2008). In addition, cool colors (e.g., blue) and low mess have been found to support creative work (Ceylan et al., 2008) by reducing stress (Stone, 2003). Hoff and Öberg (2015) showed that home-like spaces and chill-out areas promote creativity through relaxation. However, Lee (2016) found no evidence for the impact of relaxation space on creativity. ABOs also provide relaxation spaces and homely environments for employees to rest.

Figure 9. Relaxation space as a type of creative spaces
(Source: Author)

Collaboration spaces provide opportunities for idea generation among employees. Lee (2016) defined collaboration spaces as places for (1) formal meetings (typically enclosed spaces with low/high-tech tools), (2) intentional but informal meetings (some doodling tools available), and (3) unplanned work-related meetings (e.g., kitchen, hallways). Visibility is important in this space because it facilitates locating group members and colleagues for communication (Kim et al., 2016). Visibility promotes group communication, collaboration, knowledge sharing, and consequently creativity. Collaboration spaces should be provided for formal and informal meetings that have varying degrees of acoustic and visible privacy and are easily accessible for scheduled and unscheduled meetings (Suckley and Nicholson, 2018). In these spaces, it is important to set the exact level of visibility to help employees easily find their colleagues while having their required visual privacy (see Figures 10 and 11). ABOs also provide collaboration spaces, including formal and informal meeting and presentation spaces for their employees.

Figure 10. Collaboration space as a type of creative spaces
(Source: Author)

Figure 11. Cubicle sofa using for spontaneous meetings
(Source: https://www.stylepark.com/en/martela/podmeeting)

Disengaged spaces provide opportunities for group non-work-related activities with others, which include game rooms for activities such as billiards and darts, or social hangout spaces, as kitchens or cafes (see Figure 12), (Meinel et al., 2017). Informal social spaces such as game rooms improve bonding between employees and promote creativity (Hoff and Öberg, 2015) and provide a space for employees to eat lunch, to read, to check emails and a functional area for Friday drinks. Furthermore, Lee (2016) argued that disengaged space is the most important type of space for creativity. Dobson and Suckley (2015) examined the efficiency of a central kitchen on interaction levels within the organization. Although they noted that the 'hub' kitchen was intended to encourage interaction between groups around the space, it did not attract many employees who met there. They found that this was because the kitchen was, in fact, too large for the office. Disengaged spaces could bring a variety of people together to meet and interact, but their success depends on a number of key features of the facility, such as its location, accessibility and size (Suckley and Nicholson, 2018). The concept of ABOs also includes some types of disengaged spaces, such as kitchens, cafés and play areas.

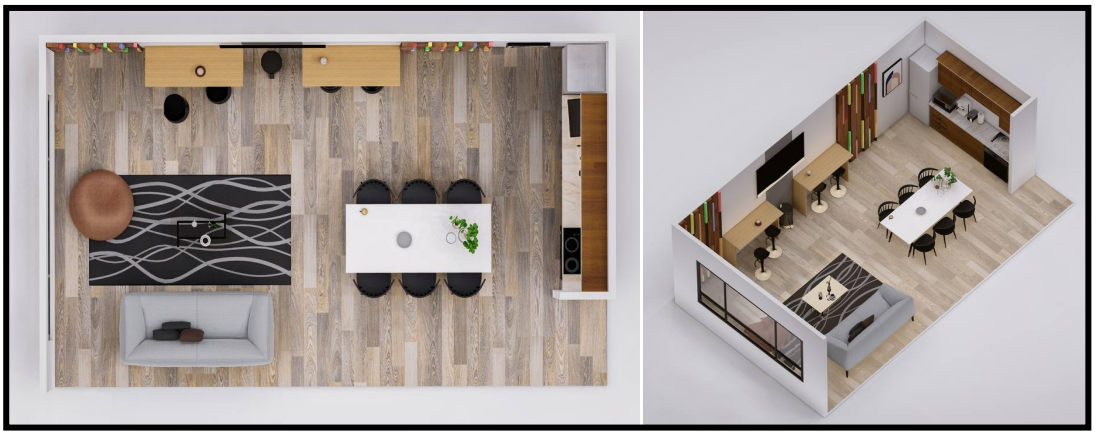


Figure 12. Disengaged spaces as a type of creative spaces
(Source: Author)

4.1.2. Interior Features for Supporting Creativity

Interior features are certain characteristics of a space that can enable a certain user activity regardless of the type of space. Therefore, interior features possess valuable capabilities to either support or hinder employee creativity (Bodin Danielsson, 2010). Interior features in the context of employee creativity have mostly focused on the functional aspects of office architecture for professional and practical attention (e.g., Collins, 1971; Holm, 2006). Interior features that support creativity appear in the form of furniture, lighting, sound, air quality, low- and high-tech equipment, privacy-supporting design, views and windows, and many other small elements that contribute to the overall construct of space in an office environment (Bryant, 2012).

These features are included but not limited to the focus area of this research. The literature also provides different classifications for interior design features in the office environment that promote creativity.

Ceylan et al. (2008) identified the perceptions of different types of offices in relation to physical interior features in terms of creativity. In their research, they investigated whether the physical environment in offices can stimulate manager's creativity. A total of 60 managers from a large manufacturing company participated in their study. Self-assessment of the creativity potential and physical elements of the office environment are conducted by 25 photographs. Based on these data, they identified the physical features of an office that support creative processes as (1) low complexity, (2) cool colors, (3) bright colors, (4) presence of plants, (5) presence of windows, and (6) presence of high technology. In addition, Van Meel, Mertens and van Ree (2010) have presented a series of principles and design aspects for office interiors (e.g., lounge, locker room). For each set of principles, they provided examples. However, this was not a systematic framework for creative spaces, but a list of resources for architects and interior designers.

In addition, Dul and Ceylan (2011) used the conceptual framework involving personality-related, psychosocial, and physical interior features that have an impact on employee creativity in developing a checklist named as Creativity Development Quick Scan (CDQS). The checklist is intended to serve as a tool to assess the work environment and its creative potential (see Figure 13). They successfully applied this instrument to a sample of 409 knowledge workers such as marketers, consultants,

and managers who worked in 49 companies of different sizes and in different industries (small and medium-sized enterprises). These employees were selected because the author had data on their creative performance. Physical features of this instrument are: window views (nature), any window view, indoor plants, calming colors, inspiring colors, quantity of light, daylight, privacy, indoor climate, smell, sound (silence, absence of noise and music), and furniture.

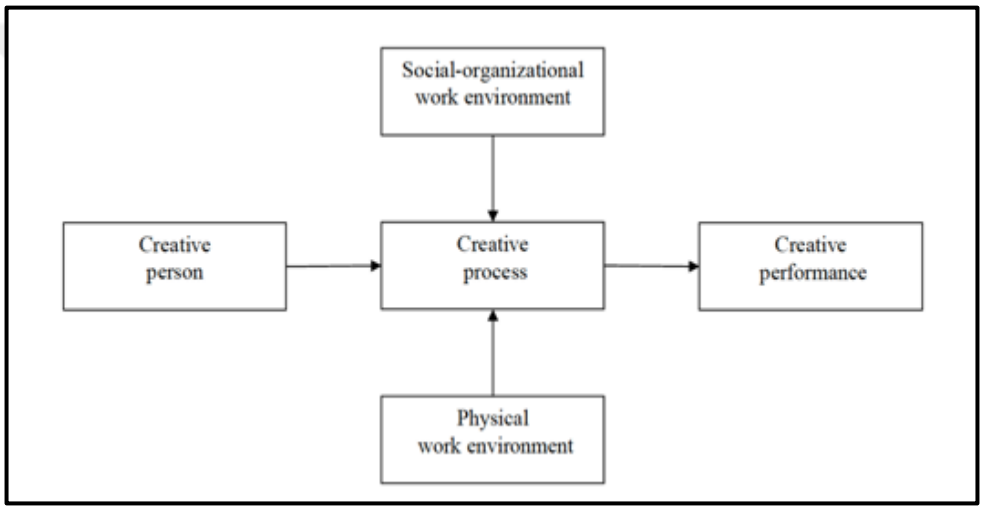


Figure 13. A conceptual framework of creative person, creative work environment, and creative performance proposed by Dul and Ceylan (2011, p. 33)

Furthermore, Hoff and Öberg's (2015) conducted interviews with thirteen digital artists (11 men and 2 women) who worked full-time in the video game or film industry as computer graphic designers, and consider themselves as artists. Based on the results of the data collected, they proposed three subcategories of interior features for supporting creativity as: 1) functional (at the individual level: adequate lighting, ergonomic furniture, noise level, and size; at the group and individual level: flexible

furniture), 2) psychosocial (at the individual level: spatial support for privacy, window views, individual workplace design, and relaxation spaces; at group level: spaces for communication, informal social spaces, and non-hierarchical spaces); and 3) inspirational (at individual and group level: brainstorming spaces and dynamic layout and interior design) (see Figure 14).

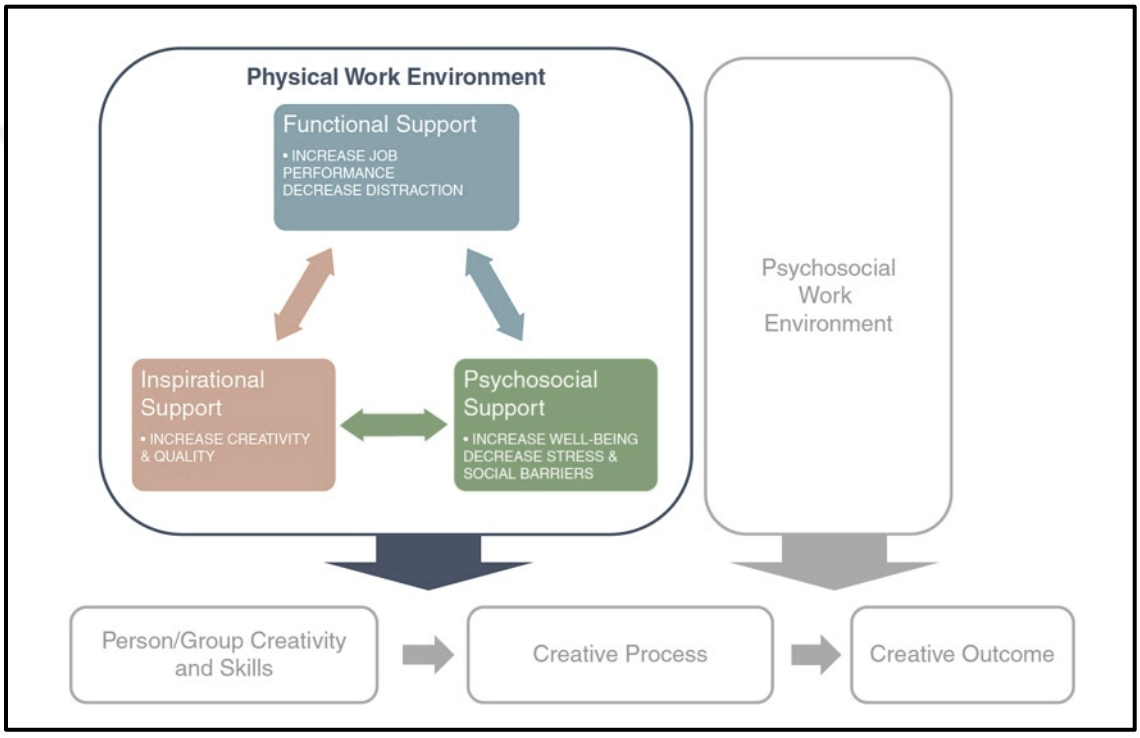
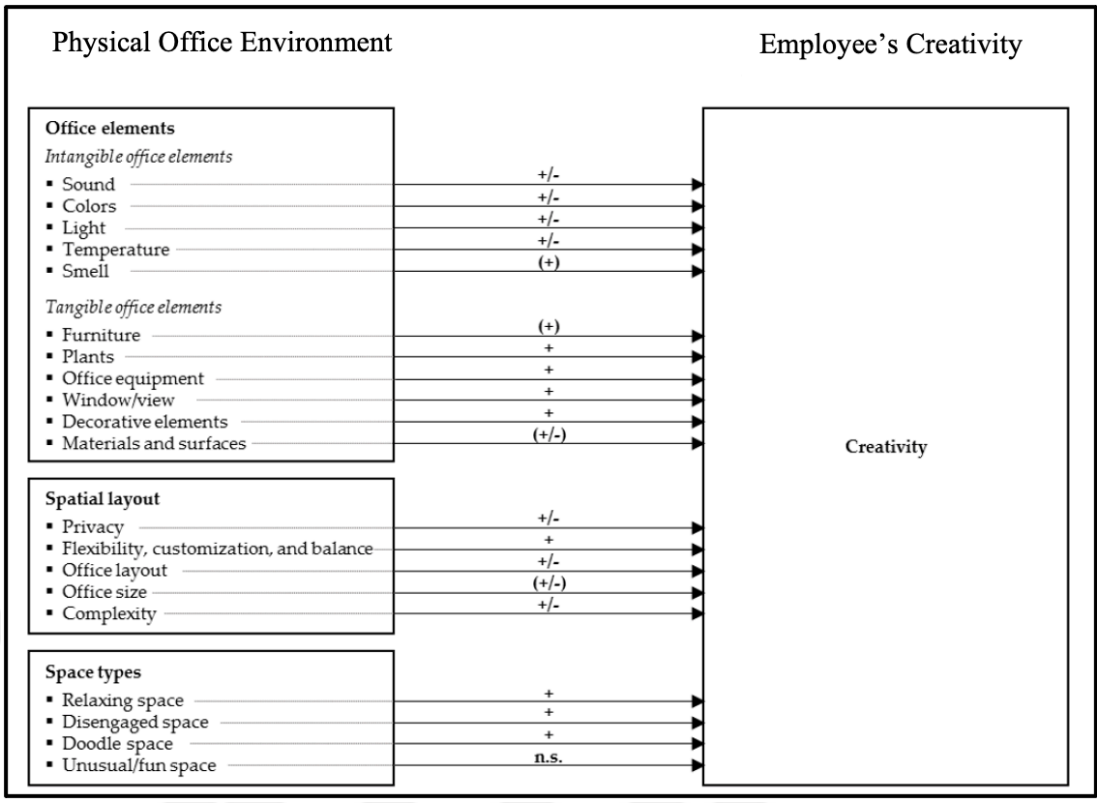


Figure 14. The physical environmental support model for creative work outcomes by Hoff and Öberg's (2015, p. 6)

Lee (2016) conducted a content and visual analysis for written and visual images in his study to identify a comprehensive list of physical work environment features that are important for employee creativity. To measure the physical environment in 22 innovative start-up companies, interviews were conducted and an instrument was

developed using the seven identified physical features. After the interviews, a group of 26 professionals was formed. The survey was conducted with the expert group to determine the importance and application problems of the seven features. As a result, they identified three important physical interior design features in offices: collaboration spaces, a balanced layout, and both low-tech and high-tech equipment for brainstorming, group activities, and supporting creativity.

Based on a literature review of 17 articles, Meinel et al. (2017) identified three categories in the office environment that influence creativity. The physical interior features of each category are presented as follows: 1) space layout (privacy, flexibility, office layout, office size, complexity), 2) office elements: intangible office elements (sounds, colors, light, temperature, smell), tangible office elements (furniture, plants, equipment, windows/view, decorative elements, materials), and 3) space types (relaxation space, disengaged space, collaboration spaces, unusual/fun space). As Figure 15 shows, some elements within these categories have the capacity to influence creativity both negatively and positively depending on the situation, while other elements can only have a positive influence on creativity. Meinel et al. (2017) explained that some elements consistently have a positive influence on creativity (e.g., plants and smell/fresh air), while others depend on situational context (e.g., temperature and office size). Furthermore, too high temperatures or too much noise, or if the office is mainly made of manufactured or composite materials, were explained to have a negative impact on creativity consistently.



Note: + = positive effect; +/- = positive and negative effects; n,s = no significant effect; () = tendencies

Figure 15. The office environment elements and their positive and negative effects on employee's creativity (Meinel et al., 2017, p. 8)

4.1.3. Job Autonomy for Enhancing Creativity in ABOs

Job autonomy refers to the degree of control over how and when tasks are performed (Amabile et al., 1996; Zhou, 1998). Autonomy involves giving the employee responsibility and a sense of ownership over work activities based on their empowering effects (Trevelyan, 2001). Consequently, autonomy involves the experience of options and choices (Gagne and Deci, 2005). Researchers have shown that perceived satisfaction with the quality of the physical environment influences work perceptions and attitudes (Sundstrom et al., 1994; Zalesny et al., 1985).

Supportive employee attitudes (e.g., organizational commitment) and work context (e.g., autonomy) can influence employee creativity (Amabile et al., 2004). Organizations support employee autonomy by allowing employees to choose how they work, when they work, where they work, who they work with, and what tools they use to get their work done, all with the goal of increasing efficiency and creativity (Demerouti et al. 2014). The literature review by De Croon et al. (2005) showed that office interior design (openness of space and distance between workstations) has an impact on working conditions (communication, autonomy and privacy). Studies reported that employees' autonomy, based on their choice of where and when to work, increased after moving to ABOs (Volker and Van Der Voordt, 2005; Vos and Van der Voordt, 2002). In parallel, Robertson et al. (2008) reported that employees' perceived work control increased after moving to an ABO environment. Engelen et al. (2019) mentioned in their literature review that there is evidence that perceptions of time and space control are higher in an ABO environment. They reported five studies (Appel-Meulenbroek et al., 2011; Kim et al., 2016; Medik and Stettina, 2014; Nijp et al., 2016; Robertson et al., 2008) that found that ABO environments have a positive effect on users' perceived job control. Two studies reported that there was no effect of ABOs on employee autonomy and control (Brunia et al., 2016; Nijp et al., 2016), while one study found a negative effect of the ABO environment on control (Gorgievski et al., 2010). Based on these considerations, the present study also investigates the influence of the ABO environment on employees' perceptions of job autonomy.

Autonomy is positively related to both the generation and testing of ideas (Krause, 2004) and their implementation (Axtell et al., 2000). Although autonomy might have

an impact on creativity, the literature does not provide consistent results on this topic (Wang, 2013). Autonomy in the work context has been considered an essential feature of the work environment to promote creativity (Hennessey and Amabile, 2010). Some studies found that employees are more creative when they are given control over the implementation of their tasks (e.g., Mathisen, 2011; Moultrie and Young, 2009; Zhou, 1998). Moreover, Spiegelaere et al. (2014) mentioned that autonomy allows employees to experience different work methods and new approaches. Therefore, this study investigates the effect of employee job autonomy on the employee group creativity. ABOs are believed to encourage perceived job autonomy, productivity, and creativity because employees have control over selecting the most appropriate space in the work environment (Kim et al., 2016). Based on the above literature, it is hypothesized that ABOs have a positive effect on job autonomy and job autonomy predicts group creativity. Therefore, this study investigates whether perceived job autonomy plays a mediating role between satisfaction with the physical environment of ABO and employees' group creativity.

4.1.4. Organizational Commitment for Enhancing Creativity in ABOs

Following the emergence of the concept of organizational commitment, much attention has been focused on identifying and explaining the strength and stability of an employee's loyalty to the organization (Lumley, 2010). Organizational commitment can be viewed as a behavioral intention and attitude that has some influence on organizational behavior and employee loyalty (Goulet and Frank, 2002).

It involves internalization of goals and motivation of employees to participate in achieving those goals (Altindis, 2011; Atak, 2011). Meyer and Allen (1991) describe organizational commitment as "a psychological state that characterizes employees' relationship with the organization and has implications for their decision to continue or discontinue membership" (p. 67).

The physical office environment is a tool that can be used to improve business results and employee well-being (Huang et al., 2004). To support employee commitment, it is critical to provide the appropriate facilities for employees. Previous studies have shown that lack of equipment and unfavorable working conditions affect employee commitment and intention to leave (Weiss, 1999; Wise et al., 1987). The physical office environment in relation to employee commitment has received little empirical attention in the literature. While McGuire and McLaren (2009) assumed that an organization's physical environment is worthy of attention, its layout and design can influence employees' attitudes toward the office. Accordingly, they measured the mediating role of employee well-being in the relationship between the office environment and employee commitment (McGuire and McLaren, 2009). They found the importance of both physical environment and employee well-being on employee commitment. They also recognized a strong positive relationship between physical environment and employee commitment. Current study investigates whether satisfaction with the physical environment of ABO has an impact on employee organizational commitment.

It is also reported that employees with high perceived organizational commitment show higher performance in their work, which is believed to be beneficial to the organization (Podsakoff et al., 2000). Nowadays, organizations emphasize the impact of innovation on long-term organizational improvement and survival, so employees with strong psychological commitment to their organization could perform tasks with higher creativity because they are in line with the organization's goal. However, there are limited number of studies investigating the relationship between employee organizational commitment and creativity (Chang et al., 2014; Van Rossenberg, 2013). Swailes (2000) examined the relationship between employee organizational commitment and employee creativity using both a qualitative and quantitative approach. The answers of interviews with supervisors showed that employees with higher organizational commitment also strive to create and innovate new techniques to improve business operations. Çekmecelioğlu (2006) also found the positive influence of organizational commitment on employee creativity. Moreover, some studies have considered other concepts such as thinking styles or high commitment work systems instead of organizational commitment (Chang et al., 2014; Hou et al., 2011). Therefore, there is not much evidence on the relationship between organizational commitment of employees and each level of creativity (individual, group, organization) because this relationship is still under-researched. In this study, the relationship between organizational commitment and group creativity is examined. When more responsibilities are provided to employees as having more decision-making power that leads to share their ideas; subsequently, they are more committed to the organization and feel more empowered (Sarboland, 2012; Weiss, 1999; Wise et al., 1987). As employee organizational commitment is an attitude and being affected by job context like autonomy level, it was conceptualized that job

autonomy would take place before employee organizational commitment. From this, the current study explores if autonomy has an effect on employee organizational commitment.

Due to filling the existing gap in the literature, including 1) the link (supporting/hindering) between the ABO physical environment and creativity; 2) the role of potential mediators for this link; 3) the role of ABOs as creative spaces; and 4) a multilevel analysis of creativity, this study aimed to investigate the role of the physical environment in supporting or hindering creativity in ABOs and also to measure this effect. Moreover, it is important to find the role of mediators in the relationship of ABOs and creativity. The next section will explain more information about the research questions and methodology of the study. The following chapter covers the procedure, setting, instruments and data analysis of the study. Further details are provided under each heading.

CHAPTER 5

METHODOLOGY

5.1. Research Questions and Hypotheses of Study

In an attempt to address the aforementioned gaps and better understand employee creativity in ABOs, the current study was designed in two stages (stage 1: qualitative approach and stage 2: quantitative approach). Stage 1 was positioned by integrating the following aspects to determine how (1) ABO, as a knowledge-intensive and flexible office concept, (2) supports and/or hinders employees' creative activities at both the (3) individual and group levels and in formal and informal settings, by adopting (4) an interactionist perspective (5) in the CKE framework. The main objective of this stage was to determine the types of spaces and interior features of ABOs that are important for the four types of creative activities, how these features support and/or hinder these activities, and, accordingly, whether ABOs can be

classified as creative spaces. The research questions formulated for this qualitative stage are as follows:

RQ1: How do types of spaces and interior features of ABOs act as possible means to support or hinder individual-formal/informal creative activities?

RQ2: How do types of spaces and interior features of ABOs act as possible means to support or hinder group-formal/informal creative activities?

In stage 2, the study aims to measure the impact of satisfaction with the ABO environment on group creativity. However, the relationship between satisfaction with the ABO environment and group creativity can be mediated by some additional work and organizational variables. This point also came up in the earlier stage of this study and during the interviews with knowledge workers. Findings from the previous stage suggested that working in ABOs leads to greater job autonomy and positive attitudes (e.g., job satisfaction and commitment) and, consequently, higher levels of idea sharing and a creative environment. However, the lack of studies in the literature suggests the need for further research. Based on the suggestions in the literature and the previous stage of the study, this study examines job autonomy and employee organizational commitment as mediating variables. Therefore, the research question related to stage 2 of the study is:

RQ3: What are the direct and indirect effects of satisfaction with the ABO environment on group creativity, and whether job autonomy and organizational commitment play a serial mediating role in this relationship?

Also, based on the following hypotheses, research question and the aim of the study, a model is proposed to investigate them (see Figure16). It is hypothesized that:

H1: Satisfaction with the ABO physical environment has a direct positive effect on perceived employee group creativity.

Also, based on some shortcoming in the literature of job autonomy the following hypotheses were suggested:

> **H2a:** Satisfaction with the ABO environment has a direct positive effect on perceptions of job autonomy.
>
> **H2b:** Perceived job autonomy has a direct positive effect on perceived employee group creativity.

Therefore, the following hypothesis is:

H2: Perceived job autonomy mediates the effect of satisfaction with the ABO physical environment on perceived employee group creativity.

From the literature of employee organizational commitment also the following hypotheses were suggested:

> **H3a:** Satisfaction with the ABO physical environment has a direct positive effect on employee organizational commitment.
>
> **H3b:** Employee organizational commitment has a direct positive effect on employee group creativity.

Therefore, the following hypothesis is proposed:

H3: Employee organizational commitment mediates the effect of satisfaction with the ABO physical environment on perceived employee group creativity.

Therefore, serially mediation of job autonomy and employee commitment are proposed:

H4: Job autonomy and employee organizational commitment serially mediate the physical ABO environment's effect on perceived employee group creativity.

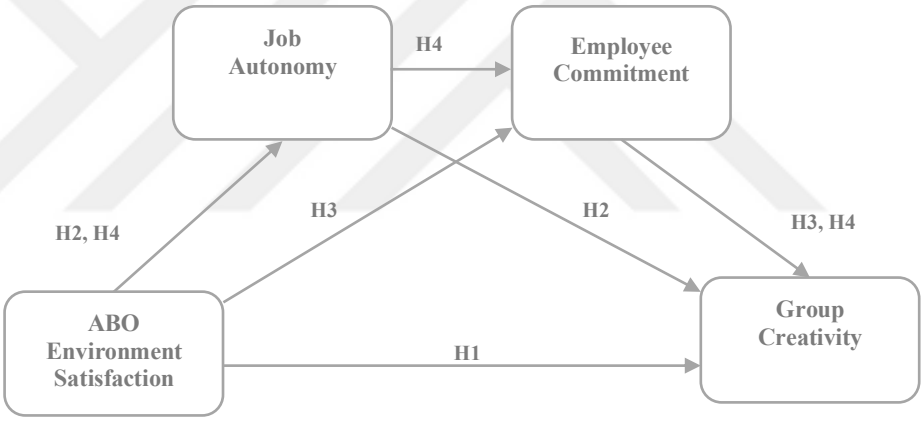


Figure 16. Conceptual model of the hypotheses in stage 2.

5.2. Study Design

The research approach of the study involving two stages is shown in Figure 17. The following sections explain the details of the methodology for each stage. The first stage of the study corresponded to the qualitative method (phase I and phase II). The

findings from the first stage fill the gap created by the lack of studies on this topic and serve to inform the researcher on the research topic. The qualitative method approach provides a more comprehensive understanding and is flexible to obtain more answers. Qualitative approaches are used when the possible answer to a question requires an explanation, not a simple yes/no (Sullivan and Sargeant, 2011). The focus in stage 1 is on the factors of the physical environment and how they support or hinder the formal and informal creativity of the individual and the group. In stage 2, the study was conducted using a quantitative method (phase III) to assess the impact of the physical environment of ABO on the group creativity of employees and to find the role of mediator variables between them. According to Sullivan and Sargeant (2011), the quantitative approach identifies cause-effect relationships.

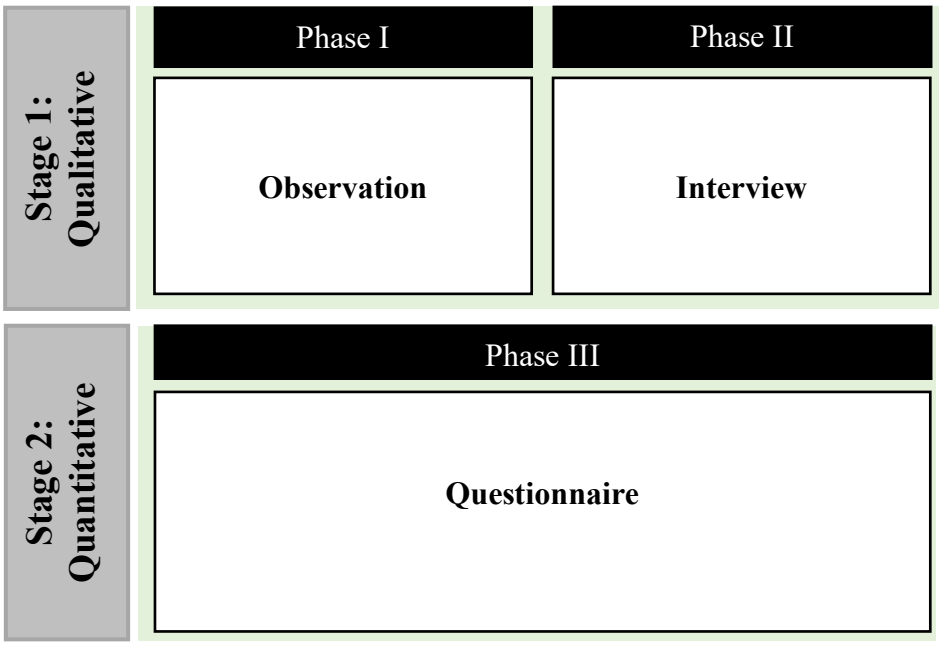


Figure 17. Study approach in two stages

5.3. Study Setting

The case study approach was chosen to study five organizations (three cases for stage 1 and two cases for stage 2) in Sweden in 2019. Case studies provide comprehensive information (Merriam, 2009) by using multiple sources when collecting data (Creswell, 2013). Our research questions, which focused on how ABO influences employee creativity, required a deep contextual understanding that the case study approach adequately fulfilled. Case studies are generally conducted in a natural setting where the researcher has limited control over events (Yin, 2018). In the present study, this approach was appropriate for an in-depth analysis and understanding of ABOs' potential to support or hinder creativity and its association with creative spaces. In addition, to reduce the aforementioned research gap, it was necessary to gain insights into real cases when studying creative spaces (Thoring et al., 2018).

A non-probability purposive sampling method was used to select the five international companies in Sweden. The main selection criterion was the types of spaces and features they possessed, which were designed to modernize employees' ways of working and encourage interaction; the employees had moved to the ABOs more than six months before the interviews were conducted. This was important because, sometimes, employees form a negative first impression after moving to their ABOs, and it takes time to adapt to the new environment (Babapour Chafi and Rolfö, 2019). Another important criterion was that these companies' work was mainly knowledge-intensive, complicated, and competitive, and hence, creativity was necessary for success. In addition, these cases were considered as typical

(Denscombe, 2014) because the companies' buildings were located in a city and considered overcrowded, leading to higher space efficiency in the ABOs (Rolfö, 2018).

In stage 1, three cases were selected in Gothenburg, Sweden. Case 1 was the headquarters of a research institute in Gothenburg. The research institute was relocated as an ABO two years before the study. Their relocation was part of more substantial development of facilities in the area and involved: (i) moving from an open plan to an ABO, (ii) providing flexible spaces as part of their services, and (iii) space reduction. The research institute had the capacity of up to 50 employees, of which 13 full-time employees participated in the study voluntarily. The participants' roles and responsibilities varied: (i) communication and marketing (ii) project leadership, such as working with the development of tools, methods, and knowledge, and (iii) administrative work.

Case 1 was located on the fifth floor of a science park building (Figure 18). The office spaces for individual and collaborative work in proximity to each other, with limited spaces for uninterrupted work. There was a competition for occupying private rooms due to their limited number. Information on use policies for Case 1 was summarized together in a document available on their homepage:

- Private rooms were used for longer telephone calls, Skype meetings, and individual concentrations. The rooms were for flexible use, not full-day use. Three of the rooms were bookable; remaining were drop-in rooms.

- Open space was used as an ordinary office workplace, and calls and shorter phone calls were made. The three workplaces at the bottom of the room (front of the windows) were primarily intended for colleagues with extra sensitive material.
- The clean desk applied if employees leave the desk for longer than 1.5 hours, so someone else can use the vacancy.
- Quiet zone open space is for occasions when full concentration is needed. Employees needed to put the phone in silent mode without vibration, and they did not talk on the phone. Others should use email or chat to contact the people sitting there and not disturb them.

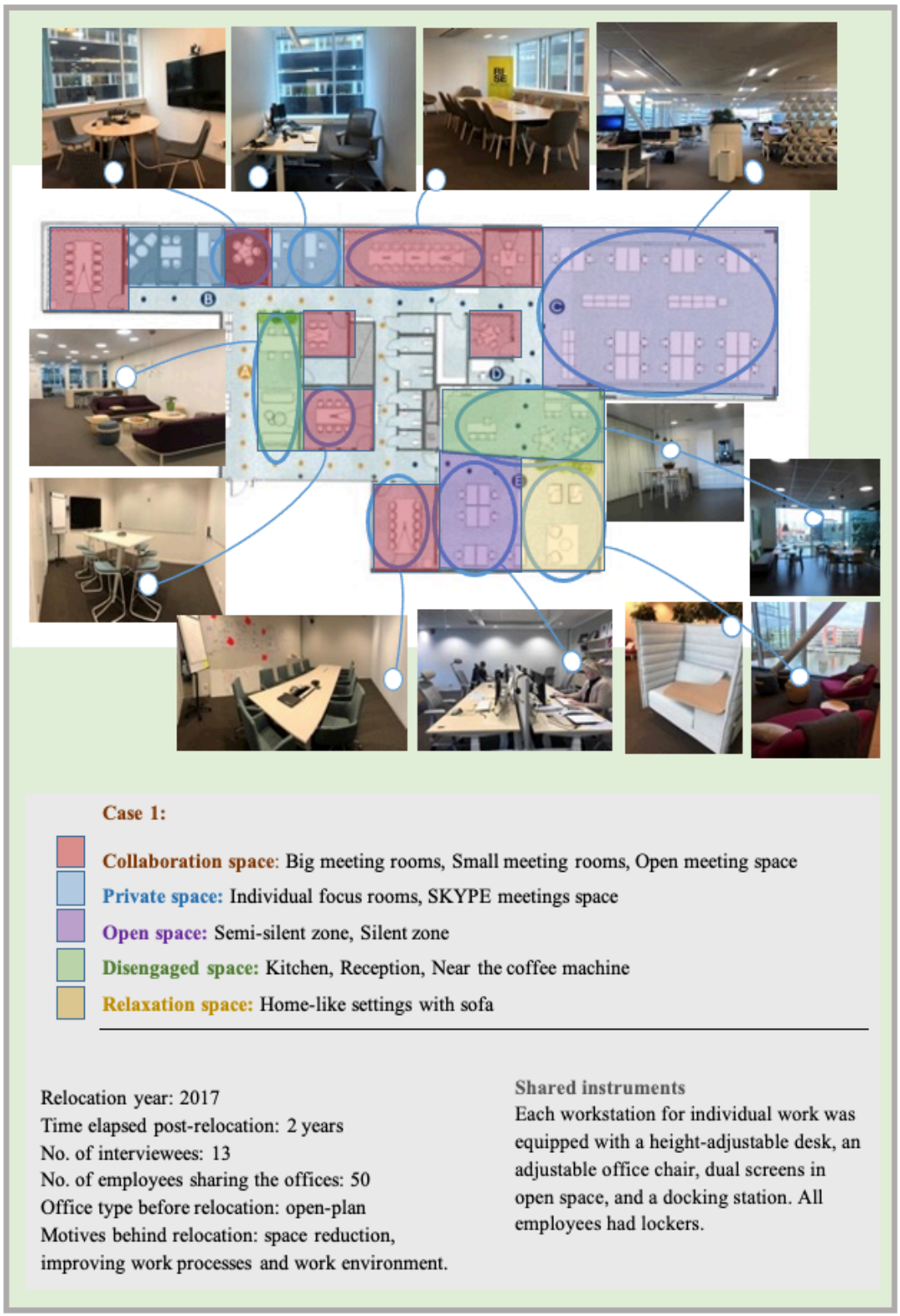


Figure 18. An overview of the ABO environment in Case 1: plan, specification of layout and the shared instruments

Case 2 was an office operated by 13 small organizations that helped new and existing entrepreneurs start and run businesses or otherwise implement their ideas by providing advice, training, entrepreneurial programs, and concrete tools. The organizations came from different locations and began working together in an ABO environment about a year and a half before the study. Case 2 could support up to 60 employees, 40 people worked full time, and up to 100 people went there part time during the week of which 11 full-time employees participated in the study voluntarily. Eleven full-time employees participated in the study. The employees' roles and responsibilities varied: (i) administrative work, e.g., offering courses, conferences and events for start-ups and entrepreneurial programs, (ii) communications and marketing, e.g., creating printed or online content, (ii) project leadership, e.g., working, and (iii) project manager.

The reasons for adopting ABO concept in Case 2 were (i) to allow flexibility and mobility, (ii) to facilitate collaboration between all small organizations - "*the sense of us versus them has disappeared*" (CEO of one of the organizations), and (iii) to encourage more meetings between employees and the public. In Case 2, the main office was located in a two-floor building and also on the second floor of the neighboring building, accessible from the outside (Figure 19). The main office was located in a two-floor building with conference and meeting rooms for administration and a large kitchen area with various furniture for individual activities and small and large informal collaborations. The building next door included a quiet, semi-quiet open area and enclosed spaces for various activities, mainly individual activities. In this case, it was reported that some individuals had challenges and

needed their desks, so two fixed desks were provided for their use. Use policy information for Case 2 was reviewed as follows:

- They could leave their bags for the day.
- They needed to erase whiteboards, keep the kitchen clean and responsible for their dishes.
- They reported the need to implement clear speech-level policies and monitor if people follow them- to be stricter about what does it mean to be social and what is a quiet area.

Figure 19. An overview of the ABO environment in Case 2: plan, specification of layout and the shared instruments; upper left first floor, upper right second floor of the main building, bellow first floor in the next building

Case 3 was the headquarters of a Swedish multinational manufacturing company in Gothenburg. While their core activity was production, distribution and sales of some products, they moved to their new building ABO a year ago. The move was part of a larger project that involved moving all of the company's other buildings to the same location and included the following: (i) moving from an open plan to an ABO, (ii) providing collaboration spaces and individual spaces for concentration, and (iii) providing effectiveness and variety for all available spaces in the office to meet the needs of employees. The roles and responsibilities of the employees varied: (i) the communications and business department, (ii) the human resources department, (iii) the Information Technology (IT) group providing support for IT projects and service management. This ABO has a capacity of up to 250 employees, but it was used by 150 full-time employees and 26 of them voluntarily participated in this study. Case 3 was located on the second floor of the large building (Figure 20). Case 3 consisted of quiet and collaboration open spaces, and individual and duo enclosed rooms for various activities. The majority of the non-bookable and bookable meeting rooms were equipped with video conferencing technology. Information on the usage guidelines for Case 3 was summarized as follows:

- The Library and Focus Workstations are silent areas. When being there employees do not interrupt our highly focused colleagues. Employees are supposed to respect this and keep phone signals and notifications off.
- Open spaces are semi silent spaces - areas where employees should expect to hear conversations and phone calls.
- If employees need to work focused, they need to choose areas suitable for focused work.

- For longer and loud conversations - employees are supposed to use of Skype workstations or fast meeting rooms.
- Employees use the collaboration areas for their loud and creative interaction with others.
- Employee's care for the persons coming after them by making sure, they leave a clean workstation, desk or table in the conference room by the end of their workday or meeting.
- When leaving their current place for more than 2 hours, employees clean in order to free up the space for others to use.
- Employees eat their hot meals in the restaurant not the kitchen.
- Employees strive to book shorter meetings when appropriate (15, 30 or 45 min instead of routinely 60 min).
- If a booked room is available, employees may use it until the owner of the booking arrives.

Figure 20. An overview of the ABO environment in Case 3: plan, specification of layout and the shared instruments

In stage 2, data were collected from two international companies in Stockholm. No observations were conducted in these offices. The first company was a multinational technology company. It develops and sells computer software, customer electronics, individual computers and related equipment. Their office was one of the first activity-based offices, in Stockholm (from 2013). The second company was one of the world's largest pharmaceutical companies, and its' primary aim was to help people live a healthier and longer life. They perform this by creative researching and manufacturing new and latest drugs. They moved to their new ABO one year ago.

All five cases from ABO were typical offices in knowledge-intensive international companies with knowledge-working employees, making them comparable in terms of physical environment and job-related factors. They had open spaces to support conversation and collaboration with additional semi-open workstations and enclosed 'back-up spaces' for focused work, large to small spaces for scheduled and unscheduled meetings, informal spaces for well-being/relaxation, and disengaged spaces such as kitchen/lounge for a quick break-out or hangout. Mostly the enclosed meeting rooms were bookable, but Case 3 also offered additional non-bookable small meeting rooms (2-3 people) for unplanned or small meetings. None of the cases had a play area or balcony. Only Case 2 had private telephone booths. High standards of furniture quality, interior design, and equipment were provided in these ABOs to encourage employees to use the spaces. Technology was integrated throughout as it is an essential part of the experience of flexible working and the way ABOs should be designed. In all five cases there were pre- and post-move workshops to involve staff in the decision-making process, familiarize them with the new environment and

introduce speech and desk-sharing policies of using the new office. All of the space types that were to be assessed in this study for linking ABOs to creative spaces were present in these case studies. Therefore, all were considered to embody the characteristics of ABO environments to a roughly equal degree. The intention in selecting these five different cases (three cases for stage 1 and two cases for stage 2) is to bring together the different and common strengths and weaknesses of ABOs. This approach was consistent with triangulation design, which is the use of multiple data sources or multiple approaches to data analysis in which the researcher collected and analyzed quantitative and qualitative data on the same phenomenon separately and then combined and linked the different results in interpretation. For these reasons, current study aimed to select typical ABO cases and the data derived from them could be considered reliable and consistence to compare and confirm the results and ultimately reach valid and well-reasoned conclusions about the effect of the ABO on creativity.

5.4. Participants

The sample of the study was drawn from the knowledge worker population for both stages of the study. Knowledge workers have a high level of education, skills, and knowledge in performing non-routine tasks, such as applying knowledge or developing original ideas. In the current study, knowledge workers were mainly business developers, controllers and analysts, product or project managers, HR managers, process and communicator managers, IT development, and CEOs. There were no participants with artistic work or design-related tasks in our study.

In stage 1, for participating in interviews, fifty knowledge workers were selected on a self-selection basis from those working in the three ABOs in Gothenburg, Sweden. One week before the interview, all participants were informed by email about the study, that it was academic research independent of their organization and that their identity would remain confidential. Participation in the interview was voluntary and offered through a sign-up list provided by us.

In stage 2, for filling questionnaire, the study sample was drawn from the population of knowledge-workers working in ABOs in international organizations; therefore, a non-probability and purposive sampling method was used to randomly approach to two big international companies in Stockholm, Sweden. Of 250 total cases, 186 had complete data on all relevant variables and were thus included in the analyses (74% response rate). G*Power Software is used to calculate the total sample size for this study (see Figure 21). The program offers the ability to calculate sample size and power for a wide variety of statistical tests. Sample size calculated 157 for linear multiple regression test with three predictors and at $\alpha=0.01$. Therefore, the sample size of this study is acceptable for the related statistical analysis.

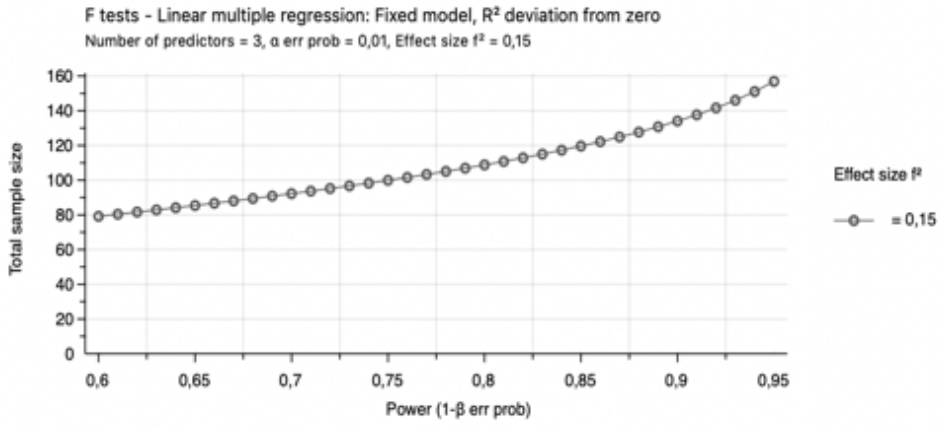


Figure 21. G*Power plot on the total number of sample size at α

5.5. Study Procedure

The study was conducted in eight steps (see Figure 22). The first step was obtaining ethics approval from İ.D. Bilkent University's Ethics Committee (see Appendix J). The second step was the permission stage. For conduction of this study official permission was acquired from all the organizations for data gathering.

The third and fourth steps of the study related to stage 1 of data collection from three case studies using a qualitative approach. The third step began with walk-throughs and systematic observations by the author to examine the physical and social environment of the ABOs. The on-site observations included walk-throughs with an informant who provided information about the workshops, the process before and after the move, and the design of the building, and the systematic observation rounds to collect data on how employees take place in each type of space, as well as feedback from the on-site informants, were used as an additional source of data to confirm the findings.

The fourth step was to conduct interviews. One week prior to conducting each interview, employees received an email informing them of the study as part of academic research independent of their organization. Participants were also informed prior to the interviews that their names would be coded with numbers, that their responses would be kept confidential by the researcher, and that the results would be presented anonymously. The data collection process for the interviews took three

days (Case 1 and Case 2) and one week (Case 3: due to more participants available for interview).

The fifth step consisted of evaluating the observation and interview results from stage 1 and developing a questionnaire to measure the creativity-enhancing aspect of the physical environment in ABOs, based on the literature and the results of the current study. In this step also, the initial findings of the qualitative study were presented to a subset of informants in Case 3 to validate their reliability.

The sixth step was the pilot study; the pilot study questionnaire was conducted with 10 knowledge workers working in ABOs. In this phase, the initial data was collected and data analysis was conducted. This phase was very helpful to understand whether the questionnaire works and is reliable to measure the role of workplace on creativity. After the pilot study, the questionnaire was revised and finalized.

The seventh step was the implementation of the questionnaire for the second stage of the study, which took place in two cases and had a quantitative approach. In both cases, employees were invited to participate and informed by email that the study was part of academic research independent of their organization. The purpose of the study was explained and potential participants were informed that participation was voluntary. They were also informed that no personal information would be shared and that the data provided would be kept confidential. The link to the questionnaire was then provided at the end of the email.

The eighth and final step involved triangulating data from all sources. Data collected from all sources, such as observations, interviews, surveys, discussions with informants, and field notes, were considered in order to compare, match and integrate the findings and reach an overall conclusion.

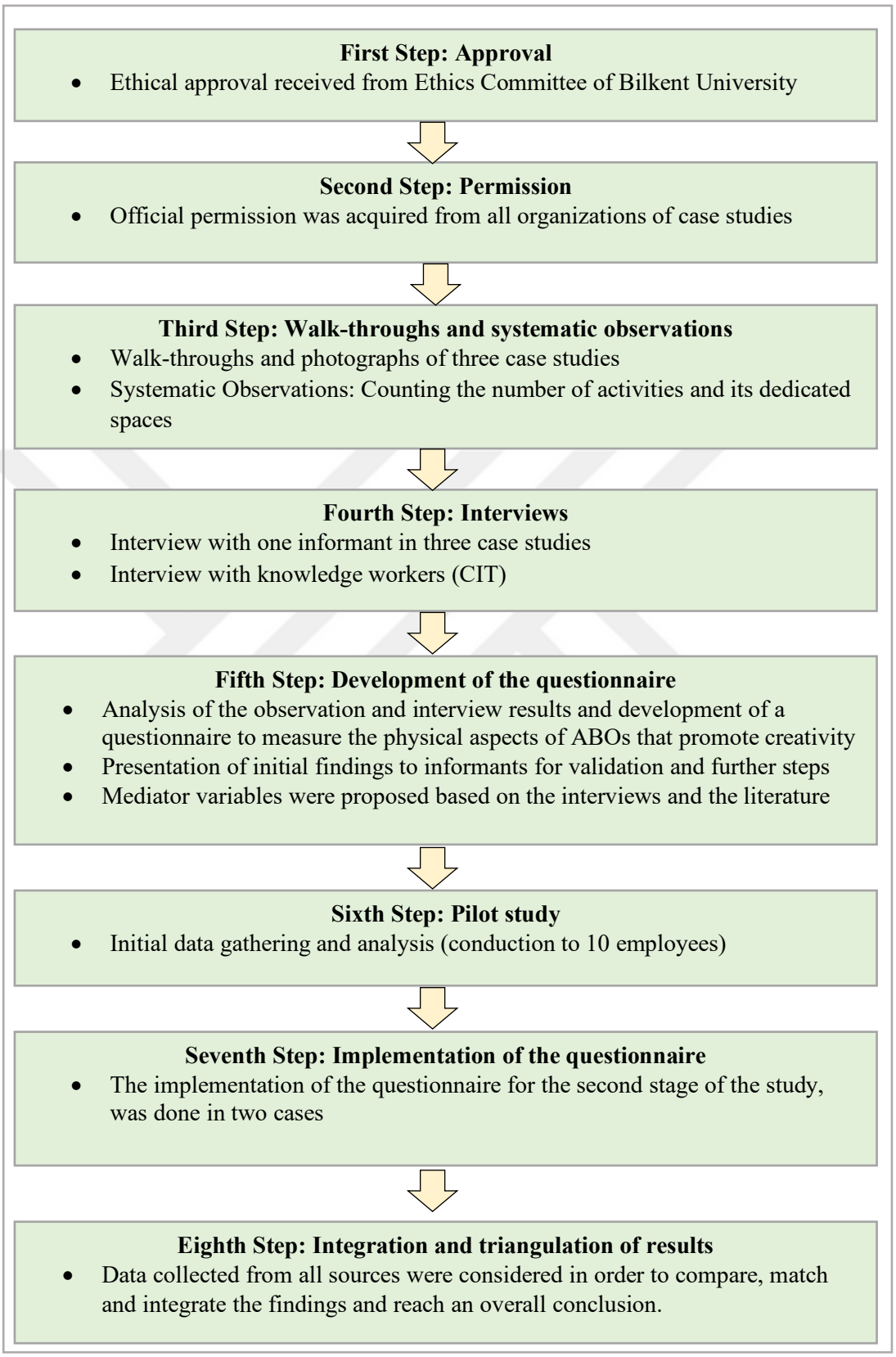


Figure 22. Workflow diagram of the eight steps of the study

Justifications for mixed methods. There are some reasons for adopting mixed methods as the research paradigm for current study. The first reason is that answering some questions with only one paradigm is not possible and not comprehensive (Leech and Onwuegbuzie, 2009). Qualitative studies focus on answering the how and why questions. Quantitative studies, on the other hand, are helpful in determining cause and effect as well as numerical correlations and how much (Sullivan and Sargeant, 2011). Therefore, the integration of quantitative and qualitative methods is fruitful to gain new empirical insights (Malina et al., 2011). Moreover, qualitative data can capture perceptions, biases and assumptions and provide compelling citations that give meaning to the findings (Miles et al., 1994). The purpose of this research could be fulfilled through a combination of qualitative and quantitative approaches as the research questions included both how and how much (cause and effect). A mixed methods perspective was used due to the difficulty in answering the research question using a single methodology.

Second, the mixed method approach seeks to incorporate multiple opinions, perspectives, and situations that include the viewpoints of both qualitative and quantitative studies (Johnson et al., 2007). Accordingly, the application of this method provides more powerful and precise techniques that lead to a better understanding of the phenomena (Hohenthal, 2006). Leech and Onwuegbuzie (2009) confirmed that there are three-dimensional typologies of mixed-methods designs:

1) A degree of combination (partly mixed vs. fully mixed),

2) A time orientation (parallel vs. sequential),

3) An affirmation of approaches (equivalent status v. leading status).

Triangulation Design is the well-known and common mixed methods approach (Creswell et al., 2003). The reason for choosing this design is to better understand the research problem by obtaining "different but complementary data on the same topic" (Morse, 1991, p. 122). The purpose of this design is to combine the various strengths and non-overlapping limitations of qualitative methods (depth, detail, small sample size) with those of quantitative methods (generalization, trends, large sample size) (Patton, 1990). The convergence model (Figure 23) is the triangulation model of the traditional mixed-methods approach (Creswell, 1999). In this model, researchers study the same phenomenon, but collect and analyze separate quantitative and qualitative data, and then merge and interpret the different results by comparing and contrasting them. This model is used to compare or validate results, or to confirm qualitative results with quantitative results. This model helps to draw valid and well-reasoned conclusions about a particular phenomenon. The rationale for this approach in this study is that the qualitative data from stage 1 and its analysis identify important features and understand the research problem by delving into the views of the participants. The quantitative data from stage 2, its analysis and statistical results provide the significance of correlations between variables; it also presents important characteristics for creativity (Creswell, 2003).

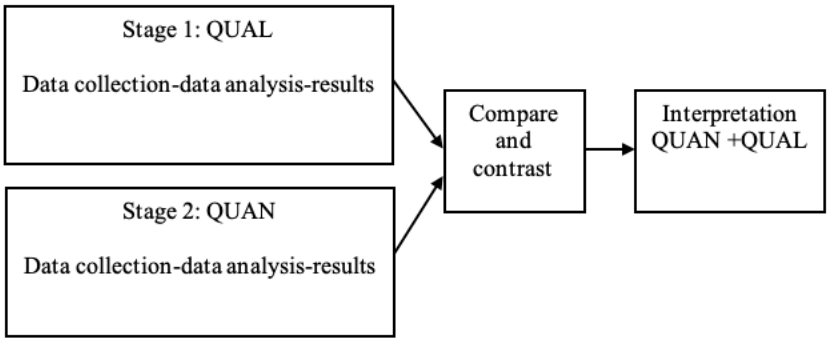


Figure 23. Triangulation design: Convergence model (Creswell and Plano Clark, 2006, p. 63)

5.6. Instruments

This study was designed in two stages. Stage 1 had a qualitative approach that used interview and observation methods as the primary data collection instruments. Data documentation was also used as a secondary data collection tool to provide the author with more information for deeper understanding and identification of the case studies. Stage 2 of the study had a quantitative approach and included a questionnaire as an instrument. In the next sections, these instruments will be explained in detail.

First, a semi-structured interview was conducted with the facility manager/process manager/staff manager in each organization to gain insight into the ABO solution, workspace specifications, intended use of the space, and the design and implementation process. This information was necessary to become familiar with each case study before the main phase of data stage. This information was also used

in introducing each case in the previous section. Some typical questions that began the interview are listed below, but are not limited to these:

- Why did the company choose the ABO concept?
- When did you move to this new building?
- What challenges did you have with employees after the move?
- How many people use this building?
- How many people can be accommodated in this building?
- What type of spaces do you have?
- Do you have any principles for using the spaces in this building?
- Do you need a room that is not available in your ABO?
- Is there any space that is not used at all? Why?

The second instrument was the interview question based on the Critical Incident Technique (CIT) with knowledge workers. The interviews with each participant lasted approximately 20 to 50 minutes. The interview questions consist of two main parts:

1. Demographic information (see Appendix B)
2. Critical Incident Technique (see Appendix C)

Demographic information such as gender, age, nationality, education level and background of the participants were collected. The time they spent in the building and the name of their workplace were also asked. Then CIT was used to interview knowledge workers (Flanagan, 1954). The main reason for using CIT was that this

method helps participants to focus on specific creative and actual incidents rather than some general opinions about work processes (Serenko, 2006). In the interview, participants were asked to recall an actual incident. This question could be phrased as, "Please recall the last time you needed a place in your office to concentrate/focus to generate a new idea/solve a problem." The areas for the incidents were spaces for formal-individual activities, e.g., concentration; formal-group activities, e.g., communication and collaboration; informal-individual activities, e.g., rest or relaxation; informal-group activities, e.g., hanging out, playing, or breaking out. When an incident was recalled, four questions were asked:

i. Which space type did you occupy for your creative purposes? How does it work?
ii. What were the most important interior features that supported your creative process? How?
iii. What were the most important interior features that hindered your creative process? How?
iv. Were you able to come up with novel ideas or solve the problem?

The CIT is suitable for studies that examine specific human activities in order to better understand them in an exploratory research. The current study takes the definition proposed by Bitner et al. (1990), "A critical incident is an observable human activity that contributes to or detracts from the general aim of the activity in a significant way" (p. 73). The CIT is used as an interview technique in which participants are motivated to talk about events rather than response the questions directly. The use of CIT neglects the inclusion of general opinions about management and operations and instead focuses on specific incidents (Serenko,

2006). There are several advantages to using CIT (Bycio and Allen, 2004; Gremler, 2004; Jaakson, 2009); (i) CIT is a relatively inexpensive and flexible method. (ii) CIT provides extensive and specific information. The method can provide information about how the person perceives the work environment and the organization. (iii) It escapes the limitations of prefabricated questionnaires and assessment procedures. Thus, CIT can provide additional or even different results. (iv) Data from critical incidents can be analyzed both qualitatively and quantitatively. (v) The technique is likely to reveal characteristics that immediately come to the mind of participants and spontaneous ideas about their office. There are also some disadvantages in using CIT; (i) The categorization process for CIT data analysis is tedious and time consuming. In this study, the categories were predefined based on the literature. (ii) Selectivity or lack of accurateness of critical incident data based on their personal recollection (Kain, 2004). In the present study, this problem was not critical and significant as the study dealt with the physical environment of the offices. However, in order to reduce the impact, only incidents that seemed realistic were included in the dataset. Considering the above advantages and the proposed solutions to the disadvantages of the CIT technique, the CIT approach to interviews is used in this study. The data collection includes CIT interviews as a facet that has a larger focus in the data collection. This provides a specific focus on creativity and the physical environment rather than obtaining general information about the ABO environment.

The third instrument was the observation protocol and printed layout for data collection. According to Denscombe (2014), observation is a method of data collection that examines what people actually do rather than what they report.

Capturing the dynamics of employee activities and behaviors through observational findings provides an opportunity to validate interview findings in analysis. Observations consisted of walk-throughs and systematic observations. The on-site observations included walk-throughs with an informant who provided information about the workshops, the process before and after the move, and the design. The systematic observations involved walking around the ABOs and marking the different types (formal, informal) and levels (individual and group) of activities on the printed layout of each case and on the observation protocol (see Table 5) for 4 times for each case, which took about 10-12 hours of observation time in total. The observation rounds were conducted in the morning, at lunchtime and midday and on different days of the week to cover the equivalent of a regular working week. This shows the workstations available, the flow of employees using the spaces and the location of different activities. The information to be collected during the observation rounds were:

i. the level and type of activities, i.e., individual activities, group activities such as meetings, information sharing, informal solitary activities, or informal interactions,
ii. the number of people using each space,
iii. the spaces or workstations used during the activities,
iv. the reserved and unattended spaces and workstations.

In addition to the observations, photographs were taken to record the type of rooms in the cases and their general interior features such as occupancy and number of partitions. Documentation (collection of secondary data) was also requested from each organization, such as planning documents, relocation goals, policy documents,

architectural drawings and floor plans, zoning assignments, and number of back-up spaces and meeting rooms. It is recommended that documentation be used as evidence of something that is significant and useful (Denscombe, 2014). Architectural drawings of floor plans could consider to record the impact of physical features of work systems (Carayon et al., 2006). The process of data collection in stage 1 is illustrated in Figure 24.

Table 5. The observation protocol used during observations in case studies

Space type	Occupied	Reserved	Unattended	No. of workstations
Private room #1				
Open space (semi-silent)				
Small meeting room (drop in)				
Private room #2				
Small meeting room #1				
Big meeting room #1				
Big meeting room #2				
Small meeting room #2				
Big meeting room #3				
Open space (silent zone)				
Relaxation space				
Reception				
…				

Data gathering process in stage 1			
	Observation	Interview	Documentation of data
First day Case 1,2,3	Walk-throughs and taking photographs of different spaces in case studies	Interview with one informant in each case	Policy documents, architectural drawings, and plan layouts
Second day Case 1,2,3	The systematic observations Round #1 Round #2	Interview with knowledge workers (CIT) 5-6 person	---
Third day Case 1,2,3	The systematic observations Round #3 Round #4	Interview with knowledge workers (CIT) 5-6 person	---
Fourth and fifth day Case 3	---	Interview with knowledge workers (CIT) 5-6 person	---

Figure 24. Data gathering process of the qualitative study in stage 1

The final instrument in this study was a questionnaire that was used in stage 2. Since there were many international employees in both organizations, the language of the questionnaire was in English. The questionnaire began with an explanation of the purpose of the study and informs potential participants that participation was voluntary. Participants had the right not to participate in the study without giving any reason. They were also informed that no personal information will be shared and that the information provided will be kept confidential. The questionnaire consisted of the following measures; (i) demographic data, (ii) job autonomy, (iii) employee organizational commitment, (iv) employee group creativity and (v) satisfaction with physical environment of ABO. All measures were self-rated and measured as employees' perceptions of their physical environment, work and creativity.

Job autonomy was assessed with a three-item autonomy scale (see Appendix F). The scale draws from Organizational Support for Innovation Questionnaire (OSIQ: Pirola-Merlo, 2000, p. 86). The items were *"I am free to determine how I will allocate my time each day"*, "*I feel able to follow leads and hunches that may arise during a project"*, and "*I am free to decide how I will approach tasks"*. Respondents were asked to rate their agreement with items using a Likert scale ranging from (1) strongly disagree to (7) strongly agree. Job Autonomy was scored as the mean of the score on all three items; high scores represent high perceived job autonomy of employees. Cronbach's alpha coefficient for the scale in this study was 0.81.

Organizational commitment is the psychological bond that an employee has with his organization. Employees with high commitment accept the organization's vision and

goals and strive to fulfill them. Organizational commitment was assessed by Organizational Commitment Questionnaire (OCQ) (Porter et al., 1979, p. 284). Over the years, researchers have investigated different facets of organizational commitment, but consensus is that the strongest component of commitment is the emotional aspect, so-called the affective commitment, the feeling of devotion and caring. The questions come from the one-dimensional OCQ that correlates most with the affective aspect of commitment and considered as one of the most frequently used scales (Kanning and Hill, 2013; Mathieu et al., 2000; Mathieu and Zajac, 1990). The reliability of the OCQ is a well-documented, reliable scale with Cronbach's Alpha values between 0.82 and 0.93 (Mowday et al., 1982). The original OCQ consists of 15 items, of which nine are positive, and 6 of them are negatively poled. Several investigations reported two factors for OCQ, in which the positive and negative items load on different highly correlated factors (Caught et al., 2000; Lee, 2005). Caught et al. (2000) reported the findings that the second factor of negatively poled items does not show any significant value. This study adopted this point of view, and keeping the one-factor solution, which consists of nine positive items (see Appendix G). The sample item of the scale is: "*I am willing to put in a great deal of effort beyond what is normally expected to help my organization be successful"*. Participants were asked to rate the degree of their agreement or disagreement with each statement using a Likert scale (from strongly disagree (1) to strongly agree (7)). Organizational commitment was scored as the mean of the score on all nine items; high scores represent high-perceived commitment employees to their organizations. Cronbach's alpha coefficient for the scale in this study was 0.88.

Employee group creativity was assessed with a 6-item creativity and innovation behavior scale developed by Scott and Bruce (1994, p. 593) (see Appendix H). The sample items were: "*at work, we always promote and champion ideas to others* and *we always investigate and secure the funds needed to implement new ideas"*. Respondents were asked to rate their agreement with items using a Likert scale ranging from (1) strongly disagree to (7) strongly agree. Group creativity was scored as the mean of scores on all six items; high scores represent high-perceived group creativity. Cronbach's alpha coefficient for the scale in this study was 0.92.

ABO Physical Environment Satisfaction Scale was developed to measure employees' level of perceived satisfaction with their office environment. The development of the 34 items, listed in Appendix E, was derived through the following process. First, some items were adapted from the existing literature on office environments (Dul and Ceylan, 2011, Dul et al., 2011, Hoff and Öberg, 2015, Lee, 2016, McCoy and Evans 2002, Thoring et al., 2018). However, most physical features related to offices have been proposed and studied only for individual creativity. Second, the results of the first stage of this study were considered, which was a qualitative research focusing on the effects of ABOs features on individual and group creativity. In addition, the features related to group creativity in the related literature were added to the scale (Hoff and Öberg, 2015, McCoy, 2005, Meinel et al., 2017). Finally, a pilot study was conducted with 10 individuals to test the reliability of the scale.

ABO physical environment satisfaction scale consists of 5 parts: 'Space Qualityt', 'Indoor Environment Quality', 'Privacy and Control', 'Interior Design Elements',

and ‘Space Equipment’. Respondents were asked to rate their satisfaction level related to the items of ABO physical environment in their current office using a scale from (1) strongly dissatisfied to (7) strongly satisfied. The sample items are: “*temperature conditions of your work area in winter*” and “*the degree of visual privacy regarding walls, separation panels and furnishings”*. ABO Physical environment satisfaction was scored as the mean of scores on all 31 items (three items were excluded due to results of factor analysis); high scores represent high-perceived satisfaction with ABO Physical environment (representing ABOs’ spaces and interior features). Cronbach's alpha coefficient for the scale in this study was 0.94.

5.7. Data Analysis

The process of data analysis is divided into three phases for data from stage 1 (phases 1 and 2) and stage 2 (phase 3) of the study. Details of the data analysis in each phase are presented in Figure 25 and the following sections.

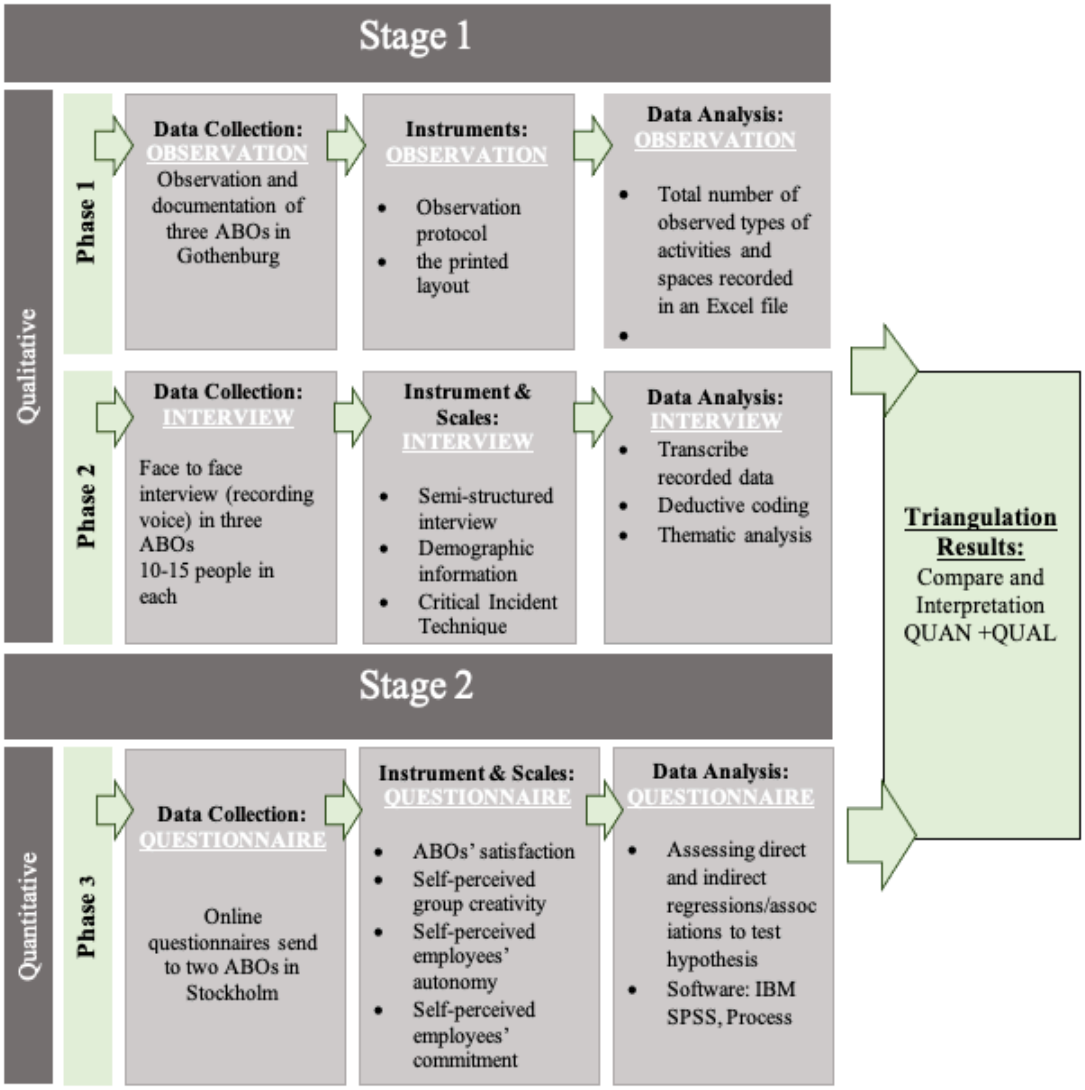


Figure 25. Overview of data analysis of two stages including phase 1, 2 and 3

In stage 1 to analyze the qualitative data from the interviews, a thematic analysis was carried out using Braun and Clarke's (2006) six-level category system. Thematic Analysis is a method of identifying, analyzing and presenting themes within the data. It classifies and explains the data set in a minimalist and (richly) detailed manner (Braun and Clarke, 2006). Thematic analysis, through its theoretical freedom, offers

a flexible and useful research tool that can provide a detailed, yet complex, account of the data. A theme captures something significant about the data in relative to the research question and characterizes some level of patterned response or meaning within the data set. The following table (Table 6) presents six phases of thematic analysis suggested by Braun and Clarke (2006) in their study.

Table 6. Phases of thematic analysis by Braun and Clarke (2006, p. 87)

Phases of thematic analysis		
1	Familiarizing with data:	Transcribing data, reading and re-reading the data, noting down.
2	Generating initial codes:	Coding interesting features of the data in a systematic fashion across the entire data set, collating data relevant to each other.
3	Searching for themes:	Collating codes into potential themes, gathering all data relevant to each potential theme.
4	Reviewing themes:	Checking if the themes work in relation to the coded extracts (Level 1) and the entire data set (Level 2), generating a thematic 'map' of the analysis.
5	Defining and naming themes:	Ongoing analysis to refine the specifics of each theme, and the overall story the analysis tells, generating clear definition for each theme.
6	Producing the report:	The final opportunity for analysis.

A total of 214 incidents (174 specific, 40 general) were collected from 50 participants. On average, the participants recalled 4.28 incidents (SD = 0.5). Interviews were fully transcribed. In the first phase, the collected descriptions of the incidents were inserted into a matrix with four separate columns for each of the interview questions: the space for the activity, encouraging and hindering features of this space, and consequences. In the second phase, each column was coded and grouped into new columns for subcategories based on their similarities. In the third phase, the subcategories were combined into larger, conceptually meaningful categories and themes. These were (1) intangible elements, (2) tangible elements, and (3) spatial layout (categories adopted from Meinel et al., 2017). In the fourth phase, themes were reviewed by checking whether they worked in relation to the coded extracts in the previous step and the whole dataset. In this phase internal homogeneity and external heterogeneity were checked to see if the codes in each category were meaningfully coherent and the themes were distinguishable.

In the fifth phase, an ongoing analysis was conducted to improve the specifics of each theme and generate a clear definition for each theme. In the final phase, inter-rater reliability was calculated to test the reliability of the coding and categorization (Lombard et al., 2002). One author was involved in the coding. As Campbell et al. (2013) claimed, a single coder codes data in most qualitative research projects. To obtain the intercoder reliability, an additional person was enrolled to code a subsample of the data (15%, depending on the size of the data set, is considered typical) (O'Connor and Joffe, 2020). This subsample was randomly selected to ensure the representativeness of the entire data set. The kappa value for intercoder reliability was substantial for formal-individual activities (κ=0.74) and formal-group

activities (κ=0.79), and almost perfect for informal-group and informal-individual activities (κ=0.90 and κ=0.84, respectively). Finally, data collected from all sources and feedback from informants in the field were used as an additional source of data to support the results.

In stage 1, the systematic observations were carried out with walking on the ABOs using an observation protocol and marking the different types of activities on the printed layout (see Appendix D):

- The level and nature of activities
- The number of people using each space
- The space or workstations used during the activities
- The unattended and disregarded spaces and workstations.

The locations of the different activities were found based on the space used by the employees for each activity. Then, the number of people who used that type of space (e.g., private space) for each activity (e.g., formal-individual: reading, writing, concentrating) was calculated and recorded in an excel file. This process was continued for each activity type occurring in each available space type across all case studies. As an example, Figure 26 depicts one of the cases with the space types used by employees for different activities. The results of the observation process are presented in the next chapter.

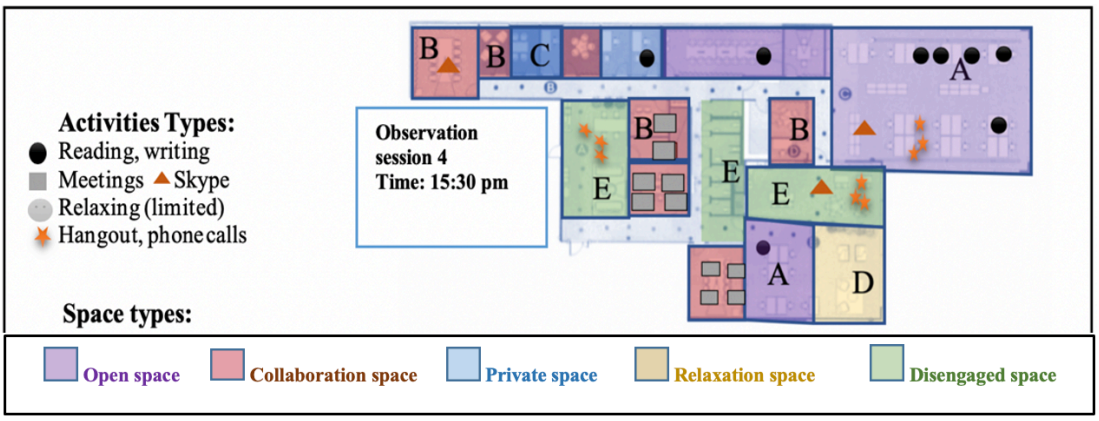


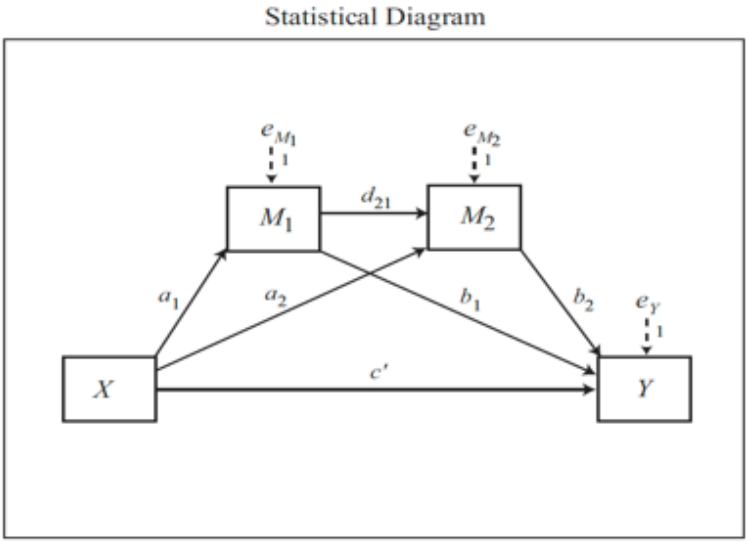
Figure 26. Space types occupied during activities by employees based on one round observation in case 1 (n=30)

In stage 2, quantitative data were collected using the online survey. All information was kept confidential. SPSS 26 statistical software was used for the following analysis.

- Descriptive statistical analysis: descriptive statistical analysis was performed to obtain information about the participants and their demographic characteristics.
- Exploratory Factor Analysis (EFA) with Varimax rotation: in order to reveal the main structure of the measured variables, an EFA was performed. EFA is a technique within factor analysis whose main objective is to identify the main relationships between the measured variables.
- Reliability analysis: the Cronbach's Alpha reliability test was used to measure the internal consistency of each scale. This test shows how

closely a set of items is considered as a group. It is considered a measure of scale reliability.

- Correlation analysis: the degree of association was measured by a correlation coefficient (r) called Pearson's correlation coefficient after its founder. It was performed to measure the linear relationships between variables.
- Regression analysis: regression analysis was used via the SPSS program using the PROCESS program (Hayes, 2013) to test the hypothesized model and mediation effects specifying a 95% confidence interval and 5000 bootstrap re-samples. This part of the study is adopted from Model 6 (see Figure 27) of PROCESS models as suggested by Hayes (2013, p. 446) to explore for further analysis. PROCESS is based on path analysis and does not test a global theoretical model, which is outside the scope of this study. PROCESS provides the ability to directly test the significance of indirect effects and facilitates the estimation of the indirect effect using a normal theory approach and a bootstrap approach to obtain confidence intervals.



Indirect effect of X on Y through M_i only = $a_i b_i$
Indirect effect of X on Y through M_1 and M_2 in serial = $a_1 d_{21} b_2$
Direct effect of X on Y = c'

Note: Model 6 allows up to 4 mediators operating in serial.

Figure 27. Model 6 of the PROCESS models by Hayes (2013, p. 446)

In the next chapter, the results of the study are presented in two stages. The results on stage 1, which takes a qualitative approach with interviews and observation, are presented in the first subsection of the next chapter. Then, the results of the quantitative stage with the questionnaire will be presented.

CHAPTER 6

RESULTS

6.1. Results Related to Qualitative Study

The results, which relate to stage 1, are presented in three sections. The first section presents the demographic characteristics of the participants. The second section addresses CIT interview findings on formal and informal activities at the individual and group levels; for each activity, the types of spaces and interior features that support or hinder creativity are presented. The final section provides information on the results of the observation.

6.1.1. Demographics of Participants in Stage 1

A total of 50 people participated. The majority of participants had a university degree; 46% had a master's degree and 38% had a bachelor's degree (see Table 7). The rest had a high school degree. Educational backgrounds were broad and included business, journalism, engineering, and human resources. The split between male and female participants was almost equal, i.e., 52% were male and 48% were female. The average age was 42 years (SD=10.44 years). A slight majority had been working in an ABO for 6-12 months (50%), 26% for less than 6 months and 24% for 1-2 years. The average time worked in an ABO was 76% of the working week (SD = 20.80).

Table 7. Demographic characteristics of the participants of the study in stage 1

Participant characteristics		Frequency	Percent
Gender			
	Male	**26**	**52%**
	Female	**24**	**48%**
Age			
	18-30	**10**	**20%**
	31-40	**9**	**18%**
	41-50	**19**	**38%**
	51+	**11**	**22%**
	Missing	**1**	**2%**
Education			
	High school	**8**	**16%**
	Bachelor's degree	**19**	**38%**
	Master's or higher	**23**	**46%**
Time spent in this building			
	Less than 6 months	**13**	**26%**
	6-12 months	**25**	**50%**
	1-2 years	**12**	**24%**

6.1.2. CIT Interview results: Influence of ABO physical environment on creative activities.

6.1.2.1. In Formal-Individual Creative Activities

This subsection presents the types of spaces used by participants for formal activities that take place at the individual level. A total of 56 (specific=49, general=7) incidents were collected. On average, participants recalled 1.12 incidents about their formal-individual activities (SD =0.52). Of the 56 incidents, 40 reported that they were able to successfully focus on their creative tasks, and 7 reported concentration problems, and all were in the open, non-silent zone (see Table 8).

Open space. The largest category of space types used for the performance of formal-individual creative activities is open space (semi-silent, library, and silent zones) (36/56).

Private space. This is the official space type and 12 out of 56 incidents were taken place in private spaces for activities like creative writing or concentration.

Collaboration space. Meeting rooms (6/56 in total) as bookable and non-bookable were also used for formal-individual activities.

Disengaged space. In one case it was reported that the kitchen was used for concentration.

Out of office. There was one case that did not find an available and suitable room for this activity in their office and instead stayed at home.

Table 8. Spaces occupied for formal-individual activities in the creative work process in the ABO (n = 50, total incidents=56)

Categories of spaces	Frequency (P)	Outcome	
		Could	Couldn't
1. Open space:	**(36/56)**	**(25/56)**	**(7/56)**
a) Semi silent	23	14	7
b) Silent/library	13	11	
2. Private space:	**(12/56)**	**(11/56)**	
a) Single room	12	11	
3. Collaboration space:	**(6/56)**	**(2/56)**	
a) Bookable	4	2	
b) Not bookable	2		
4. Disengaged space:	**(1/56)**	**(1/56)**	
a) Kitchen	1	1	
5. Any place out of office:	**(1/56)**	**(1/56)**	
a) Home	1	1	
Total incidents	**56**	**40/56**	**7/56**

The largest category of supporting interior features for formal-individual creative activities is ***spatial layout*** (53/122). Subcategories are social distraction-free (19/122), space location (13/122), privacy (11/122) and space openness (10/122) (see Table 9). Some examples of comments on this category are given below:

- Distraction-free: "*I sat there (the library), and nobody found me, (...) When I sit there, colleagues reach out to me via email, but when I sit in a private room, they come in person, which is distracting when I am focusing on a problem*." (N- C(1-3): from now on the first number stands for the participant code and "C(1,2 or 3) for the case study number).
- Visual privacy: "*There was a wall behind me that means safe, not people going behind me*" *(7-C2).*
- Layout: *"The workstation is near the kitchen if I wanted something" (23-C3).*

The second largest category of supporting interior features for formal-individual creative activities is ***tangible office elements*** account for 36 out of 122 total supporting features, with window/view (13/122) and office equipment (11/122), decoration and design (8/122), and furniture (4/122) as the subcategories.

- Window: *"Window to the outside was important to me" (21-C3).*
- Equipment: *"Well equipped with 3 screens for my work" (26-C3).*

As a supporting feature, ***ambience office elements*** (33/122) is the third category. Positive sound (26/122) and light (7/122) the subcategories.

- Sound-level: "*No one disturbs you in the silent zone, and it is quiet, no talking and chatting, no phone is allowed. It is an excellent place for concentration*" *(4-C1)*.
- Light: "*I was sitting there, facing the outside, which gives natural light*" *(22-C3)*.

Table 9. Interior features supporting or hindering formal-individual creative activities in the ABOs (n=50, total incidents=56)

	Supporting interior features			Hindering interior features	
	Category/Subcategory + **Details**	**P of total supporting features**		**Category/Subcategory** – **Details**	**P of total hindering features**
1	**Spatial layout**	**53/122**	**1**	**Tangible office elements**	**17/45**
a)	**Social distraction-free** + *No social distraction*	**19/122**	a)	**Equipment** • **High-tech** – *Technical issues /monitors* – *More speaker/ headphone* • **Low-tech** – *Lockers are too small*	**6/45**
b)	**Space location** + *Close to window or behind* + *Close to kitchen/locker*	**13/122**	b)	**Window/View** – *No window* – *No transparency*	**4/45**
c)	**Privacy** + *Visual privacy* + *Acoustical privacy* + *General Privacy*	**11/122**	c)	**Decoration and design**	**4/45**
d)	**Space openness** + *Visible for team* + *Seeing colleagues*	**10/122**	d)	**Furniture** – *Ergonomic issues* – *Have to carry ergonomic supports* – *No support under my foot*	**3/45**
2	**Tangible office elements**	**36/122**	**2**	**Spatial layout**	**15/45**
a)	**Window/View** + *Window view* + *Transparency between spaces*	**13/122**	a)	**Social distraction**	**8/45**
b)	**Equipment** + **High-tech** + **Low-tech**	**11/122**	b)	**Privacy** – *Visual privacy* – *Acoustical privacy* – *General Privacy*	**5/45**
c)	**Decoration and design** + *Pleasant design*	**8/122**	c)	**Space location** – *Library in open area*	**2/45**
d)	**Furniture** + *Adjustable desks and chairs*	**4/122**	d)	**Space openness** – *Openness is distracting*	**2/45**
3	**Ambience office elements**	**33/122**	**3**	**Ambience office elements**	**13/45**
a)	**Sound-level** + *Quiet/ Low noise level* + *Headphone*	**26/122**	a)	**Sound-level** – *Distracting noise*	**8/45**
b)	**Light** + *Daylight*	**7/122**	b)	**Light** – *No daylight* – *Glare* – *Desk light*	**3/45**
			c)	**Air quality** – *No ventilation/air movement*	**2/45**
	Total supporting features	**122**		**Total hindering features**	**45**

In terms of hindering interior features for formal-individual creative activities, ***tangible office elements*** is the largest category (17/45), relating to lack of equipment (6/45), windows/view (4/45), decoration and design (4/45) and furniture (3/45) (see Table 10). Representative statements are listed below:

- Equipment: *"But we also have IT challenges technical limitation. You should spend time to unplug and plug the computer and connect it somewhere else. You do not have opportunity to move around because of technical issues. It takes time. That's why I did not change my seat, but I could not concentrate" (2-C3).*
- Window/view: "*It does not have any transparency and no window to the corridor, I don't like it. I feel totally separated. I worked there for 3 hours and I felt isolated" (4-C1).*
- Furniture: *"My neck was sorted because the chair was bad. My neck had no support"*.

The third category within hindering interior features for formal-individual creative activities is ***ambience office elements*** (13/45) with subcategories of negative sound (8/45), light (issues) (3/45), and air quality (issues) (2/45).

- Unwanted sound: "*I was in the middle of the two people talking to each other over me. I can ignore background noise, but not that much noise" (2-C3).*
- Air quality: *"No air movement" (3-C2).*

6.1.2.2. In Informal-Individual Creative Activities

The space types related to informal-individual activities, e.g., relaxation and chill-out during creative activities were analyzed (see Table 10). A total of 51 (specific=30, general=21) incidents were reported. On average, participants recalled 0.9 incidents (SD =0.31). Among all participants, 2 individuals reported that they never used a relaxation room or were relaxed at work "*I am not good at relaxing when I am working".* There were also comments about not being informed that there was a relaxation area in the office, for example: "*I didn't see a relaxation area in our office*" (10-C1). In addition, there were some comments around concern about the judgement of others about the use of relaxation rooms at work: *"It seems odd to go to relaxing rooms", or* "*It is very obvious that when you are there you are not working. Even men could make joke of softer side. People avoid that" (17-C3).*

For ***disengaged space***, 16 out of 51 participants mentioned spaces such as kitchens/coffee areas and lobbies as spaces to conduct informal-individual activities. The home, coffee shop, and public library are the places employees might use because of the flexibility offered by technology and NewWow. Going home, walking, and biking are 11 of 51 of the places used for relaxation.

- *"If I feel I really want that thing then I go home and work from home-have control on my timing. It is good to have opportunity to timing my work that is the thing that make us creative"(7-C2).*

Only 10/51 of all participants used ***relaxation spaces*** for relaxing.

- *"We don't use relaxation room because we cannot talk or have phone call there.*
- *I cannot see a good place in my office for that if I want to get relax, I go out of the office" (7-C1).*

Open space. Semi silent areas and silent areas were also used for relaxation (7/51).

Private space. In this case, this category (4/51) refers to single rooms and semi-private sofas.

Collaboration space. In the non-bookable meeting room, in the telephone booth and in the bookable meeting room, there was one case each that used these rooms for relaxation (3/51).

Table 10. Spaces occupied for informal-individual activities in the creative work process in the ABO (n = 50, total incidents=51).

Categories of spaces	Frequency (P)
1) Disengaged space	**(16/51)**
a) Kitchen/Coffee area/Sofa	16
2) Out of office	**(11/51)**
a) Go home/Walk/ Ride bicycle	11
3) Relaxation space	**(10/51)**
a) Wellbeing room	10
4) Open space	**(7/51)**
a) Semi-silent	1
b) Silent	6
5) Private space	**(4/51)**
a) Single room	4
6) Collaboration space	**(3/51)**
a) non-bookable/bookable	3
Total incidents	**51**

Interior features found to either support or hinder informal-individual activities enhancing the creativity process in the office (see Table 11). ***Spatial layout*** is the largest category within the supportive interior features, accounting for 21 of a total of 41 supportive interior features, with privacy, distraction-free, and office layout as subcategories.

- Privacy: *"I close the blinds and rest for 30 minutes" (3-C2).*
- Distraction-free: *"The fact that you are isolated and that you are not disturbed is helpful" (25-C3).*

Tangible office elements is the second largest category within supporting interior features (15/41) and its subcategories are window/views and furniture here refers to relaxing and informal furniture.

- Furniture: *"Cubicle furniture I used to relax; they were comfortable. I had the computer on my lap to relax" (8-C3).* Cubicle furniture is the term used here to describe back-high chairs in the shape of a cube designed to provide employees with a degree of privacy.

Ambiance office elements category accounts for 12% as a supporting characteristic. This subcategory refers to low noise levels and light.

- Sound-level: *"I stayed there that I needed a quiet place to relax and refresh"* (8-C3).

Table 11. Interior features supporting or hindering informal-individual creative activities in the ABOs (n=50, total incidents=51)

	Supporting interior features			Hindering interior features	
	Category/Subcategory + **Details**	**P of total supporting features**		**Category/Subcategory** – **Details**	**P of total hindering features**
1	**Spatial layout**	**21/41**	**1**	**Tangible office elements**	**9/16**
a)	**Privacy** + *Visual* + *General*	**15/41**	a)	**Decoration and design** – *Not cozy design* – *No pictures*	**5/16**
b)	**Distraction-free** + *No social distraction*	**3/41**	b)	**Furniture** – *Not ergonomic table* – *Not adjustable furniture*	**4/16**
c)	**Space location** + *Close to the kitchen/nearby/open area*	**3/41**			
2	**Tangible office elements**	**15/41**	**2**	**Ambiance office elements**	**5/16**
a)	**Window/view**	**10/41**	a)	**Sound-level** – *No conversation* – *No policy for phone call*	**5/16**
b)	**Furniture** + *Support laying down* + *Support working*	**5/41**			
3	**Ambiance office elements**	**5/41**	**3**	**Spatial layout**	**2/16**
a)	**Sound-level** + *Quiet* + *Headphone* + *low noise level*	**5/41**	a)	**Space location** – *Hidden space* – *Far space*	**2/16**
	Total supporting features	**41**		**Total hindering features**	**16**

Tangible office elements for the hindering interior design features (9/16) are furniture that indicates not comfortable working in relaxed positions and decorative elements that indicate a perceived lack of interior design such as pictures or colors or have, for example, only the colors gray and white as subcategories.

- Furniture: *"I had some meetings in a relaxing room, but I couldn't take notes. I love the chairs, but it is not proper for working just for relaxing" (5-C1).*
- Decoration and design: *"It is not a cozy room in that sense; it is like a*

dentist waiting room. It is not comfortable at all" (1-C3).

Among the ***ambience office elements*** within the hindering interior features, intangible office elements are the largest category (5/16), referring to being in an area where speaking is not allowed.

- Sound: *"Relaxation zone is in the silent room, so you don't want to go there because you can't speak it's hidden in the silent room and you can't make a sound*" (5-C1).

Spatial layout, for hindering features (2/16), refers to when relaxation areas are distant or difficult to reach for some reason.

- Office layout: *"The building is really long. From the kitchen to relaxing room is 150 meters. It is a matter of distance*" (3-C2).

6.1.2.3. In Formal-Group Creative Activities

The types of spaces used for formal-group creative activities were analyzed (see Table 12). A total of 63 incidents (specific=58, general=5) were collected about formal-group activities and on average participants recalled 1.28 incidents (SD =0.58). Of these 63 incidents, 37 were successful in completing their creative tasks.

Collaboration space. These spaces were mentioned as 54 out of a total of 63 incidents. The meeting rooms were designed for meetings, with projector and

monitor, video conferencing equipment, cloud-based video, web and audio-conferencing equipment were available in most cases.

Open space. Open collaboration zone used for 5/63 of incidents.

Private space. Single rooms as a type of private spaces category declared as 2/63 of all incidents.

Disengaged space. Also 2 out of 63 of work-related meeting happened at the kitchen or around it.

Table 12. Spaces occupied for formal-group activities in the creative work process in the ABO (n = 50, total incidents=63).

Categories of spaces	Frequency (P)	Outcome Could	Couldn't
1. Collaboration space	**(54/63)**	**(33/63)**	**(2/63)**
a) Bookable meeting room	39	19	2
b) Fast meeting room	13	12	
c) Dou focus room	1	1	
d) Phone box	1	1	
2. Open space	**(5/63)**	**(2/63)**	
a) *Open collaboration zone*	5	2	
3. Private space	**(2/63)**	**(1/63)**	
a) Single room	2	1	
4. Disengaged space	**(2/63)**	**(1/63)**	
b) Kitchen	2	1	
Total incidents	**63**	**37/63**	**2/63**

Interior features that either support or hinder formal-group activities are presented in Table 13. ***Tangible office elements*** are the largest category of supporting interior features at 54/105; office equipment (29/105), furniture (13/105), decoration and design (8/105), and windows/view (4/105) are subcategories. Some representative responses were:

- Space size: *"It is good for move around and works on the whiteboard for a creative meeting" (7-C1).*
- Furniture*: "Sitting in a more relaxed way to have a meeting is good in these rooms that furniture is informal. Think a lot, discuss and be creative" (8-C2).*
- Window/view*: "I had a window view of the train station" (8-C2).*

Spatial layout category accounts for the second largest proportion of incidents within the supporting interior features (36/105), with the largest subcategories are space size and layout (11/105), privacy (11/105), space location (10/105), social distraction-free (4/105), space openness (3%).

- Space size: *"Best function to have video equipment not too close to the camera, of you so close to camera people could only see one people, so the shape and size of the room is important for video calls" (8-C1).*
- Privacy*: "We had confidential information on monitors. This room is isolated [...] if you use the curtain, it is okay" (9-C1). In addition, there is an interesting comment about the level of transparency between spaces and its effect on privacy; "We have blinds on the windows at eye level so people*

can't see inside when they walk past. soundproof (in the old office we could hear through the walls)" (7-C3).

- Space location: *"The meeting room is in the corner, it is a good thing to be a little bit private in the meeting, you lose focus when people are passing by all the time" (7-C2).*
- Socially distraction-free: *"You get distracted and lose focus when people keep walking past, so I sat facing the window" (8- C2).*

As a supporting feature, ***ambience office elements*** category stands for 15/105, with light (6/105) referring to daylight and artificial light, sound (4/105) referring to the speech policy that enables conversation possible, color (3/105) and air quality (2/105) as subcategories.

Table 13. Interior features supporting or hindering formal-group creative activities in the ABOs (n=50, total incidents=63)

Supporting interior features			Hindering interior features		
	Category/Subcategory Details	**P of total supporting features**		**Category/Subcategory Details**	**P of total hindering features**
1	**Tangible office elements**	**54/105**	**1**	**Tangible office elements**	**31/49**
a)	**Equipment**	**29/105**	a)	**Equipment**	**15/49**
	• **High-tech**			• **High-tech**	
	+ *Big screens*			– *Screen issues*	
	+ *easily connecting to monitors*			– *Lack of speakers*	
	+ *Speakers*			– *Lack microphone*	
	+ *Microphone*			– *No instruction for high-tech*	
	+ *Supporting equipment*			• **Low-tech**	
	• **Low-tech**			– *No whiteboard*	
	• *White board*				
b)	**Furniture**	**13/105**	b)	**Furniture**	**13/49**
	+ *Informal furniture*			– *Difficulty with adjusting/or not adjustable*	
	+ *Adjustable for different positions*			– *Broken wheels (not flexible)*	
	+ *Ergonomic table*			– *Small/round table (not support tasks)*	
c)	**Decoration and design**	**8/105**			
	+ *Informal design*				
	+ *Cozy*				
d)	**Window/view**	**4/105**	c)	**Window/view**	**3/49**
	+ *Window*			– *Need window*	
	+ *Transparency*				
2	**Spatial layout**	**36/105**	**2**	**Spatial layout**	**14/49**
a)	**Space size and layout**	**11/105**	a)	**Privacy**	**5/49**
	+ *Space size supports small and big meeting*			– *Visual*	
	+ *Space size supports virtual meeting*			– *Speech confidential data*	
b)	**Privacy**	**11/105**	b)	**Space size and layout**	**4/49**
	+ *Visual*			– *Personal distance*	
	+ *General*		c)	**Social distraction**	**3/49**
c)	**Space location**	**10/105**		– *Social Movement*	
	+ *Closest to us/kitchen*		d)	**Space location**	**2/49**
	+ *Corner/end of the corridor*			– *Far space*	
d)	**Social distraction-free**	**4/105**			
	+ *No social distraction*				
3	**Ambience office elements**	**15/105**	**3**	**Ambiance office elements**	**4/49**
a)	**Light**	**6/105**	a)	**Air quality**	**4/49**
	+ *Daylight*			– *Hot air*	
	+ *Artificial light*			– *No ventilation*	
b)	**Sound-level**	**4/105**			
	+ *Quiet*				
c)	**Color**	**3/105**			
	+ *Stronger colors like red*				
d)	**Air quality**	**2/105**			
	+ *Ventilation and air*				
	+ *Fresh air through window*				
	Total supporting features	**105**		**Total hindering features**	**49**

For hindering interior features, ***tangible office elements*** are the most represented with 31 out of a total of 49 hindering features, referring to the lack of or problems with some equipment (15/49), problems with furniture (13/49), such as not being adjustable or ergonomic, and windows/views (3/49). In terms of high-tech equipment, there were some problems with the screen, lack of speakers/microphones and difficulties in using the new video system due to lack of clear instructions;

> *"I had a meeting, I had a double screen, and I called a colleague, but no one got along, and in the end, we only used one of the screens, so it would be good to have a manual explaining how to use it" (19-C3).*

Other represented examples of some replies were:

- Equipment*: "In terms of low-tech equipment, the most important factor mentioned in the interviews was the lack of a whiteboard. "We missed having a whiteboard when we wanted to be creative" (5-C1).*
- Furniture: *"2 hours in there with those high chairs, they were not comfortable for long meetings, I got back pain" (13-C1).*
- Window/view*: "There was no window in the room and no sunlight" (19-C3).*

Spatial layout accounts for 14 of a total of 49 hindering features, also with privacy (5/49), space size and layout (4/49), social distraction (3/49), and space location (2/49) as subcategories.

- Privacy and distraction: *"People could stare into the room, also it is a bit bad noise insulation" (1-C2).*

- Privacy: *"Acoustic privacy is too bad you can hear people in meeting rooms" (2-C2).*
- Social distraction: *"Doors and glass walls are completely transparent. You see people passing by and smile and wave. It is distracting and disturbing" (5-C2).*
- Space layout/arrangement: *"I did not understand the purpose of the room. We used it for morning meetings, in the beginning it was like the old co-worker sitting there, like listeners, and our boss stood in the front and led the meeting". "Before that it was much more coworking, everyone was involved, in the beginning the space couldn't contribute to coworking because you sit in a row and don't face each other and talk, it's more like someone presenting something rather than collaborating"* (1-C2).

And also, another comment about the same meeting room:

> *"Since we know each other, it was okay, but if you do not know each other, you cannot sit that much close"* (10-C2).

- Office layout: *"Yesterday, we were in the open area at the lunch table, it was a formal meeting [...], We didn't go to a regular meeting room because it needs the extra effort of going to the second floor, and they are out of sight" (2-C2).*

Ambience office elements. this category stands for 4/49 of the hindering interior features, with air quality as its only subcategory.

- Air quality: *"Air conditioners did not work. So hot air and no fresh air" (13, C1).*

6.1.2.4. In Informal-Group Creative Activities

A total of 44 incidents (specific=37, general=7) were mentioned about informal-group activities like hangout. On average, each participant recalled 0.9 incidents (SD =0.65) (see Table 14). Some participants stated as a result of their informal interaction, "*It helped to get rid of the mind blocks and help feel at ease*" (23-C3).

In most incidents, respondents mentioned the kitchen, which is the ***disengaged space*** type of space for informal gathering and hanging out. The remaining incidents occurred in the reception area or on the semi-private sofa near the kitchen area.

> *"There were four of us sitting on the kitchen couch, it was spontaneous, and we were talking about something, and then we just brainstormed. Then we had a meeting about it."* (10-C2).
>
> *"I meet people when I am in the kitchen"* (10-C1).

Table 14. Spaces occupied for informal-group activities in the creative work process in the ABO (n = 50, total incidents= 44).

Categories of spaces	Frequency (P)
1. **Disengaged space**	**44/44**
a) Kitchen-Coffee place	30
b) Sofa in open area (semi-private or not)	6
c) Reception	5
d) Other (outside of the office)	3
Total incidents	**44**

Interior features were found to either support or hinder informal- group activities (e.g., hangout or play) during the employee creativity process (see Table 15).

Tangible office elements as a supportive feature are the largest category at 47/83. The subcategories are equipment refers to coffee machine as the most important supporting feature for meetings, appropriate furniture and environmental design.

- Equipment: *"Around the coffee machine, it is a good idea to open up" (19-C3).*
- Decoration and design: *"(In this kitchen) you feel invited to be a bit more informal" (23-C3).*
- Decoration and design: *"It comes naturally, that's the way this environment is designed, because of the big kitchen. Kitchen it becomes relaxed and relaxing informal atmosphere"* (8-C2).

Within the supporting interior features, **spatial layout category** contains 29 of 83 supporting features. The subcategories are privacy, openness, space location, distraction-free, and space layout.

- Openness: *"You can see all the area and control all the area" (6-C2).*
- Distraction-free*: "Closed both doors and did not disturb anyone while informally meeting and hanging out" (3-C1).*
- Privacy: *"Close couch (high-backed sofa), we want to feel a bit private"* (6-C3).

Ambiance office elements is the last category for supporting interior features is ambiance office elements (7/83) with sound-level as a subcategory.

Table 15. Interior features supporting or hindering informal-group creative activities in the ABOs (n=50, total incidents=44)

Supporting interior features			**Hindering interior features**		
	Category/Subcategory + Details	P of total supporting features		Category/Subcategory – Details	P of total hindering features
1	**Tangible office elements**	**47/83**	**1**	**Tangible office elements**	**5/9**
a)	**Equipment** + *Coffee machine*	**21/83**	a)	**Furniture** – *Not ergonomic furniture*	**5/9**
b)	**Furniture** + *The big table for discuss* + *High back couch* + *Comfortable chairs for sit*	**14/83**			
c)	**Decoration and design** + *Cozy/inviting* + *Informal*	**12/83**			
2	**Spatial layout**	**29/83**	**2**	**Spatial layout**	**2/9**
a)	**Privacy** + *Visual* + *Acoustical*	**9/83**	a)	**Distraction** – *Distracting others*	**2/9**
b)	**Openness** + *Space has no wall to be divided* + *Space is open and visible*	**6/83**			
c)	**Space Location** + *Space is in the middle of the building* + *Space is close to coffee machine*	**6/83**			
d)	**Distraction-free** + *Not disturbing others with noise of hangout*	**5/83**			
e)	**Space size** + Big space	**3/83**			
3	**Ambiance office elements**	**7/83**	**3**	**Ambiance office elements**	**2/9**
a)	**Sound-level** + *OK to talk and laugh loudly*	**7/83**	a)	**Sound-level** – *Cannot talk too loudly*	**2/9**
	Total supporting features	**83**		**Total hindering features**	**9**

For hindering interior features for informal-group creative activities in informal groups, ***tangible office elements*** are represented as the first category with 5/9, and tangible office elements have only furniture as a subcategory.

- Furniture: *"I miss a proper sofa for hang out around the kitchen"* (1-C1).

Spatial layout is the second category of hindering interior features (2/9), which includes social distraction as a subcategory, which in this case means that a social distraction related to the environment does not allow employees to have a higher noise level to hang out and this interferes with their hanging out activities.

- Distraction: *"We felt we were disturbing people sitting nearby" (2-C2).*

Ambiance office elements is the last category for hindering interior features (2/9) with sound-level as a subcategory. This category mainly refers to complaints about not being able to speak too loudly due to the space layout mentioned in the previous point.

6.1.3. Observation

Information about space types and the activities performed in each space types was collected in a total of 12 observation rounds (4 rounds for each case). Figure 28 shows the total number of activities in each space type in four activity groups based on the observation results of three cases. A total of 556 activities (255 formal individuals, 206 formal-group, 94 informal-group and only one informal-individual) were recorded. These were daily activities of knowledge workers that have creative potential. Therefore, not all observed activities were specifically creative. The

observation results show that open spaces (145/255) and private spaces (47/255) were mainly used for formal individual activities. Bookable meeting rooms (193/208) and non-bookable meeting rooms (39/208) were mainly used for formal-group and virtual meetings. One person was observed sitting alone and relaxing in the kitchen. This limitation in observation could be due to individuals not wanting to show others that they were not working. Overall, 86 out of 94 individuals were observed hanging out in the kitchen. In addition to the creative spaces mentioned in the literature, ABOs also provide open spaces (De Been and Beijer, 2014) to support collaboration, with additional semi-open workstations in silent zones for focused work. As this study considers ABOs as a setting for analysis, the creativity potential of their open spaces was also assessed.

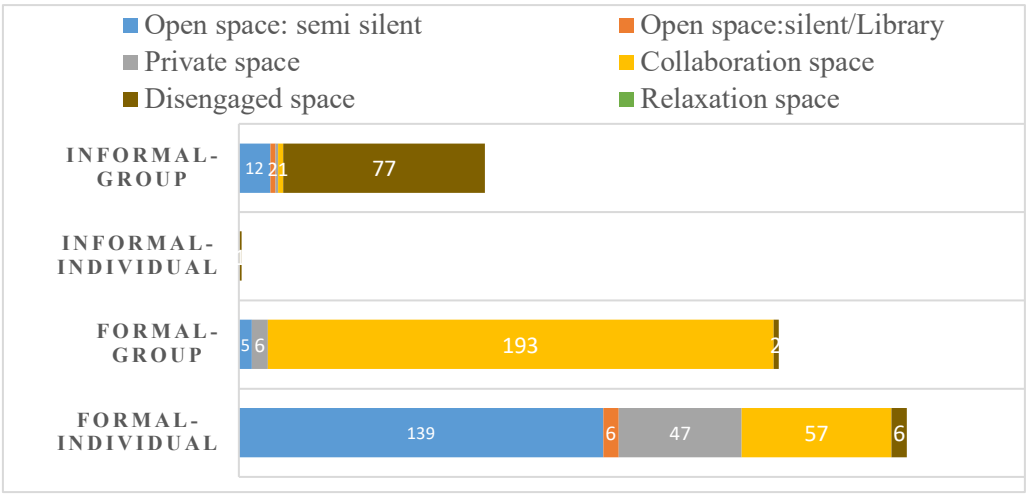


Figure 28. Space types occupied during activities based on the observations in three case studies (n=556)

The following protocol refers to Case 1, which was conducted on a random weekday and lasted one hour (11:00 to 12:00). There is some information about the availability and use of the different types of spaces in cases. According to this protocol (see Table 16), two of four individual rooms were occupied during this event. Three of the small meeting rooms (one was under construction) were occupied. Three of the large meeting rooms were occupied. Field notes and observation schedules used during the systematic observations were reviewed and compiled to extract the space usage, including the number of workstations available, reserved, and occupied. The data obtained from the observations were used as a secondary and additional source to match the interview findings on the types of activities and space use of space in ABOs. It also helped the author to become familiar with the environmental routines and the actual use of the different spaces by the employees. This was valuable in enhancing the validation and discussion of the findings.

Table 16. Observation protocol giving some information about availability of different spaces (n=33), (time: 11:00-12:00)

Space type	Occupied	Reserved	Available	No. of workstations
Private room	1	No ✗	No ✗	1
Open space (semi-silent)	12	No ✗	Yes ✓	20
Small meeting room	2	Yes ✓	No ✗	4
Private room	1	No ✗	No ✗	1
Small meeting room	2	Yes ✓	No ✗	4
Big meeting room	4	Yes ✓	No ✗	10
Big meeting room	2	Yes ✓	No ✗	10
Small meeting room	3	Yes ✓	No ✗	4
Big meeting room	4	Yes ✓	No ✗	6
Open space (silent zone)	2	No ✗	Yes ✓	6
Relaxation space	0	No ✗	Yes ✓	-
Reception	0	No ✗	Yes ✓	-

6.2. Results Related to Quantitative Study

6.2.1. Demographics of Participants in Stage 2

The gender ratio of participants was 56.3% women, 37.9% men, 0.6% uncertain, and 5.2% did not want to answer. The mean of participants' work experience was 21 years (SD = 9.05). Most participants had a university degree (83.1%). Nearly one in five participants worked as a manager (17.9%), and the rest worked in non-managerial positions without personnel responsibility (82.1%). The demographic characteristics of the sample are shown in Table 17.

Table 17. Demographic characteristics of the participants in stage 2

Participant characteristics		Frequency	Percent
Gender	Male	**66**	**37.9%**
	Female	**98**	**56.3%**
	Uncertain	**1**	**0.6%**
	Do not want to answer	**9**	**5.2%**
	Missing	**12**	
Education	Elementary school	**1**	**0.6%**
	High school	**28**	**16.3%**
	University and higher	**143**	**83.1%**
	Missing	**14**	
Work Experience years	1-5 years	**10**	**6.2%**
	6-10 years	**17**	**10.5%**
	11-20 years	**48**	**29.6%**
	21-30 years	**69**	**42.6%**
	More than 30 years	**18**	**11.1%**
	Missing	**24**	
Executive responsibility (Manager)	Yes	**31**	**17.9%**
	No	**142**	**82.1%**
	Missing	**13**	

6.2.2. Exploratory Factor Analysis

Exploratory factor analysis with varimax rotation was applied for each scale. Following Field's (2013) advice, “factor loadings below 0.3 are suppressed” (p. 692). All retained factors should have at least three items with loadings greater than 0.4. In addition, the proportion of total variance explained by retained factors should be at least 50% (Costello and Osborne, 2005; Streiner, 1994; Tabachnick and Fidell 2014).

Group Creativity and Innovation

Exploratory factor analysis with varimax rotation yielded one factor that accounted for 71.82% of the variance (KMO=0.90) (Table 18). The factor was composed of all six items (Table 19). There were no floor or ceiling effects. Group creativity was calculated as the mean of the scores of all six items for each participant; high scores represent high-perceived group creativity.

Table 18. Total Variance Explained for group creativity and innovation

	Initial Eigenvalues			Extraction Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.310	71.826	71.826	4.310	71.826	71.826
2	0.519	8.648	80.473			
3	0.363	6.043	86.516			
4	0.310	5.162	91.678			
5	0.268	4.465	96.142			
6	0.231	3.858	100.000			

Extraction Method: Principal Component Analysis.

Table 19. Factor analysis result for group creativity and innovation

Items	Factors
1. Colleagues in the office promote and champion ideas to each other or to other people	0.861
2. We develop creative ideas.	0.860
3. Colleagues in the office are innovative	0.854
4. Colleagues in the office we investigate and secure funds needed to implement new ideas	0.845
5. We develop adequate plans and schedules for the implementation of new ideas	0.833
6. We search for new product ideas.	0.832

Extraction Method: Principal Component Analysis.

Job Autonomy

Exploratory factor analysis with varimax rotation revealed one factor accounting for 73.23% of the variance and KMO= 0.68 (Table 20), confirming the one-factor structure of the scale (Table 21). There were no floor or ceiling effects. Therefore, job autonomy was calculated as the mean of the scores of all three items; high scores represent high-perceived job autonomy of employees.

Table 20. Total Variance Explained for job autonomy

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.197	73.235	73.235	2.197	73.235	73.235
2	0.507	16.908	90.143			
3	0.296	9.857	100.000			

Extraction Method: Principal Component Analysis.

Table 21. Factor analysis result for job autonomy

Items	Factors
1. I feel able to follow leads and hunches that may arise during a project.	0.900
2. I am free to decide how I will approach tasks.	0.850
3. I am free to determine how I will allocate my time each day.	0.815

Organizational Commitment

Exploratory factor analysis with varimax rotation yielded one factor, accounting for 56.64% of the variance and KMO= 0.91 (Table 22). Thus, it is confirming the one-factor structure of the scale (Table 23). There were no floor or ceiling effects.

Therefore, organizational commitment was scored as the mean of the score on all nine items; high scores represent high-perceived organizational commitment of employees.

Table 22. Total Variance Explained for organizational commitment

	Initial Eigenvalues			Extraction Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	5.098	56.647	56.647	5.098	56.647	56.647
2	.922	10.240	66.887			
3	.657	7.302	74.189			
4	.642	7.129	81.317			
5	.429	4.767	86.085			
6	.385	4.278	90.362			
7	.373	4.146	94.509			
8	.291	3.228	97.737			
9	.204	2.263	100.000			

Extraction Method: Principal Component Analysis.

Table 23. Factor analysis result for organizational commitment

Items	Factors
1. I talk up this organization to my friends as a great company to work for.	0.847
2. I find that my values and my organization 's values are very similar.	0.837
3. I am proud to tell others I am part of my organization.	0.824
4. My organization brings out the best in me and makes me perform on top.	0.822
5. I am very happy that I chose to work for this organization compared to other organizations I chose between when applying for a job.	0.792
6. I care about the fate of my organization.	0.773
7. In my opinion, my organization is the best possible employer for which you can work	0.698
8. I am willing to put in a great deal of effort beyond what is normally expected in order to help your organization be successful.	0.658
9. I would accept almost any type of job assignment in order to keep working for your organization.	0.426

ABO Physical Environment Satisfaction

Exploratory factor analysis with varimax rotation yielded five factors accounting for 71.41% of the variance, with a KMO value of 0.89 (see Table 24 and 25, for details). There were no floor or ceiling effects. The first factor consists of nine items (disengaged spaces, meeting spaces, presentation spaces, relaxation spaces, play spaces, private spaces, space size, principles that allow the use of different spaces, seclusion from others in open space). This factor seemed to touch on the types of space and comfort for users and was referred to as 'Space Quality'.

The second factor includes seven items that deal with environmental quality. These items include winter and summer temperature, air quality and temperature, daylight and artificial lighting, and sound level. Accordingly, the second factor is referred to as 'Indoor Environmental Quality'.

The third factor consists of five items. This factor is designed to address employees' perceived privacy and control over space. These items are the degree of visual privacy, auditory privacy, control over the desired level of social interaction and privacy, control over the personal design and decoration of the space, and control on adapting air conditioning and lighting control systems. Therefore, this factor is called 'Privacy and Control'.

The fourth factor consists of five items dealing with office interior design issues, including warm colors (e.g., orange, red and yellow), cold colors (e.g., green, blue and violet), aesthetic values, decorative elements, and the presence of plants. Therefore, this factor is referred to as 'Interior Design Elements'. The last factor consists of five items dealing with the functionality of equipment in ABOs and is referred to as 'Space Equipment'. This factor includes the presence of high-tech equipment (e.g., audio-visual display devices or wireless connectivity), low-tech equipment (such as flipcharts or whiteboard), comfort, adjustability and variety of furniture in the office.

Three items were excluded because they had weights lower than 0.4 or were not included in any factor. These items were storage spaces, openness of spaces in terms of being able to easily find colleagues to meet them, and spatial layout and design. ABO Satisfaction with physical environment was scored as the mean of the scores of all 31 items (three items were excluded based on the results of the factor analysis); high scores represent high perceived satisfaction with ABO physical environment (see Figure 29).

Table 24. Total Variance Explained for ABO physical environment satisfaction

Total Variance Explained									
Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	15.014	48.432	48.432	15.01	48.432	48.432	5.591	18.036	18.036
2	2.934	9.463	57.895	2.934	9.463	57.895	5.272	17.006	35.042
3	1.649	5.320	63.215	1.649	5.320	63.215	4.295	13.855	48.897
4	1.421	4.585	67.800	1.421	4.585	67.800	3.948	12.735	61.632
5	1.120	3.614	71.414	1.120	3.614	71.414	3.033	9.783	71.414
6	.983	3.170	74.584						
7	.904	2.915	77.499						
8	.780	2.515	80.015						
9	.650	2.096	82.111						
10	.551	1.776	83.886						
11	.546	1.762	85.648						
12	.476	1.535	87.183						
13	.422	1.361	88.544						
14	.398	1.283	89.827						
15	.381	1.230	91.057						
16	.312	1.007	92.064						
17	.295	.953	93.016						
18	.287	.925	93.941						
19	.249	.804	94.745						
20	.234	.755	95.500						
21	.217	.699	96.198						
22	.212	.685	96.884						
23	.174	.560	97.444						
24	.160	.516	97.960						
25	.144	.465	98.425						
26	.123	.395	98.820						
27	.108	.348	99.168						
28	.088	.285	99.452						
29	.068	.220	99.672						
30	.058	.186	99.859						
31	.044	.141	100.000						

Table 25. Factor analysis result for ABO physical environment satisfaction

What extent are you satisfied with the following physical environment elements in your current office?	1	2	3	4	5
1. Space quality					
The disengaged spaces for hang out and break	0.84				
The spaces for meetings and ideas (open, semi open, closed)	0.82				
The spaces for your relaxation/chill-out	0.72				
Space for presentation (open, semi open, closed)	0.71				
The playing spaces e.g., table soccer and table tennis	0.66				
The private for concentration	0.63				
Principles allow for using different spaces (desk-sharing and speech policies)	0.60				
The possibility of working secluded from view of others in open space	0.54				
The size of spaces for receiving visitors and team activities	0.49				
2. Indoor Environmental Quality (IEQ)					
Temperature conditions of your work area in winter		0.81			
Temperature conditions of your work area in summer		0.80			
The amount of daylighting		0.79			
The overall air quality (fresh air, ventilation)		0.77			
The amount of artificial lighting		0.67			
The quietness level of work stations (noise level)		0.55			
General acoustic, ability to understand desired sounds		0.52			
3. Privacy and Control					
The acoustic privacy at your work place			0.77		
The degree of visual privacy regarding walls, separation panels and furnishings			0.75		
The control over your required level of privacy and social interaction			0.70		
Control over personalize and decorating your workspace			0.58		
Control on adapting air conditioning and lighting control system			0.55		
4. Interior Design Elements					
The presence of cool colors (e.g., Blue, green)				0.83	
The presence of warm colors (e.g., Yellow, red)				0.80	
The presence of decorative elements (books, art work)				0.43	
Overall aesthetics				0.64	
The presence of natural plants and flowers				0.56	
5. Space Equipment					
The adjustability of height of tables and chairs					0.79
The presence of high technology and monitors (display tools, internet)					0.60
The comfortability of office furniture (chairs, desks, cabinets)					0.59
The presence of low technology (whiteboards)					0.53
The variety of seating options (chairs, sofas)					0.46

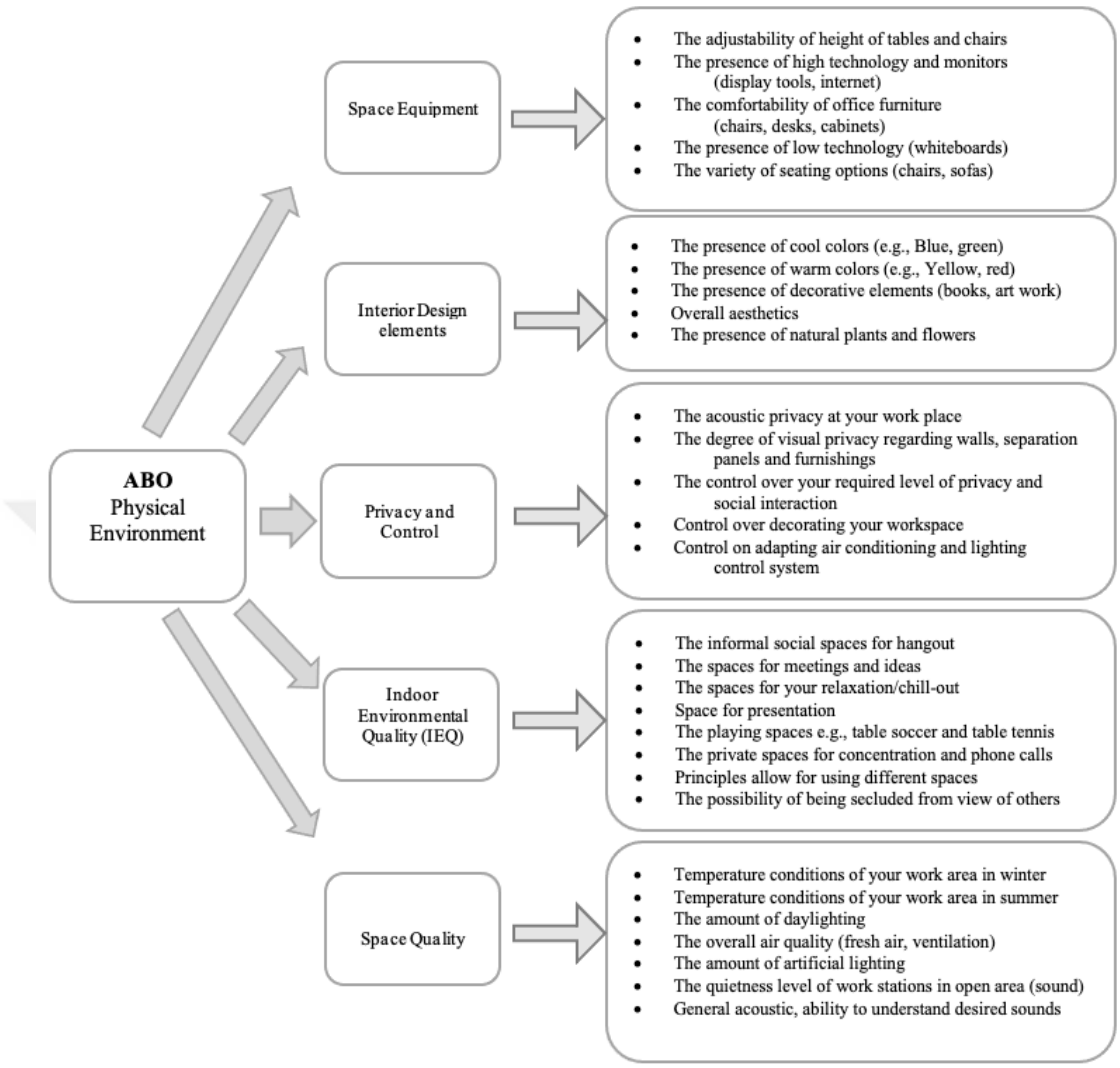


Figure 29. ABO physical environment items and factors

6.2.3. Factors of ABO Physical Environment

'Space quality' was the feature with which ABO residents were more satisfied (M=5.21) (see Figure 30). 'Space equipment' (M=5.16) was the second most frequently perceived satisfactory feature of the environment of ABO. Based on employees' satisfaction perception, 'interior environment quality (IEQ)' and 'interior design' (both M=4.66) were the third ABO features. And the last factor was 'privacy and control' (M= 4.17), which was the least satisfactory characteristic among the others, showing that employees were neutral about the perceived privacy and control in the ABO environment.

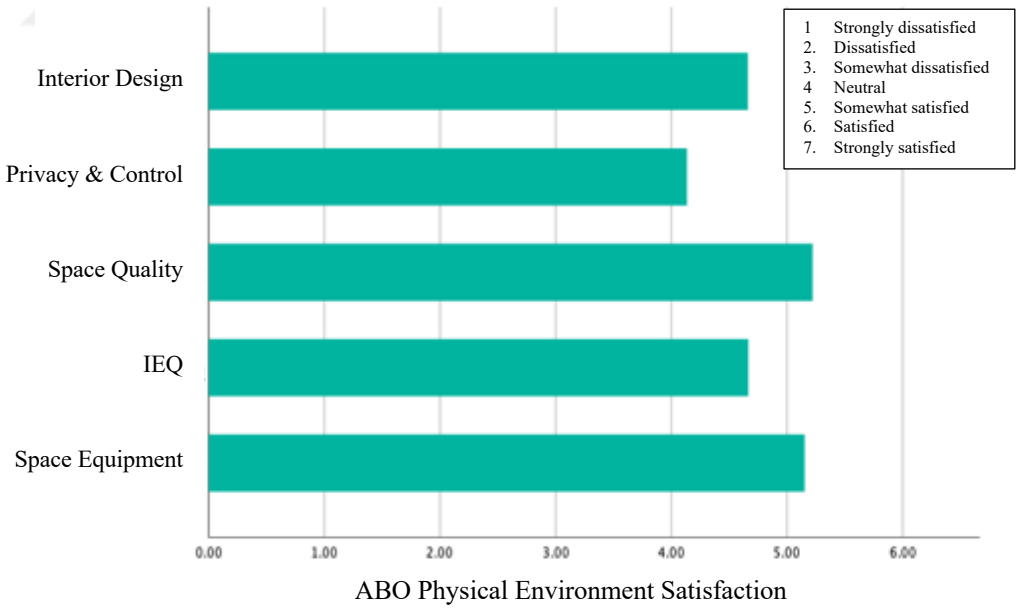


Figure 30. The mean scores for each category for ABOs' satisfaction with the physical environment

The correlations between the factors of ABO physical environment and group creativity were measured to show how they influence each other, and the results are presented in Table 26 below. In the first column of the following correlation matrix (from left), it is shown that the physical factors of ABO have a small and positive correlation with group creativity. That is, when employees are more satisfied with the level of 'privacy and control' (0.279**, $p< 0.01$), 'space quality' (0.265**, $p< 0.01$), 'space equipment' (0.219**, $p< 0.01$), 'IEQ' (0.200**, $p<0.01$), and 'Interior design elements' (0.132**, $p< 0.01$) in their ABW, they also perceive themselves as more creative. For example, if they have a private environment where they can sit and think undisturbed, they will also be able to think and solve their work-related problems and generate better ideas to present to their teams. Or the ergonomics of their chair and desk can help them work comfortably and for longer periods of time if needed.

Table 26. Correlations among ABO physical factors and group creativity (n = 186).

Correlations

		Group Creativity	Space Equipment	Interior Design Elements	Privacy and Control	Space Quality	IEQ
Group Creativity	Pearson Correlation	1	0.219**	0.132	0.279**	0.265**	0.199**
	Sig. (2-tailed)		0.003	0.088	0.000	0.000	0.008
	N	184	178	168	173	174	179
Space Equipment	Pearson Correlation	0.219**	1	0.644**	0.587**	0.672**	0.599**
	Sig. (2-tailed)	0.003		0.000	0.000	0.000	0.000
	N	178	179	169	174	175	179
Interior Design Elements	Pearson Correlation	0.132	0.644**	1	0.541**	0.661**	0.506**
	Sig. (2-tailed)	0.088	0.000		0.000	0.000	0.000
	N	168	169	169	169	169	169
Privacy and Control	Pearson Correlation	0.279**	0.587**	0.541**	1	0.687**	0.680**
	Sig. (2-tailed)	0.000	0.000	0.000		0.000	0.000
	N	173	174	169	174	174	174
Space Quality	Pearson Correlation	0.265**	0.672**	0.661**	0.687**	1	0.532**
	Sig. (2-tailed)	0.000	0.000	0.000	0.000		0.000
	N	174	175	169	174	175	175
IEQ	Pearson Correlation	0.199**	0.599**	0.506**	0.680**	0.532**	1
	Sig. (2-tailed)	0.008	0.000	0.000	0.000	0.000	
	N	179	179	169	174	175	180

**. Correlation is significant at the 0.01 level (2-tailed).

Satisfaction with items from 'Space Quality'

'Space quality' contained the largest factor (M=5.21) for satisfaction with the physical environment of ABO. The space size, presentation and meeting rooms were identified as characteristics with the highest satisfaction scores (see Figure 31). Private space and game rooms were selected as characteristics with the lowest satisfaction levels and highest dissatisfaction levels.

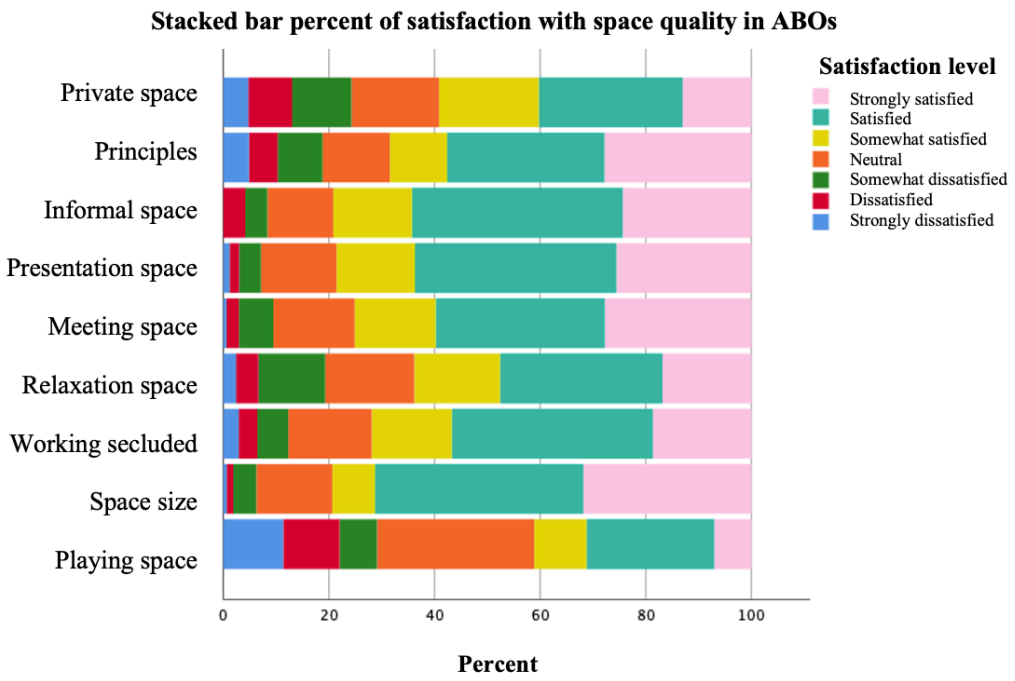


Figure 31. Stacked bar percent of satisfaction with items of space quality in ABOs

Satisfaction with items from 'Space Equipment'

This category accounted for the second largest proportion for satisfaction with the physical environment of ABO (M=5.16). The most important subcategories for perceived satisfaction were adjustability and variety of furniture (see Figure 32). High-tech equipment, low-tech equipment and furniture convenience were the items with the lowest perceived satisfaction levels.

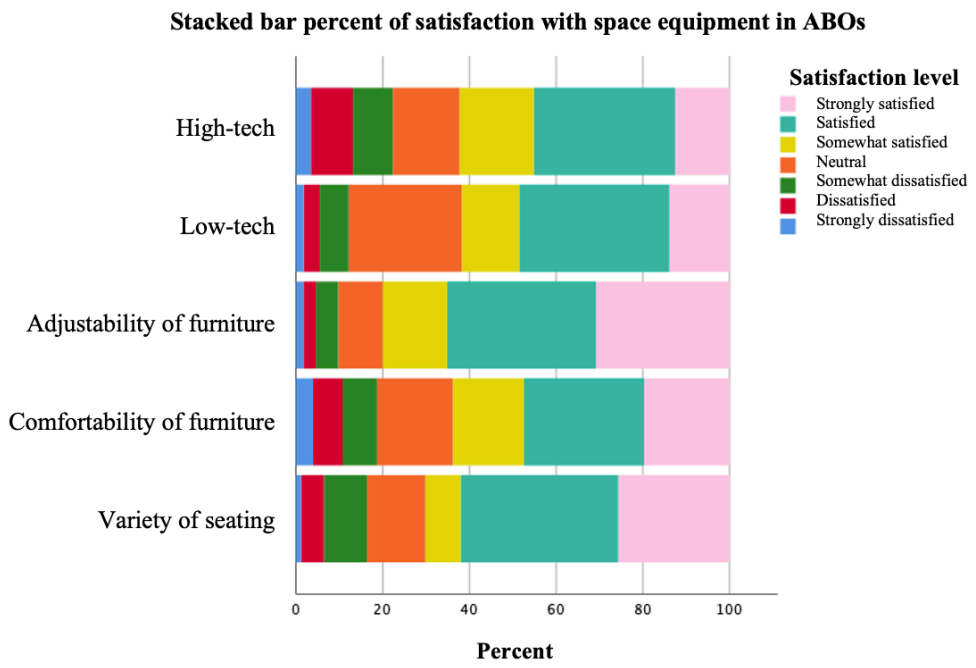


Figure 32. Stacked bar percent of satisfaction with items of space equipment in ABOs

Satisfaction with items from 'IEQ' and 'interior design elements'

The IEQ and interior design elements categories account for the third largest proportion for satisfaction with the physical environment of ABO (M=4.66). The most important subcategories for perceived satisfaction with IEQ were daylight and artificial light (see Figure 33). Summer and winter temperature, general acoustics, and noise level (silence) were the items with the lowest perceived satisfaction levels. In terms of satisfaction with interior design elements (see Figure 34), aesthetics was the item with the highest level of "somewhat satisfied", while natural plants were the item with the highest level of "dissatisfied".

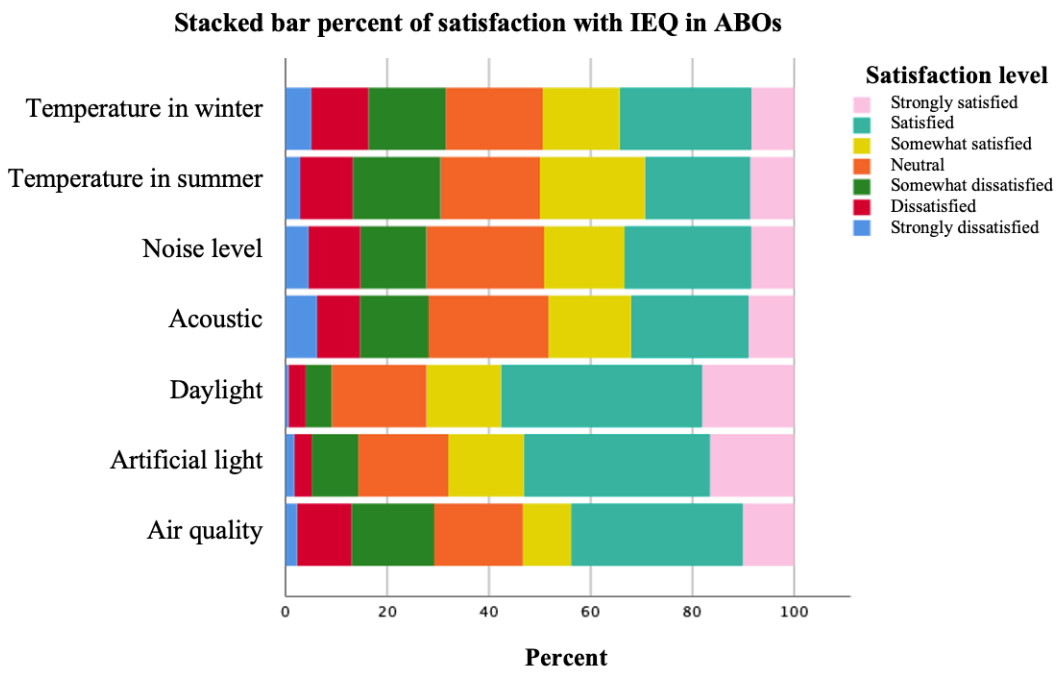


Figure 33. Stacked bar percent of satisfaction with items of IEQ in ABOs

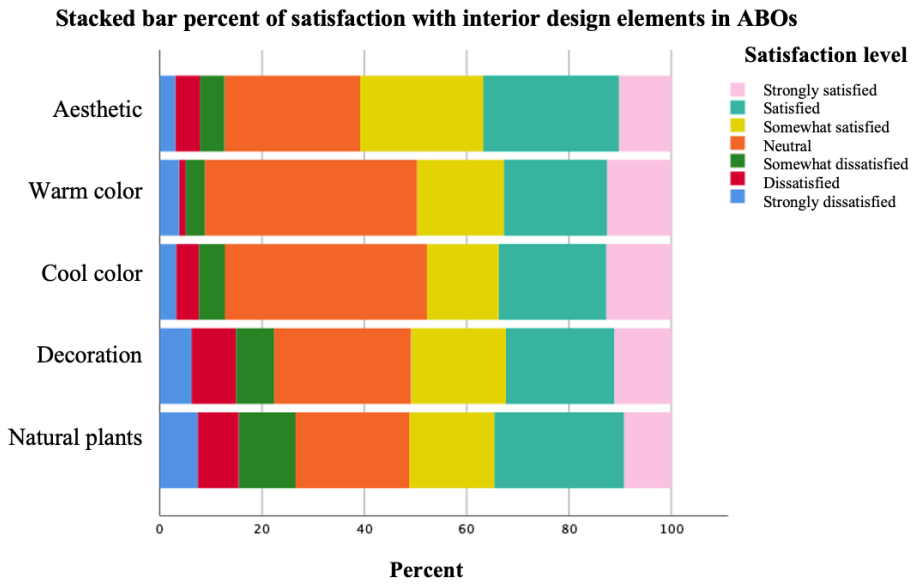


Figure 34. Stacked bar percent of satisfaction with items of interior design elements in ABOs

Satisfaction with items from 'Privacy and Control'

'Privacy and control' contained the final factor (M= 4.17) for perceived satisfaction with the physical environment of ABO. Control over privacy-interaction to limit distractions, and auditory and visual privacy were found to be characteristics with the highest satisfaction levels in this category (Figure 35). Control over decoration and indoor climate (air quality and lighting) were selected as the least perceived 'satisfaction' and highest 'dissatisfaction'

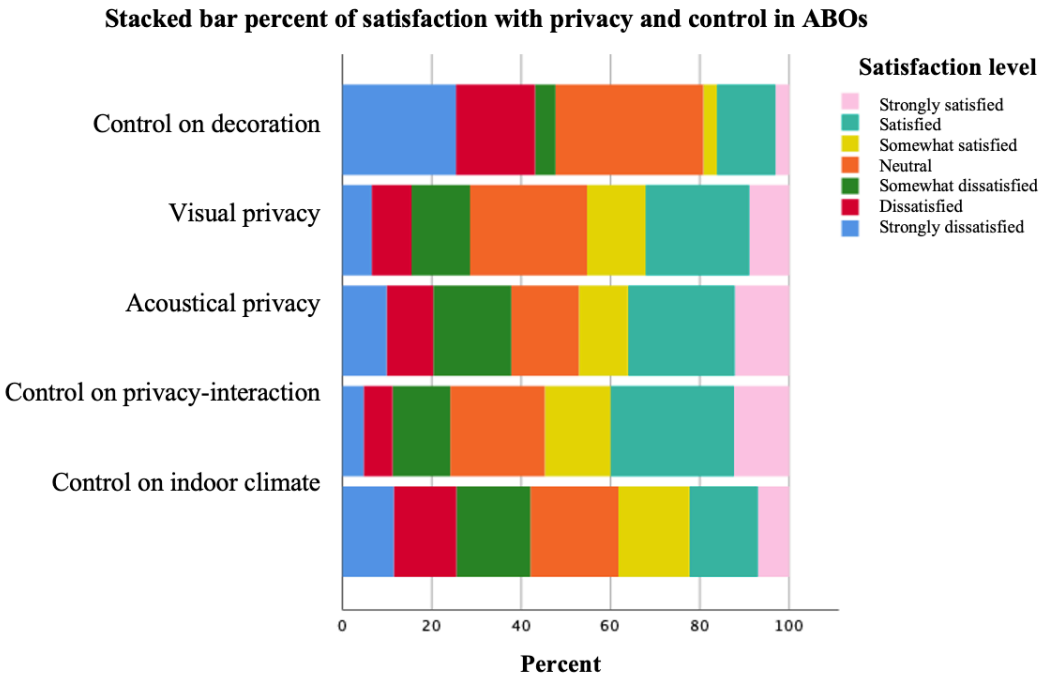


Figure 35. Stacked bar percent of satisfaction with items of privacy and control in ABOs

6.2.4. PROCESS Procedure

Means, standard deviations, and correlations between variables are presented in Table 27 (see Appendix M). Work experience was negatively correlated with education; older participants tended to be less educated than younger participants. Satisfaction with the physical environment of ABO was positively correlated with job autonomy, organizational commitment, and group creativity; those who were more satisfied with the physical environment of ABO tended to be more satisfied with their level of independence at work, felt more attached and committed to the organization, and rated themselves as more creative in group collaboration. Job autonomy correlated positively with both organizational commitment and group creativity; employees who were satisfied with their autonomy in the job were more committed to their organization and more satisfied with group creativity in group-level collaboration. Organizational commitment was positively correlated with group creativity. None of the demographic characteristics were associated with group creativity.

Table 27. Means, standard deviations and correlations among study variables (n = 186).

Variable	Mean	S.D.	1	2	3	4	5
1. Work Experience	21.14	9.05					
2. Education	2.83	0.39	-0.24 **				
3. ABO Physical Environment	4.83	1.06	-0.33	-0.01			
4. Job Autonomy	5.99	0.89	0.02	0.08	0.22**		
5. Organizational Commitment	5.72	0.79	0.00	0.10	0.25**	0.39**	
6. Group Creativity	5.24	1.07	-0.05	0.12	0.28**	0.35**	0.36**

** $p < 0.01$

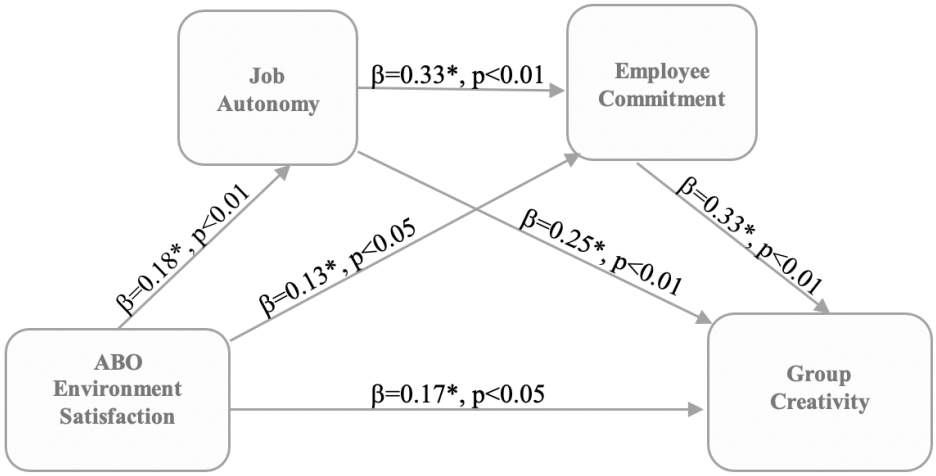
Mediation of the relationship between satisfaction with the ABO physical environment and group creativity by focusing on job autonomy and employee commitment

Since demographic variables were not related to group creativity, they were not included in the analysis. Table 28 shows the results of the regression analysis. Regression analysis is used via the SPSS program with the PROCESS program (Hayes, 2013) to test the hypothesized model (Figure 36 and see Appendix I for details) and mediation effects given a 95% confidence interval and 5000 bootstrap repeated samples.

Table 28. Test of mediation of job autonomy and employee commitment on the relationship between satisfaction with the ABO physical environment and group creativity: Bootstrap results.

Path/effect	**Standardized**		
	β	**SE**	**p**
ABO satisfaction→ Autonomy	0.18	0.06	<0.01
Autonomy→ Commitment	0.33	0.06	<0.01
ABO satisfaction→ Commitment	0.13	0.05	<0.05
Autonomy→ Group Creativity	0.25	0.08	<0.01
Commitment→ Group Creativity	0.33	0.10	<0.01
Indirect effect (ABO satisfaction→ Autonomy→ Group Creativity)	0.05	0.02	<0.001
Indirect effect (ABO satisfaction→ Commitment→ Group Creativity)	0.04	0.02	<0.001
Indirect effect (ABO satisfaction→ Autonomy→ Commitment → Group Creativity)	0.02	0.01	<0.001

The 95% confidence intervals for the standardized results were produced with bias corrected bootstrap resamples = 5000 option in the PROCESS macro (Hayes, 2013).



Total effect: X on Y: β=0.28*, p<0.01
Direct effect: X on Y: β=0.17*, p<0.05
Indirect effect:
ABO satisfaction→ Autonomy→ Group Creativity β=0.05*, p<0.001
ABO satisfaction→ Commitment→ Group Creativity β=0.04*, p<0.001
ABO satisfaction→ Autonomy→ Commitment→ Group Creativity β=0.02*, p<0.001

The 95% confidence intervals for the standardized results were produced with bias corrected bootstrap resamples = 5000 option in the PROCESS macro (Hayes, 2013).

Figure 36. Tests of the hypothesized models.

Hypothesis H1. Satisfaction with the ABO physical environment would predict employee group creativity. The significance test of the ABO physical environment satisfaction-group creativity relationship revealed that ABO physical environment satisfaction predicted group creativity (β = 0.17*, SE = 0.07, p < 0.05). Therefore, **hypothesis H1** was supported (see Figure 37).

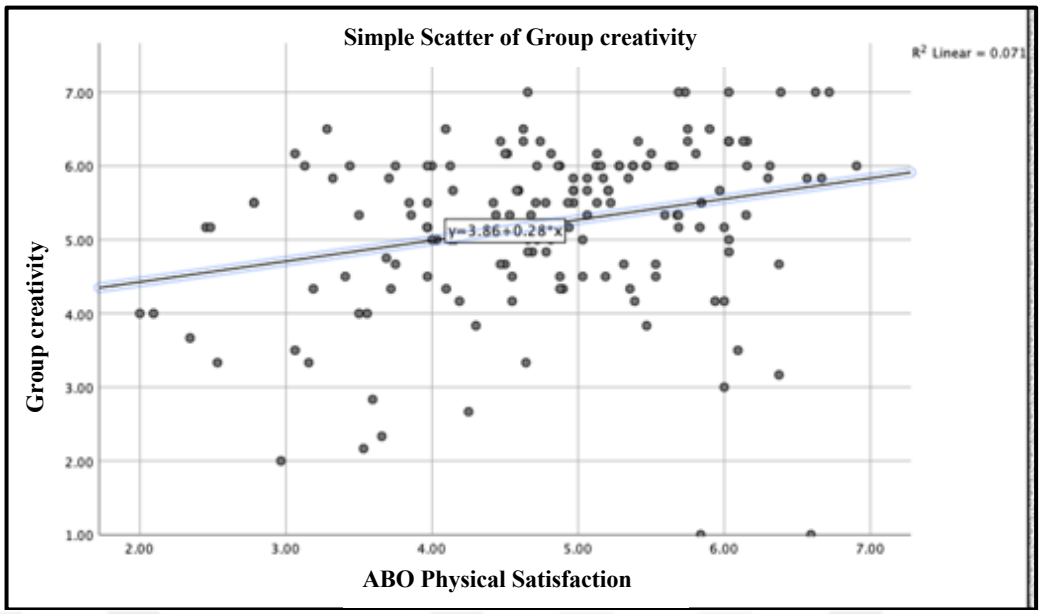


Figure 37. Simple Scatter of group creativity by ABO physical environment satisfaction

H1 predicted that satisfaction with the ABO physical environment had a direct positive effect on perceived employee group creativity. Indeed, our regression analysis demonstrated a significant positive effect of the satisfaction with ABO physical environment on group creativity ($\beta = 0.17^*$, SE = 0.07, $p < 0.05$). Therefore, **H1** was supported (see Figure 38).

H2 predicted that perceived job autonomy would mediate the relationship between satisfaction with the ABO physical environment and group creativity in ABOs. The significance test required a prediction of an indirect effect of ABO physical environment satisfaction→ job autonomy → group creativity. To test **H2**, it was needed to first test **H2a** and then **H2b.** Results showed that satisfaction with the ABO physical environment predicted job autonomy ($\beta = 0.18$, SE = 0.06, $p < 0.01$),

thus **H2a** was supported. Also, job autonomy predicted group creativity ($\beta = 0.25$, $SE = 0.08$, $p < 0.01$), so **H2b** was supported. Consequently, there was an indirect effect of satisfaction with the ABO physical environment on group creativity through the mediation of job autonomy ($\beta = 0.18 \times 0.25 = 0.05$, $SE = 0.02$, $p < 0.001$). Thus, **H2** was supported; job autonomy mediated the ABO physical environment satisfaction-group creativity relationship.

H3 predicted that employee commitment would mediate the relationship between satisfaction with the ABO physical environment and employee group creativity. The significance test required a prediction of an indirect effect of ABO physical environment satisfaction→ employee commitment→ group creativity. To test **H3**, it was needed to first test **H3a** and then **H3b.** Results showed that satisfaction with the ABO physical environment predicted employee commitment ($\beta = 0.13$, $SE = 0.05$, $p < 0.05$), thus **H3a** was supported. Also, employee commitment predicted group creativity ($\beta = 0.34$, $SE = 0.10$, $p < 0.01$), so **H3b** was also supported. Consequently, there was an indirect effect of satisfaction with the ABO physical environment on group creativity through the mediation of employee commitment ($\beta = 0.13 \times 0.34 = 0.04$, $SE = 0.02$, $p < 0.001$). Thus, **H3** was supported; employee commitment mediated the ABO physical environment satisfaction-group creativity relationship.

H4 predicted that job autonomy and employee commitment would serially mediate the relationship between ABO physical environment satisfaction and employee group creativity. The significance test required a prediction of an indirect effect of ABO physical environment satisfaction → job autonomy → employee commitment

→ group creativity. To test **H4**, it was needed to test **H2a** and **H3b,** respectively. As mentioned above, results revealed that satisfaction with the ABO physical environment predicted job autonomy ($\beta = 0.18$, SE = 0.06, $p < 0.01$), thus lending support to **H2a**. Further, job autonomy predicted employee commitment ($\beta = 0.33$, SE = 0.06, $p < 0.001$) and as explained above (in **H3b)** employee commitment predicted group creativity ($\beta = 0.34$, SE = 0.10, $p < 0.01$). Therefore, the indirect effect of satisfaction with the ABO physical environment on group creativity through the mediation of job autonomy and employee commitment was significant ($\beta = 0.18 \times 0.33 \times 0.34 = 0.02$, SE = 0.01, $p < 0.001$). Thus, **H4** was supported; job autonomy and employee commitment serially mediated the ABO physical environment satisfaction-group creativity relationship. Total indirect effect of satisfaction with the ABO physical environment on group creativity was ($\beta = 0.28$, SE = 0.07, $p < 0.01$).

These results are discussed in the next chapter. First, the results from the qualitative stage and then the results from the quantitative stage of the study are discussed in light of the existing literature and theories. Subsequently the results from both stages are mixed to give some guidelines for practical purposes.

CHAPTER 7

DISCUSSION

The primary objectives of this study were (i) to determine the types of spaces and interior features of ABOs that are important for the four types of creative activities, and how these features support and/or hinder these activities; (ii) whether the spaces of ABO can be classified as creative spaces, based on the qualitative study, and (iii) measuring the impact of ABOs on creativity; and identifying and measuring the impact of a mediator/moderator of some additional work or organizational variables in the ABO-creativity relationship, based on the results of the quantitative phase of the study.

7.1. Impact of Space Type and Interior Features on Creative Activities in ABOs

Based on the results of the CIT interviews, Figure 38 shows and compares which interior features were important for each creative activity type and whether they supported or hindered the process. The results of the qualitative phase helped in trying to clarify the interaction mechanisms of the physical environment, employee preferences and creative activities, and a three-component model was proposed, shows in Figure 39. Contributing to the interactionist perspective, employee preferences emerged in the results as a component that has explanatory power for the interaction between ABOs and creativity, along with the ABO environment and creative activities. The importance of matching ABOs with employee preferences to improve performance has been mentioned in some studies (e.g., Chafi, 2019; Chafi et al., 2020), but its role as an influencing factor on creativity has not been determined. Therefore, this is an important finding in the study of creativity in ABOs. Details of the findings on this topic were discussed below under three different interactions of the physical environment.

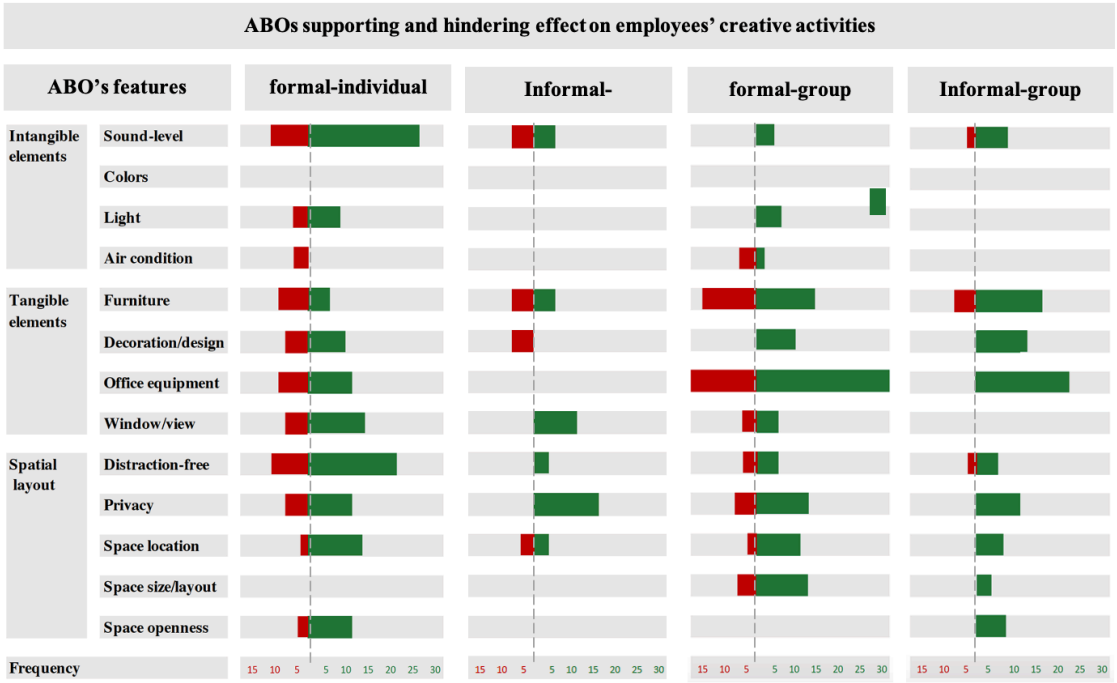


Figure 38. ABOs' interior features enhancing/hindering creative (a) formal-individual activities (b) informal-individual activities (c) formal-group activities (d) informal-group activities of employees (n=50)

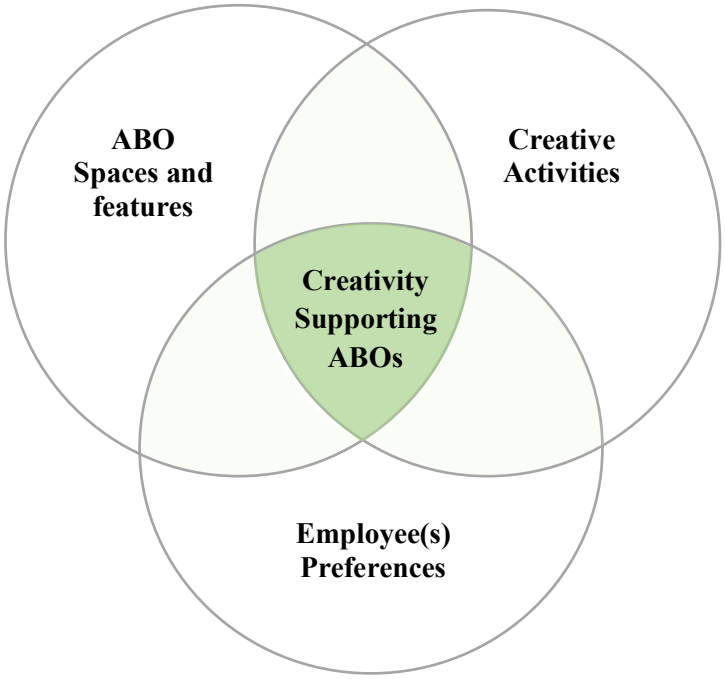


Figure 39. The three components of creativity supporting physical environments.

(1) Features continuously support or hinder employees' creativity

Some features continuously support creativity, such as comfortable, adjustable, and ergonomic furniture (Meinel et al., 2017). This has been overlooked in theory and practice, as ergonomic and adjustable furniture is generally observed to support only formal activities. Thus, our findings add to the existing theory that apparently employees need comfortable and ergonomic furniture for informal activities. In the present study, privacy and a distraction-free (control on the level of distraction) environment were also found to be important supporting features for all four types of

creative activities. Privacy has also been considered mainly for individual activities (Yekanialibeiglou and Demirkan, 2018), and in general, the visual and acoustic privacy required for group activities has not been taken into account. This could be due to the lack of research on office context's influence on group creativity (Oldham and Baer, 2012). A distraction-free environment, which is important for all types of creative activities, is improved after the organization adopts an ABO layout, according to previous studies (Van der Voordt, 2004). Other features that were observed to support all types of creative activities included a cozy and welcoming environment, space location in terms of proximity to the kitchen, and separate spaces based on their noise level and speech policy (Babapour Chafi and Rolfö, 2019). On the other hand, absence/inadequacy of the above supporting features can hinder employees' creativity (e.g., social distraction and low privacy). Therefore, it is found that the mentioned physical features of ABOs have a direct impact on creativity. Dul et al. (2011) also found that the physical environment has a direct influence on individual creativity, but they did not provide details about the interaction between each interior feature and creativity.

(2) Features whose effects depend on employee preferences

Employee preferences seem to play a role in the use of ABO spaces and employee creativity. It is found that the same space can be perceived as creativity supporting or hindering depending on employee preferences. For example, for the same activity type, some employees found too much silence or transparency between spaces supporting, while others found it distracting. This could account for the contradiction

in the literature about the effect of open spaces on employee creativity (Hoff and Öberg, 2015), and it demonstrates the importance of considering the interplay between the employee and environment (Olsson, 2012). In office interior design research, it has been discussed that individual characteristic can affect how employees respond to their environment, thus influencing the relationship between office features and employee performance (Seddigh, 2015). Recognizing user differentiation can provide a better understanding of user needs for office spaces (Hoendervanger et al., 2018). In flexible environments such as ABOs, this response may also manifest itself as employee preferences for the use of a space. Based on our results, at the individual level, personality traits and psychosocial needs, such as extraversion, openness to experience, agreeableness, need for autonomy and trust, self-leadership, and supportive leadership—all of which are important for creativity (Anderson et al., 2014)—can be antecedents to employee space preferences in creative activities. For example, in one case in this study, a participant reacted negatively when her supervisor restricted the group to a specific corner of the open space to exert control during their individual activities and the participant said; "*Creativity is supported when you have the opportunity to choose around different areas with different kinds of furniture. It is motivation*". This shows how controlling leadership, and lack of autonomy, freedom and trust can hinder employees from using ABO spaces based on their preferences, and the result of this negative interaction hinders their creativity. In line with these findings, Wohlers and Hertel (2017), in their literature review, concluded that extraversion and agreeableness appear to be the most relevant to employees' reactions toward ABOs. Thus, consistent with the interactionist perspective, it is found that creativity flourishes

when the ABO environment, employee psychosocial needs, and personal characteristics are aligned (Woodman et al., 1993).

At the group level, size, supportive leadership, communication, and interpersonal relationship needs can be antecedents to space preferences. For example, one participant reported feeling uncomfortable and distracted by the close personal distance in a meeting room due to poor interpersonal relationships in his group, and that he would prefer a larger room to meet with that group. Thus, interpersonal relationships, which are important for group creativity (Hemlin et al., 2008), may also play a role in employees' preferences in choosing a meeting room. This study adds to the existing theory by highlighting some of employees' characteristics and needs that affect their preferences for space usage in ABOs, which ultimately affects creativity. A deeper understanding of personality traits and employee needs for using ABO workstations for creative activities is complex and beyond the scope of this study; thus, it should be investigated in future studies.

(3) Features whose effects depend on the nature and level of the creative activity

This study found some interior features such as pleasant light and fresh air to be important for formal creative activities (both individual and group), but not for informal ones. Consideration of the nature of creative activities (formal and informal) might explain some inconsistencies in the literature on the importance of light for creativity (e.g., Meinel et al., 2017). Considering the importance of pleasant lighting for formal activities, Faria et al. (2017) emphasized that there is no clarity on what constitutes a pleasant lighting, but employees understand what would create

discomfort. In addition, it is found some features to be important depending on the level of creative activities. For example, sufficient physical space and office equipment and facilities were found to be important for group creativity (Lee, 2016), but not necessarily for individual creativity. This could be due to the fact that knowledge workers in CKEs usually tend to work in diverse group sizes, collaborate between groups, and even form new groups (face-to-face, hybrid, or in the digital space) depending on their immediate tasks and location. Therefore, they need fully equipped, adaptable, and appropriately sized spaces to support their flexibility, knowledge sharing, and group creative activities.

Overall, our findings are consistent with those of Evans et al. (1994, op cit. Leather et al., 2003), who adopted an interactionist perspective for their study and found that any feature of the physical environment can directly influence outcomes and/or interact with psychosocial work elements. Vithayathawornwong et al. (2003) also found that the physical office environment assisted the social work environment in influencing creativity, although they found no direct influence. Our results contrast with those of Dul et al. (2011) who found no interaction between creative personality, social-organizational features (e.g., teamwork, autonomy, and supportive leadership), and physical features of offices. Moreover, none of these studies examined group creativity. Findings of current study suggest that ABOs should be carefully designed and implemented to ensure that provision of different types of work environments interacts positively with (1) employees' preferences based on their personalities and needs, and (2) employees' creative activity patterns to boost their creativity at the individual and group levels.

7.2. Classification of ABOs as Creative Spaces

Another issue explored in this study based on the results of interviews (Figure 40) and observations was to understand the potential of ABOs to be classified as creative spaces, which the existing literature does not address. By definition, certain types of spaces and features in office environments that enhance creativity are referred to as creative spaces. In the current study, creativity was examined at individual and group levels based on its formal and informal nature in relation to each major space type and interior features in ABOs, which allowed a new perspective in analyzing the creativity of flexible offices and provided comprehensive results. The results showed that most ABO spaces (except relaxation space and open meeting rooms) support at least one of the four types of creative activities. Details of the findings on this aspect are discussed below.

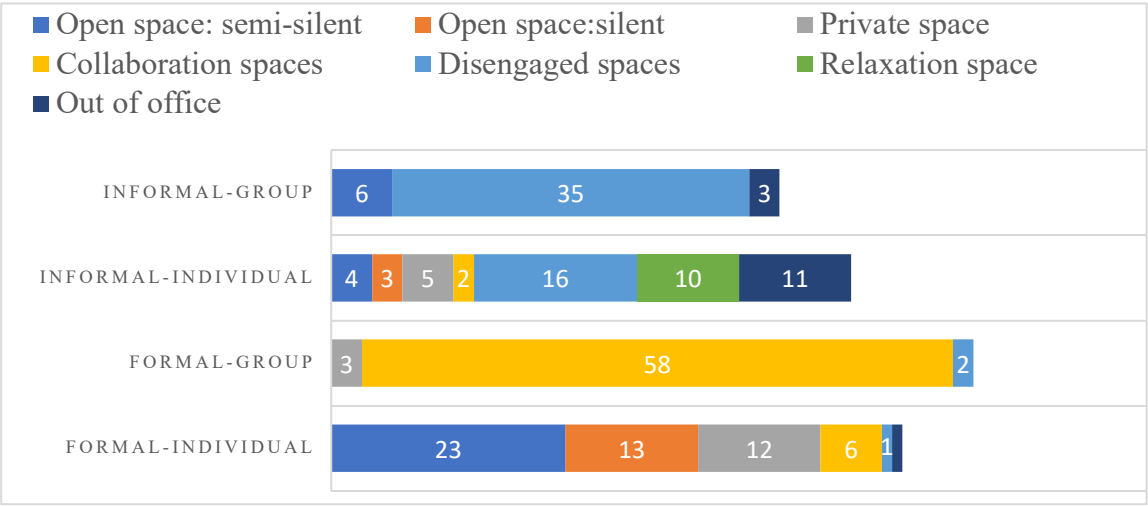


Figure 40. Space types occupied during creative activities by the employees (n=214)

(1) Spaces for formal-individual creativity

Private and open spaces (semi-silent and silent zones) combined with distraction-free environments were found to be most important in supporting individual creative activities. The results indicated that having enough number of private spaces are important for a creative environment in offices, which is consistent with the study by Thoring et al. (2018). Of the 12 formal-individual events that took place in private spaces, 11 were fruitful, suggesting that access to private spaces is important for concentration as a support for individual creativity. This is in contrast to Evans et al.'s (1994) assertion that private spaces are not necessary for improved concentration. Furthermore, these findings are consistent with a study by Hoff and Öberg (2015) who found that distracting noise hinders creativity.

Results of observations and interviews indicated that ABOs provide an acceptable level of quietness and social distraction-free environment for deep private concentration of employees. Providing zones for different noise levels through well-defined policies was found to be an important benefit of ABOs' open spaces in supporting individual creativity, and in this way the findings contribute to existing theory (which focuses on ABOs and creative spaces). The proximity and combination of spaces with different noise levels should be considered to avoid unwanted distractions and hinder creativity (Vithayathawornwong et al., 2003). Findings of this study, which emphasizes the need for speech regulation of open spaces and the arrangement of spaces based on their noise levels, may explain the

inconsistency of the results of some studies on concentration in ABOs (e.g., Engelen et al., 2019). Based on the results of the observations, private spaces were also used for some Skype meetings and relaxation. In some cases, it was observed that some employees occupied private spaces for a day, which caused problems with room availability for others.

(2) Spaces for informal-individual creativity

Observations revealed that the relaxation spaces were mostly unoccupied. This finding is not surprising, as some of the previous studies (e.g., Lee, 2016) have reported, that relaxation spaces in ABOs do not function as intended. However, the reason for this is not clear in the literature. In this study, it is found that the concept of relaxation in the workplace is not yet fully accepted. This leads to employees having concerns about visibly relaxing during work hours, especially when they are not given explicit permission to do so by their supervisors in ABOs; "*When you're in the work-related environment, it's much more okay to have something like time off than in the relaxation room*" (14-C3). Some participants indicated that they need a place in the office to rest and relax for psychological reasons, but they prefer corners that are not visible to their colleagues. These findings indicated that relaxing at work is affected by whether individuals feel physically, socially and emotionally comfortable or not. For informal-individual activities, privacy, and window/view are the main affecting interior features.

Privacy was found to be totally significant feature for supporting creative informal-individual activities in ABOs. Having a window view was found as an important

feature for relaxation as being in line with Stone and Irvine (1994) and Hoff and Öberg's (2015) studies that stated window to outside and daylight foster well-being and relaxation. Among other organizational and design factors, a lower openness to experience, a lack of freedom, and a shyness to new experiences (McCrae, 1987) were cited in the interviews as characteristics responsible for individuals not preferring relaxation spaces for their informal activities. However, studies on relaxation spaces and the reasons for employees' preferences for these spaces are limited and further research is needed. Unlike Hoff and Öberg's (2015) study, which found the role of relaxation spaces in relaxing and promoting creativity, this study found no evidence to support this. However, this does not mean that relaxation, as an activity does not promote creativity.

(3) Spaces for formal-group creativity

It is found that formal-group activities took place mainly in closed, bookable meeting rooms. This is consistent with the findings of Lee (2016). Furthermore, the on-site observations revealed that the provision of additional non-bookable meeting rooms (two to three people) encouraged creative ad hoc meetings and the sharing of ideas—such rooms also ensure that more bookable meeting rooms are available. However, it was also found that open collaboration spaces were largely underused and ineffective in promoting creativity. One explanation for this could be the difficulty in sharing confidential data, which hinders knowledge sharing and communication (Babapour Chafi and Rolfö, 2019)—important processes for group creativity (Hülsheger et al., 2009).

Based on the observations and interviews, some meeting rooms were used for concentration when individual private rooms were not available. Office equipment and resources are the most important features of collaboration spaces to support group creativity (James and Drown, 2012), as they facilitate communication and help in the development of new ideas (Paulus and Dzindolet, 2008). Wi-Fi access, conferencing and communication software provide an office environment without the need for employees to be physically present in the office, which lends itself to flexible working (e.g., face-to-face, hybrid and digital meetings). This is consistent with the findings of Lee (2016), who found that office equipment is a fundamental feature for collaboration, group brainstorming and creativity.

The findings also revealed that adjustable, flexible and comfortable furniture that supports posture during long meetings and collaboration is important in promoting creativity and lack of it would hinder creativity. This is in line with the findings of Thoring et al. (2018) study, which found that ergonomic and adjustable furniture is crucial for creativity. The third important feature that has an impact on group creativity is privacy. Having a safe place to communicate without having to internally monitor every thought, as physical seclusion would provide, has a positive effect on creativity as more ideas can be shared. Meinel et al. (2017) also found that privacy enhances creativity and a lack of privacy hinders it. The studies by Hoff and Öberg's (2015) and Dul and Ceylan (2011) mentioned privacy only to support creativity at the individual level; however, the results of this study showed that privacy is also important for creativity at the group level. In contrast to Keeling et al.'s (2015) findings that agile offices support confidential conversations as much as

a private office, this study found mixed results on this topic. In some ABOs, overhearing was a problem in a shared open space with different work groups, which is consistent with Babapour Chafi and Rolfö (2019) and De Been et al.'s (2015) studies. An appropriate balance between openness of space, visibility and privacy was an issue in some ABOs. In addition, the location of meeting rooms is important in providing privacy and distance, which is consistent with the findings of Hua et al. (2010). These findings are an indication that the concept of ABOs has the potential to support collaboration and group creativity if they are appropriately designed. In line with these findings, previous studies have found that ABOs have a positive impact on collaboration and performance (Blok et al., 2012; De Croon et al., 2005; Robertson et al., 2008; Rolfö et al. 2018).

(4) Spaces for informal-group creativity

Informal-group activities took place in the ABOs mainly around disengaged spaces (kitchen tables as a space for large gatherings, small tables with fewer chairs for smaller groups, and semi-enclosed sofas in lounge zones), and are mainly is arranged by sending a message such as "*Coffee in 15 min*?" (De Paoli and Ropo, 2017; Lee, 2016). Previous studies found that informal conversations improve relationships and bonding among employees and stimulate idea generation (Damanpour and Aravind, 2012). The coffee machine was found to be the greatest motivator for employees to gather in disengaged spaces, improving the scope for serendipity in casual meetings (see Steiner, 2006).

There were also some grievances about loneliness at ABO (see also Babapour Chafi and Rolfö, 2019) and difficulty finding colleagues to interact and share ideas with (De Been and Beijer, 2014); "*I feel alone, hardly see my colleagues*" (17- C3), which were found to be hindering features for creativity in the current study. This is in line with the findings of De Been and Beijer (2014) and Babapour Chafi and Rolfö (2019), as employees were not satisfied with the possibility of social interaction within the group in ABOs. However, there are other studies (e.g., Gorgievski et al., 2010; Keeling et al., 2015; Kim et al., 2016) that found that ABOs environments are perceived as supportive to allow informal conversations. But it seems that employees in ABOs with desk-sharing policies need more organizational support for their social activities compared to offices with assigned desks, as one of the participants said, "*In an office like this, where we don't even know who the other people are sitting around, we need Fika*[1] *to socialize*" (9-C1). Moreover, it is found that the absence or poor design of disengaged spaces in ABOs can affect employees' psychosocial environment, which in turn can hinder informal group activities. Consequently, our findings indicated that most spaces (with the exception of relaxation rooms and formal meeting areas in open spaces) in ABO support creativity and can be classified as creative spaces based on the definition for this study.

[1] *Fika: In Swedish culture, this is a coffee break, where colleagues can socialize with each other*

7.3. Measuring the Impact of ABOs on Creativity; and Mediating Role of Job Autonomy and Organizational Commitment

The study conducted at this stage to assess the effect of ABO environment on creativity, also whether employee job autonomy and organizational commitment mediate the relationship between satisfaction with ABO physical environment and creativity of employee group. In general, employees in the sample appeared to be satisfied with their ABO physical environment, and their satisfaction was related to perceived job autonomy, organizational commitment, and consequently their perceived creativity at the group level.

The findings of this study showed that satisfaction with the ABO physical environment (comprising of 'space quality', 'IEQ', 'privacy and control', 'interior design elements', and 'space equipment' factors) has a positive effect on employee's perceived group creativity. This finding is important because there is a lack of studies on creativity in the context of the physical environment of ABO and also on how group level creativity is influenced by the physical environment of ABOs. The findings of this study are consistent with some previous studies in the literature that reported the effects of physical work environment on employees' perceived creativity (e.g., Dul et al., 2011; Martens, 2011) at both individual and group levels (Haner, 2005; Magadley and Birdi, 2009). The previous stage of this study also found that individual and group creativity is enhanced when employees' needs are met through the spaces and functions of ABO.

From this study, there are some other important findings related to satisfaction with the physical environment of ABO. It is found that employees were most satisfied with the factors of 'space quality' and 'space equipment'. This is in line with previous studies that found that employees in ABOs are satisfied with the functionality of the equipment of the environment (Appel-Meulenbroek et al., 2011; Candido et al., 2016; De Been and Beijer, 2014; Medik and Stettina, 2014; Robertson et al., 2008; van der Voordt, 2004). However, in contradiction to these findings, De Been et al. (2015) found employee dissatisfaction with high-tech equipment in ABOs.

'Privacy and control' factor was found to be less in terms of satisfaction with the physical environment in ABO compared to the other factors. The less satisfactory items in this factor belonged to 'control on personalizing and decorating workspace' and 'control over the indoor climate'. Employees had mentioned both items during the interviews in the first stage of this study. The restriction on the use of personal decoration items in the ABOs led some employees to perceive the environment as impersonal, thus reducing their satisfaction. In line with the findings of this study, De Been et al. (2015), Gorgievski et al. (2010), and Candido et al. (2016) found low satisfaction with the perceived privacy of users of ABO. However, this finding contrasts with the results of the studies by Keeling et al. (2015) and Kim et al. (2016).

In the context of creativity, the factors ‘privacy and control’, ‘space quality’, and ‘space equipment’ factors had weak positive correlations with the employee group creativity. These findings are in line with previous studies that found a positive relationship between privacy and control (Aiello et al., 1977; Haner, 2005; Hoff and Öberg, 2015; Meinel et al., 2017; Stokols et al., 2002); space types and comfort (Hoff and Öberg, 2015; Hua et al., 2010; Lee, 2016; Meinel et al., 2017, Suckley and Nicholson, 2018; Thoring et al., 2018) and space equipment (Ceylan et al., 2008; De Been and Beijer, 2014; Dul and Ceylan, 2011, 2014; Dul et al., 2011; Haner, 2005; Hoff and Öberg, 2015) with employee creativity. In the prior stage of this study, it was also found that space equipment (high-tech, low-tech and furniture) and privacy influenced creative collaborations as the most important characteristics.

(1) Mediation role of job autonomy

In the previous studies in the literature, ABO physical environment is found to positively predict job autonomy (Appel-Meulenbroek et al., 2011; Kim et al., 2016; Medik and Stettina, 2014; Robertson et al., 2008; Volker and Van Der Voordt, 2005; Vos and Van der Voord, 2002). This study also found the same result. This result is in contrast to the findings of Brunia et al. (2016), Nijp et al. (2016) and Gorgievski et al. (2010) who found a negative or no effect of ABOs on job autonomy. It is also found that job autonomy mediates the relationship between satisfaction with the ABO physical environment and group creativity. Similarly, the results of Duffy's (1997) study also found a relationship between group creativity and physical work environment by relating the relationship between autonomy and interaction to

contribution to the physical work environment and job performance. In addition, McCoy (2005) reported the positive relationship of job autonomy, the physical environment and group creativity in her literature review.

(2) Mediation role of organizational commitment.

In this study, it is shown that ABO physical environment positively predicts employees' organizational commitment. This result is consistent with the study of McGuire and McLaren (2009) who found a positive relationship between physical environment and employee commitment. In addition, Bangwal et al. (2017) found strong evidence for the relationships between workspace, job satisfaction, and organizational commitment. This study also found that organizational commitment has a positive effect on group creativity. This is consistent with the findings of Swailes (2000) and Çekmecelioğlu (2006) who found that employee organizational commitment influences employee creativity.

It is revealed that organizational commitment of employees plays as a mediator in the ABO physical environment-group creativity relationship. This result suggests that employees who are satisfied with their physical environment are more committed to their organizations, and this satisfaction and commitment lead them to be more creative when working together. It was also found that employees' perceived job autonomy predicted their organizational commitment. This finding is consistent with the findings of previous research that favorable working conditions

such as high job autonomy and satisfaction promote intention to stay in the organization (Sarboland, 2012; Weiss, 1999; Wise et al., 1987).

The results showed that the relationship between satisfaction with the ABO physical environment and group creativity was mediated by job autonomy and organizational commitment. Based on the above findings, this study contributes to the models of relationships involving the physical environment. The results not only confirmed a previous finding on the relationship between the physical work environment and creativity, but also provided evidence on the factors underlying this relationship, such as job autonomy and commitment.

7.4. Triangulation Framework of Qualitative and Quantitative Data

The main objective of this study was to evaluate how space types and interior features of ABOs influence employee creativity. To this end, two qualitative and quantitative stages of the study were designed and conducted. In this step, the results from both stages are triangulated to integrate the findings and develop some suggestions for practical implications.

In stages 1 and 2, it was found that some types of spaces were more conducive to creativity than others due to their interior features as mentioned by the employees. In addition, two mediators were found to positively mediate the relationship between perceived satisfaction with ABOs and employee creativity. Table 29 shows the types

of spaces and details of interior features that were found to be significant in hindering or supporting employee creativity in ABOs based on the results of the study. It also presents the non-physical features such as policies and personal, group, and organizational features that were found to be important in the effect of ABOs on creativity. Designers and organizations when setting up ABOs to give their employees a choice of features can consider the variety of features in each space and for each activity. The results of this table are unique in that they provide a comprehensive view of employees' need for creative work activities, including individual and group creativity at the same time. This table is important to help designers, managers, and organizations consider important physical and non-physical features for employee creative activities before they begin designing and planning for the move to a new building and after. They need to consider what kind of activity and creativity they expect from their employees to provide them with a better environment.

Table 29. Summary of the finding for each type of creative activity results

Category	Elements	Interior features for each creative activity type			
		Formal-Individual	**Informal-Individual**	**Formal-Group**	**Informal-Group**
Physical env.	**Space type**	Open space (semi-silent)*** (silent/library)** Private space**	Disengaged space (kitchen/enclosed sofa)** Out of office**	Collaboration space (bookable)**** (non-bookable)**	Disengaged space (kitchen)**** (enclosed sofa)*
Intangible office elements	**Sound/ noise level**	+Quiet +Low +Using headphones -Distracting noise	+Quiet +Low +Headphones -No conversation	+Quiet +Soundproof	+Allowed to be loud -Cannot talk too loudly
	Colors		-White and gray (cold)	+Cold: green, blue +Warm: red	
	Light	+Daylight -Lack of daylight -Lack of desk light -Glare		+Daylight +Artificial light	
	Air condition	-Bad ventilation		+ Fresh air through windows -Hot air -No ventilation	
Tangible office elements	**Furniture**	+Adjustable furniture -Ergonomic issues -Lack of a workstation -Need for foot supports	+Supports informal postures/lying down +Supports postures for working with laptop -Leads to improper working postures -Not adjustable/comfortable	+Adjustable furniture +Supports postures +Proper table +Foot supports -Not adjustable -Inflexible/broken wheels -Round table: Unsupported; does not face the screen	+Big table +High back private sofa +Comfortable chairs - Unergonomic furniture
	Decoration and design	+Closed doors or partitions +Informal/relaxing -Lack of a sense of belonging -Uninviting	-No pictures -Uncozy design	+Curtains and blinders +Enclosed by doors +Relaxing and cozy	+Inviting/informal/ cozy -Sterile/too formal
	Office equip	**High-tech:** +Screens/speakers/ headphones -Technical issues of plug-in monitors -More speakers/headphones		**High-tech:** +Big screens +Easily connectable screens +Speakers/microphone -Technical issues of plug-in monitors -Lack of speakers/microphone -No instructions for new tech	**High-tech:** +Coffee machine
		Low-tech: +Whiteboard -Small lockers		**Low-tech:** +Whiteboard -No whiteboard	**Low-tech:** +Newsletters/magazines
	Window/ view	+Window/view +Transparency -No window -No transparency	+Window/view	+Window/view +Transparency -No window	
Spatial layout	**Distraction -free**	+No social distraction -Social distraction	+No social distraction	+No social distraction -Social distraction	+Not disturbing others -Social distraction
	Privacy	+Visual/acoustical/ data privacy -Lack of visual/acoustical/data privacy	+Visual/general privacy	+Visual/acoustical/data privacy -Lack of visual/acoustical/data privacy	+Visual/acoustical privacy
	Space location	+Close to kitchen/locker/window +Corner -Library in an open area	+Close to kitchen +Close to window -Matter of distance	+Close to kitchen +In corners/end of corridors -Far from other spaces	+Close to kitchen/coffee machine +In the center
	Space size and layout			+Proper size for small/big meetings/virtual meetings -Personal distance	+Proper size of kitchen/table/couch

Table 29 (continued)

				-Row layout for co-working	
	Space openness	+Open area overlooking others -Distracting openness		-Open space for big meetings	+ No dividing wall + Open and visible
ABO policies	**Desk-sharing/ speech policies**	+Speech policy: silent zone, supports concentration -Silent and active zones close to each other -Desk-sharing policy: private rooms occupied all day	-Unfitting speech policy hindered using relaxation room	-Desk-sharing policy: double focus rooms occupied by only one person	+Desk-sharing policy: more spontaneous meetings +Meeting people from other departments -Difficult to find colleagues and weak social bonds -Sense of loneliness and exclusion -Speech policy: Sofa in quiet rooms
Non-physical env.	**Personal/ group**	• Employee autonomy • Self-leadership • Leadership style: *Supporting for informal creativity Non-controlling* • Personality traits		• Employee autonomy and commitment • Leadership style: *Supporting for informal creativity Non-controlling* • Group communication • Interpersonal relationships	
*1–10 incidents **10–20 incidents ***20–30 incidents ****30–40 incidents + creativity supporting feature - creativity hindering feature					

Based on the mixed results of stage 1 and 2 six main guidelines are presented to be used by organizations, environmental psychologists, designers, and facility managers.

(1) Well-defined policies for open spaces and favorite spots

Private spaces and open spaces (semi-silent and silent zone) mainly function as an individual space that promotes creativity, accompanied by the control of noise level and distraction by defining different zones in the open environment, which can be found as the main supporting interior features. Providing zones with different noise levels through clearly defined policies in open spaces was found to be an important supportive feature for ABOs to promote individual creativity in open spaces. Based

on field observations and participant comments, it was noted that the proximity and combination of spaces with different speech levels should be considered to avoid unwanted distractions. Some employees used the collaboration spaces as private space for individual tasks because private rooms and silent spots were not available. A cost-effective solution to this problem is to provide well-defined clear desk-sharing policies that limit the duration of use and lead to more available favorite spaces such as private rooms. These policies must be clearly stated. Policies in ABO must be discussed by employees, such as allowing the same workstation in open and closed areas on consecutive days, assigning spaces for verbal interaction with colleagues, and allowing or prohibiting interruptions (Rolfö, 2018). Therefore, based on the results of the current study, the following suggestions are proposed to promote creativity in ABOs:

- Speech and desk sharing policies should be clearly defined for employees to avoid any confusion (especially in semi-silent zone and private spaces).
- Different zones in the open space for silent, semi-silent and dynamic environments are important to support individual and group, high concentration and low concentration creative activities.
- The proximity and combination of spaces with different speech levels should be considered to avoid unwanted distractions.
- Interior design: (color, textiles, materials, etc.) in open spaces should reduce the sterility and impersonality that some employees feel from the lack of personal decorative elements.
- A nature-based environmental design that provides mental relaxation can be achieved in the workplace by providing access to nature (e.g., plants and

windows) and using natural materials in interior design (e.g., use of natural wood and natural fibers).

(2) Social supports for using relaxation rooms

Based on the observations in stage 1 of the study, the relaxation rooms were seen mostly unoccupied and should be considered for further investigation. Based on the interviews, one explanation could be that the perception of relaxation in the workplace is not yet fully accepted. This makes it less obvious to actually relax if one does not receive appropriate support from the social environment. In addition, the study found privacy as the most important supporting feature for relaxation. Also, looking out of the window was found to be an important feature for both concentration and relaxation (see also Hoff and Öberg, 2015, and Stone and Irvine, 1994). Therefore, based on the results of the current study, the following suggestions are proposed to promote creativity in ABOs:

- Managers using these non-work-related spaces would help employees to adapt and feel comfortable with this aspect of the NewWoW.
- A high degree of autonomy and a flat corporate culture should ensure that employees feel free to use informal spaces without hesitation.
- Interior design-wise, this space should be cozy, with window views and comfortable furniture, yet with a simple table for employees to work on.
- Privacy should be ensured in this space and there should be curtains at the windows and signs on the door to show when the space is occupied.

(3) Fully equipped bookable and non-bookable meeting rooms, less open meeting spaces

The findings of the observations and interviews in stage 1 showed that formal-group activities took place mainly in closed, bookable meeting rooms. The results of stage 2 of the study also showed that collaboration spaces correlate positively with group creativity. It is also found that employees are satisfied with their presentation and meeting rooms as collaboration spaces. Based on the results of both the qualitative and quantitative study in stage 1 and stage 2, it was found that office equipment, including high-tech, low-tech, and adequate furniture (e.g., ergonomic, adjustable, and flexible), are the most important features for group creativity. It is critical that employees can access and share data within the group during face to face and virtual meetings (Lee, 2016). Couple this with appropriate furniture, the interview findings indicated that it is important for organizations to provide instructions for using equipment and adjusting furniture that could be confusing to some employees. In addition, based on the results of the observations and interviews, providing additional non-bookable meeting rooms (2-3 people) provides more room availability and improves creative ad hoc meetings. They also provide more availability for bookable meeting rooms. Nevertheless, during observation sessions, open collaboration spaces were mostly not used. One possible explanation was the challenge of sharing confidential data due to low levels of privacy (Babapour Chafi and Rolfö, 2019; De Been et al., 2015) and high social distraction in open spaces. The results of the quantitative study in stage 2 also showed that employees were not satisfied with the overall privacy in their ABOs, although privacy was found to be important for individual and group creativity. Employees also suggested replacing

open collaboration areas with more individual workstations (see also Chafi et al., 2020) or private areas. Therefore, based on the results of the current study, the following suggestions are proposed to promote creativity in ABOs:

- Adequate number of meeting rooms.
- Appropriate size of spaces for small and large meetings.
- Planned and unplanned groupwork spaces.
- Providing some movable partitions or curtains to support privacy for confidential meetings or to block visual distractions from the outside.
- Ensure good air quality in the rooms.
- Movable furniture (chairs with wheels) provides more flexibility for collaboration.
- Providing comfortable and adjustable furniture,
- Support IT, high-tech (i.e., monitor, microphones) and low-tech
- Providing some instructions on how to use high-tech equipment that could be confusing
- Having non-bookable meeting rooms for small and quick ad hoc meetings allows for more group creativity.
- Open dynamic zones tend to be unoccupied and not used for most meetings due to low privacy and high distraction from people walking around.
- Employees find it difficult to discuss confidential information in open spaces during collaborative activities.
- The office environment for group activities and collaborations should support certain level of privacy and a distraction-free environment

(4) Social activities with fixed time in disengaged spaces

It is found that employees in ABOs with a desk-sharing policy need more organizational and managerial support in organizing social activities, as employees were not satisfied with the opportunity for social interaction within the group in ABOs. Such activities are important for employees to expand their social bonds—informal social events bring different groups and departments together, which can improve idea exchange and internal communication, and create so-called weak social ties, all relatively strong predictors of innovation at the organizational level (Damanpour and Aravind, 2012). Having fixed-time social activities (e.g., playing games or coffee break) could also help employees improve their social bonding.

Designers should pay special attention to the design of kitchen and disengaged spaces and its central placement in the office layout. Observations showed that employees mainly gather for social activities around the kitchen. Based on the results of the interviews, it is found that disengaged spaces (kitchen table and enclosed sofas in the lounge areas) provide employees with the opportunity to refresh their minds and also share various ideas that are important for creativity. In stage 2, the results of the questionnaire showed that employees are satisfied with their informal, disengaged spaces such as the kitchen, but they are not satisfied or missed a play space in their ABOs. The results showed that the biggest encouraging feature for informal-group activities is the proximity to a coffee machine, which motivates people to gather in disengaged spaces and enhances the possibility of serendipity meetings (see Steiner 2006). Therefore, based on the results of the current study, the following suggestions are proposed to promote creativity in ABOs:

- Providing a large central kitchen in the office help employees to meet more and share ideas, which encourages creativity
- Coffee machines are one of the key features that encourage people to go to the kitchen and meet colleagues
- In addition, a clean and nice environment with large and small tables and semi-private sofas in the coffee corner can encourage employees to gather and improve social activities and idea exchange
- The organization can coordinate some social events to increase social bonding among employees.

(5) Work autonomy for employees to work when, where and how it fits them

To improve employees' creativity and performance, it is essential to ensure that they are free to use the spaces in an ABO to their full potential. Supportive and non-controlling managers who promote autonomy and trust are important in CKEs and probably play a central role in how ABOs are used for creative purposes. The organizational conditions and social structures such as innovative work tasks, flat hierarchy structures and a strong culture must be created in cooperation with physical change (Rolfö, 2018). In addition, organizations and designers of ABO environments must ensure that they provide numerous fully equipped space types, various options for control social distraction and privacy, and a functionally designed furniture and decorated office to give employees choice and control over how they use their environment. If employees in ABOs are deprived of workplace autonomy, it could reduce the match between employee preferences, environment, and activity type, which would hinder their creativity. Job autonomy leads to higher organizational

commitment, which together mediates the relationship between ABOs and group creativity. This is also an interesting finding in the joint literature of creativity and ABOs.

(6) Employees be engaged as end-users in the process of the planning and design stage

Environmental psychologists, interior designers, and facility managers are involved in the entire design and construction process of ABOs, but employees, who are the end users of these workplaces, typically are not. One important consideration for organizations is to identify employees' preferences and creative requirements by engaging them in the process at the planning and design stages (Doorley and Witthoft, 2012). Taking into account employees' different preferences is a crucial aspect in designing a creative work environment. Individuals implement their creative thoughts and activities in different ways—some prefer seclusion, while others prefer to have multiple social interactions and feedback from others.

CHAPTER 8

CONCLUSION

This study examined the influence of ABO space types and interior features on individual and group creativity. An interactionist perspective was adopted, implying that one must consider the interplay between individual and environment to fully understand creativity. Due to the flexible ways of working in ABOs and their highly knowledge-intensive environment, this study applied the theoretical framework of CKEs at the micro level to investigate the interactions between knowledge workers, at the individual and group levels, and their ABO environment.

The mixed-methods approach was used to triangulate data from two phases (qualitative and quantitative). The two data sets were merged by combining the separate findings in the discussion section to interpret the results and suggest some practical implications for organizations and designers to improve creativity in ABOs. A large number of participants in interviews (50) and questionnaires (186) enabled a

deep understanding of how ABOs are used for creative purposes by employees. In addition, triangulation of data with planning documents, architectural drawings, and observations assisted understanding of interviewees' comments and questionnaire results about the environment of ABOs, to better understand the research problem and obtain complementary data on the same topic. The findings of this study contribute to the interactionist perspective, complement the theoretical framework of CKEs and creative spaces in the following three ways to better understand the role of ABO's physical environment in promoting or inhibiting creativity. In what follows, three main contribution of the study is presented in details.

First, the ABO environment has a crucial impact on supporting and hindering individual and group creativity. The main conclusion regarding the role of ABO spaces in individual creativity was that private spaces and quiet zones of open spaces with well-defined speech and desk-sharing policies could be classified as creative spaces. To support group creativity, the findings indicated that it is important to provide appropriately equipped and furnished non-bookable meeting rooms alongside bookable ones. The CKE framework suggests that certain working styles and spaces in which individuals and groups have high levels of autonomy and self-leadership are crucial for creativity. Based on this study, it is noted that working in ABOs also requires high levels of autonomy and self-leadership skills. Though social interaction is mentioned as a positive psychosocial antecedent to CKEs, it is also noted that a desk-sharing policy sometimes makes it difficult for employees to find their colleagues, limiting their interactions and idea exchange.

Second, it is noted that to support creativity, the ABO environment should appropriately interact with the various preferences of individuals and groups, which is a new finding from the interactionist perspective. Characteristics and needs in individual preferences (e.g., need for autonomy and commitment, personality traits) and group characteristics (group size, supportive leadership, etc.) are important components of the CKE framework. It is found that ABOs, when designed by considering employees' actual needs, characteristics, and types of activities have the potential to meet most of these preferences by providing a variety of spaces and functions. Further research in psychological and cognitive studies adopting an interactionist perspective may also help clarify additional predictive individual/group preferences and characteristics and how they interact with various types of spaces and the social environment to influence employee creativity.

Third, this study classified four types of creative activities (formal-individual, informal-individual, formal-group, and informal-group), which fits well with the flexible concept of ABOs and creative spaces, and allows a new perspective in studying the interaction between the physical environment and creativity. It is found that each activity type is influenced by different environmental characteristics in different ways (supporting/hindering). This study mainly examined idea generation and found that activities aimed at that require different spaces in the office, depending on their nature (formal/informal) and level (individual/group). Therefore, when studying creativity in any office environment, it is important to specify which activity type is being studied.

In conclusion, leveraging the interactionist perspective, our study found that a positive interaction between the ABO environment and employees' individual/group preferences and creative activities leads to higher employee creativity. This is a novel contribution to the interactionist perspective as there are only a few studies from this perspective with inconsistent results and focusing on the traditional physical environment. Another novel finding is that the ABO environment has a greater potential to promote employee creativity than traditional offices do, as employees have higher job autonomy and control over the environment and can change their workstation if it does not suit their preferences or the activity type. This emphasizes choice, flexibility, and personal control in workspaces to accommodate employee's commitment to their organizations and enhance their creative tasks. Therefore, ABOs with diverse and flexible spaces that can be reconfigured and adapted to different needs during the creative process can be classified as creative spaces. The CKE framework suggests that the flexibility and fluidity of a nonphysical knowledge-intensive environment can enhance creative efforts. It is found that this flexibility should also be applied to the physical environment to enhance creativity. This emphasizes the physical environment's role in organizational creativity theories, a topic that has been researched insufficiently.

From a practical point of view, it is important that employees have supportive rather than controlling managers who promote autonomy and trust. It was also found that employees in ABOs with desk-sharing policies need clearly defined guidelines for the use of the spaces, in addition to social support for the use of relaxation spaces and management support for organizing social activities. Such activities are important for employees to improve their idea sharing and creativity. Employees who are the end

users of ABOs should also be involved in the design process. An important consideration for managers is to identify the preferences and creative requirements by involving them in the process during the planning and design phase. Considering the different preferences of employees is a crucial aspect of designing a creative work environment. This study provides a comprehensive framework that can be employed in practice when firms want to design workspaces to support employees' preferred spaces and features for different types of employee creativity; consequently, the findings could be of interest to an organization as well as consultants and designers who value creativity in office interior design.

This study also has some limitations. Knowing employees' preferences and needs for each activity type, and involving them in the design process of their work environment could influence their perceived support for creativity. However, further studies are needed to investigate this and determine which individual/group characteristics are important for employees' preferences in using ABOs for creative purposes. Future studies adopting an interactionist perspective could also examine additional individual/group characteristics and preferences to determine how they interact with the ABO physical environment and employee creativity. In addition, further studies are needed to elaborate the results in terms of satisfaction with the ABO environment in relation to group creativity in stage 2 in physical, architectural or social, solid implications in a practical way.

In this study, five companies in Sweden were investigated. Because of the representative sample of knowledge workers with approximately equal proportions of men and women, the results can be reasonably transferred to other knowledge-

intensive institutions using ABOs. However, a larger data set, collected in different countries with different work cultures, will increase the generalizability of the conclusions and cross-validate the findings. Country culture and organizational culture might influence creativity (Hemlin et al., 2008) through space use, employee preferences, and leadership style in ABOs. In addition, the result may show variations in organizations in different locations, type of jobs, gender distribution, working hours, and age of the organizations.

Another limitation of our study was that the CIT interviews were conducted in English, which was the second language of most of the participants. However, since all the cases were international companies, the participants spoke English during parts of their workday. There were no major communication problems during the interviews; however, the pace of the interviews was relatively slow.

Considering that this study was conducted before the pandemic COVID -19, the results of this study might be affected and further studies will be needed in view of the expected major changes after the global pandemic. One of the expectations is the increase in work from home (WFH) and digital and virtual teamwork. In the future, the desire to work from home will underline the need for companies to introduce more flexibility, and digitization and the shift in employee thinking via COVID - 19 could be a powerful accelerator for ABO concepts to be adopted more. It is expected that in the future WFH will be a place frequently used by employees and could have the potential to be seen as a creative space for certain types of activities. Other new concepts such as co-working spaces and satellite offices should also be further

explored to find out their advantages and disadvantages for employee creativity compared to the ABO concept.

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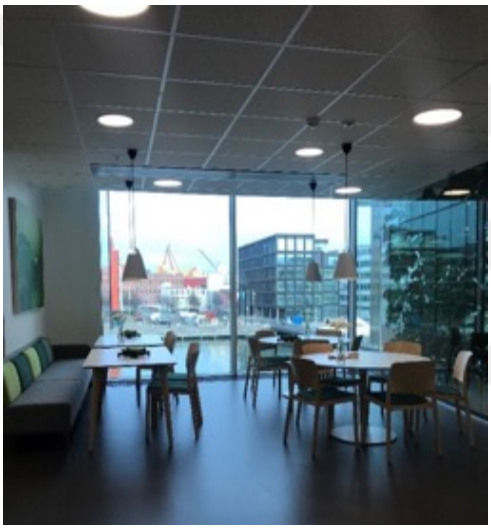
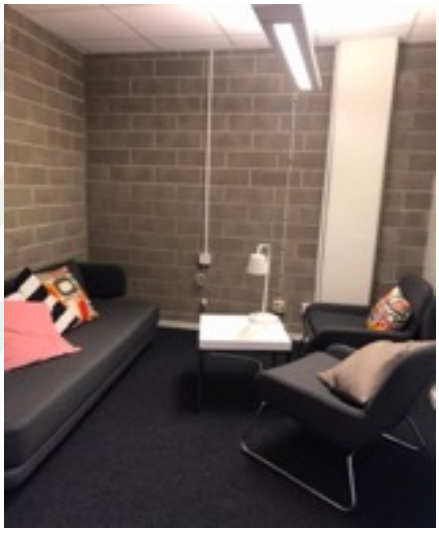
APPENDICES

Appendix A. Photos of different spaces types in case studies

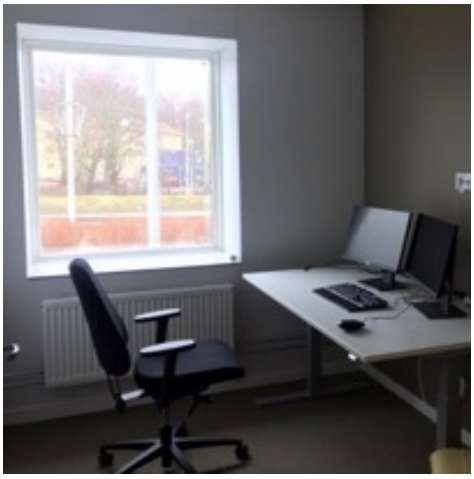
Disengaged spaces:



Relaxation space:



Private space (Single rooms):

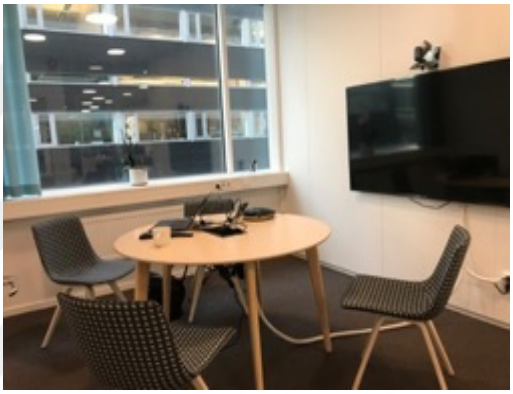


Semi-private couches:

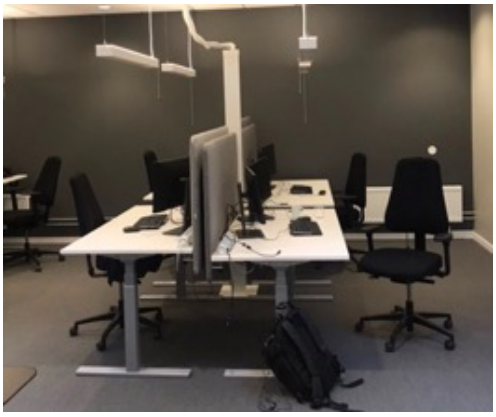
Collaboration spaces (bookable):

Collaboration spaces (open space):

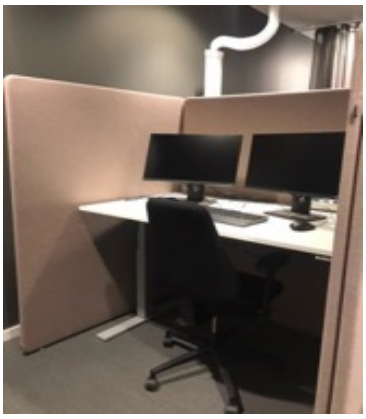
Collaboration spaces (non-bookable):



Open space (semi-silent zone):



Open space (silent zone):



Appendix B. Interview-Demographic

The table presents the demographic questions used in Stage 1 of the study in Cases 1, 2, and 3.

Demographic
1) Gender: Male ◯ Female ◯ Other ◯ Do not want to answer ◯ 2) Age: ☐ 3) Nationality: ☐
4) Education level: High school graduate ◯ Associate degree ◯ Bachelor's degree ◯ Master's degree ◯ Doctorate degree ◯ 5) Education Background: …….
6) Time spent in this building: Less than 6 months ◯ 7-12 months ◯ More than 1-less than 2 years ◯ More than 2-less than 5 years ◯ More than 5 years ◯ 7) Your job title: Consultants ◯ Marketers ◯ Controller ◯ Technical ◯ Designer ◯ Manager ◯ Administrator ◯ Other ◯ ……

Appendix C. Interview-CIT

The table presents the interview questions used in Stage 1 of the study in Cases 1, 2, and 3. The CIT was used in this series of inteviews.

Critical Incident Technique Interview **Investigating the supporting and hindering effects of space types and interior features in ABOs for four different types of creative activities.**
1. Remember the last time that you needed a place in your work environment to **concentrate** to generate new ideas: a) When was the incident at the time? Where were the space and why did you choose that space? b) What were the most important interior factors that encouraged you in the creative activity (solving a problem or generating an idea)? c) What were the most important interior factors that hindered you in the creative activity (solving a problem or generating an idea)? d) What were the consequences? How did you be able to come up with novel ideas/solve the problem at the end?
2. Remember the last time that you needed a place in your work environment to **communicate** or **collaborate** with your team or out of your team members (external/internal) to generate new ideas: **a)** When was the incident at the time? Where were the space and why did you choose that space? **b)** What were the most important interior factors that encouraged you in the creative activity (solving a problem or generating an idea)? **c)** What were the most important interior factors that hindered you in the creative activity (solving a problem or generating an idea)? **d)** What were the consequences? How did you be able to come up with novel ideas/solve the problem at the end?
3. Remember the last time that you needed a place in your work environment to **get relaxed and calm down** in process of generating new ideas: a) When was the incident at the time? Where were the space and why did you choose that space? b) What were the most important interior factors that encouraged you in the creative activity (solving a problem or generating an idea)? c) What were the most important interior factors that hindered you in the creative activity (solving a problem or generating an idea)? d) What were the consequences? How did you be able to come up with novel ideas/solve the problem at the end?

4. Describe the last time that you needed a place in your work environment to **play and hangout** in process of generating new ideas:

a) When was the incident at the time? Where were the space and why did you choose that space?

b) What were the most important interior factors that encouraged you in the creative activity (solving a problem or generating an idea)?

c) What were the most important interior factors that hindered you in the creative activity (solving a problem or generating an idea)?

d) What were the consequences? How did you be able to come up with novel ideas/solve the problem at the end?

Appendix D. Observation tools

Illustration of three rounds of observation in case 1

Appendix E. ABOs Physical Environment Satisfaction

What extent are you satisfied with the following physical environment elements in your current office?	Strongly Dissatisfied	Dissatisfied	Somewhat Dissatisfied	Neutral	Somewhat Satisfied	Satisfied	Strongly Satisfied	N/P
Space Comfort								
The disengaged spaces for hangout and break								
The spaces for meetings and ideas (open, semi open, closed)								
The spaces for your relaxation/chill-out								
Space for presentation (open, semi open, closed)								
The playing spaces e.g., table soccer and table tennis								
The private for concentration								
Principles allow for using different spaces (desk-sharing and speech policies)								
The possibility of working secluded from view of others in open space								
The size of spaces for receiving visitors and team activities								
Indoor Environmental Quality (IEQ)								
Temperature conditions of your work area in winter								
Temperature conditions of your work area in summer								
The amount of daylighting								
The overall air quality (fresh air, ventilation)								
The amount of artificial lighting								
The quietness level of work stations in open area (noise level)								
General acoustic, ability to understand desired sounds								
Privacy and Control								
The acoustic privacy at your work place								
The degree of visual privacy regarding walls, separation panels and furnishings								
The control over your required level of privacy and social interaction								
Control over personalize and decorating your workspace								
Control on adapting air conditioning and lighting control system								

Interior Design Elements								
The presence of cool colors (e.g., Blue, green)								
The presence of warm colors (e.g., Yellow, red)								
The presence of decorative elements (books, art work)								
Overall aesthetics								
The presence of natural plants and flowers								
Space Equipment								
The adjustability of height of tables and chairs								
The presence of high technology and monitors (monitors, speakers)								
The comfortability of office furniture (chairs, desks, cabinets)								
The presence of low technology (whiteboards)								
The variety of seating options (chairs, sofas)								
Excluded items based on results of EFA								
Storage spaces								
Space openness in terms of allowing you ease of locating/finding your colleagues to meet them								
Spatial layout and arrangement								

Appendix F. Job Autonomy

Job autonomy, job control, work time control, decision latitude

The scale below is a sub-dimension of the Organizational Support for Innovation Questionnaire (OSIQ).

Original scale

From Organizational Support for Innovation Questionnaire (OSIQ: Pirola-Merlo and Mann, 2000)

Job Autonomy								
(OSIQ: Pirola-Merlo and Mann, 2000)	**Strongly Disagree**	**Disagree**	**Somewhat Disagree**	**Neutral**	**Somewhat Agree**	**Agree**	**Strongly Agree**	**N/P**
1. I am free to determine how I will allocate my time each day.								
2. I feel able to follow leads and hunches that may arise during a project.								
3. I am free to decide how I will approach tasks.								

Appendix G. Organizational Commitment

Organizational Commitment Questionnaire (Porter, Mowday, and Steers, 1979).

Employee Organizational Commitment								
(OCQ: Porter, Mowday, and Steers, 1979)	Strongly Disagree	Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Agree	Strongly Agree	N/P
1. I am willing to put in a great deal of effort beyond what is normally expected in order to help my organization be successful.								
2. I talk up this organization to my friends as a great company to work for.								
3. I would accept almost any type of job assignment in order to keep working for my organization.								
4. I find that my values and my organization's values are very similar.								
5. I am proud to tell others I am part of my organization.								
6. My organization brings out the best in me and makes me perform on top.								
7. I am very happy that I chose to work for my organization compared to other organizations I chose between when applying for a job.								
8. I care about the fate of my organization.								
9. In my opinion, my organization is the best possible employer for which you can work.								

Appendix H. Group Creativity and Innovation

In this part of the survey, we ask you to give your idea of how creativity, innovation and development work works office. Below are a number of claims about creativity and innovation*. Please indicate how well they match your perceptions.

Group Creativity and Innovation (Scott and Bruce, 1994).								
Please indicate how often the following statements characterize this employee.	Strongly Disagree	Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Agree	Strongly Agree	N/P
1. In the office we search for new technologies, processes, techniques, and/or product ideas.								
2. In the office we develop creative ideas.								
3. Colleagues in the office promote and champion ideas to each other or to other people.								
4. Colleagues in the office we investigate and secure funds needed to implement new ideas.								
5. In the office we develop adequate plans and schedules for the implementation of new ideas.								
6. Colleagues in the office are innovative.								

Appendix I. Results related to PROCESS

Run MATRIX procedure:
********** PROCESS Procedure for SPSS Version 3.4.1
****

Written by Andrew F. Hayes, Ph.D. www.afhayes.com
Documentation available in Hayes (2018). www.guilford.com/p/hayes3
****

Model : 6
Y : Group Creativity
X : Physical
M1 : Auton
M2 : Commit

Sample
Size: 186

****
OUTCOME VARIABLE:
Auton

Model Summary

R	R-sq	MSE	F	df1	df2	p
.2157	.0465	.7892	8.6368	1.0000	177.0000	.0037

Model

	coeff	se	t	p	LLCI	ULCI
constant	5.0928	.3102	16.4192	.0000	4.4807	5.7049
Physical	.1844	.0628	2.9389	.0037	.0606	.3083

****
OUTCOME VARIABLE:
Commit

Model Summary

R	R-sq	MSE	F	df1	df2	p
.4483	.2009	.5167	22.1291	2.0000	176.0000	.0000

Model

	coeff	se	t	p	LLCI	ULCI
constant	3.1144	.3986	7.8126	.0000	2.3277	3.9011

Physical	.1308	.0520	2.5160	.0128	.0282	.2334
Auton	.3327	.0608	5.4709	.0000	.2127	.4527

****
******
OUTCOME VARIABLE:
Group Creativity

Model Summary

R	R-sq	MSE	F	df1	df2	p
.4638	.2151	.9336	15.9850	3.0000	175.0000	.0000

Model

	coeff	se	t	p	LLCI	ULCI
constant	.9823	.6219	1.5795	.1160	-.2451	2.2096
Physical	.1731	.0711	2.4337	.0160	.0327	.3135
Auton	.2494	.0884	2.8209	.0053	.0749	.4240
Commit	.3372	.1013	3.3282	.0011	.1372	.5372

********** TOTAL EFFECT MODEL
****
OUTCOME VARIABLE:
Group Creativity

Model Summary

R	R-sq	MSE	F	df1	df2	p
.2786	.0776	1.0847	14.8975	1.0000	177.0000	.0002

Model

	coeff	se	t	p	LLCI	ULCI
constant	3.8744	.3636	10.6546	.0000	3.1567	4.5920
Physical	.2839	.0736	3.8597	.0002	.1388	.4291

********** TOTAL, DIRECT, AND INDIRECT EFFECTS OF X ON Y
****

Total effect of X on Y

Effect	se	t	p	LLCI	ULCI
.2839	.0736	3.8597	.0002	.1388	.4291

Direct effect of X on Y

Effect	se	t	p	LLCI	ULCI
.1731	.0711	2.4337	.0160	.0327	.3135

Indirect effect(s) of X on Y:

	Effect	BootSE	BootLLCI	BootULCI
TOTAL	.1108	.0396	.0388	.1929
Ind1	.0460	.0256	.0053	.1039
Ind2	.0441	.0237	.0029	.0946
Ind3	.0207	.0128	.0024	.0513

Indirect effect key:
Ind1 Physical -> Auton -> Group Creativity
Ind2 Physical -> Commit -> Group Creativity
Ind3 Physical -> Auton -> Commit -> Group Creativity

********** ANALYSIS NOTES AND ERRORS **********
Level of confidence for all confidence intervals in output:
95.0000
Number of bootstrap samples for percentile bootstrap confidence intervals:
5000
------ END MATRIX -----

Appendix J. Ethical approval

Bilkent Üniversitesi
Akademik İşler Rektör Yardımcılığı

Tarih : 21 Kasım 2019

Gönderilen : Sepideh Yekanialibeiglou

Tez Danışmanı : Halime Demirkan

Gönderen : H. Altay Güvenir
İnsan Araştırmaları Etik Kurulu Başkanı

Konu : *Creativity in the ...*" çalışması etik kurul onayı

Üniversitemiz İnsan Araştırmaları Etik Kurulu, 21 Kasım 2019 tarihli görüşme sonucu, "*Creativity in the Activity-Based Offices*" isimli çalışmanız kapsamında yapmayı önerdiğiniz etkinlik için etik onay vermiş bulunmaktadır. Onay, ekte verilmiş olan çalışma önerisi, çalışma yürütücüleri, ve bilgilendirme formu için geçerlidir.

Bu onay, yapmayı önerdiğiniz çalışmanın genel bilim etiği açısından bir değerlendirmedir. Çalışmanızda, kurulumuzun değerlendirmesi dışında kalabilen özel etik ve yasal sınırlamalara uymakla ayrıca yükümlüsünüz.

Etik Kurul Üyeleri:

Ünvan / İsim	**Bölüm / Uzmanlık**
1. Prof.Dr. H. Altay Güvenir	Bilgisayar Mühendisliği
2. Prof.Dr. Erdal Onar	Hukuk
3. Prof.Dr. Haldun Özaktaş	Elektrik ve Elektronik Müh.
4. Doç.Dr. Işık Yuluğ	Moleküler Biyoloji ve Genetik
5. Dr. Öğr. Üyesi Burcu Ayşen Ürgen	Psikoloji
Yd.1.Doç.Dr. Çiğdem Gündüz Demir	Bilgisayar Mühendisliği
Yd.2. Dr. Öğr. Üyesi A.Barış Özbilen	Hukuk

Kurul karar/toplantı No: 2019_11_21_06

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