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Future of work: new ways of working to foster creativity and innovation

Candidato: Ing. Carlotta Cochis

Relatore (Tutor): Prof.ssa Fabiola Bertolotti

Correlatore: Prof.ssa Paula Ungureanu

Coordinatore dottorato di ricerca: Prof. Franco Zambonelli

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List of Publications

The list of author's publications on journals, on the basis of which the thesis has been prepared:

Papers for International Journals and Books:

i. How Perceptions of Work-Life Balance and Technology Use Impact upon Creativity in Collaborative Spaces. In *Digital Transformation and Human Behavior* (pp. 217-234). Springer, Cham. (Study 4), paper published in 2021 and co-authored with: Mattarelli, E., Bertolotti, F., Scapolan, A. C., Montanari, F., and Ungureanu, P. (2021).

ii. Multiplex boundary work in innovation projects: the role of collaborative spaces for cross-functional and open innovation. *European Journal of Innovation Management,* 24(3), 984-1010. (Study 3), paper published in 2020 and co-authored with: Ungureanu, P., Bertolotti, F., Mattarelli, E., and Scapolan, A.

iii. "Innovation in globally distributed teams: The role of brokers", (Study 1), paper in preparation for Journal of Management Studies and co-authored with Mattarelli E., Eisenberg J., and Gupta A

iv. How designed and emergent organizational structures impact upon creativity and work-life balance. *European Journal of Innovation Management,* currently under minor revision. (Study 2) and co-authored with: Mattarelli, E., Bertolotti, F. and Ungureanu, P.

Author's Contribution to the Publications

The contribution of the author to the papers in this thesis is:

i. The author of the thesis had a leading role in reviewing the literature, computed the data analysis and econometric estimations, and co-wrote the article, including the explanation of the research problem, the literature review, the discussion of the results, and the conclusion of the paper.

ii. The author of the thesis had a principal role in data collection (conducting interviews), coding dataset and reviewing the literature. The author of the thesis co-wrote the article, including the explanation of the research problem, the literature review, the results, and the conclusion of the paper.

iii. The author of the thesis had a relevant role in preparing a specific data subset for the paper, constructing model, analyzing data, reviewing the literature. The author of the thesis co-wrote the article.

iv. The author of the thesis had a principal role in reviewing the literature, defining model, computed the data analysis and econometric estimations, and co-wrote the article, including the explanation of the research problem, the literature review, the discussion of the results, and the conclusion of the paper.

Abstract

Recent global changes, from the pressing technological progress to the global pandemic, have enabled the diffusion of new ways of working (NWW) in response to increased individual needs for flexibility. NWW change temporal and physical boundaries of work and are characterized by a mixture of flexibility in terms of time and place. My research focuses on how the adoption of NWW affect creativity and innovation performance.

I apply multiple methods to study these complex relationships: quantitative methods to investigate the positive and negative effects of NWW on creativity and innovation outcomes; and qualitative methods to provide a rich description of boundary work processes.

My thesis is composed of 4 studies. The first study is based on a survey conducted in an IT multinational organization and investigates how boundaries are overcome in globally distributed teams. I focus on the team members who act as brokers between subgroups to "bring the team together" and address the challenges of having multiple geographical subgroups. I propose that, on the one hand, brokers foster team innovation by increasing knowledge sharing and perceptions of proximity; besides, brokers may reduce the opportunities for shared leadership within a global team. In the second study, I investigate how NWW designed to promote innovation (i.e., flexibility and social-organizational work environment) and emergent structures interpreted as facilitators of new ideas, differently impact creativity and work-life balance at the individual level. The results from a survey in a multinational company in the robotics industry show that flexibility is positively related to increased work-life balance but not creativity. Instead, the social-organizational work environment is associated with an increased level of new ideas but with a reduction in work-life balance.

NWW are often associated with the creation of new physical spaces for workers. In this regard, Collaborative Spaces (CS) are workspaces characterized by physical set-ups to foster collaborative and flexible work dynamics. In a third study, based on interviews and observations in a large food company, I investigate the role of CS in two types of innovation: internal innovation through cross-functional teams and collaborative innovation with external stakeholders. I highlight the importance of the relationship between expectations and experiences about the CS in the employees' ability to perform boundary work inside and outside the organization. In a fourth study, I focus on an additional type of CS, i.e., coworking. I explore how positive resources related to well-being and work-life balance promoted by NWW interact with the use of collaborative technology in influencing individual creativity. Through a survey of 132 workers in 27 coworking spaces, I discovered a positive relationship between the perceived level of satisfaction with work-life balance and individual creativity. However, the intense use of collaborative technology can generate perceptions of overload making the work-life balance's impact on creativity insignificant.

I contribute to the emerging debate in the literature on the role of human perceptions and behaviors in NWW adoptions. Mainly, I contribute to understanding the implications of NWW adoptions, collaborative technology, and emergent structures on innovative and creative work. I also contribute to the literature on boundary work by showing the challenges of using CS as organizational support tools and of using globally distributed teams.

Keywords: creativity, innovation, new ways of working, boundary work, work-life balance

Abstract (Italian language)

I recenti cambiamenti globali, dall'incalzante progresso tecnologico alla pandemia globale, hanno consentito la diffusione di nuove modalità di lavoro in risposta alle esigenze di flessibilità. Le nuove modalità di lavoro (NML) cambiano i confini temporali e fisici e sono caratterizzate da flessibilità in termini di tempo e luogo. La mia ricerca si concentra su come l'adozione di NML influenzi la creatività e l'innovazione.

Applico diverse metodologie per studiare queste complesse relazioni: metodi quantitativi per indagare gli effetti positivi e negativi delle NML sui risultati creativi e innovativi; e metodi qualitativi per fornire una ricca descrizione dei processi di gestione dei confini.

La mia tesi è composta da quattro studi. Il primo studio si basa su un'indagine condotta in un'organizzazione multinazionale IT e indaga come vengono permeati i confini nei team distribuiti a livello globale. Mi concentro sui membri che fungono da intermediari tra i sottogruppi con l'obiettivo di "riunire il team" e affrontare le sfide di avere più sottogruppi geografici. Propongo che i broker promuovano l'innovazione del team aumentando la condivisione delle conoscenze e le percezioni di prossimità; dall'altra parte, possano ridurre le opportunità di leadership condivisa all'interno di un team globale. Nel secondo studio, indago come le NML progettate per promuovere l'innovazione e le strutture emergenti interpretate come facilitatori di nuove idee, influenzino in modo diverso la creatività e il work-life balance. I risultati di un sondaggio in una multinazionale robotica mostrano che la flessibilità è positivamente correlata a un maggiore equilibrio tra lavoro e vita privata, ma non alla creatività. L'ambiente di lavoro socio-organizzativo è invece associato a un aumento di idee innovative, ma a una riduzione della soddisfazione del work-life balance. Le NML sono spesso

associate alla creazione di nuovi spazi fisici per il lavoro. Gli spazi collaborativi (SC) sono spazi di lavoro caratterizzati da ambienti fisici progettati per favorire dinamiche collaborative e flessibili. In un terzo studio, basato su interviste e osservazioni in una grande azienda alimentare, indago il ruolo di uno spazio collaborativo in due tipi di innovazione: innovazione interna attraverso team inter-funzionali e l'open innovation con stakeholder esterni. Sottolineo l'importanza del rapporto tra aspettative ed esperienze nel SC e la capacità dei dipendenti di svolgere lavori sui confini (interni ed esterni) dell'organizzazione. In un quarto studio mi concentro su un ulteriore tipologia di SC, il coworking. Esploro come le risorse positive relative al work-life balance promosse dalle NML interagiscono con l'uso della tecnologia collaborativa nell'influenzare la creatività individuale. Attraverso un sondaggio su 132 lavoratori in 27 coworking, scopro una relazione positiva tra il livello di soddisfazione percepito di work-life balance e la creatività. Di contro, l'uso intenso della tecnologia collaborativa può generare percezioni di sovraccarico rendendo insignificante l'impatto del work-life balance sulla creatività.

Contribuisco alla letteratura sul ruolo dei comportamenti umani nelle adozioni delle NML, e a comprendere come i NML vengano percepiti dai lavoratori adottanti. Contribuisco a comprendere le implicazioni delle adozioni delle NML, della tecnologia collaborativa e delle strutture emergenti sul lavoro innovativo e creativo. Contribuisco anche alla letteratura sulla gestione dei confini di lavoro, mostrando le sfide dell'utilizzo di SC come strumenti di supporto organizzativo e dell'utilizzo di team distribuiti a livello globale.

You cannot mandate productivity,

you must provide the tools to let people become their best.

—Steve Jobs

Introduction and Thesis Overview

Introduction

We are in the digitalization era. Nowadays, work, social life, training (formal and informal) take place both in real-life settings and in the virtual world. It is increasingly common to find professionalizing courses or degree courses offered on e-learning platforms or to meet friends and colleagues on social media by entertaining informal relationships through these channels via synchronous and asynchronous interactions.

Work has undergone a profound change from the internet advent. New technologies have revolutionized the way we work. The digital transition, enabled by new technologies, brings a set of technological, cultural, organizational, social, and managerial changes in organizations (see e.g., Stolterman & Fors, 2004; Zaoui & Souissi, 2020; Ebert & Duarte, 2018). Therefore, the digital transition of the work faces increasingly complex challenges, from implementing new work arrangements to radically changing organizational culture. This transformation is often denoted as the "New Ways of Working" (NWW) (Veldhoen, 1995).

NWW refer to all flexible practices that allow workers to determine *how*, *where*, and *when* they work and decide which resources they use and with whom they work. These practices, under-used by many employers just a few years ago, have become essential after the COVID-19 pandemic (see e.g., Diab-Bahman & Al-Enzi, 2020; Schmidtner et al., 2021).

In this chapter, I will connect the NWW to the complex scenario of the work of the future and show how my work, presented in the remaining chapters of this thesis, contributes to this research area. First, I will define what is meant by NWW. I will see how the original definition has evolved

into an articulated model with five facets. Then, I will analyze the advantages and disadvantages of adopting NWW and flexible working practices for organizations and highlight the most crucial literature debates, finding what remains to be further explored. In particular, I will portray how there is a paucity of studies that analyze the effect of NWW on workers' creativity and innovation, leaving space for further theoretical and empirical developments.

Finally, I will provide an overview of the entire thesis. The thesis is composed of 4 studies that contribute to the emerging debate in the literature on the role of human perceptions and behaviors in NWW adoptions. Mainly, I contribute to understanding the implications of NWW adoption, collaborative technology, and emergent structures on innovative and creative work. I also contribute to the literature on boundary work by showing the challenges of using Collaborative Spaces (CSs) and globally distributed teams.

The Future of Work and New Ways of Work

The growing diffusion and adoption of innovative and sophisticated ICT technology engender numerous new work ways. Artificial intelligence, blockchain technology, online applications, collaborative platforms, augmented reality, and virtual realities are just some examples of new technologies that contribute to changing how we think about the workplace. With "Future of Work" academics and practitioners typically refer to how work will be performed over the next decade, affected by technological, generational, and social shifts (see e.g., Adler, 1992; Donkin & Donkin, 2010; Schwartz et al., 2019). The new innovative technologies answer workers' need for flexibility and freedom to manage their work. *New ways of working* in the current wave of technological innovation are leading to a work culture transformation that can benefit both organizations and workers.

New ways of work (NWW) are a set of practices that promote flexibility and freedom for the worker, made possible by using technology (e.g., Baane et al., 2010; Blok et al., 2011; Gerards et al., 2018).

The concept of NWW is not recent. The first flexible working practices were implemented in the 1960s and 1970s. At that time, technology was still scarce and inaccessible. It did not allow connections between devices (informatics networks did not exist) to exchange information in real-time, and costs were excessive (Pérez et al., 2005; Van Meel, 2011).

However, flexible working arrangements such as teleworking took off in the 1990s, when organizations developed more innovative offices and wanted to save on office space (Kingma, 2019). The term "New Ways of Work" was coined in the Netherlands in the 90s by Erik Veldhoen. He published his first book entitled "Offices no longer exist" (1995), in which he envisaged the phenomenon of virtual collaboration through the "farewell to paper" as a key element of managerial activity. After the publication of his book, he worked on some innovative business projects, including the Interpolis project, a Dutch insurance company, in which he implemented for the first time the management of activities according to the principles of Smart Working (Jensen, 2011). This was his first successful smart working project. After the first virtuous case and other incredible successes that followed, the trend was reversed until reaching a percentage of 75% of failures of similar initiatives in other companies. The causes of these failures can be found in an organizational culture not yet ready for such dynamic management, according to Erik Veldhoen, and above all in technological innovation not yet suitable for managing a correct sharing of data and objectives. Furthermore, organizations were not ready to manage a distributed workforce not physically visible to management for most of the working time (Jensen, 2011; Veldhoen, 2004).

New Ways of Work: finding a shared definition

NWW are a relatively new topic in literature, and there is no common, unique definition (Blok et al., 2012). Many different studies on NWW use a variety of definitions and measurements of NWW. Mainly, NWW refer to all organizational employees-center practices that allow the workers to determine how, where, and when they work and decide which resources they use and with whom they work (Bijl & Gray, 2011). The first definition of NWW identified three key characteristics. The first key concept is the timing of work. The employees get more flexibility, and they can decide when they work. No fixed work schedule replaces the traditional 9 a.m. to 5 p.m. work pattern usually adopted in the office culture. The second is the workspace. NWW offer the employee free choice about the place of work, including the office, home, commuting location (e.g., when traveling, in a waiting room), the client's office, a cafe, or a temporary office, to give a few examples.

On the other hand, traditional workspaces are redesigned in a new way, simple, suitable, and accessible for every employee who comes to the office, e.g., mobile stations, movable furniture, etc. Last, NWW are supported and facilitated by new multimedia technologies (ICT), such as smartphones and videoconferencing systems. These technologies allow employees to be present (online presence) from any place and at any time (Baane et al., 2010; Bijl, 2009; Harrison et al., 2003; Veldhoen, 2004).

A definition borrowed from the consultancy world and published by Baane et al. (2010) summarizes NWW in three key points (3B): bricks, bytes, and behavior changes (Baane et al., 2010). Bricks refer to all aspects of the physical space (i.e., management of the physical work environment), bytes refer to technological dimension concerning the ICT implementations, and behavior changes

are organizational changes concerning the manager-employee relationship and the experience of workers (Baane et al., 2010).

Afterward, other authors have used different declinations to define the key aspect of the transformation involved by NWW. For instance, Blok et al., (2012) develop four key aspects: 1) the physical workspace, 2) (ICT) technology, 3) organization & management, and 4) work culture.

These four dimensions are not simply an evolution of the previous three key aspects (i.e., 3B), but rather redesigned features promoted by Baane et al., (2010) and other authors, building a broader and more articulated definition of NWW. The first aspect takes up the concept of bricks (Baane et al., 2010) and refers to workspace management practices as flexible practices that allow managing where and when to work (Blok et al., 2012). In particular, they refer to flextime and flexplace. Flextime is the "ability of rearranging one's working hours within certain guidelines offered by the company" (Hill et al., 2001, p. 50), while flexplace reflects the degree of control given to employees over where to work (Shockley & Allen, 2007). The definition by Blok et al. (2012) amplifies the previous one of bricks (Baane et al., 2010) by adding time flexibility in addition to place flexibility. The first dimension of Baane et al., (2010) was intended only as the management of the physical workspace (e.g., modifying the workstation, working from an unconventional station, using alternative furniture in office). As for the second aspect, ICT technologies support improving communication and overcoming the barriers imposed by time and space. As a result, workers can collaborate at any time and in any place and up to an infinite possibility of access to sources of information (Blok et al., 2012). This second aspect does not differ from that of Baane et al., (2010) of bytes. The third "B", behavior changes, defined by Baane et al., (2010) is split into two different concepts by Blok et al., (2012). Thus, the third key aspect proposed by Blok et al., (2012) is

“organization and management”, in which the focus is on employee management and the manager-employee relationship. The NWW implementation makes no longer visible where, when, and what employees are working. The trust-based relationships established within the organizational hierarchy become essential, and managers should implement evaluations grounded on achieved objectives and measurable outcomes, allowing employees autonomy in the management of their work. (Blok et al., 2012). The fourth and last aspect is the “work culture.” Promoting an open culture focused on information sharing and collaboration in networks becomes essential (Blok et al., 2012).

In recent years a more detailed and comprehensive definition of NWW has emerged. The definition includes five individual facets (Gerards et al., 2018). They distinguish the following five facets of NWW: (1) time- and location-independent working, (2) output management, (3) free accessibility and use of knowledge and ideas, (4) flexibility in working relations, and (5) freely accessible, open workplaces (Baane et al., 2010; Bijl, 2009; Gerards et al., 2018).

The first three NWW facets are similar to previous work. Notably, 1) time- and location-independent working, refer to flextime (Hill et al., 2001) and flexplace (Shockley & Allen, 2007), or what Gerards et al. (2018) call: “anytime, anywhere” (Gerards et al., 2018, p. 519); 2) management on output refers to how employees conduct their work. Again, the authors exploit Baane et al.’s expression: “manage your own work” (2010, p. 42); 3) the idea of free accessibility and use of knowledge and ideas is similar to the second key aspect of Baane et al. (2010)’s definition of NWW, i.e., "unlimited access and connectivity” (Gerards et al., 2018, p. 519).

The fourth facet, flexibility in working relations, "describes as a transition from -one size fits all- to -my size suits me-" (Baudewijns et al., 2015, p. 6). Baudewijns and colleagues refer to work

practices that allow workers to adapt the work situation to their needs. This personalization of work allows employees to adapt their working life to their current private situation (Baudewijns et al., 2015; Gerards et al., 2018). The fifth facet, i.e., "freely accessible, open workplaces," comes from studies emphasizing the interplay between the physical and cognitive environment and building on the work of Graham (2004), who argues that employee behavior to some extent always depends on physical elements of the workplace.

The most important contribution of Gerards et al. (2018) is to estimate a model in which these five facets are aggregated into one and shown to affect employees' work engagement (Gerards et al., 2018).

Current debates in NWW Literature

Although the NWW literature trend is relatively new, the concept of teleworking (Di Martino & Wirth, 1990), flexible work arrangements that allow working anywhere and anytime (Brewster et al., 1997), is not new. Therefore, the advantages and disadvantages of adopting flexible practices in organizations are already known in the literature.

First, an unquestionable advantage, already known for a long time, is the reduction of costs and saving time (Brewster et al., 1997; Demerouti et al., 2014; Di Martino & Wirth, 1990; Ten Brummelhuis & Bakker, 2012). Implementing flexible work practices in which employees are equipped with electronic devices connected to the Internet allows workers to work anywhere, without going to the office. Teleworking allows for savings on overhead costs, especially in large cities with high population density (e.g., London, Tokyo, New York), where the price of offices is soaring. When Rank Xerox in 1982 introduced teleworking as a pioneer of the work of the future, it aimed to reduce

fixed costs of offices in London, and they achieved fixed cost savings of 31% (Di Martino & Wirth, 1990). Most recent studies based on surveys indicate that for nearly six out of ten US employers, cost savings due to remote working were deemed a significant benefit (Global Workplace Analytics, 2015). Furthermore, the same consultant group has published in a recent whitepaper the estimate that employers can save an average of $11k/year for each halftime remote worker (Mamaysky & Lister, 2022). Likewise, the Eurofound report 2020 on telework and ICT-based mobile work suggests that employers' resort to such work arrangements to reduce costs and improve firm performance (Eurofound, 2020). Not having to reach the traditional office located in the company's building daily brings advantages in terms of reducing fixed costs for the organization and reducing costs for the workers. Employees will save money on transportation, for example, gasoline costs, the sunk costs of the car, or the cost of public transportation. This choice saves costs and is also an advantage in terms of sustainability, for example, reducing road traffic and CO2 emissions (Manochehri & Pinkerton, 2003).

Another advantage identified in the literature is increasing productivity and work engagement. The productivity milestone is attributed to the lack of interruptions (see e.g., Blok et al., 2012; Di Martino & Wirth, 1990; Manochehri & Pinkerton, 2003) and to a saving in terms of time to reach the workplace (Di Martino & Wirth, 1990). Furthermore, eliminating the wasted time and frustration of commuting also brings improved concentration, greater motivation and satisfaction at work, more outstanding dedication and morale, and a higher energy level (e.g., Di Martino & Wirth, 1990; Gajendran & Harrison, 2007; Manochehri & Pinkerton, 2003).

Many studies have demonstrated that NWW have a significant positive impact on work engagement through increased worker autonomy (Peters et al., 2014), increasing employee process

control, and facilitating more efficient communication among colleagues (Ten Brummelhuis et al., 2012), increasing social interaction in the workplace and transformational leadership (Gerards et al., 2018).

Finally, according to Di Martino and Wirth (1990), an essential advantage of flexible work arrangements would also be obtained in terms of inclusion. Indeed, allowing flexibility in working practices can facilitate the employment of disabled and neurodiverse workers. These workers have been shown, according to the authors, to have competitive advantages in flexible working. As a result, a new source of highly motivated and competent workers would emerge. Furthermore, the adoption of NWW favors rural development. In the mid-1990s, teleworking was sued to create jobs in rural and isolated areas and thus helped reduce regional imbalances in the U.S. In 1989, the European Commission highlighted the potential of teleworking "to reduce the social-economic gap between urban and rural, central and peripheral regions and the need to move away from focusing attention on the individual teleworker to embrace the working group"[1] (Di Martino & Wirth, 1990).

Two different academic debates are identified in the existing literature. The first debate is about the perceptions of work autonomy. Increased productivity and work engagement are also attributed to increasing the perceptions of work autonomy (Van Steenbergen et al., 2018). Implementing flexible work practices allows workers to perceive more autonomy in managing and organizing their work because the supervisor control is reduced (Bailey & Kurland, 2002; Gajendran & Harrison, 2007; Mann et al., 2000). Autonomy is a key concept in both work motivation, i) intrinsic motivation by fulfilling the basic human need of being in control over one's life (Deci & Ryan, 2013), and ii)

[1]Commission of the European Communities: Opportunities for applications of information and communication technologies in rural areas (Brussels, 1989), Annex A, Draft 4. https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:51989PC0506&from=EN

extrinsic motivation through the accomplishment of goals (Bakker & Demerouti, 2007), improving job performance (Katzell & Thompson, 1990; Steers et al., 2004).

However, some studies show that the adoption of NWW does not increase the perception of autonomy; on the contrary, it decreases it (see e.g., Van Steenbergen et al., 2018). According to some scholars, when the transition to NWW in an organization is mandatory, it reduces autonomy (e.g., Franken et al., 2021; Lapierre et al., 2016; Shamir & Salomon, 1985; Van Steenbergen et al., 2018).

These studies became very relevant, when in March 2020, in response to a global pandemic, many organizations were forced to ask their employees to work remotely from home for the foreseeable future. Forcing telework is one of the measures to contain COVID-19 infection (Franken et al., 2021). Workers feel that the obligatory nature of the transaction to new working practices, albeit flexible, is a limitation of their freedom (it is perceived as a "mandatory" transaction) and forced transition involves adopting new work guidelines and policies, which could decrease the perception of autonomy (Lapierre et al., 2016; Shamir & Salomon, 1985) for example, the request of continuous presence and availability on organizational enterprise platforms.

Perception of autonomy leads to a sense of control over working time that can help employees manage their work-life balance (Beckers et al., 2012), which is associated with good mental health at work (Haar et al., 2014) because it can give workers a chance to perform family duties (e.g., take care of children in after school activities) (Kotera et al., 2020). Work-life balance refers to situations where individuals are equally satisfied and equally involved in their work and family roles (Greenhaus et al., 2003). Some research (e.g., Hammer et al., 1997; Hill et al., 2001) found that perceived flexibility in terms of time and space is associated with higher levels of work-family balance, especially for

minority groups and underrepresented (Chung & Van der Horst, 2018). Providing employees with tools to improve flexibility can reduce negative emotions and, by increasing workers' perception of control over the resources of their work environment, can promote a better work-life balance (e.g., Anderson et al., 2002; Demerouti et al., 2014; Hill et al., 2001; Kossek & Ozeki, 1999).

The literature disagrees on the benefits of NWW on the perception of satisfactory work-life balance (Kotera & Correa Vione, 2020; Renard et al., 2021). Thus, the second academic debate emerges. Previous studies have reported both positive and negative effects of flexible work arrangements on work-family conflict (see e.g., Gajendran & Harrison, 2007; Glass & Finley, 2002; Kattenbach et al., 2010). Fundamental work is that of Gajendran and Harrison (2007). Their work covers a broad range of issues about NWW, in particular perceived autonomy and the effects of telework on the conflict between work and family. Through a meta-analysis, they systematize the studies on NWW and summarize the results to address what is still unknown despite decades of investigation. They answer three key questions from the debate "First, is telecommuting or distributed work effective? What are its predictable positive (and negative) consequences for individuals? Second, how do those consequences occur? What psychological mechanisms carry telecommuting's effects? Third, when do those consequences occur? Under what conditions does telecommuting have its strongest effects? " (Gajendran & Harrison, 2007, p. 1525).

In summary, they argue that telework has mainly beneficial effects on proximal outcomes, such as perceived autonomy and conflict between work and family. They emphasize the beneficial effects of teleworking on more distal outcomes, such as job satisfaction, performance, the intent of turnover, and stress on the role. The beneficial effects are mediated (even if partially) by perceived autonomy. They underline that teleworking did not generally negatively affect the quality of employment

relationships. Only high intensity teleworking (more than half a week) has accentuated the beneficial effects of telework on the conflict between work and family, but it has damaged relationships with colleagues (Gajendran & Harrison, 2007).

Some other studies highlighting the disruptive effects of technology use underline how collaborative technology (i.e., enterprise platform, videoconferencing applications, etc.) increases interruptions and disruptions on individuals' work, burdening them with an increased cognitive load (e.g., Karr-Wisniewski & Lu, 2010; Speier et al., 1999). However, some studies show that this is true only for intensive knowledge work. For example, Speier et al. (1999), find that interruptions negatively affect decision-making performance only for complex tasks. For simple tasks, they find the opposite effect. In a knowledge-intensive context, continuous connection with the work sphere, through smartphones, collaborative applications and enterprise platforms, increased pressure at work, and the inability to break it (Demerouti et al., 2014; Lang & Jarvenpaa, 2005). Indeed, managing the boundaries between work and private life becomes more challenging (Lang & Jarvenpaa, 2005).

Furthermore, a recent study has highlighted the risk of job burnout, especially in women, deriving from the forced teleworking imposed by the pandemic shelter in place orders (Aldossari & Chaudhry, 2021). Job burnout means "a psychological syndrome that involves a prolonged response to chronic interpersonal stressors on the job" (Maslach & Leiter, 2006, p. 45). The most common consequences of job burnout are: decreasing creativity and commitment, disengagement, absenteeism, and a drop in job performance (Aldossari & Chaudhry, 2021; Cherniss, 1992; Maslach & Leiter, 2006; Schaufeli & Bakker, 2004).

Some studies in the literature highlight another negative effect of teleworking and technology mediation: the isolation and lack of support from colleagues (Daniel et al., 2018; Di Martino & Wirth, 1990; Dolan, 2011). Indeed, working in an alternative place to the traditional office (e.g., home, coworking, internet café, etc.) creates a loss of physical contact with colleagues who are available only through virtual platforms (Daniel et al., 2018; Dolan, 2011). Teleworking can generate isolation and stress and negatively impact employee morale (Di Martino & Wirth, 1990). According to a literature stream referring to Social Presence Theory (1976) applied to computer mediated communication (CMC) (e.g., Joinson, 1998; Rice & Case, 1983), face-to-face interactions are the richest form of communication (e.g., Golden et al., 2008). Communications mediated by technology (e.g., e-mails, chats, phone calls, video calls, etc.) provide fewer social signals, which in turn can lead to misunderstandings, fewer feelings of belonging, and weakened collaboration. The adoption of NWW reduces the frequency of onsite (face-to-face) interactions and therefore limits the opportunities to receive (and give) support from supervisors and colleagues, thus perceiving them more distant (Demerouti et al., 2014).

The Focus of This Dissertation: Research Questions and Overview

NWW and position in the work-related social network as antecedents of Creativity and Innovation

The fundamental role of innovation and creativity for organizations has been at the heart of many economic theories for a long time. Schumpeter (see e.g., 1934, 1942) argued that innovation was nothing more than “a creative response that occurs when the economy or a sector act differently, outside the existing practice” to highlight the fact that innovations continually revolutionize the economic structure, considering “this process of creative destruction” as “the fundamental element of capitalism” (Schumpeter, 1942, p. 38). Nowadays, technological innovation is the most important

factor influencing business success in a competitive and dynamic environment. According to Amabile (1996), “innovation is the successful implementation of creative ideas within an organization.” (Amabile, 1996, p. 1) and “creativity is the production of novel and useful ideas in any domain." (Amabile, 1996, p. 1). Hence the creative process is central to organizations to promote innovation and thus maintain their competitive advantage in the market (e.g., Amabile, 1988, 1996; Florida & Goodnight, 2005; Schumpeter, 1934, 1942; Udwadia, 1990).

The literature has generally focused on the relation between NWW and work performance (e.g., Blok et al., 2011; Eaton, 2003; Kattenbach et al., 2010), worker productivity (e.g., Blok et al., 2011; Di Martino & Wirth, 1990; Kattenbach et al., 2010; Manochehri & Pinkerton, 2003), costs reduction (Blok et al., 2011; Di Martino & Wirth, 1990), and job satisfaction (e.g., Bakker & Demerouti, 2007; Irawanto et al., 2021), work engagement (e.g., Gerards et al., 2018; Peters et al., 2014; Ten Brummelhuis et al., 2012), perception of satisfactory work-life balance level (see e.g., Gajendran & Harrison, 2007; Glass & Finley, 2002; Kattenbach et al., 2010) and organizational commitment at the team level (e.g., de Leede & Nijland, 2016).

Few studies have empirically explored the link between NWW and creativity (e.g., Wang et al., 2018) or innovative outcomes (Medik & Stettina, 2014). For instance, the literature on individual creativity suggests that knowledge workers *should* be given more flexibility to develop more and better ideas (Boschma, 2005). Furthermore, some studies have shown that individual perceptions of autonomy in setting schedules and defining work practices are associated to higher creativity (Wang et al., 2009). In addition, NWW design can promote creativity by developing a sense of creative self-efficacy, i.e., the extent to which individuals believe they can produce novel ideas or the extent to which they perceive themselves to be creative (Wang et al., 2018).

If on the one hand, as already mentioned above, NWW have beneficial effects on proximal outcomes, such as perceived autonomy and conflict between work and family, on the other hand, some studies have shown that NWW can negatively influence the perception of employess' work-life balance (Demerouti et al., 2014; Lang & Jarvenpaa, 2005). For instance, the literature has neglected what the effects of this negative influence on creativity and innovation outcomes could be. Stress and perception of work overload can negatively affect individual creativity (Florida & Goodnight, 2005). Since creativity and innovation are determined factors for the success of the organizations or entrepreneures (see e.g., Schumpeter, 1934; Udwadia, 1990), it is interesting to investigate how the adoption of NWW impacts creativity and innovation, thus contributing to the organization's success.

The NWW are worker-centered practices intended to favor well-being and foster productivity. Communication technology plays a central role in allowing the adoption of NWW because it allows developing and maintaining social relationships (synchronous and asynchronous) with colleagues and stakeholders (Baane et al., 2010; Bijl, 2009; Harrison et al., 2003; Veldhoen, 2004). In this regard, an interesting trend in the literature emerging in recent years is "the social side of creativity" (Perry-Smith & Shalley, 2003, p. 89), that is the relationship between the position in the work-related social network and capacity to generate new ideas (Perry-Smith & Shalley, 2003). The literature shows discordant positions and paradoxes related to social network analysis and creativity. On the one hand, the centrality position in the social network brings benefits in terms of knowledge sharing (e.g., Perry-Smith & Mannucci, 2017), shared leadership (e.g.,Small & Rentsch, 2011), and perception of proximity in virtual teams (e.g, Hung et al., 2021), which are factors that affect individual creativity and innovative outcomes (e.g., Hoch, 2013; Hu & Randel, 2014; Leonardi, 2014). Research on work-related social networks demonstrates that individual centrality favors performance and innovation

(e.g., Ibarra, 1993; Kim et al., 2018; Perry-Smith & Shalley, 2003). For instance, being central in work-related social networks has been associated with positive outcomes for individuals' ability to leverage work-related resources, including task quality and quantity of strategic information (Cross & Cummings, 2004; Sparrowe et al., 2001; Sykes et al., 2014), which often result in creative outcomes (Perry-Smith & Mannucci, 2017; Tang et al., 2017). Research on social networks and creativity suggests that centrality in advice networks can lead to generating more creative ideas. Being exposed to knowledge and perspectives coming from multiple sources expands individuals' knowledge base and enables them to envision creative knowledge combinations (e.g., Fleming et al., 2007; Shah et al., 2018).

On the other hand, managing an extensive work-related social network does not only bring about benefits but also requires significant investments of energy (Day & Kilduff, 2003; Landis, 2016). The resource perspective (Ten Brummelhuis & Bakker, 2012) suggests that maintaining and sustaining a large number of instrumental relationships in the workplace requires time and effort and, as a consequence, can tax a person's cognitive resources. Therefore, being central to the work-related social network could lead to a perception of increased workload, associated with stress and feelings of overload, thus adversely affecting creativity (Florida & Goodnight, 2005).

However, the relationship between NWW and creative and innovative outcomes remains unexplored, and we need more evidence on the effects of the individuals' position in the work-related social network on creativity: Therefore, this work aims to explore:

R1: How do the various facets of NWW implementation and the position in work-related social networks impact workers' well-being, creative and innovative outcomes?

This thesis studies the NWW effect on creativity and innovation in cooccurrence with the position of workers in the work-related social network in the first part of the thesis. The first two papers investigate the simultaneous effect, through structural equations model, of NWW and SNA measurements as antecedents of creativity, innovation and perception of work-life balance.

Workspace designed for NWW

NWW are often associated with creating new physical spaces for workers (Graham, 2004; Kingma, 2019). Collaborative Spaces (CSs) are localized workspaces that give free access to resources (e.g., office equipment, collaboration platforms, prototyping technologies) and are characterized by a culture of openness and sharing, not only of material resources, e.g., the physical space itself, but also of knowledge, skills, and abilities (Capdevila, 2013).

These alternative workspaces can be of various kinds. There are collaborative spaces built within organizations to be a shared workspace for all employees where they find alternative ways of carrying out work tasks. An example is the space of LARNIA (study 3), designed according to the principles of design thinking (Brown, 2008). This space has walls and furniture easy to move to adapt the space to the needs of the project. There are various uncommon materials for an office, in this space, such as colored cardboard, glue, straws, woods, Lego, and other objects useful for prototyping and creating artifacts during design thinking sessions. Since the space promotes collaborative practices and moments of sharing, it also presents a common relaxation area (composed of sofas, tables, cushions) and a shared kitchen.

CSs external to companies also have common areas where coworkers can meet and exchange knowledge. For example, the coworking space "Smistamento", based in Rome, is a place of shared

planning. The space is designed to welcome designers, students, and professionals from different fields and connect them to give life to unique and innovative projects. The space is characterized by large tables, bright spaces, wi-fi, single direct lighting for each station, very long rolls of drawing paper hanging on the walls that run directly on the desks, printers, all kinds of books from which to draw inspiration. In addition, this space has a relaxation room with a refreshment area, creative readings, and leisure moments. Other CSs (e.g., FabLab), in addition to technologies and collaborative spaces, present laboratories equipped with sophisticated machinery (e.g., for working wood, 3D printing, modeling clay) available to coworkers.

These workspaces are created to facilitate and promote flexible work practices and social interactions (Aroles et al., 2019; Kingma, 2019). Specifically designed physical set-ups are intended to foster collaborative and flexible work dynamics (e.g., Amir, 2020; Cabral & Van Winden, 2016; Spinuzzi, 2012). The reasons for attending a CS are cost reduction, the attractiveness of NWW, work-life balance, efficiency, sustainability, and regional development incentives (e.g., Kojo & Nenonen, 2017; Spinuzzi, 2012).

CSs are designed also to foster the development of a sense of creative community (Garrett et al., 2017). The community that interacts in a physical space plays a central role in exchanging ideas. Starting from the assumption that face-to-face contact positively impacts the propensity of individuals with different backgrounds to interact and exchange ideas (Oksanen & Ståhle, 2013), CSs encourage individual creativity (Bouncken & Aslam, 2019; Bouncken et al., 2016; Capdevila, 2015; Moriset, 2013; Spinuzzi, 2012).

Furthermore, creating a CS within organizations or in public spaces is often associated with smart work strategies to promote individual well-being and work-life balance. Various potential users operate in these CSs, including public and private employees, freelancers, entrepreneurs, small and micro enterprises, using numerous technological resources and services (Capdevila, 2019; Errichiello & Pianese, 2018) and exploiting flexible work arrangements. Therefore, NWW promoting CSs should promote work-life balance, with positive implications for individual and team results. The second research question unpacks NWW dynamics within the CS:

R2 How do the elements of NWW in CS impact employee well-being, creativity and innovation?

To answer this research question, the second part of the thesis consists of two papers investigating the positive and negative effects of workspaces designed for NWW (CS) on creative and innovative outputs through quantitative and qualitative studies.

Table 1 shows the four studies composing this thesis, the concepts and measures used, which NWW facets are studied, the hypotheses (if present) and main research questions. In the next paragraph I will detail the contents of each of these studies.

Table 1. Thesis contents overview

Paper Title	Methods	Measure	NWW	Papers' Hypothesis or Specific Objectives	Main Research Questions
1) Innovation in globally distributed teams: The role of brokers	Survey based – quantitative study	IV: Brokerage, knowledge sharing, perceived proximity, shared leadership DV: Team innovation	Virtual distributed teams	H1: Brokerage across subgroups will have a positive effect on team innovation via increased codified knowledge sharing H2: Brokerage across subgroups will have a positive effect on team innovation via increased perceived proximity H3: Brokerage across subgroups will have a negative effect on team innovation via reduced shared leadership	R1: How do the various facets of NWW implementation and the position in work-related social networks impact workers' well-being, creative and innovative outcomes?
2) How designed work environment and enacted work interactions impact creativity and work-life balance	Survey based – quantitative study	IV: Flexible arrangements and elements of the social-organizational work environment, outdegree centrality in instrumental network. DV: Individual creativity, perception of work-life balance.	A work environment designed to promote innovation, work interactions among employees (online and onsite)	H1: Flexible work arrangements have a similar impact on both creativity and work-family balance H2: A social-organizational work environment designed to promote creativity differently impacts creativity and work-family balance H3: Receiving advice from a large number of colleagues (i.e., centrality in instrumental social networks) differently impacts creativity and work-family balance	
3) Multiplex Boundary Work in Innovation Projects. The Role of Collaborative Spaces for Cross-functional and Open Innovation	Qualitative study	Expectations about the CS, experiences about CS. Internal innovation (cross-functional teams) open innovation (with external stakeholders).	Collaborative spaces as tools for multiplex - boundary management in innovation projects	Investigate the impact of the collaborative space on employees' ability to simultaneously perform internal and external boundary work by comparing their expectations about the space with actual experiences of it.	R2: How do the elements of NWW in CS impact employee well-being, creativity and innovation
4) How Perceptions of Work-Life Balance and Technology Use Impact Upon Creativity in Collaborative Spaces	Survey based – quantitative study	IV: Perceived level of work-life balance satisfaction; technology mediated interactions. DV: Individual creativity.	Collaborative space	H1: The higher the perceived level of work-life balance experience through the CS, the higher the creativity H2: The higher the technology mediated interactions with external actors (outside of the CS), the higher the creativity H3: The positive relationship between work-life balance and creativity is negatively moderated by technology mediated interactions with external actors	

Study 1: Innovation in globally distributed teams: The role of brokers

The first study is based on a survey conducted in an IT multinational organization and investigates how boundaries are overcome in globally distributed teams. Globally distributed teams are temporary teams of people who are connected via communication technologies across functional, organizational, and/or geographic boundaries in order to combine skills and resources to achieve a goal (see e.g., Jarvenpaa et al., 1998). The members of globally distributed teams apply flexible working practices. They work from different places and at different times than the standard working time (9 am - 5 pm), also due to different time zones. Furthermore, they make intensive use of technology to communicate and manage teamwork. Therefore, investigating the dynamics of the globally distributed teams allows us to study the five facets of the NWW operating simultaneously in the dynamics of the teams.

Organizations have been increasingly relying on globally distributed teams for innovation, and these teams frequently experience issues related to the emergence of geographical subgroups dynamics. The paper proposes that the presence of brokers addresses some of the challenges related to subgroups, by increasing perceptions of proximity and knowledge sharing, positively influencing team innovation, but reduces shared leadership within a team, negatively influencing innovation. The analysis includes the evaluation of 1334 responses from employees in 111 globally distributed teams, which were evaluated by 97 managers. in a multinational company engaged with developing new IT systems for global clients. The results support for the mediating effect of knowledge sharing and perceived proximity between brokerage and team innovation. This work has implications for understanding global teams functioning, team innovation, and the role of brokers in organizations.

Study 2: How designed work environment and enacted work interactions impact creativity and work-life balance

The second study investigates how NWW and emergent structures interpreted as facilitators of new ideas differently impact creativity and work-life balance at the individual level. In particular, this paper investigates how i) a work environment designed to promote innovation (i.e., through flexible arrangements and elements of the social-organizational work environment) and ii) the amount of enacted work interactions among employees, interpreted as facilitators of new idea generation (i.e., outdegree centrality in instrumental networks), differently impact creativity and work-life balance. The study was conducted in a knowledge-intensive multinational company and collected data through a survey on a sample of 207 workers. The company is specialized in the design and engineering of robotic systems for industrial plant logistics. Thanks to highly innovative hardware and software solutions, it was one of the first players to anticipate the industry 4.0 revolution in the early 1990s, becoming widely known as a market leader of integrated automation solutions. Given these characteristics, this company well exemplifies the innovative fast-growing technological companies in Europe and beyond (e.g., Avigdor & Wintjes, 2015). Findings highlight that flexible work arrangements, adopting by organization, are positively related to increased work-life balance but not to creativity, whereas the social-organizational work environment designed to promote creativity is associated to an increased level of idea generation, but to a reduction in work-life balance. In addition, centrality in instrumental social networks is also associated to a reduction of work-life balance. Findings thus point to a potential trade-off between structures aimed at increasing creativity and initiatives aimed at engendering work-life balance.

The research contributes to the current debate on new organizational practices for innovation and creativity, highlighting their unexpected implications for workers. The research also contributes to the literature on work-life balance by unravelling previously unexplored antecedents, i.e., social networks and the social-organizational work environment designed for creativity.

Study 3: Multiplex Boundary Work in Innovation Projects. The Role of Collaborative Spaces for Cross-functional and Open Innovation

The third study, based on interviews and observations in a large food company investigates the role of CS in two types of innovation: internal innovation through cross-functional teams and collaborative innovation with external stakeholders. In particular, the study focuses on collaborative spaces as tools for multiplex -i.e., simultaneous internal and external- boundary management in innovation projects. The study was conducted in a multi-divisional organization that set up in its headquarters a collaborative space for collaborative product development. The CS was designed and managed by the R&D Department of the Group, and commonly hosted work-teams composed of employees from company's multiple departments and offices, clients, suppliers, consumers, consultants, opinion leaders, bloggers, journalists, master's students, and researchers. Each project team was called upon to solve a need or to optimize a product, or a process, within projects that lasted from several weeks to more than a year. Given the focus on interactive and hands-on collaborative sessions, the furnishings of the space were for the most part mobile, so that the actors involved could change the space layout according to emergent needs at each session of use. The CS follows the new approach to innovation based on collaborative dynamics. Data were collected through semi-structured interviews and participant observations.

Findings highlight that the relation between expectations and experiences about the collaborative space impact on employees' ability to perform boundary work inside and outside the organization. In addition to the collaborative space's affording role for expectations about hands-on collaborative innovation (space as laboratory), the study also highlights a set of collaboration constraints. These latter are generated by perceived boundary configurations (i.e., degree of boundary permeability and infrastructuring in internal and external collaborations) and by discrepancies between expectations (space as laboratory) and actual collaboration experiences in the space (i.e., space as maze, cloister, showcase and silo). Results show that space-generated constraints slow down internal and external boundary work for innovation and generate a trade-off between them. Using the process-based perspective of boundary work, the paper connects studies on cross-functional teaming and open innovation through the concept of 'multiplex boundary work'. It also contributes to the literature on boundary work by showing the challenges of using collaborative spaces as organizational support tools for multiplex boundary spanning.

Study 4: How Do Perceptions of Work-Life Balance and Technology Use Impact Upon Creativity in Collaborative Spaces

The fourth study unpacks creative processes in collaborative spaces (CS) focusing on how the positive resources related to well-being and work-life balance derived from working in CS interplay with the use of collaborative technology in affecting individual creativity. Data were collected through a survey with individuals working in 27 different CS in Italy. The survey reached individuals in different types of collaborative spaces, mainly coworking spaces (55% of respondents), business incubators (8%), science parks (20%), and hybrid spaces (17%). The research proposes and finds a positive relationship between the perceived level of work-life balance satisfaction and individual

creativity. Instead, it does not find a significant relationship between the frequency of technology mediated interactions with external actors and individual creativity. Furthermore, the relationship between work-life balance and creativity is negatively moderated by technology mediated interactions with external actors. In other words, an intense use of collaborative technology with actors external to the CS can generate perceptions of overload and therefore making the impact of work-life balance on creativity not significant.

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Study 1: Innovation in globally distributed teams: The role of brokers

Introduction

Globally distributed teams are increasingly utilized by organizations to conduct knowledge intensive and innovative work (Koppman et al., 2016; Mell et al., 2021). However, the effective functioning of these teams still faces multiple challenges, as the pandemic has further underlined (e.g., Feitosa & Salas, 2020). The literature on globally distributed teams has stressed, for example, how the presence of multiple geographical subgroups (one or more individuals localized in an office, home, a co-working space or some other specific location) leads to reduced knowledge sharing, lack of perceived proximity, and other challenges (Gibbs et al., 2021; Janssens & Brett, 2006; Mattarelli et al., 2017; O'Leary & Mortensen, 2010; Søderberg & Romani, 2017). The option of having one or more team members, who act as brokers between subgroups, has been proposed, both in theory and practice, as a way to 'bring the team together' and address the challenges of having multiple geographical subgroups (e.g., Eisenberg & Mattarelli, 2017). They can be formally assigned their position as brokers or volunteer to engage in brokering behaviors by facilitating interactions of fellow team members, frequently across a team's subgroups. Previous research has explored how brokers can increase knowledge flows across subgroups (e.g., Mattarelli & Gupta, 2009; Reus et al., 2020) and how certain individuals can help in making everyone in the team aligned and aware of what everyone else is doing (e.g., Jang, 2017; Leonardi & Bailey, 2008), but how brokerage in teams affects team innovation is still underexplored. As team innovation is crucial for organizations to succeed in the modern dynamic environment characterized by complexity, developing an understanding about factors that influence it is key (Li et al., 2016).

Social network literature has investigated the relationship between brokerage and innovation, focusing mainly on the *individual* and *organizational* levels of analysis (Clement et al., 2018). For example, individuals who act as brokers tend to be more creative, as they span boundaries across different knowledge groups or communities (Burt et al., 2013; Li et al., 2018), and are more involved with innovation processes within organizations (Obstfeld, 2005), although they may experience an increased individual workload (Mell et al., 2021). A few studies have focused on the benefit of having brokers for organizations, networks, or communities. For example, Grigoriou and Roathmael (2014) find that the number of brokers within an organization is positively related to the firm innovation outcome and Lingo and O'Mahoney (2010) show how brokers acting as connectors within a community of music producers distribute knowledge and foster creative collective outcomes.

Brokers can also be harmful to organizations (Halevy et al., 2019) for example, when they act as hostile mediators across parties (Zhang et al., 2017), when they use their position to engage in gossip (Kniffin & Wilson, 2005) or when they take advantage of their position for personal outcomes (Quintane & Carnabuci, 2016). Brokers also need to be able to connect to others on the team, which despite being necessary, may be harder to do in dispersed - and thus less personal - settings associated with geographically and globally distributed teams. These examples suggest that brokers may not always have a positive influence on factors that affect team innovation.

In this paper, we focus on the underexplored relationship between brokerage and innovation in teams and we propose that the benefits of having brokers within globally distributed teams are accompanied by potential drawbacks. Specifically, drawing from the social network and communication theories (Carson et al., 2007; Grosser et al., 2019; Mell et al., 2021) we propose that, on the one hand, brokers can foster team innovation by increasing knowledge sharing and perceptions

of proximity; and on the other hand, brokers may reduce the opportunities for shared leadership within a global team, with negative implications for team innovation.

Hypothesis Development

Following a social network perspective, brokers have the power of bringing together individuals or subgroups that, otherwise, would be disconnected (e.g., Halevy et al., 2019). Dysfunctional processes across geographic subgroups are common in global teams, largely due to the limited, sometimes nonexistent, interactions across distant individuals, that lead to amplified status differences (Koppman et al., 2016; Metiu, 2006; Søderberg & Romani, 2017), lack of mutual understanding and familiarity (Cramton, 2001; Maynard & Gilson, 2014; Maynard et al., 2019) and limited trust (Jarvenpaa & Leidner, 1999).

A study of over 200 teams concluded that "sharing knowledge among team members is critical to accomplishing innovation," highlighting the need to overcome communication barriers (Hu & Randel, 2014, p. 213). Previous literature has underlined how brokers can act as bridges across distinct subgroups and integrate competing perspectives (Mell et al., 2021), thus enabling increased information and knowledge flows (Eisenberg & Mattarelli, 2017; Leonardi & Bailey, 2008; Mattarelli & Gupta, 2009; Søderberg & Romani, 2017). To this regard, Levina and Vaast (2005) describe the emergence of informal brokers as 'boundary-spanners-in-practice' that bring together different knowledge through the use of boundary objects, such as FAQs and shared folders.

We argue, in particular, that brokers facilitate team innovation by increasing the flow of *codified* knowledge (e.g., documented knowledge about the architecture of a product) across subgroups. Previous research has shown that brokers help bridge the distance among team members and lead to

improved team functioning (Mattarelli et al., 2017). More specifically, they contribute to facilitating knowledge transfer across onsite, offshore and other types of locations (Gupta et al., 2009; Mattarelli & Gupta, 2009; Reus et al., 2020). Mattarelli and Gupta (2009) found that, when status differences across subgroups are high - a condition that is common in globally distributed teams (see for example Metiu, 2006) - brokers are more helpful in facilitating the flow of codified knowledge than tacit knowledge. However, in their study, the effect on innovation is not investigated. In virtual and globally distributed teams, where face to face interactions are limited or absent, team members tend to share codified knowledge rather than tacit knowledge. Codified knowledge is explicit, i.e., can be expressed or articulated in text, formulae, reports, drawings, etc. (Brown & Duguid, 1991; Tagliaventi & Mattarelli, 2006) and can be shared through collaborative technology. We argue that, through the distribution of codified knowledge, brokers can contribute to increased team innovation by helping team members engage in more effective knowledge sharing behavior, which has been shown to positively influence team innovation (e.g., Hu & Randel, 2014; Leonardi, 2014).

H1: Brokerage across subgroups will have a positive effect on team innovation via increased codified knowledge sharing

By bringing together members of different subgroups, brokers may increase team members' perception of proximity. Theories of team awareness underline how global teams often lack an understanding of what other members are doing (Hinds & Weisband, 2003; Jang et al., 2002). Brokers can help increase team members' awareness of each other's competences and tasks by enhancing integration (Mell et al., 2021), in turn improving a sense of perceived proximity among teammates. Perceived proximity is a dyadic and asymmetric construct that represents a subjective perception of one individual about how close or far another individual is, regardless of the physical distance that

separates them (Wilson et al., 2008), making it particularly relevant to the study of globally dispersed teams. Perceived proximity has increasingly been utilized to study the effects of distance on geographically and globally dispersed team member interactions due to its relevance in reflecting team member perceptions (Eisenberg et al., 2021; O'Leary et al., 2014; Wilson et al., 2008);. Brokers engage in coordination related work and facilitate team member interactions, which are associated with perceived proximity (O'Leary et al., 2014). Further, following the Changing Others' Relationships (COR) Framework (Halevy et al., 2019), brokers affect relationships between team members in different subgroups by strengthening interdependencies and by aligning interests and expectations (Halevy et al., 2019), thus increasing perceived proximity.

Perceived proximity has been found to positively influence global team functioning (Eisenberg et al., 2018). In particular, perceptions of non-spatial proximity are important for team innovation in global virtual teams (Hung et al., 2021). Thus, we argue that brokers will have a positive influence on global team innovation by increasing team members' perceived proximity.

H2: Brokerage across subgroups will have a positive effect on team innovation via increased perceived proximity

In addition to the positive effects brokers can have in a team, they may also act as filters by reducing the opportunities for spontaneous direct interactions across subgroups. The team will rely on one or few individuals in a brokerage role to distribute relevant information. This may make it more difficult for other individuals to step up as leaders within a team, engaging in what is referred to as shared leadership. Shared leadership is defined as a "relational phenomenon involving mutual influence between team members as they work toward team objectives" and it facilitates a "reciprocal

influence," which further develops and facilitates existing relationships among team members (Carson et al., 2007, p. 1220). Theories on shared leadership have suggested that it is beneficial for team effectiveness (Zhu et al., 2018), virtual team performance (e.g., Hoch & Dulebohn, 2017) and virtual team innovation (Hoch, 2013). While shared leadership has generally been suggested to have positive influence in teams (for a recent review, see Zhu et al., 2018), some have highlighted the importance of examining boundary conditions when team members may not welcome the influence of fellow teammates (Muethel & Hoegl, 2012). Specifically, Muethel and Hoegl argue that for shared leadership to be effective, team members have to appreciate the attempts of others on the team to influence them (2012). However, the literature on network brokerage underlines that the perception from other team members that a broker may be exploiting their position for personal benefit may reduce confidence in the broker (Stovel et al., 2011) and trust in the team (Yamagishi & Kiyonari, 2000). Thus, a broker's influence on the team may result in reduced shared leadership. This may be particularly relevant if team members do not perceive it as necessary. Further, Fleming and Wagenspack (2007) suggest that broker's behaviors tend to make one person emerge as a leader, reducing the opportunities for shared leadership. Since shared leadership is beneficial for team innovation (Hoch, 2013), by reducing the opportunities for shared leadership within a team, brokers may have a negative effect on team innovation.

H3: Brokerage across subgroups will have a negative effect on team innovation via reduced shared leadership

Figure 1.1 outlines our hypothesized model.

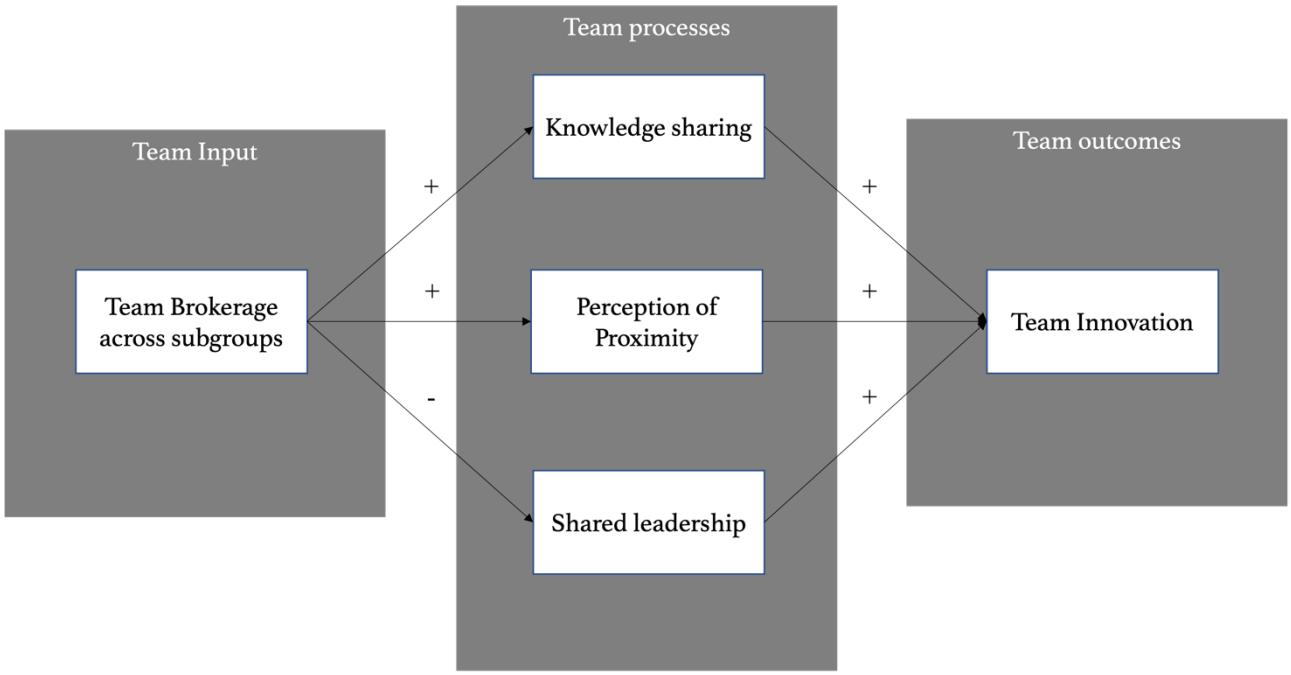

Figure 1.1. Theoretical Model and Hypotheses

Data and Methods

We conducted a survey-based study of globally distributed teams in a large global IT company headquartered in India. The company develops new IT systems for client organizations and is a leader in next-generation digital services and consulting. Founded in the early '80s, it provides end-to-end business solutions for its customers, including technical consulting, product engineering, development, maintenance, systems integration, package-enabled consulting, and infrastructure implementation and management services. This company has over 243,400 employees in 200 locations across 46 countries globally, with annual total revenues of over 12 billion dollars. The company uses globally distributed teams for the development of IT systems for clients around the world and adopts an onsite-offshore model (e.g., Koppman et al., 2016), with some team members based onsite at the client office, and some members based in India. In the past 10 years, the company has invested in moving away from providing general IT services to becoming an innovative partner

of its clients. To do so, it has invested in organizational practices to promote the idea of 'innovation anytime anywhere.' The company received several awards and recognitions. For example, Forbes ranked it amongst the world's top 20 most innovative companies in 2012. More recently, Forbes ranked it among the 10 Best Regarded Companies in the World.

Survey Data Collection

With the support of an executive at the company, we invited 1743 employees, who were members of globally distributed teams, to participate in an online survey. In a second survey, we invited 115 stakeholders to evaluate the outcomes of the teams. These stakeholders were at least one or more hierarchical levels above the team manager(s), enabling them to provide an unbiased evaluation, while still familiar with the team's functioning and outcomes. Since some of the stakeholders were supervising multiple teams, they ended up providing an evaluation for multiple teams.

After excluding responses with missing data, we retained 1334 responses from team members and the evaluation of 366 teams from 97 stakeholders. We aggregated the data from the individual level to the team level, obtaining a final sample of 111 teams, after data cleaning, and data validation processes. The teams were composed of a minimum of two to a maximum of thirty-one team members. Following earlier research (e.g., Williams, 2010), we decided to include the teams of dyads in our analyzes. As stated by Williams (2010), "[…] what a group is. This is it: two or more people. The end." (Williams, 2010, p. 269). In his work, Williams offers a detailed explanation for why dyads should be included in team studies. He further claims that excluding dyads from team studies could lead the research results to be "specious and shortsighted" (Williams, 2010, p. 273). Often groups of two people are simply small groups, which exhibit the same dynamics as groups of three or more

people (Williams, 2010). Our decision to include the dyads in our analyses is aimed at avoiding missing essential insights into group dynamics for our research.

The age of team members was between 20 - 25 years (38%), 26 - 30 years (38%), 31 - 35 years (14%), 36 - 40 years (6%), and 41 years and above (4%). The high percentage of young employees is consistent with the characteristics of this industry (IT consultancy) and the location of headquarters (India) of this company.

Measures

Team Brokerage across subgroups. In order to measure brokerage in global teams, we used social network analysis questions measuring the amount of communication and advice (Labianca et al., 1998). We first asked respondents to identify the names of colleagues with whom they had interactions and then how often they communicated with each person for work-related matters. The response scale was: Hourly, Daily, Weekly, Monthly, Yearly.

The measure of brokerage is based on betweenness centrality. Betweenness centrality measures the number of times a node lies on the shortest path between other nodes. This measure shows which nodes are 'bridges' between nodes in a network. Betweenness is useful for analyzing communication dynamics (e.g., Landherr et al., 2010). Betweenness can be represented as:

$$Betweenness(v) = \sum_{s \neq v \neq t \epsilon V} \frac{\sigma_{st}(v)}{\sigma_{st}}$$

where σ_{st} is the total number of shortest paths from node s to node t and $\sigma_{st}(v)$ is the number of those paths that pass-through v (Newman, 2004). We measured brokerage across subgroups as the average brokerage within the team.

Knowledge Sharing. Codified Knowledge sharing was measured with the three items proposed by Choi et al. (2010). The three items are related to stakeholders' perceptions of the degree to which the team members share different forms of knowledge and were assessed on a 5-point Likert scale (from 1= strongly disagree to 5= strongly agree). We asked respondents: "Our team members share their work reports and official documents with other team members?"; "Our team members provide their manuals and methodologies for other team members?"; "Our team members share their experience or know-how from work with other team members?" Team knowledge sharing was collected as a team level measure. The Cronbach's alpha coefficient for team knowledge sharing is 0.94, and the square root of average variance extracted (AVE) is 0.89.

Perceived Proximity. We measured perceived proximity by adapting O'Leary et al. scale (2014) on a 5-point Likert scale (from 1, "not at all," to 5, "to a very great extent"). We asked respondents: "To what degree do they perceive to be close (i.e., feelings of closeness regardless of physical distance, often thinking of him/her in relation to work issues) to your team members?" They had to answer for each team member previously identified. Perceived proximity was measured as an average of the perceived proximity outdegree of the team2.

[2] Cronbach's alpha is not performed because perceived proximity is a measure of social network analysis and not deriving from responses in Likert scales.

Shared Leadership. We used the six items by Hoch (2013) on a 5-point Likert scale (from 1 = totally disagree to 5 = totally agree) to measure shared leadership. The six items are related to individuals' perceptions of degree to shared leadership inside their team. For example: "My team consists of multiple members exercising leadership." Team shared leadership was measured as an average for the team. The Cronbach's alpha coefficient for shared leadership is 0.93, and the square root of average variance extracted (AVE) is 0.70.

Team Innovation. We measured team innovation on a 5-point Likert scale (1 = Disagree Strongly to 5 = Agree Strongly), asking stakeholders: "This team searches out new technologies, processes, techniques, and/or product ideas", "This team creates new ideas which are transformed into useful applications" and "I am satisfied with this team's innovativeness" (Post, 2012). Team innovation was collected as a team level measure. The Cronbach's alpha coefficient for steam innovation is 0.96, and the square root of average variance extracted (AVE) is 0.89.

Control Variable: Team size was measured as the total number of employees working together on the same project. The company provided team related data for each participant invited to complete the survey.

Analysis

The measures used in this study are at the team level of analysis. To justify aggregation of data from the individual to the team level for shared leadership, we had to calculate rwg(j) values (James et al., 1984). More than 95% of rwg(j) values were above the recommended cutoff value of 0.70 (LeBreton & Senter, 2008), multi-team rwg mean = 0.90 and median 0.95. These rwg values indicated

acceptable inter-rater agreement (James et al., 1984) and good inter-rater reliability (LeBreton & Senter, 2008), thus justifying the aggregation of data from the individual level to the team level.

Considering the complexity of the model resulting from the hypotheses, we used structural equation models (SEM). SEM allowed us to correct the multi-item study measures for eventual unreliability and to test the hypothesized relationships simultaneously (Kline, 2015). While it is challenging to develop generalized guidelines regarding sample size requirements for SEM, various rules-of-thumb have been advanced. According to Boomsma (1982), the minimum sample size for SEM analysis should be minimum 100 entries, our sample size is 111 teams.

In order to verify the adequacy of the multi-item scales of our model, we performed the confirmatory factors analysis (CFA) for the hypothesized model and some alternative models. The hypothesized model includes six factors and shows a good fit ($\chi2 = 121.03$; df = 78; $\chi2$ / df =121.03/78 = 1.55; TLI = 0.96; CFI =0.97; SRMR =0.05; RMSEA = 0.07).

To build alternative models, we have combined some independent and dependent variables. The first alternative model includes five factors, in which the items for the knowledge sharing variable are combined with the items for the team innovation variable in a single factor. This first alternative model shows a poorer fit than the hypothesized model ($\chi2 = 436.04$; df =83; $\chi2$ / df = 436.04/83 = 5.25; TLI = 0.68; CFI = 0.75; SRMR = 0.09; RMSEA = 0.20). The second alternative model includes five factors, where the six items to measure the shared leadership variable and the perceived proximity variable are combined in a single factor. This second alternative model also shows a poorer fit than the hypothesized model ($\chi2 = 151.9$; df = 82; $\chi2$ / df = 151.9/82 = 1.85; TLI =0.94; CFI =0.95; SRMR =0.07; RMSEA =0.9). In this case, the fit is poorer than the hypothesized model, but the goodness of

fit values are close to that of the hypothesized model. We, therefore, studied the values of ΔSRMR and ΔCFI of this alternative model in comparison with the hypothesized model, and they were also larger than 0.005, as Chen (2007) suggests. Finally, we performed a model in which all items have been loaded into a single factor, included the control variable; the one-factor model has a very poor fit ($\chi2 = 977.51$; df = 90; $\chi2$ / df = 977.51/90 = 10.86; TLI = 0.26; CFI =0.36; SRMR = 0.25; RMSEA = 0.30). These results indicate that the factorial structure built into our model is strong.

Results

Table 1.1 reports means, SDs, Cronbach's alphas, correlations between the study variables, and the average variance extracted (AVE). Team innovation and knowledge sharing were significantly correlated ($r = 0.55.$, $p < .001$), and AVE indices were all greater than the .50 threshold (Fornell & Larcker, 1981). Team size, the control variable, does not show a statistically significant correlation with the model's variables. In order to maintain a parsimonious model and to reduce the number of parameters to be estimated, we have excluded the control variable from our model.

Table 1.1. Descriptive Statistics, Correlations, Cronbach's Alphas and Reliabilities.

	M	SD	Cronbach's alpha	1	2	3	4	5
1 Team size	6.84	5.88	-					
2 Shared leadership	3.83	0.38	0.93	0.00	(0.70)			
3 Perceived proximity	5.58	0.46	0.92	-0.05	0.43**	(0.66)		
4 Knowledge Sharing	5.80	1.19	0.94	0.13	0.00	0.14	(0.89)	
5 Team Innovation	5.70	1.08	0.96	0.00	0.07	0.11	0.55**	(0.89)
6 Team Brokerage across subgroups	1.15	1.80	-	0.14	0.01	-0.01	0.13	0.03

Note. N = 111. *p < .05; **p < .01. The square root of average variance extracted (AVE) are reported on the diagonal (within parenthesis).

We tested our hypothesized model using the Bootstrap method, using 5000 resampling. Given the sample size and the presence of multiple mediators, the bootstrap method is particularly suitable for calculating the power for the total mediated effect and the indirect effects for the individual hypotheses (Kline, 2015). Table 1.2 shows the results of the path analyses for the model.

Table 1.2. Tests of Hypotheses via SEM

	Dependent variables							
	Team Brokerage across subgroups				Team Innovation			
Variables	Estimate	Std.Err.	z-value	P(>|z|)	Estimate	Std.Err.	z-value	P(>|z|)
Knowledge Sharing	0.11	0.05	2.01	0.04**	0.35	0.13	2.78	0.01**
Proximity Perceived	0.24	0.06	4.22	0.00**	0.18	0.08	2.24	0.03**
Shared Leadership	0.00	0.01	0.12	0.91	0.09	0.17	0.51	0.61
Team Brokerage across subgroups	-	-	-	-	-0.04	0.04	-1.06	0.29
Number of requested bootstrap draws				5000				
Number of successful bootstrap draws				4996				
Number of observations				111				

The table provides unstandardized coefficients (Estimate) and standard errors (Std.Err.); corresponding p-values for significance testing were generated through the bootstrapping procedure with 5,000 resampling.

*p < .05. **p < .01. ***p < .001.

First, we tested mediators had a statistically significant direct effect on the dependent variable and the independent variable had a statistically significant direct effect on mediators. Next, we analyzed the indirect effects and the total mediated effect (Iacobucci et al., 2007). Table 1.3 shows the analysis results of indirect effects, 95% confidence intervals.

Table 1.3. Indirect Effects

Indirect effects of Team Brokerage across subgroups on Team Innovation: Model (5000 bootstrap) - 95% confidence interval					
	Team Brokerage across subgroups				
	Estimate	Std.Err	z-value	ci.lower	ci.upper
Knowledge Sharing	0.04	0.02	1.65	0.006	0.101
Proximity Perceived	0.04	0.02	2.14	0.010	0.091
Total Effects	0.66	0.27	2.47	0.149	1.195

Figure 1.2 summarizes the results of the analysis. The standardized indirect effects of team brokerage across subgroup via knowledge sharing on team innovation was 0.04 (lower bound = 0.006; upper bound = 0.101; Model Est 2, CI= 95%), and the standardized indirect effects of brokerage in subgroups via perceived proximity on team innovation was 0.04 (lower bound= 0.010; upper bound= 0.091; Model Est 2, CI= 95%). The results support both hypotheses H1 and H2. There are no significant direct effects between team brokerage across subgroups and shared leadership (b = 0.00; p = 0.91) and between shared leadership and team innovation (b = 0.09; p = 0.59).

Therefore, hypothesis HP 3 was not supported

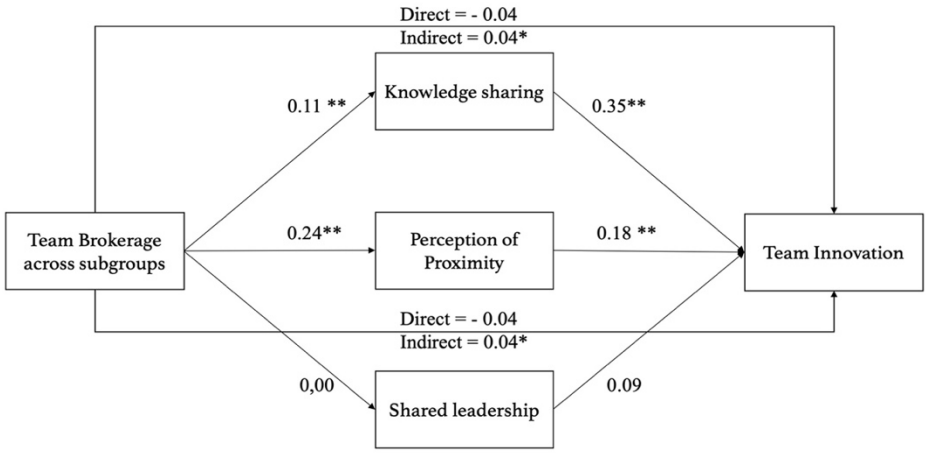

Figure 1.2. Path model showing both direct and indirect paths (standardized coefficients).

**p ≤ 0.05; * Indirect effect is significantly different from zero

The fit indexes for the model ($\chi 2 = 81.78$, df = 65, p = 0.08; TLI= 0.98; CFI = 0.99; RMSEA = 0.04) suggest that the data fit the model well. In summary, the results of this study support the first two hypotheses. First, knowledge sharing mediates the relationship between team brokerage across subgroups and team innovation (H1). Second, the perception of proximity between team members mediates the relationship between team brokerage across subgroups and team innovation (H2). However, H3 is not supported.

Discussion

Theoretical and Practical Implications

Our paper contributes to the literature on brokers and globally distributed teams. We examine the influence of brokers on team innovation in dispersed settings, which is a timely and relevant topic in the current environment (Mattarelli et al., 2017; Mell et al., 2021). Previous literature on team dynamics has suggested how brokers may help team functioning, for example, by facilitating knowledge sharing across dispersed subgroups (Eisenberg & Mattarelli, 2017; Leonardi & Bailey, 2008). However, team brokerage has received limited attention in relation to team innovation. Social network studies on brokerage have mostly focused on outcomes - both positive and negative - for individuals and organizations (e.g., Clement et al., 2018), leaving us with a limited understanding of how brokers can help or hinder *teams* in becoming more innovative.

Our examination of the effect of brokers on team innovation suggests that brokerage positively influences a team's innovative efforts by facilitating knowledge sharing and perceptions of proximity. In other words, having individuals who emerge or are formally appointed as brokers within globally distributed teams can facilitate the exchange of codified knowledge, thus helping the team in

developing new and useful products and services. Brokerage also helps overcome the perceptions of distance that often taunt globally distributed teams. Brokers, we argue, can distribute a shared awareness about tasks and a sense of alignment in expectations (Halevy et al., 2019), that can facilitate how team members work together towards innovative goals.

We further hypothesized that brokerage reduces shared leadership, with negative implications for team innovation. However, in our study, brokerage is not related, neither positively nor negatively, to shared leadership. This may be due to the dynamics of global virtual teams where brokerage may facilitate connections *among team members* but given the nature of the relationship between the broker and other team members, does not encourage individuals to step up as leaders and participate in decision making. Further, there are a number of factors that may influence the dynamics of shared leadership behaviors and obstacles that can lead to misunderstandings and communication issues, requiring further coordination in global virtual teams (Nordbäck & Espinosa, 2019). Brokers may not be adequately prepared to address these issues and thus have not had a significant influence in our study. Finally, the particular context of our study may have impacted on our results. The organization we studied had codified and standardized processes and practices in place that, coupled with unique cultural characteristics ((e.g., high power distance, Rinne et al., 2012), may have discouraged shared leadership within the team.

By advancing further understanding of the complex dynamics in global teams (Hung et al., 2021) and its influence on team innovation, our results also have practical implications. Modern organizations often appoint brokers to facilitate team interactions. Our results suggest that both formal and emergent brokers (i.e., not formally appointed by organizations) may facilitate team innovation, by increasing perceived proximity and knowledge sharing. Providing team members, irrespective of

their formal position, with tools and opportunities to connect different subgroups can further facilitate brokerage processes in teams, and in turn foster team innovation.

Limitations and Future Research

Our study is not, of course, without limitations. It includes a range of technical specialists from predominantly one culture in a limited period of time. While the advantage of this context is that it enables us to control for extraneous factors, more work is needed to understand the effects of brokers in multicultural teams across multiple industries and over time. To this regard, the study of Reus and colleagues (2020) of groups in online communities found that brokerage across groups is a facilitator of the acquisition, generation, and section of organizational knowledge over time. Building on their and on our study, the exploration of how brokerage affects team innovation over time in different contexts appears a promising avenue for future research. Relatedly, it could be interesting to investigate the different effect of brokers on tacit versus codified knowledge sharing. Codified or explicit, knowledge is completely formalized and placed in documents concerning structured information such as data, patents, multimedia files, rules, and procedures. Since the data collection and connection processes are known, explicit knowledge is easily readable, reproducible, transmissible, and storable. Conversely, tacit knowledge concerns information not in documentary form, such as the skills, intuitions, reputation, experience, and knowledge of the individual who works in the organization. As such, it is intangible and difficult to transmit. Therefore, it is interesting to investigate the role of brokering in contexts where tacit knowledge is particularly relevant, as this poses further challenges to intermediation mechanisms.

Additionally, we focused on studying the effects of perceived proximity rather than other dimensions related to proximity as it was focused on social processes and relationships in globally distributed teams. Future studies should consider and may want to contrast the effects of other dimensions of proximity (such as temporal and spatial distance, O'Leary & Cummings, 2007).

Further, our study did not find a significant effect of brokerage on shared leadership. This is potentially due to a number of reasons that should be further investigated. Future research should examine various boundary conditions associated with the effects of brokerage on shared leadership across different environments, time zone differences, among other factors.

Finally, our measure of brokerage does not distinguish between formal and emergent brokering. Future studies could investigate the different implications of formally appointing brokers through the definition of specific roles versus having team members emerging informally as brokers, following their personal preferences and work identities (e.g., Mattarelli et al., 2021).

Conclusion

As organizations continue to focus on fostering team innovation by utilizing the expertise of global team members, our findings provide timely implications for including brokers in such teams. Global teams face a number of challenges and brokers can help to address these by helping team members cross the multiple boundaries that separate them. However, organizations should also take into account that while brokers may facilitate interactions among team members in global virtual teams, relying on brokerage for fostering shared leadership may be questionable and should be further investigated.

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Study 2: How designed work environment and enacted work interactions impact creativity and work-life balance

Introduction

To favor innovation at the workplace, organizations provide their people, especially knowledge workers, with work practices and approaches that aim at accommodating individual needs and capabilities while maximizing contributions to the organization (e.g., Agarwal & Farndale, 2017). In particular, organizations are increasingly adopting new approaches such as design thinking, lean, and agile, to facilitate creativity and innovation processes (Annosi et al., 2020; Caniëls & Rietzschel, 2015; Elsbach & Stigliani, 2018). These approaches often rely on the formal design of new organizational work environments, based on the assignment of flexible work arrangements and the setup of a work environment expected to facilitate the creation, exchange, and dissemination of new ideas. For example, knowledge workers are often offered a *social organizational environment* that aims at fostering innovation through the use of teamwork, the assignment of complex tasks, task rotation, and the design of specific incentives for creative outcomes (Agarwal & Farndale, 2017; Dul & Ceylan, 2011; Dul et al., 2011; Möldner et al., 2020; Theurer et al., 2018). In addition, they may be offered the *flexibility* to work from different work locations and to control the scheduling of their tasks (Allen et al., 2013; Gonsalves, 2020; Kelly et al., 2008).

Besides organizations' attempts to promote change through designed organizational structures, relational perspectives on innovation processes in the workplace (e.g., Perry-Smith & Shalley, 2003) suggest that individual creativity relies on the employees' ability to build interpersonal relationships and leverage social networks at the workplace, for example by engaging in inter-functional collaboration and pursuing co-creation (Leavy, 2012). In this regard, research on *work-related social*

networks demonstrates that individual centrality in emergent instrumental networks favors performance and innovation (e.g., Ibarra, 1993; Kim et al., 2018; Perry-Smith & Shalley, 2003).

Given the recognized interdependence between the work and life spheres (e.g., Greenhaus & Powell, 2006), scholars have paid attention to how the experiences in the work domain may affect positively or negatively the other domain through the generation or depletion of various types of resources (e.g., psychological, affective, time). From this perspective, both the designed work environment and the enacted work interactions are often implicitly expected to empower individuals and enrich their jobs, with the hope that an increase in individual work satisfaction also has the potential to trigger a positive spillover to the personal life domain (Agarwal & Farndale, 2017; Kelly et al., 2008; Thompson & Prottas, 2006; Valcour, 2007). In turn, a better ability to manage the work-life interface reduces stress and overload, and has the potential to increase individual creativity, generating in this way a self-sustaining virtuous cycle (Florida & Goodnight, 2005; Tang et al., 2017).

However, while a work environment which is designed to foster creativity and enacted as such by workers through frequent social interactions at the workplace can be expected to positively relate to the generation of new ideas, we know little about if and how designed elements and enacted interactions also have a positive impact in terms of work-life balance. For instance, environments designed to foster creativity have been shown to produce higher commitment workers and to promote integration between work and life domains, e.g., workers taking their work at home (e.g., Törnquist Agosti et al., 2017). Yet, studies do not agree upon whether highly committed workers manifest higher or lower levels of overall well-being (see e.g., Mkamwa, 2020). Also, work-life balance, which is a main component of overall well-being (Greenhaus et al., 2003; Törnquist Agosti et al., 2017) has rarely been studied in relation to organizational practices that aim at fostering creativity at work.

While some studies argue that this mechanism may positively spill over to other domains of an employee's life (e.g., Straub et al., 2019), other studies seem to suggest that high-commitment environments may lower the overall quality of an employee's life if such environments do not also provide the worker enough autonomy to organize life outside of work (Abstein & Spieth, 2014). Relatedly, theories on the use of individual resources argue that demands in one domain (e.g., work) can deplete personal resources and impede accomplishments in the other domain (e.g., family) (Ten Brummelhuis & Bakker, 2012). Using a resource perspective (Ten Brummelhuis & Bakker, 2012), the objective of our work is thus to address such puzzle and to understand the dual impact of designed work environment and enacted work interactions on creativity *and* work-life balance.

To address our research question, we developed hypotheses on the influence of perceptions of the designed work environment (flexible work arrangements and other elements of the social-organizational work environment) and perceptions of enacted work interactions (centrality in instrumental networks) on creativity and work-life balance. We hypothesize that some designed elements of the work environment and enacted work interactions expected to promote creativity may have negative consequences in terms of work-life balance. We conducted a survey study in a multinational knowledge intensive company that designs innovative automated solutions for consumer goods companies. Our analyses show that flexible work arrangements are positively related to increased work-life balance, but not to creativity, whereas the social organizational environment designed to promote creativity is associated to an increased level of idea generation, but to a reduced work-life balance. Also, the amount of advice a person receives through the instrumental social network (network centrality) is negatively associated to work-life balance.

Therefore, our results point to an interesting tension between strategies to increase creativity and practices that improve work-life balance. Overall, our work contributes to the current debate on new practices for innovation and creativity, highlighting their unexpected implications for workers (Annosi et al., 2020; White et al., 2003; Wood & De Menezes, 2011). We also contribute to the literature on work-life balance (Beauregard & Henry, 2009; Hirschi et al., 2019) by unravelling previously unexplored antecedents such as enacted networks and social-organizational work environments designed with a creativity focus.

Theoretical background and hypotheses development

Organizations have a long tradition of investing in the formal design of work environments that aim at fostering creativity (e.g., Amabile et al., 1996; Annosi et al., 2020; Caniëls & Rietzschel, 2015; Elsbach & Stigliani, 2018; Shalley & Gilson, 2004). In addition, recent approaches to innovation in organizations, e.g., design thinking and agile methodologies, place increasing attention on the importance of promoting interactions, such as informal relations across functions, occupations, and organizations (Annosi et al., 2020; Leavy, 2012). The enacted social relationships between employees, above and beyond the formal organizational design, have been associated to unexpected combinations of ideas leading to innovation (Perry-Smith & Mannucci, 2017; Perry-Smith & Shalley, 2003). However, how designed work environment and enacted work interactions impact individual wellbeing in general, and work-life balance more specifically is, to our knowledge, underexplored. This is surprising, given that anecdotical and academic evidence shows that knowledge intensive environments, for which creativity is a fundamental process, are often characterized by high levels of stress and overload and by extended working hours (Reid & Ramarajan, 2016), which are often also associated with the presence of proactive and helping norms (see for example the norms of

'Googliness', Meiert, 2013). The literature on the work-life interface recognizes that there is a spillover between work and life and *vice versa* (Hill et al., 2001; Tang et al., 2017). Examples of negative spillovers from work to life, due to high level of work overload and stress, are withdrawal from family interaction, marriage conflict, and depression. Following a resource perspective, negative states experienced in the life domain, can, in turn, deplete psychological resources in the work domain, thus affecting job satisfaction, absenteeism, and the long-term ability to maintain high levels of work performance (e.g., Cochis et al., 2021; Ten Brummelhuis & Bakker, 2012).

In this paper we investigate how perceptions of designed work environment and enacted work interactions simultaneously impact creativity and work-life balance and the potential trade-off between initiatives that foster creativity and those that foster work-life balance. Rather than focusing on the *existence* of specific elements of the work environment and of work interactions, we will focus on how individuals *perceive* work environments and work interactions. Indeed, previous literature has shown how individual perceptions about specific organizational elements, rather than the existence of those elements, impact creativity and work-life balance (Dul et al., 2011; Hill et al., 2001).

The effect of flexible work arrangement on creativity and work-life balance

Organizations offer flexible work arrangements to their employees in terms of timing (flextime) and location (flexplace) of work, now more than ever, also in response to the COVID-19 pandemic (SHRM Foundation, 2020, Gonsalves, 2020). Flextime refers to the 'ability of rearranging one's working hours within certain guidelines offered by the company' (Hill et al., 2001, p. 50), while flexplace reflects the degree of control given to employees over where to work (Shockley & Allen,

2007). Although literature has generally focused on the relation between work flexibility and work performance (e.g., Eaton, 2003) a few studies have empirically explored the link between flexible work arrangements and creativity (e.g., Wang et al., 2018). For instance, the literature on individual creativity suggests that knowledge workers *should* be given more flexibility to develop more and better ideas (Boschma, 2005). Some studies have shown that individual perceptions of autonomy in setting schedules and defining work practices are associated to higher creativity (Wang & Cheng, 2010). In addition, flexible work arrangements can promote creativity by developing a sense of creative self-efficacy, i.e., the extent to which individuals believe they have the ability to produce novel ideas or the extent to which they perceive themselves to be creative (Wang et al., 2018).

Flexible work arrangements programs (e.g., smart working, telecommuting, homeworking) are usually offered with the hope of improving employees' work-life balance (Beauregard & Henry, 2009 SHRM foundation, 2020). For instance, previous research (e.g., Hammer et al., 1997; Hill et al., 2001) found that the perceived flexibility in terms of time and space is associated to higher levels of work-family balance, especially for minority and under-represented groups (Chung & Van der Horst, 2018). Providing employees with tools to enhance flexibility may lower negative emotions, and, by increasing workers' perception of control over the resources of their work environment, may promote a better work-life balance (e.g., Anderson et al., 2002; Hill et al., 2001; Kossek & Ozeki, 1999).

By synthesizing previous studies, we thus hypothesize that the perception of flexible work arrangements has a positive impact on both creativity and work-life balance.

H1.a: Flexible work arrangements are positively associated to creativity.

H1.b: Flexible work arrangements are positively associated to work-life balance.

The effect of the social-organizational work environment on creativity and work-life balance

Dul, Ceylan and Jaspers (2011) define the social-organizational work environment as the designed social organizational elements of the work environment that motivate people to be more creative. A creative social-organizational environment is sustained by providing job design methods and human resources practices, such as designing challenging (i.e., high-involvement) jobs, promoting teamwork and multi-teaming, formalizing task rotation, allowing for 'thinking time', formally recognizing creative ideas, and establishing incentives for creative results (Dul & Ceylan, 2011). When individuals perceive that these practices are relevant in their organizational context, they tend to be more creative (Amabile et al., 1996; Mahmood et al., 2019). Dul and Ceylan (2011), for instance, show that creativity-supporting work environments positively impact both workers' self-appraisals of creativity and supervisors' assessments of the creativity of their team, and Zhang and Bartol (2010) show that the more experienced the workers, the greater the impact of creative environments on their creative performance.

Research on the role of designed organizational work environments has produced contrasting findings and contradictory debates in relation to work life balance (Shockley & Allen, 2007; Thompson et al., 1999). Many scholars presume that the positive relationship between social-organizational work environment and creativity is explained by more positive individual work attitudes such as commitment and engagement (Amabile et al., 1996) and that, in turn, positive work attitudes can have positive spillovers to the life domain (Choo et al., 2016; Clark, 2000). However, it is also acknowledged that work commitment can have a two-sided effect: increased creativity, on the one hand, and decreased perceived work-life balance, on the other. For example, the more committed entrepreneurs studied by McDowell et al. (2019) were successful in terms of their creative initiatives,

but experienced increased work family conflict. From this standpoint, the same creativity-enhancing practices could drive people to invest extra time and effort in the work domain, e.g., increased commitment to get rewarded for innovative ideas or working longer hours and overtime to be seen positively by colleagues, with the likely consequence of blurring the line between work and family domains (e.g., Abstein & Spieth, 2014). From a resource perspective (Ten Brummelhuis & Bakker, 2012), these mechanisms may lead to increased job overload, especially when workers are involved in multiple teams simultaneously (e.g., Reid & Ramarajan, 2016), with potentially negative implications for workers' life domain. For instance, some studies have shown that when high-commitment environments provide too many stimuli for workers to manage, they lower workers' perceived autonomy in their work-life management, triggering intense emotional labour that can lead to burnout and anxiety (Jackson, 1989; Mkamwa, 2020). Abstein and Spieth (2014) further suggest that, when organizations offer creativity-designed environments, but workers experience high work-life conflict, individuals may conclude that the company does not genuinely care about their wellbeing which further deepens the perception of a trade-off (see also Ungureanu, Bertolotti, & Pilati, 2019).

We thus argue that the perception of a creative social organizational environment has a different effect on creativity and work-life balance. We argue that it has a positive effect over creativity, but a negative effect over work-life balance.

H2.a: A social-organizational work environment designed to promote creativity is positively associated to creativity

H2.b: A social-organizational work environment designed to promote creativity is negatively associated to work-life balance

The effect of enacted work interactions on creativity and work-life balance

In knowledge intensive work settings, workers are exposed to a large percentage of interactive activities that occur spontaneously, i.e., without formal planning (Bertolotti et al., 2019; Perlow, 1999). Research on social networks in the workplace has investigated different types of instrumental interactions such as communication, advice, knowledge transfer (e.g., Cross & Cummings, 2004; Sykes et al., 2014) and the important role of individuals who occupy central network positions (Ahuja et al., 2003; Ibarra, 1993; Sparrowe et al., 2001). By centrality in instrumental networks, we here refer to the number of different people a person can reach for advice and help, above and beyond the formal requirements of the organization. Centrality in instrumental networks has been associated to positive outcomes for individuals' ability to leverage work-related resources, including task quality and quantity of strategic information (Cross & Cummings, 2004; Sparrowe et al., 2001; Sykes et al., 2014), which often result in creative outcomes (Perry-Smith & Mannucci, 2017; Tang et al., 2017). Receiving advice from a large set of colleagues gives access to diverse sources of knowledge that can be combined in novel ideas (Perry-Smith & Mannucci, 2017). Research on social networks and creativity suggests that centrality in advice networks can lead to generating more creative ideas. Being exposed to knowledge and perspectives coming from multiple sources not only expands individuals' own knowledge base but also enables them to envision creative knowledge combinations (e.g., Fleming et al., 2007; Shah et al., 2018).

Unfortunately, managing a large instrumental network does not only bring about benefits but also requires significant investments of energy (Day & Kilduff, 2003; Landis, 2016). The resource perspective (Ten Brummelhuis & Bakker, 2012) suggests that maintaining and sustaining a large number of instrumental relationships in the workplace requires time and effort, and, as a consequence, can tax a person's cognitive resources. Therefore, while we acknowledge that extant literature has documented a positive relationship between social support, i.e., *collegial* relationships with co-workers and supervisors, and work-family spillover (e.g., Russo et al., 2016; Wayne et al., 2007), we propose a negative relationship between centrality in *instrumental* advice networks and work-life balance. We base our argument on the following reasons. In knowledge intensive contexts, individuals continuously look for colleagues' help and advice (Ashford & Cummings, 1985) and face the risk of being overwhelmed by the need to reach out to others for completing their work. In addition to handling multiple colleagues' requests, individuals high in centrality need to attend to their own individual tasks. This, in turn, may lead to lower levels of work-family balance, especially when the daunting task of network management leads the individual to extend working hours (Perlow, 1999) and create an unhealthy overlap (or integration) across the two domains (Wepfer et al., 2018). Conversely, peripheral individuals who are less dependent on others and manage a lower number of relationships may be better at separating work and family domains and abler to pursue a balance between the two (see also Bulger & Hoffman, 2018).

Overall, we argue that centrality in instrumental networks has positive implications for creativity, but is detrimental for work-life balance:

H3.a: Receiving advice from a large number of colleagues (i.e., centrality in instrumental social networks) is positively associated to creativity

H3.b: Receiving advice from a large number of colleagues (i.e., centrality instrumental social networks) is negatively associated to work-life balance

Figure 2.1 summarizes our model and hypotheses.

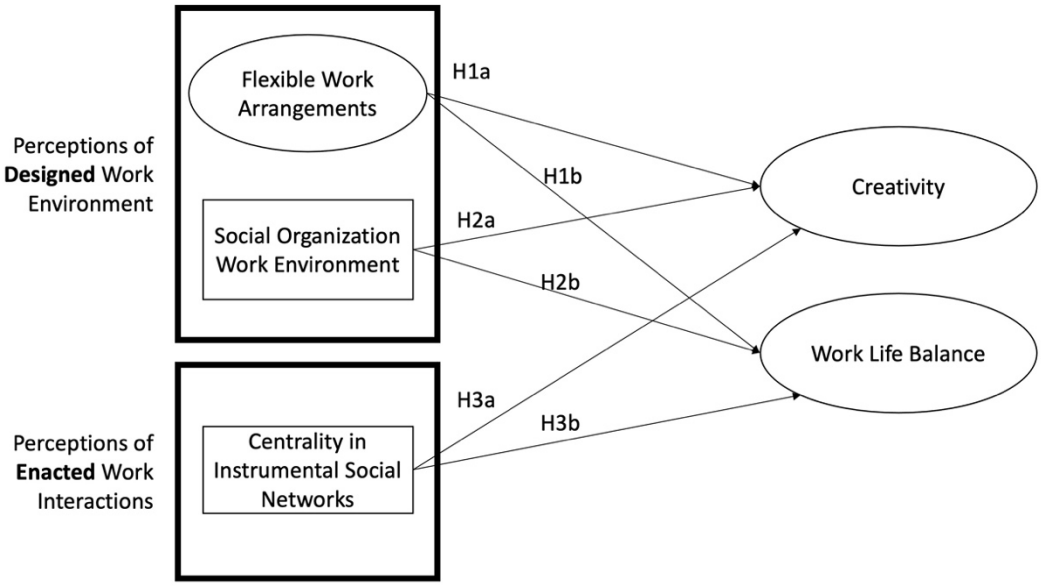

Figure 2.1. Model

Data and methods

Context and data collection

We conducted a survey study in a multinational company, headquartered in Italy and specializing in the design and engineering of robotic systems for industrial plant logistics. Specifically, the company creates automated solutions for consumer goods in the food, beverage, and tissue industries. Thanks to highly innovative hardware and software solutions, it was one of the first players to anticipate the industry 4.0 revolution in the early 1990s, becoming widely known as a market leader

of integrated automation solutions. The company maintains its leadership position thanks to continuous investments in R&D and innovation projects, as well as in organizational practices for attracting and valuing talented professionals. At the time of our study, it counted around 800 employees, mainly engineers, technicians, and highly specialized equipment operators, and was experiencing continuous growth. In 2019, the company counted for an 150% increase in revenues, and opened 90 new job positions. In 2017, it won the international Gulfood Manufacturing Industry Excellence Award for the best practices and innovation in the food manufacturing industry value chain, and in 2020 it was included in the annual innovation report of the Symbola Foundation as one of the 100 Italian Excellence companies for robotics and automation technologies. Given these characteristics, this company well exemplifies the innovative fast-growing technological companies in Europe and beyond (e.g., Avigdor & Wintjes, 2015).

The company is organized in different functional units, most of which are knowledge-intensive, such as electro-mechanic design, system engineering, PLC (Programmable Logic Controller), supply chain, LGV (Laser Guided Vehicles). Therefore, it largely carries out knowledge-intensive engineering activities that rely on the design of an organizational work environment that enhances and supports creative processes, such as incentivizing employees to take responsibilities and risks, promoting a problem-solving focus (i.e., encouraging individuals to discuss ideas and work on new problems), and constantly assigning knowledge workers to multi-functional project teams.

In order to get access to and have a rich understanding of our context, we availed ourselves of the help of a research assistant who did a six-month internship in the company collecting data and maintaining regular interactions with managers and employees. We developed a multi-section online questionnaire that we submitted to 401 members of the functional units engaged in knowledge

intensive work. We assured respondents that their individual responses would be used only for research purposes and asked them to return the completed questionnaires directly to us instead of routing them through the organization. Given the organizational support for our survey and the insider role performed by the research assistant, 62% of the questionnaires, i.e., 249, were returned. After the data cleaning process, our dataset consists of 207 questionnaires. The response rate of 52% is considered acceptable in both survey-based and SNA studies (see, e.g., *Grosser et al.*, 2018). Respondents had worked with the organization for an average of nine years (mean = 8.90, s.d. = 7.57); 74,4% of them were based at the headquarters; 12,6% held a managerial position. Finally, 92,7% of respondents were male. This represents a typical feature of Italian and Western firms where people in technical/engineering roles are often men.

Measures and analyses

Dependent variables

We measured creativity with the three items of the self-perceived creativity scale used by Dul, *et al.*, (2011) and Dul and Ceylan (2011), adapted from George and Zhou (2001), on a 5-point Likert scale. The three items are: “In my work, I often have new and innovative ideas”, “In my work, I often come up with creative solutions to problems,” and “In my work I often suggest new ways of performing work tasks”. We performed confirmatory factor analysis (CFA) for the creativity measure. The resulting one-factor model showed acceptable fit ($\chi 2 = 4.54$, $p > 0.03$; RMSEA = 0.13; TIL = 0.92; CFI = 0.97 SRMR = 0.04; Coefficient of determination = 0.78). Composite reliability was 0.71, which

is beyond the recommended level of 0.70. The average of variance extracted (AVE) was 0.47[3]. Cronbach alpha was 0.70.

We measured work-life balance with the composite measure used by Hill et al. (2001), consisting of five questions about the ability of employees to balance the demands of work and life. Two exemplar items are: "How easy or difficult is it for you to balance the demands of your work and your personal and family life" (responses on a 5-point scale: from very difficult to very easy) and "I have sufficient time away from my job at [company name] to maintain adequate work and personal/family life balance" (responses on a 5-point scale: from strongly disagree to strongly agree). The confirmatory factor analysis on one-factor model showed good fit ($\chi2 = 5.55$ $p > 0.162$; RMSEA = 0.56; TIL= 0.98; CFI = 0.99 SRMR = 0.03; Coefficient of determination = 0.86). Composite reliability was 0.78. The average of variance extracted (AVE) was 0.45[1.] Cronbach alpha was 0.77.

Independent variables

Flexible work arrangements were measured with the four items proposed by Amabile et al. (1994). The four items are related to the respondent's perception of the degree of flexibility in the timing and location of work and were assessed on a 5- point Likert scale. The factorial confirmatory analysis on the flexible work arrangements variable had excellent fit results ($\chi2 = 0.01$ $p > 0.932$; RMSEA = 0.00; TIL= 1.04; CFI = 1.00 SRMR = 0.00; Coefficient of determination = 0.81). Composite reliability was 0.74. The average of variance extracted (AVE) was 0.42[1]. Cronbach alpha was 0.70.

[3] The AVE value can be considered acceptable under 0.5 when Composite reliability is above 0.70 (Fornell and Larcker, 1981)

The social organizational work environment was measured using the Creativity Development Quick Scan (CDQS) (Dul & Ceylan, 2011; Dul et al., 2011), where informants are asked to rate, on a Likert scale, how much they perceive those nine creative supportive elements of the social organizational environment are present. Given the nature of the specific work context, we removed two items. The seven remaining items are: challenging job, teamwork, task rotation, autonomy in job, time for thinking, recognition of creative ideas, and incentives for creative results. Following Dul et al. (2011) we computed a 'formative' index to obtain the overall measure of the social organizational work environment. Given that the elements of the scale do not need to correlate with each other, test methods for computing reliability, or latent variable construct, do not apply for this measure. For the same reason, we have considered the social organizational work environment index as one observable variable in SEM analysis (explained in section 3.2.4), computed as the mean of the seven items.

To measure the centrality in the instrumental network, we collected data on a work-related network that has been frequently investigated in the social network literature: the advice network. The advice network includes relations through which individuals share specific assistance and guidance related to the completion of work (Sparrowe et al., 2001). We asked our informants: 'if you have a question or problem at work, to whom would you go for help or advice?'. We asked them to fill in the name of the colleagues to whom they ask for work-related help and advice, above and beyond the formal organizational structure. We computed the respondents' centrality in terms of their outdegree scores (Borgatti et al., 2002; Wasserman & Faust, 1994). The outdegree in the advice network represents the number of colleagues a person declared he/she could count on for work-related advice. We also conducted post-hoc analyses using the indegree centrality. The indegree in the advice

network represents the number of colleagues who declared they could count on a focal actor for work-related advice (that is an objective measure of the amount of advice offered by a focal actor).

Control variables

As other variables may act as predictors of creativity and/or work-life balance, we included the following controls: location, gender, tenure, position, and education. We controlled for the location, i.e., whether the person was based in the headquarters (1) or in one of the international offices (0). Being in the headquarters may give access to resources (e.g., access to top management, financial resources) that facilitate the enactment of creative processes.

Gender is typically used as a control variable both in studies on creativity and on work-life balance (Dul et al., 2011), as multiple studies have reported differences in terms of gender role enactment and creativity (see e.g., Baer & Kaufman, 2008) as well as differences in terms of gender role enactment and work-life balance assessment (Scandura & Lankau, 1997). We coded female respondents with 0 and male respondents with 1.

Tenure captures how many years an individual has been an employee of the organization. The longer a person has been part of the organization, the better he/she knows how to actively participate in the generation of ideas (Gilson et al., 2013). Also, according to tenure and life-cycle stage, workers' perceptions of work-life balance may be different (Sturges & Guest, 2004).

We also included position as a control variable because it may have implications for one's work demands and, as a consequence, for the work-family interface (Kossek et al., 2006). Position can also affect the control over resources, thus influencing creative processes. We coded position as 1 if the person held a managerial position (e.g., unit head) and 0 otherwise.

Finally, we controlled for the education level using a scale from 1 to 7 where 1= middle school; 2 = high school; 3 = associate's degree; 4 = bachelor's degree; 5 = master's degree; 6 = master post degree; 7 = doctoral degree.

Data analysis

To assess the factor structure of the latent construct, we performed a confirmatory factor analysis (CFA). We calculated the ICCs for all latent variables in our model to check the degree of interdependence within the group in our data. None of the variables had significant ICC (all ICCs were less than 0.01). These results indicate that there is no significant group-level variance in the variables. Thus, even if the employees were nested in functional units, their membership in the units did not count for a significant variation in the variables. In such a case, single-level analysis is recommended (Cohen, 1988).

We tested our hypotheses through structural equation modeling (SEM) using STATA 16 software. SEM allowed us to correct the multi-item study measures for eventual unreliability and to test the hypothesized relationships simultaneously (Kline, 2015). We used maximum-likelihood estimation for all models.

Given that dependent and independent variables are computed from a single source of data, we recognize that common method bias could be a problem. However, it is important to underscore that in previous studies on individual creativity researchers have extensively tested models in which dependent and independent variables come from the same source, i.e., employees (e.g., Dul et al., 2011), as "employees are best suited to self-report creativity because they are the ones who are aware of the subtle things they do in their jobs that make them creative" (Shalley et al., 2009, p. 495).

Therefore, the presence of individual and /or contextual factors may make creative self-assessment appropriate, particularly when creative changes and creative outputs may not be captured by a third person (Ng & Feldman, 2012), or when research conditions make it necessary (Kaufman, 2019). Nevertheless, we took a set of actions to make sure that common method bias did not represent an issue for our study. First, when preparing the questionnaire, we followed the prescriptions suggested in the relevant literature, such as guaranteeing anonymity, emphasizing that the questions did not imply right or wrong answers, and separating the questionnaire sections with questions for dependent and independent variables (Podsakoff et al., 2003). We also performed Harman's single factor test to examine whether common method variance was pervasive in our dataset (Podsakoff et al., 2003). This technique involves inserting all elements of the survey into a principal components' analysis. Thus, if a single factor emerges, or if a factor represents more than 50% of the variance in the variables, common method bias is likely to be present (Harman, 1967). Three factors emerged from the unrotated factorial solution, and the first factor explained only 21% of the variance, suggesting that the common method variance is not problematic in the present research.

Finally, multicollinearity should not be an issue because we have built a saturated structure equation model including all the three components of the model: definition of the latent variable, specification of the regressions, and specification of the residual correlation (Kline, 2015).

Results

Table 2.1 presents descriptive statistics and correlations between study variables. The correlation is built with aggregate variable values for the model's latent variables.

Table 2.1. Descriptive statistics

Variable	Mean	Std. Dev.	Min	Max	1	2	3	4	5	6	7	8	9	10	11
1. Location	0.74	0.44	0.00	1.00	1.00										
2. Gender	0.93	0.26	0.00	1.00	-0.04	1.00									
3. Tenure	8.90	7.57	1.00	40.00	0.15*	0.06	1.00								
4. Position	0.13	0.33	0.00	1.00	-0.04	-0.06	0.03	1.00							
5. Education	3.06	1.42	1.00	7.00	0.03	0.06	-0.02	-0.05	1.00						
6. Flexible Work Arrangements	3.23	0.64	1.00	4.50	-0.01	-0.03	-0.02	0.02	-0.03	1.00	**(0.70)**				
7. Social Org. Work Environment	2.84	0.65	1.57	4.71	0.00	-0.02	-0.01	0.14*	-0.14*	0.38**	1.00				
8. Work-Life Balance	3.11	0.68	1.40	4.60	-0.01	0.08	-0.05	-0.17*	-0.12	-0.23**	-0.06	1.00	**(0.77)**		
9. Creativity	3.14	0.75	1.00	4.67	-0.07	0.00	0.01	0.11	-0.04	0.17*	0.48**	-0.26**	1.00	**(0.70)**	
10. InDegree	1.55	2.90	0.00	20.00	-0.07	-0.06	0.02	0.64**	-0.09	0.13	0.27**	-0.10	0.14*	1.00	
11. OutDegree	2.83	2.69	0.00	15.00	-0.01	0.11	-0.04	0.03	0.01	-0.03	-0.09	-0.21**	0.06	0.05	1.00

*Correlation is significant at 0.05 level (2-tailed). ** Correlation is significant at the 0.01 level (2-tailed).
In parentheses Alpha's Cronbach value.

Table 2.2 shows the fit indices of CFA. With a sample size of 207, there are convergence problems that can occur when the number of estimated parameters approaches the sample size, and this entails a difficulty in estimating the fit model through the chi-square analysis only (the significance p-value tends to be around .00, not allowing to reject the null hypothesis). For this reason, we evaluated the CFA model and then the SEM models through all the main good-of-fit parameters. The fit indices of the CFA model are acceptable and indicate a good adaptation of the model to the latent construct. This CFA included 3 latent variables made up of 12 items in total (see figure in appendix).

Table 2.2. CFA Model Fit Indices

Goodness-of-fit	Estimates	Cutoff values based on model characteristics
Chi-square (χ^2)	79.81	
Degrees of freedom	48	
Probability level	0.003	Not significant p-values can be expected[a]
X2/d. f. Ratio	1,66	< 2.00 excellent
CFI	0.95	> 0.90
TLI	0.94	> 0.90
RMSEA	0.06	< 0.07 with CFI of 0.90 or higher
AIC	5977.78	Akaike's information criterion
BIC	6117.76	Bayesian information criterion
SRMR	0.05	

Note: CFI – Comparative Fit Index; TLI – Tucker Lewis Index; RMSEA – Root Mean Square of Approximation SRMR - Standardized Root Mean Square Residual

[a]In "Chi-square" (CMIN) statistic its associated p-value should not be statistically significant if there is a good model fit. However, the $\chi 2$ statistic is very sensitive to sample size and is no longer relied upon as a basis for acceptance or rejection (Schermelleh-Engel, Moosbrugger, & Müller, 2003)

To determine if all latent constructs have discriminant validity, we have performed the chi-square difference test (Segars, 1997). All the difference test results were significant (p= 0 < 0,05), which means that all constructs present discriminant validity (see table 2.3).

Table 2.3. Discriminant Validity Analysis

Construct Variable 1	Construct Variable 2	χ^2	χ^2 differences	Df difference	p-value
Work-Life Balance	Flexible Work Arrangements	202,42	90,65	1,00	0,00
Work-Life Balance	Creativity	210,89	99,13	1,00	0,00
Flexible Work Arrangements	Creativity	210,38	98,62	1,00	0,00

We have tested the structural model of figure 2.2. Table 2.4 describes structural model fit indices. The good-of-fit indices indicate a good fit of our model.

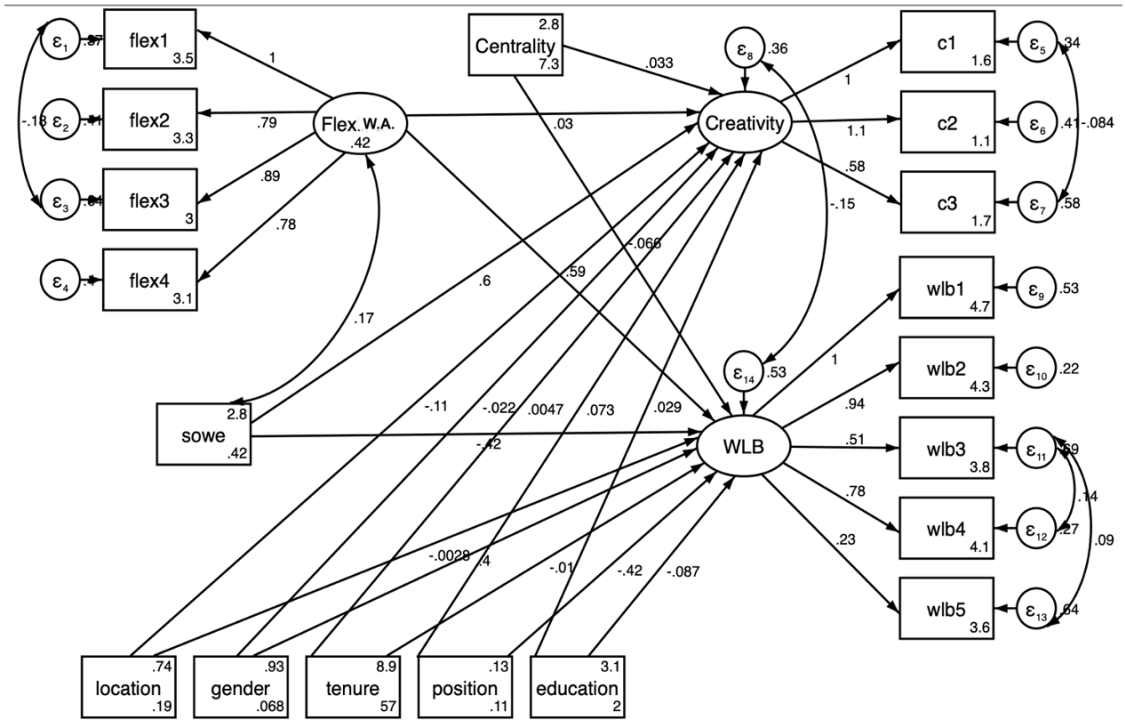

Figure 2.2. Structural Equations Model with Estimation

Table 2.4. SEM Model Fit Indices

Goodness-of-fit	Estimates	Cutoff values based on model characteristics
Chi-square (χ^2)	157.65	
Degrees of freedom	116	
Probability level	0.006	Not significant p-values can be expected[a]
X2/d. f. Ratio	1.36	< 2.00 excellent
CFI	0.95	> 0.90
TLI	0.93	> 0.90
RMSEA	0.04	< 0.07 with CFI of 0.90 or higher
AIC	9848.35	Akaike's information criterion
BIC	10041.65	Bayesian information criterion
SRMR	0.05	< 0.08 good
CD	0.87	Coefficient of determination (R^2)

[a]In "Chi-square" (CMIN) statistic its associated p-value should not be statistically significant if there is a good model fit. However, the $\chi 2$ statistic is very sensitive to sample size and is no longer relied upon as a basis for acceptance or rejection (Schermelleh-Engel, Moosbrugger, & Müller, 2003)

Table 2.2. Structural Parameters Values

Variables	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
Creativity (R^2 = 0.31)						
Location	-0.11	0.12	-0.98	0.33	-0.34	0.11
Gender	0.02	0.19	-0.12	0.91	-0.40	0.35
Tenure	0.00	0.01	0.70	0.48	-0.01	0.02
Education	0.03	0.04	0.82	0.41	-0.04	0.10
Position	0.07	0.15	0.49	0.62	-0.22	0.37
Flexible Work Arrangements	0.03	0.10	0.29	0.77	-0.17	0.23
Social org. Work Environment	0.60	0.09	6.49	0.00 ***	0.42	0.78
OutDegree	0.03	0.02	1.77	0.08	0.00	0.07
Work-Life Balance (R^2 = 0.28)						
Location	0.00	0.13	-0.02	0.98	-0.26	0.26
Gender	0.40	0.22	1.78	0.08	-0.04	0.84
Tenure	-0.01	0.01	-1.34	0.18	-0.03	0.00
Education	-0.09	0.04	-2.11	0.04*	-0.17	-0.00
Position	-0.42	0.18	-2.38	0.02*	-0.77	-0.07
Flexible Work Arrangements	0.59	0.14	4.45	0.00***	0.32	0.87
Social org. Work Environment	-0.42	0.11	-3.91	0.00***	-0.63	-0.21
OutDegree	-0.07	0.02	-2.99	0.00***	-0.11	-0.02

* Significant at the 0.05 level. ** Significant at the 0.01 level. *** Significant at the 0.00 level.

Table 2.5 summarizes our coefficients values of structural model analysis (regression equations) for hypotheses 1, 2 and 3 related to creativity and work-life balance. We included the main effect of flexible work arrangements, which was not a significant predictor of creativity ($\beta = .03$; $p < .77$), thus not providing support to hypothesis 1a. The main effect of Social Organization Work Environment was a significant predictor of creativity ($\beta = .60$; $p < .00$), thus providing support to hypothesis 2a. The measure of instrumental social network centrality, i.e. Outdegree Centrality ($\beta = .03$; $p < .08$) was not a significant predictor of creativity, thus not providing support to hypothesis 3a.

Flexible work arrangements were a significant predictor of Work-Life Balance ($\beta = .59$; $p < .00$), thus providing support to hypothesis 1b. Social-Organization Work Environment was negatively associated to Work-Life Balance ($\beta = -.42$; $p < .00$), thus providing support to hypothesis 2b.

Outdegree Centrality was negatively and significantly associated to Work-Life Balance ($\beta = -.07$; $p < .00$), thus providing support to hypothesis 3b.

We conducted post-hoc analyses using the indegree as a measure of network centrality, but we did not find a statistically significant association between indegree centrality and neither work life balance nor creativity.

Discussion

We started our research with an interest in investigating the different effects that work environments designed to increase employees' creativity and enacted instrumental social networks might have on workers' creativity and their ability to manage the interface between work and family. We found that flexible work arrangements, such as perceived freedom in choosing time and place to work, is related to a better ability to manage the interface between work and family, but not to creativity. We found that while social-organizational work environments designed to support creativity are indeed related to greater idea generation, they are negatively related to experiences of work-life balance. Finally, the amount of advice received in the workplace (that we measured as the outdegree centrality in instrumental networks) – is also negatively related to work-life balance. Our study provides several contributions to the innovation and creativity and to the work-life balance literatures, as well as practical implications.

Theoretical implications

While existing literature supports a highly optimistic view that organizational work environments designed to enhance creativity may improve both creativity at work and quality of life experienced by employees (Agarwal & Farndale, 2017; Kelly et al., 2008; Thompson & Prottas, 2006; Valcour,

2007), we caution that a trade-off perspective should be considered more carefully, given that the very same organizational design can affect positively workers' ability of idea generation but negatively their perceived work-life balance. We contribute to this debate by highlighting, for organizations focused on creativity enhancement, the need to consider the relationship between work-involvement processes and the perceptions that workers have of designed organizational practices, especially in terms of the autonomy/control that these afford. We propose that an important reflection regards the so-called "high-involvement work processes" which are often assumed to generate virtuous circles for employees by creating spillovers into the life domain (e.g., Clark, 2000). In particular, these studies suggest that to the extent to which organizational practices for creativity give workers greater control over their jobs, by promoting work involvement and commitment, they can reduce work-life stress and thus promote better work-life balance (Mackie et al., 2001; Wood & De Menezes, 2011). Our findings about the positive impact of flexible work arrangements practices confirm this statement.

However, we also show that if employees are simultaneously embedded in an over-committing relational structure, they may nevertheless perceive lack of autonomy or inability to set clear boundaries between life and work commitments. Two mechanisms may be related with this tendency, we argue. First, by eliciting aspects such as proactivity and interdependency, organizational structures designed to support creativity may walk a thin line between commitment and overcommitment to work tasks. Future studies may further investigate how and to which extent embedding individuals in dense webs of social interactions and knowledge exchanges (e.g., multiple teamwork, lean and agile project management) is responsible for perceptions of work commitment or pushes employees towards over-commitment (perceptions of control loss and work-life conflict) (Kinman & Jones,

2008; Meijerink et al., 2020). Second, more recent research has shown that HR initiatives, which are intended to facilitate employee wellbeing or autonomy, may fail when employees are not able to fully understand their strategic importance and appreciate the consistency across initiatives (see Ungureanu, Bertolotti, & Pilati, 2019; Wang & Verma, 2012). We further argue that, if employees can see organizational workplaces designed for creativity as part of a unitary whole (i.e., design consistency), they may perceive them as less encroaching on their autonomy or personal lives (Abstein & Spieth, 2014; Ehrhardt et al., 2011; Shalley & Gilson, 2004).

As far as enacted interactions are concerned, we bring attention to how centrality in instrumental social networks, have counterintuitive effects on work-life balance. We found that outdegree centrality in advice networks is negatively related to work-life balance. Outdegree centrality measures how much a person relies on others for work-related help or advice. Thus, it also captures how much employees perceive themselves to be dependent on others for carrying out their tasks, which could negatively affect perceived autonomy and, therefore also work-life balance. Future research could further investigate the trade-off between different network structures and centrality measures in differentially affecting creativity and work-life balance.

Importantly, this finding makes a specific contribution to the literature on work-life balance by proposing a new antecedent of perceptions of work-like balance: centrality in instrumental social networks. While previous research has already testified to the role of a supportive organizational environment (e.g., supervisor or coworkers support for enhancing employees' ability to better balance work and life domains (Beauregard & Henry, 2009; Smith & Gardner, 2007), the effect of individuals' position in the enacted social structures represents a novel perspective. Work-family scholars have called for more research on contextual antecedents of the work-family pathways, such

as conflict and enrichment (Chan et al., 2016; Greenhaus & Powell, 2006; Wayne et al., 2006). While such literature has been mostly limited to the individual level of analysis (Casper et al., 2007), focusing on social networks provides a contextual variable (e.g. resources perspective, Greenhaus & Powell, 2006) that focuses on interactions among work colleagues, and thus also provides a novel method of analysis for the work-family literature. Importantly, the negative effect of outdegree centrality on work-life balance offers a new interesting perspective on the interplay between the work context and other life domains, such that the higher the number of people a person feels s/he to be dependent, the higher the perception that resources in one domain can in turn drain the other domain. This conclusion may appear inconsistent with previous studies according to which work-to-family conflict can be reduced through social support mechanisms such as collegial relationships with colleagues and supervisors (Carlson & Perrewé, 1999). We further qualify the concept of social support by referring specifically to the amount of work-related task advice a person can receive. As highlighted above, we propose that a possible explanation of this counterintuitive finding may be related to the increased perception of dependency on others (i.e., seeking information from others) and the likely associated perception of reduced autonomy.

Practical implications, limitations, and future research directions

Our considerations also pave the way for a relevant managerial reflection: when designing contexts for creativity, managers should be aware of the trade-offs they may entail. HR managers and employers in general should pay attention to the meanings that workers attribute to organizational environments designed to enhance creativity, as well as to their perceptions regarding the degree of autonomy that they have in organizational advice networks. Such reflections can avoid a paradoxical situation by which tools given to knowledge workers to increase their autonomy at work and at home,

and spontaneous processes that are considered beneficial for both domains (i.e., help and advice networks), end up by reinforcing one domain at the expense of the other. To this purpose, managers could precede the actual introduction of designed organizational structures with a prototyping phase aimed at assessing the impact of such structures on workers' perceptions, as well as on a variety of attitudes and abilities related to workplace performance and creativity within and beyond the working sphere (high-commitment work environment, work-life conflict, and perception of conflict versus enrichment). Second, if organizations truly value both creativity and employee wellbeing, this double-ended priority should be communicated to employees coherently and strategically. Future research may investigate thus whether different HRM strategies at the company level can contribute to reducing the perceived trade-off. For instance, Abstein and Spieth (2014) suggest that incorporating specific 'metafeatures' or messages about company expectations within designed HRM (i.e., individual-centrism, discretion, effort rather than results orientation and predictable expectations), may promote coherence by increasing employees' perceptions of a creative environment and diminishing feelings of work-life balance conflict. This may sometimes even imply anticipating and warning employees that creative task approaches may generate high levels of commitment which, if not managed properly, may cross the over-commitment line. While such anticipations may sometimes cause undesired reactions, such as employees' lack to commit or self-fulfilling prophecies, they can also testify to the organization's authentic concern to make creativity a participatory organizational process.

This work is not without limitations. First, our data were collected in one single knowledge-intensive context and our evidence cannot be generalized to other settings. As with all cross-sectional studies, the test of our hypotheses precludes making definitive causal statements. Clearly,

longitudinal research or laboratory studies are required to assess with greater confidence the paths in our proposed model. In addition, a limitation that is common in survey research design is that although we controlled for education, tenure, gender, position, and location, there may be other uncontrolled variables that affect our dependent variables in the workplace.

Interestingly, our study did not support the existence of a positive relationship between instrumental network centrality and creativity. This may be due to the fact that a creative process is composed of different stages (idea generation, idea elaboration, idea championing, and idea implementation, Perry-Smith & Mannucci, 2017) and that receiving advice at different stages can have different impacts on the quality and quantity of idea generated, elaborated, or implemented. Studies that distinguish between the different stages of the creative process could tell a more refined story about the tradeoffs of creativity and work life balance. In addition, in our conceptualization and measure of instrumental network centrality we did not distinguish between formal advice, i.e., advice received by supervisors and immediate colleagues such as team members, from informal advice, i.e., advice received by peers or other colleagues in other units or teams. Another fruitful avenue for future research is to explore how centrality within the formal versus informal instrumental network affects creativity and work-life balance.

In spite of these limitations, we believe that this work offers an important perspective on the 'dark side' of new managerial and human resources practices for creativity, in terms of the potential negative long-term implications for the well-being of employees. In line with the boundary-breaching nature of our study with respect to different research traditions, we encourage HR and innovation scholars to further investigate the nuanced, complex, and unexpected trade-offs entailed by innovative organizational contexts.

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Study 3: Multiplex Boundary Work in Innovation Projects. The Role of Collaborative Spaces for Cross-functional and Open Innovation

Introduction

An organization's ability to innovate is often associated with the ability to cross boundaries, be they internal (i.e., by means of cross-functional innovation teams) or external (i.e., by means of open innovation projects involving external stakeholders). As organizations attempt to cross internal and external boundaries in the search for new innovation-based competitive advantages, generating innovative ideas and ultimately transferring them into the market become increasingly complex (Chesbrough et al., 2006; Clark & Wheelwright, 1993; Edmondson & Harvey, 2018; Thamhain, 2003). Innovation studies usually treat internal innovation and open innovation separately, to highlight their unique challenges and opportunities. In doing so most works have adopted a configurational approach and have tried to identify the characteristics that such collaborations must have to maximize innovation outcomes. For instance, conducting open innovation with diverse stakeholders such as clients, suppliers and users is an opportunity in terms of better knowledge flows, more diverse learning opportunities and timelier and more adequate responses to the market. At the same time, risks include high coordination costs, cultural and professional barriers, opportunism, difficulties to converge towards a common goal and intellectual property rights management (Brown & Eisenhardt, 1995; Jassawalla & Sashittal, 1999; McDonough III, 2000). Similarly, studies on internal innovation suggest that participants' diversity in cross-functional teams may fuel but also seriously deter innovation processes (Edmondson & Harvey, 2018; Holland et al., 2000; Lovelace et al., 2001). Risks concern the complexity of managing multiple actors with diverse backgrounds and

channeling them towards the same objectives which in innovation situations are often multi-faceted and ill-defined (Tushman, 1978).

It is noteworthy that organizations often make use of external and internal innovation simultaneously, crossing both functional and organizational boundaries in order to successfully manage their portfolio of innovation projects. However, not only have external and internal boundary spanning for innovation rarely been studied together, but their benefits and challenges have also not been integrated within a common frame. In this work, we focus on the concept of 'boundary work' (Carlile, 2004; Faraj & Yan, 2009; Langley et al., 2019) to connect the concepts of internal and open innovation. By multiplex boundary work we refer to those strategies that members of organizations enact to construct, tear down and reshape differences in internal cross-functional teams and in open innovation teams simultaneously. To this regard, we already know that relational capabilities, or the organizational skills required to manage resources shared between heterogenous stakeholders (e.g. De Silva & Rossi, 2018; Dyer & Singh, 1998) play an important role in successful collaboration for innovation. However, how organizational *members* may leverage relational capabilities to engage in these activities *simultaneously*, and with what consequences for an organization's ability to innovate, still need to be addressed. Importantly, in line with the boundary work framework, we highlight that collaboration boundaries are often managed through concrete tools and creative practices made available by the organization. The literature on creativity and innovation has underlined the fundamental role of physical proximity and shared organizational artifacts (i.e., boundary objects) in favoring boundary work in innovation processes. The implicit assumption is that proximity boosts relational capabilities such as increased attention to others' needs, familiarity, coordination, and spontaneous conversations enabled by face-to-face encounters and interactions (Bechky, 2003;

Kiesler & Cummings, 2002; Koskinen, 2005; Nicolini et al., 2012). Collaborative spaces are physical spaces specifically designed and built to support the creativity of individuals, groups and organizations by leveraging on physical proximity (Capdevila, 2015; Furnari, 2014; Garrett et al., 2017; Oksanen & Ståhle, 2013). We are thus concerned with the strategies by which organizations try to enact internal and external boundary work simultaneously, and we inquire about the strategies that allow them to do so, focusing on the role of collaborative spaces as support tools for internal and external innovation,

To this purpose, we conducted a qualitative study in a multi-divisional organization in the food industry that created a collaborative space in its headquarters in order to foster collaboration in both internal and external innovation projects. We studied the impact of the collaborative space on employees' ability to simultaneously perform internal and external boundary work by comparing their expectations about the space with actual experiences of it. Findings show that collaborative spaces are expected to have revolutionary effects on how employees collaborate across organizational functions and with external stakeholders such as clients, suppliers, consumers, and the public press. In particular, by serving as a laboratory (i.e., being plastic, informal and central) the space is expected to tear down internal and external boundaries, affording free knowledge exchanges and an improvement in creativity and knowledge exchange quality. Although we confirm that a collaborative space may afford the alignment between participants' initial expectations and actual experiences, we also show that increasing diversity in collaborations can trigger unexpected constraints that generate a trade-off between participants' ability to perform internal and external boundary work.

In addition to linking studies on cross-functional teaming and open innovation through the boundary work perspective, we propose the term of multiplex (internal-external) boundary work and

describe its mechanisms, including the paramount role played by materiality and the role of (perceived) boundary configurations. Drawing on our theoretical contributions, we also discuss implications for how organizations may design feasible spaces for different forms of collaboration for innovation.

Theoretical Framework

Crossing internal and external boundaries to innovate from cross-functional teams to open innovation

Internal innovation: cross-functional teams for product development

Ancona and Caldwell (1992) define a cross-functional product development team as a collection of members of different departments and disciplines brought together under the same responsibility and given the charge not only to make product development decisions but also to provide support for them throughout the organization. Research on cross-functional teams has largely adopted a configurational perspective - i.e., investigated the team compositions and conditions that maximize advantages and minimize disadvantages for innovation outcomes. According to existing studies, participants' diversity - i.e., the personal, organizational and professional differences that members bring along in a cross-functional team, drives both opportunities and disadvantages of collaborative innovation. On the one hand, diversity is shown to increase creativity in the development process. Brown and Eisenhardt (1995) showed that an increase in the amount and variety of information available to design products allows team members to understand the design process more deeply and quickly, such that the overall project performance, learning opportunities and quality of information exchanged are improved. On the other hand, however, studies suggest that diversity of viewpoints may generate and escalate conflict at the team level (Dahlin et al., 2005; Holland et al., 2000;

Lovelace et al., 2001). Another frequently mentioned characteristic of cross-functional teams is their being assigned to development projects on a temporary basis. This characteristic may push members to act creatively and overcome rigid roles and organizational structures, on the one hand, but also risks increasing coordination and negotiation costs at the team level, on the other hand. Moreover, cross-functional teams often face high-performance expectations and aspirational goals such as compressing development times, creating new knowledge, and enhancing organizational learning. While such expectations may stimulate members to top perform, they may also generate stress and conflict, including scapegoating at the team level or competition for resources (Dahlin et al., 2005; Lovelace et al., 2001).

External boundary work: open innovation with external stakeholders

As sources of innovation become more diverse and distributed throughout industries and geographic regions, firms shift the focus beyond their own organizational boundaries, often engaging in collaboration with external stakeholders such as other organizations, clients, consumers, NGOs and other societal actors to create joint intellectual property (Baldwin & Von Hippel, 2011; H. Chesbrough, 2003; Greer & Lei, 2012; West & Bogers, 2014). Research has discussed open innovation as a paradigm according to which infusing external ideas in product development can provide significant competitive advantage for an organization, especially if aligned with the organization's business model (H. W. Chesbrough, 2003; West & Bogers, 2014; Zott et al., 2011). Just as in the case of cross-functional teams, the literature on open innovation has taken a configurational approach, focusing on the type of actors taking part and the form of collaboration taking place, the drivers for participating in open innovation projects, and the characteristics of innovation outcomes (West & Bogers, 2014). For instance, while most research still refers to dyadic

collaborations (Bercovitz & Feldman, 2007; Li & Vanhaverbeke, 2009), attention is shifting to innovation networks and innovation communities. These latter are characterized by the presence of a large variety of stakeholders holding different background and abilities to participate to the development process, as well as different incentives and levels of motivation (Baldwin & Von Hippel, 2011). Echoing the findings in the cross-functional team literature, recent contributions identify also a list of disadvantages, such as difficulty in establishing overarching goals, conflict escalation due to diverse backgrounds, high coordination costs due to heterogeneous capabilities and motivations, and the difficulty of incorporating external ideas into a single company's products and services (Baldwin & Von Hippel, 2011; Greer & Lei, 2012; Lifshitz-Assaf, 2018; West & Bogers, 2014). Other studies mention strategic disadvantages at the firm level, including the trade-off between resources donated to project partners and results obtained, or loss of strategic control, information and competitive advantage at the organizational level (Spaeth et al., 2010; Stam, 2009).

Performing boundary work in cross-functional teams and open innovation

Summarizing, despite adopting similar perspectives grounded in a configurational approach, internal and external boundaries work for innovation are often treated separately in the innovation literature, as cross-functional teams, and open innovation, respectively. Interestingly, a few studies suggest that configurations of diversity -be they internal or external- do not explain by themselves innovation performance, such that more attention must be paid to relational capabilities that allow organizational members to leverage diversity in collaborative innovation. Following a relational view, relational capabilities are defined as the capacity of an organization to purposefully create, extend, or modify its resource base by demonstrating willingness and ability to partner with stakeholders across boundaries (Dyer & Singh, 1998; Helfat & Peteraf, 2003). Different components

of relational capability have been highlighted (e.g. De Silva & Rossi, 2018; Johnsen & Ford, 2006). For instance, De Silva and Rossi (2018) identify three macro-types of relational capabilities. Structuring capability regards an organization's ability to set up ex ante structures such as contracts, mutually accepted frameworks or platforms to facilitate collaboration. Alignment capability refers to partners' ability to align their goals, objectives, and practices (e.g., partners' effective leveraging of knowledge and experience, their ability in project management and coordination). Finally, communication capability denotes the ability to maintain dialogue and find consensus (see also Bäck & Kohtamäki, 2015; Capaldo & Petruzzelli, 2011; De Silva & Rossi, 2018; Gulati & Sytch, 2008; Perkmann & Salter, 2012). However, by focusing on the *type* of relational capabilities needed, many studies in these macro areas have not shed light on the way relational capabilities are leveraged by organizational members in collaborative innovation. An exception is constituted by the study of Swan and colleagues (2007) who propose to switch attention from relational *capability* to relational *processes*. The authors highlight that the success of collaboration in interorganizational partnerships depends on partners' ability to align interests, expectations, and commitments during a collaboration, by negotiating aspects such as credibility, values and perceptions in their everyday work. The configurational approach then can be complemented by studying boundary deployment -i.e., the process of blurring boundaries between capabilities developed and nurtured within a firm and those developed through external relationships (Hakansson & Gadde, 2001; Swan et al., 2007).

In advancing the literature on relational capabilities, then, and in clarifying how R&D collaboration occurs simultaneously across internal and external boundaries, a central role is played by boundary management processes. These refer to strategies enacted by members of a team to obtain information and resources from diverse sources, to initiate interactions with, and respond to

communications from, other parties inside and outside the organization, despite differences. In innovation studies, research on boundaries is still in its initial stages. For instance, Boscherini and colleagues (2010) talk about the boundary management strategies that can help firms to identify, plan, and manage a pilot project for open innovation and Koskinen (2005) about the ability to recognize and correctly use boundary objects to overcome innovation barriers. However, studies on boundary work conducted in other settings suggest that there is no 'correct' way to use a boundary object, and that boundary objects are often created and re-created ad-hoc, instead of waiting to be planned or recognized by project members. For instance, it has been shown that individuals can leverage diversity in highly creative ways, acting as resourceful strategists that simultaneously defend and tear down functional boundaries (Bechky, 2003; Carlile, 2002, 2004; Edmondson & Harvey, 2018; Kellogg et al., 2006; Majchrzak et al., 2012).

Therefore, focusing on transitions between breaking and defending boundaries, or on interplays between setting up and interpreting boundary objects may further help understand the dynamics of collaborative innovation, especially when analyzing internal and external collaboration together. To shed light on these issues, we further turn our attention to the literature on the role of collaborative spaces as organizational support tools for boundary work.

The Role of Collaborative Spaces for Boundary Work and Innovation

Increasing evidence suggests that the success of cross-functional innovation teams depends on organizations' ability to provide support and facilitation. This can happen, for instance, by creating collaboration structures such as new organizational roles, project brokers, collaboration contracts or appropriate climates for learning and innovation (De Silva & Rossi, 2018; Donnellon, 1993;

Dougherty, 1992; McDonough III et al., 2001). While many studies have traditionally focused on the role of contracts and brokers for R&D collaboration (see Blomqvist et al., 2005), more recently attention has shifted to informal collaboration structures and in particular to collaborative spaces for cross-functional work (Cabral & Van Winden, 2016; De Vaujany et al., 2019; Garrett et al., 2017; Ungureanu, Deborah, et al., 2018).

The creation of collaborative spaces within organizations is based on the assumption that face-to-face contact has a positive impact on the propensity of individuals with different backgrounds to interact and exchange ideas (Narula & Santangelo, 2009; Oksanen & Ståhle, 2013), thus favoring the development of creative collaborative communities (Garrett et al., 2017; Ungureanu, Cochis, et al., 2018). It is interesting to notice that collaborative spaces have the potential to meet the double challenge of internal and external collaboration for innovation (Ungureanu, Bertolotti, Mattarelli, et al., 2019; Ungureanu, Deborah, et al., 2018). In cross-functional teams, proximity increases the chances of spontaneous knowledge exchange, fast decision making, timely responses to the needs of others, creativity and market success, while isolation and geographical distribution have the opposite effect (Ambos et al., 2016; Meyer et al., 2011). Regarding open innovation, studies on 'third places' such as co-working and makers' spaces show that actors from different organizations are encouraged to pursue creative outcomes thanks to absence of hierarchical structures, flexibility and freedom. At the same time, they also enjoy some typical advantages of the organizational life like access to networking opportunities and participation to the social life of a community (Gandini, 2015; Howell & Bingham, 2019; Spinuzzi, 2012).

As highlighted above, studies on collaborative spaces have also adopted a configurational approach, correlating physical features of spaces and affordances for innovation (e.g., 'open space'

and 'informality'). However, the same studies acknowledge that the role of organizational space in innovation behavior is still ambiguous and that practical attempts to control informal interaction in organizations through workspace design often result in failure (Fayard & Weeks, 2007; Pearce et al., 2016; Ungureanu, Bertolotti, Mattarelli, et al., 2018). To this concern, researchers highlight the need to study the relationship between organizational space and organizational boundary management.

Specifically, it has been argued that the materiality of spaces is essential for organizational members to accomplish common projects because it co-locates them in the same dimension, encourages them to explore each other and enables them to create a common tangible ground for mitigating differences (Elsbach & Pratt, 2007; Van Marrewijk & Yanow, 2010). Yet, physical spaces can also act as barriers whenever participants feel threatened inside a cross-functional project. It results that although the material dimension of spaces matters, what we usually refer to as materiality does not derive from the use of spaces itself, but from the entanglement between material artifacts and social action -the myriad of interpretations, intentions, goals and expectations that individuals project towards collaborative spaces as well as towards each other (Carlile et al., 2013; Leonardi, 2012). For instance, layouts of organizational spaces (walls, doors, furniture, colors, and sizes) will combine in unique ways with the symbolical, affective, ethical or ideological connotations given to them by users, becoming ad hoc tools for innovation projects. A compartmented but modular space may protect participants and allow them to have open meetings in the idea generation phase of a development project, on the one hand, but also to find concentration and privacy in subsequent phases of idea elaboration and refinement (Elsbach & Pratt, 2007).

In conclusion, many studies explore the configurational properties of teams for collaborative innovation, the configurational properties of collaborative spaces, and their impact on innovation

outcomes. To expand this literature, we propose a switch from configuration to processes (Edmondson & Harvey, 2018). We propose to pay closer attention to the uses of boundary spaces in cross-functional and open innovation, especially in relation to individuals' need to perform multiplex (i.e., internal and external) boundary work and to their innovation outcomes. A focus on multiplex boundary work processes not only can help us understand how internal and external boundaries are managed jointly in innovation projects, but also contribute to the call in the boundary work literature for a deeper understanding of multiple boundary spanning (Langley et al., 2019).

Data and Methods

Context: Foodcorp's Collaborative Space

We draw on empirical evidence from a six-months field study to explore the role of a collaborative space set up inside an organization aiming to promote internal (cross-functional teams) and external (i.e., open innovation teams) projects for product innovation.

The context studied is a multinational group in the food industry, fictitiously labelled FoodCorp. Founded in 1870s in Italy as a food shop, today FoodCorp is a world leader in the food market in different segments, with estimated 3 billion turnover and approximately 8,000 employees across the world, counting more than 25 production sites and exporting to over 100 countries worldwide. As a benchmark in production and distribution processes, FoodCorp also invests in continuous innovation. Among FoodCorp's strategic goals are those of pursuing product and process innovation for expanding its market share, reducing environmental impact, and promoting healthy lifestyles. Traditionally, FoodCorp's innovation projects adopted a 'phase and gate' model that divided the development process into neatly distinct stages such as scouting, design, testing and validation,

industrialization and launch, separated by decision points (i.e., gates). While such organization allowed for both efficient specialization and collaboration, it also lacked flexibility, undermining the creativity of the single participants and the overall innovativeness of the projects. Consequently, FoodCorp set up in 2015 a collaborative space within its headquarters to propose less constrained collaborations between organizational functions, and between headquarters and local branches, in addition to increasing interaction with external stakeholders. The collaborative space (from now on, CS) was designed and managed by the Research and Development Department of the Group, and commonly hosted work-teams composed of employees from company's multiple departments and offices, clients, suppliers, consumers, consultants, opinion leaders, bloggers, journalists, master's students and researchers. Each project team was called upon to solve a need or to optimize a product, or a process, within projects that lasted from several weeks to more than a year. The CS was created following a 'smart urban' style. It occupied a former factory building that was owned and operated by FoodCorp. It was set up as an open space with minimalist design furnishings based on recycled materials. Given the focus on interactive and hands-on collaborative sessions, the furnishings of the space were for the most part mobile, so that the actors involved could change the space layout according to emergent needs at each session of use. In 2016, more than 200 people from different countries (Zimbabwe, UK, Congo, Canada, Colombia, Italy) and the most varied skills, from communication to marketing through design and sales, participated in innovation-related projects within the CS. FoodCorp is currently also trying to test the new approach to innovation in other local offices in Sweden and the United States.

Research design and data collection: A grounded theory approach

We conducted a six-month field study in FoodCorp and we defined a qualitative case study in accordance with the grounded theory approach which implies iterations between data collection, data analysis and theorizing (Strauss & Corbin, 1998).

We collected data continuously in the time span between February 2018 and June 2018, and sporadically in the period from June 2018 to September 2019 (i.e., we entered and exited the contexts 5 times for various research purposes such as new rounds of thematic exploration, confirmatory analyses of the coding scheme, managers' follow-up requests and verification of the final model with the CS managers and users). We employed multiple data sources to support our theory building process, specifically, semi-structured interviews and participant observations. We collected more than 60 hours of observations in the field, and we conducted 31 semi-structured interviews.

Semi-structured interviews: The semi-structured interviews were conducted face-to-face and have an average duration of 110 minutes. The interviews were organized around a set of open-ended questions following an interview protocol that focused on issues related to expectations, perceptions, management and use practices of the CS. We interviewed 24 persons internal to the organization, coming from 6 different functional areas and 7 externals, including actors from other organization and master's students. 58% of informants were females. All interviews were fully recorded and transcribed. Table 3.1 summarizes key characteristics of the informants involved in the data collection.

Table 3.1. Key aspects of data collection: informants' details

Functional Areas	ROLE Description/ Mission IN THE CS	Informants	Years in the Org.
CS Managers	Space management & innovation project design: open innovation design; collaboration process facilitation, applied collaboration sessions, space design, space planning, coordination of both internal and external innovation projects.	2 (female)	>10 (1) <5 (1)
HR	Plan, manage and evaluate operations of the Human Resources department, including knowledge management, talent development, organizational welfare programs, etc.	1 (female) 1 (male)	>10 (2)
Marketing	Research, determine, examine and evaluate demand for new and existing products, targeted campaigns and promotional strategies, market research interface	4 (male)	>10 (3) <5 (1)
Quality	Coordinate and manage all the quality control and prevention activities of a production process, to ensure that all product process meets internal and external standards	1 (female)	>10
R&D	Research and development in technological innovation related to improving products and production processes or creating new ones; with other functions define new product specifics and follow new product industrialization; manage org. knowledge for innovation	8 (female) 6 (male)	>10 (12) >5 (2)
Sales	Plan, organize, direct, control and evaluate the activities of companies and departments involved in commercial, industrial, institutional, e-business and wholesale sales activities.	1 (female)	>5
External STAKE HOLDERS	Masters' students working under supervision on specific innovation challenges launched by the organization Business consultants on open innovation implementation using design thinking method Customers (retailers) invited to contribute to specific new product development projects	5 (female) 2 (male)	<1 (7)

According to the grounded theory approach, the interview protocol was continually adjusted during the research. Simple open questions included: "Describe innovation projects in FoodCorp"; "Describe the collaborative space"; "Why and when do you use the collaborative space?"; "Describe an innovation project in which you participated in the collaborative space". Some questions entering into more details, guided from respondent's answers, included: "Who do you collaborate with more

often in the collaborative space, and why?"; "What are some collaboration-for-innovation challenges you faced inside and outside the CS?; "How do you manage differences during innovation projects and how satisfied are you about what you accomplished during CS sessions?"; "Can you describe a meaningful innovation project in which team differences were managed with satisfying/unsatisfying results?".

Participant observation: During the in-residence period inside FoodCorp we also conducted participant observations of many occasions. We observed our first meetings with the CS manager, and 8 episodes of FoodCorp's work life (3 observations of open workspaces in FoodCorp, 2 observations of the meeting rooms adjacent to the CS, 1 observation of a guided tour to the pilot R&D production plant, 2 observations of R&D offices). Moreover, we conducted 5 observations of the CS: 3 observations of collaborative sessions organized in the CS, 2 observation episodes of external stakeholders (i.e., master's students) working in the CS on a project assigned by FoodCorp. Finally, we also conducted observations during feedback and follow-up sessions with our informants at the end of the project. About 80% of the observations were conducted by the first two authors who checked field notes and discussed them after each observation episode. The remaining was conducted by a research assistant who worked under the supervision of the first author.

Data Analysis

We analyzed our data following the grounded theory methodology (Strauss & Corbin, 1998) which is particularly useful for investigating arguments that provide insufficient theoretical guidance for a deductive approach, and for showing how, rather than why, processes occur and unfold (see also Sousa & Hendriks, 2006). Prior studies using a qualitative grounded theory approach to cross-

functional innovation and open innovation (Dougherty & Takacs, 2004; Jassawalla & Sashittal, 1999; Leonardi, 2011; Seidel & O'Mahony, 2014; Swan et al., 2007) were additionally used as sensitizing devices for data collection and analysis.

After we transcribed interviews and observations into field notes, we imported them into an integrated database. In the beginning, we read independently the transcripts to identify original terms and phenomena in the data, group them into categories, and generate first order (informant centric) concepts. We regularly met to analyze sets of two or three transcripts, discuss our independent coding, and agree on first-order concepts. Specifically, during the first rounds of coding we identified several aspects related to our research questions such as perceived influence of the CS for collaborative innovation (negative and positive perceptions and feelings about the space), expectations about CS features and about collaboration with others, perceptions about collaboration differences (i.e., boundary perceptions) and references to strategies for managing collaboration differences (i.e., boundary work strategies, for instance, boundary blurring and boundary buffering). Then, by separately clustering convergent categories at a higher level of abstraction, we looked for relationships among first-order concepts to identify theoretical categories (i.e., second-order themes). Specifically, in a following round we perfectioned our coding scheme by grouping the aforementioned open categories into second ordered themes. For instance, the first order categories regarding informants' expectations about what the CS could do for innovation projects (CS as plastic space; CS as melting pot, CS as informal; CS as boundary breaker, CS as central and practical, CS as hands-on-experience, etc.) were grouped under the second-order theme "Generalized expectations: CS as laboratory". Similarly, informants' expectations about their colleagues' behavior in the CS (dedicate full attention to CS activities, no use of computer, smartphone, no instant messaging; always

come in prepared; motivate absence to CS meetings, etc.) were grouped under the second-order theme "Expected collaborative behaviors in the CS". In a following phase, we further grouped the second-order themes into theoretical aggregates. For instance, the two aforementioned categories were grouped under the label "Expected impact of CS on multiplex boundary work". As a final step in our coding, we identified relationships between second-order themes and aggregate theoretical dimensions. To do so, we coded for critical incidents regarding the aforementioned categories, specifying frequency (things happen often or seldom) and causation (one appears to cause another) (Saldaña, 2015). After further refinement, we connected the previously identified categories following a process-oriented perspective (Langley et al., 2019) and organized the model in three stages showing how the organization manages internal and external boundaries with the help of a collaborative space. Figure 3.1 provides a representation of the three levels in our data structure.

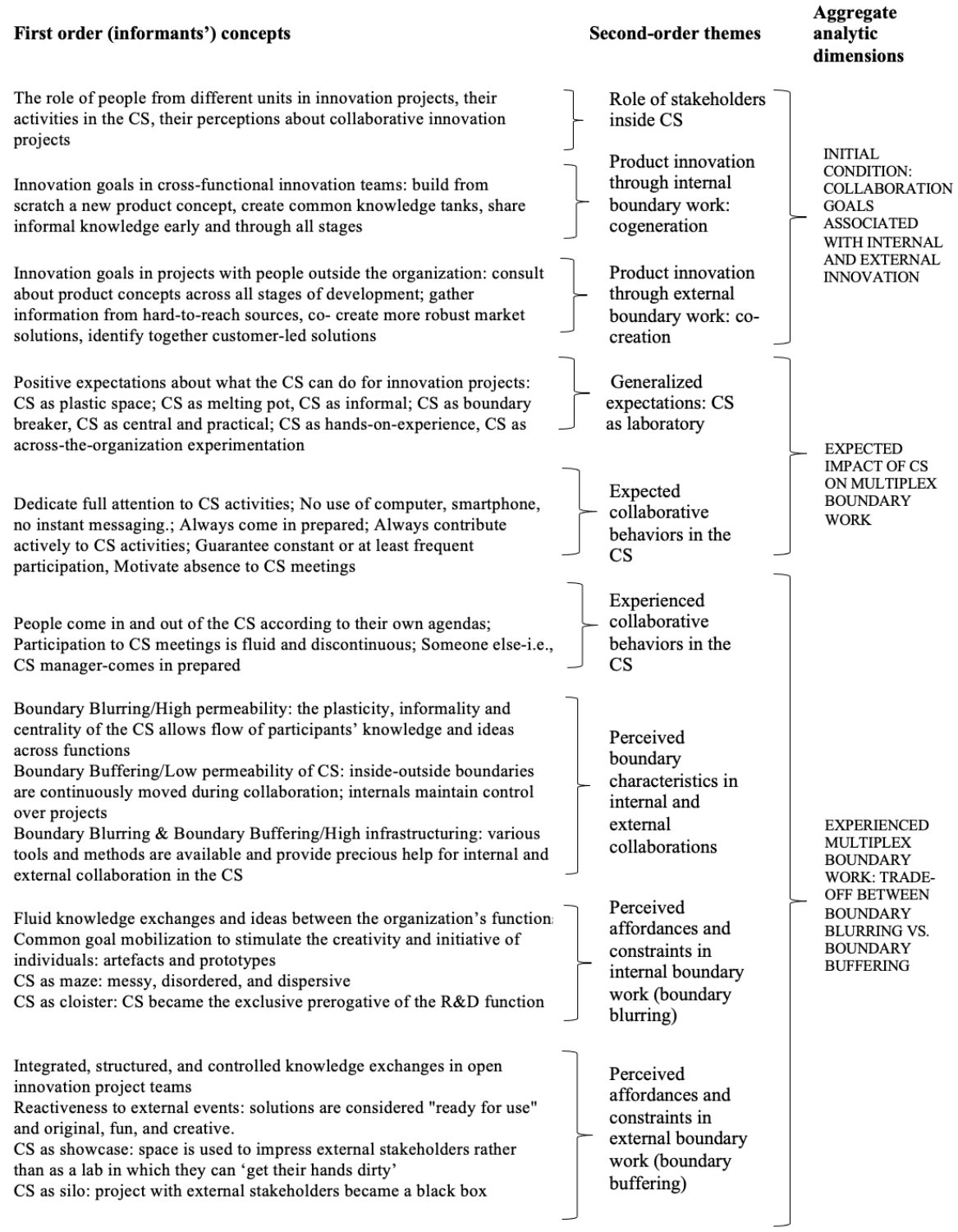

Figure 3.1. Data structure of the grounded model

Throughout the coding process, we met frequently to discuss about the themes we had identified independently and to solve disagreements. We used the Nvivo software to perform all the stages of coding. To validate our model, we organized two meetings, one with the CS managers and one with the CS managers and 8 informants who agreed to give us feedback on the model. We took extensive notes of their comments and suggestions, and we modified the grounded model to account for the new information. For instance, we refined our connections between categories in the model, and came up with new information regarding a pivotal category in our model (i.e., perceived trade-off between internal and external boundary work").

Findings

To better illustrate our empirical evidence, we anticipate our grounded model in Figure 3.2. In the next sections we provide evidence for the different categories of the model.

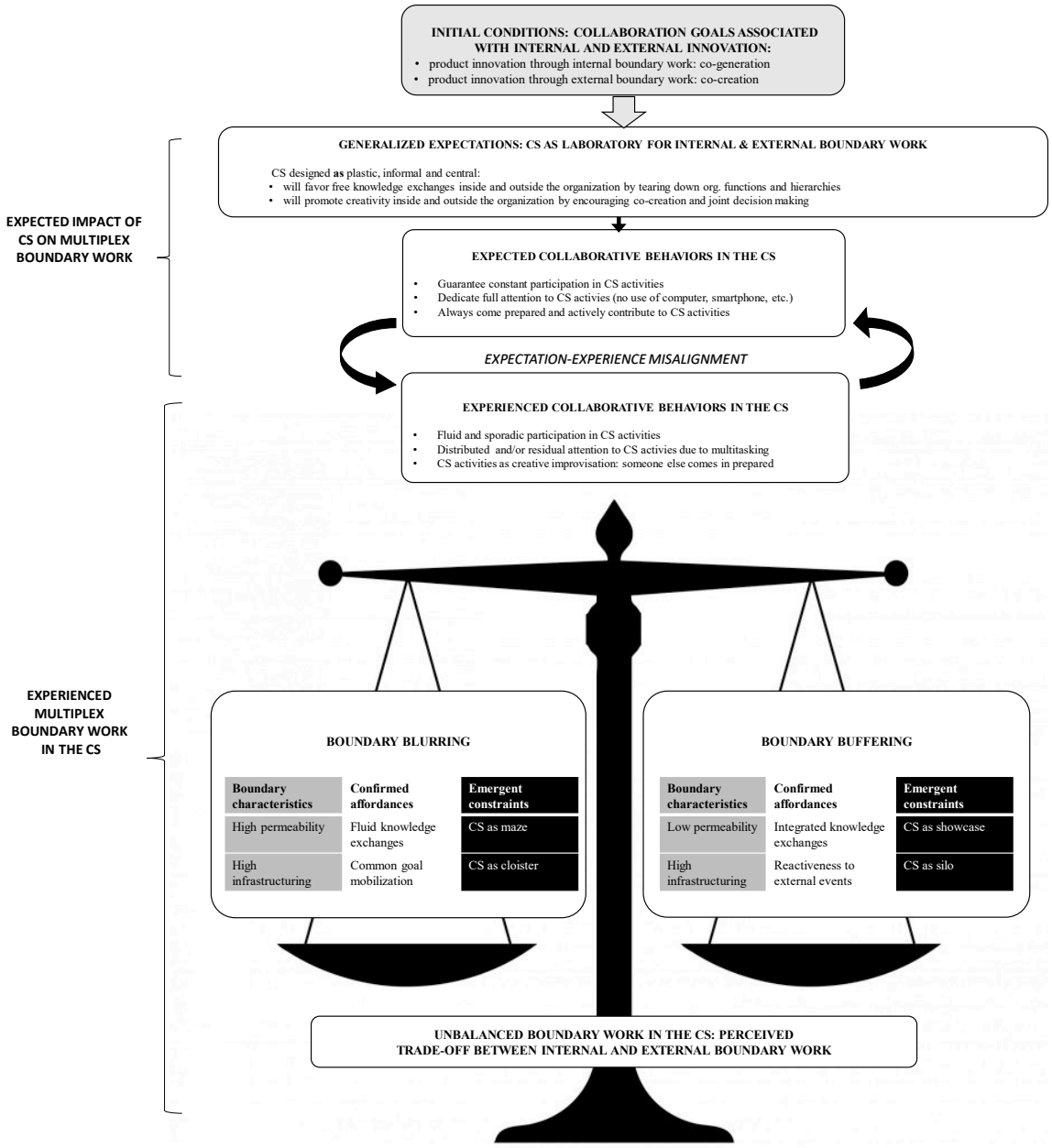

Figure 3.2. A grounded model of the role of collaborative space as organizational support for internal and external boundary work in innovation projects.

Initial conditions: Collaborative goals associated with internal and external innovation

At the origins of the process that we investigate lies FoodCorp's pressing need to overcome pre-existing processes for product development by trying to *'de-structure the product innovation processes in place'* and overcome '*product development bureaucracy*', as many informants explained to us. When we entered into the field, therefore, we identified a pervasive rhetoric regarding the need to embrace change in the development process, leveraging, in addition to the 'stage and gate' model, on the alternative approach of design thinking, based on participative and iterative product development. As the manager of the CS explained to us, the CS was designed according to the design thinking approach and aimed to pursue two interrelated goals: innovation through internal co-generation and innovation through co-creation with external stakeholders.

In relation to internal co-generation, even if FoodCorp had always manifested great attention to cross-functional interaction for product development, the degree of involvement of each function was significantly different across phases, such that the R&D had a dominant role over the first phases, and the other functions came in later in the process, often for validation purposes. Conversely, the new design thinking method was considered a '*democratic'* approach capable of better encouraging all members of the organization to share ideas and visions about new product development from the earliest stages of a project, this way mobilizing all company resources and exploiting different knowledge and expertise across the organization.

"Let's say that we see the design thinking sessions in the CS as the beginning of everything. We tend to use them in projects that have not entered the phase and gate process yet. The goal is to create the next innovation platforms, for example, the protein platform, it's not an R&D project yet, it hasn't entered phase and gate, so this is the moment to push for co-generation (…) the method is more

about pure innovation, let's say, pulling out the most brilliant ideas out there, and giving everybody in the organization the opportunity to contribute, not just R&D technicians" (Informant 15, R&D).

Internal collaboration sessions were often promoted by the R&D unit which launched a challenge to other organizational functions such as marketing, HR, quality, digital transformations and sales, and organized the working sessions with those who accepted to participate.

Similarly, external projects also had the main goal of fostering innovation but by pursuing co-creation with external stakeholders. This implied that outsiders like retail customers, consumers, suppliers, consultants, researchers, and students, were no longer seen as mere validators of the products developed internally; Instead, they were expected to actively contribute to their creation, for instance by providing input based on their own needs and knowledge of the market, and by working with FoodCorp side by side to develop integrated, and mutually feasible solutions for the market. For these reasons, informants referred to this type of innovation as '*embedded'* and defined it as the most challenging but also the most rewarding initiative of the organization. In practical terms, external collaboration implied the mobilization of an internal promoter (in informants' words, 'sponsor') who launched a challenge to both internal and external actors and coordinated with the CS management to plan and organize design thinking sessions for the project.

"The embedded project is characterized by the fact that it involves a team of external people, let's call them consultants, who are invited and work together with an internal team on a project that is designed and assigned to us by the organization. For instance, now we are working with R&D people and experts in other five functional areas. At the end of the day the goal is to reach a high level of idea integration as the project moves forward" (Informant 2, external user)

Expected impact of collaborative space on internal and external boundary work

In terms of expectations about the role of the CS on internal and external boundary work, we refer not only to the objective for which the CS was designed and built by the organization, but also to the desiderata that each user had about how the CS would have contributed to their work within the organization, and to the behaviors expected from other participants in the development process. From such standpoint, we found that the physical characteristics of the CS were stably and recurrently associated with users' expectations about their collaboration, as well as with the innovation outcomes they hoped to generate.

Generalized expectations: CS as laboratory for internal and external boundary work

In line with the declared purposes of FoodCorp's CS, the generalized expectations were that the space served as a melting pot – or 'boundary breaker', as some informants termed it – gathering contributions from people with different backgrounds, goals and interests, and allowing them to express freely and to build on each other's inputs without the pressure of formal constraints. The informants often referred to the CS as a laboratory with three distinct features: centrality, plasticity, and informality, and explained how insiders and outsiders could have taken advantage of these features to engage in radically new ways of collaboration.

First, the CS was located in an area of the central building that belonged to the R&D function. The area had high traffic and was situated not far away from the cafeteria, but it was also somewhat separate from the offices and the adjacent production plant. According to informants, such potition expressed CS's openness towards the outside and its potential to stimulate creativity in everyone,

immersing them in a *"different environment from the traditional office"*, while also giving them the opportunity to *"reach the venue within minutes"*.

Second, the CS was seen as plastic because it was designed by the organization as a *'creativity temple'* for the changing needs of users and visitors alike. For instance, the layout was easy to transform such that users could easily switch between closed offices, semicircle working stations and open areas for presentations.

Third, the CS was perceived as highly informal in its layout and furnishings – i.e., bright, colorful, comfortable and friendly. Our informants expected such features to allow free knowledge exchanges as well as more participated and less hierarchical decision making about the project, leading to faster development processes and thus solving, this way, a main problem of the traditional phase and gate process. These features are summarized in the following excerpt:

"[…] the fact that it's modular can have many advantages, not only the area can be modified according to the specific needs of each group, but it can be both an active idea lab and a space for reflection where to finally stop running and start thinking. Importantly, an open and easy area allows you to engage in spontaneous talks with colleagues, you know, just have some plain conversation, beyond roles, hierarchies and stuff like that, just bringing people together freely. Or it can be just a huge open space where to make big things happen. To me it's a place where things will happen, where you can cook new recipes, try things, experiment." (Informant 5, R&D)

Despite the different collaboration goals that FoodCorp had set internally and externally, the CS was seen as a laboratory capable of equally tearing down internal and external boundaries, encouraging co-creation, fostering joint decision making and creating value both inside and outside the organization.

Expected collaborative behaviors in the CS

The generalized expectations mentioned above led to the formation of more specific expectations about how others should have behaved in the CS, described next.

Maintain constant participation in CS activities. First, informants explained that the design thinking activities promoted in the CS are effective if the team created upfront is heterogeneous and preserves its heterogeneity throughout the development project. This implies that team members, be they internal or external to the organization, must actively participate to all the project meetings and sessions organized in the space (especially when the project develops across multiple sessions).

Dedicate full attention to CS activities (no use of computer, smartphone, etc.). CS is experienced by FoodCorp employees as an 'analogical space'. In fact, since employees report often feeling overloaded by collaborative technologies available in the company (e-mail, instant messaging, videoconference), they explained that taking some time off from the workstation would have helped them reduce stress and work overload, and re-appropriate of some time to think out of the box. Consequently, the CS management encouraged participants to enter the CS without their laptops and smartphones, and avoid working simultaneously on other projects, so that there would be no interruptions or fragmentation of the teamwork during sessions.

Always come prepared and actively contribute to CS activities. According to participants, for a successful session in the CS it is essential that all participants, be they members of the organization or external members, come in prepared and actively contribute to projects' activities. The following excerpt exemplifies the three expected behaviors mentioned above:

"Here in the CS we intend to stay analogic, just put away all the distractions, like answering-emails and being-on-the-phone, which everybody is doing during meetings. We don't want that here, we want people to come in and participate with all their senses, having body and mind present in the same place, at the same time (…) Also, for projects to evolve, there must be commitment and continuity, some motivation to see the group's ideas grow (…)" (Informant 11, CS Manager, R&D)

Experienced internal and external boundary work in the collaborative space

Experiences about boundary work refer to the way people actually use the CS to shape and shift their work boundaries, both internally and externally. We compared actual experiences with the goals and the expectations described above. To this purpose, we distinguished between the following sub-categories: experienced collaborative behaviors in the CS, experienced collaboration affordances and constraints of the CS, and experienced internal-external boundary work in the CS, each presented in a following section.

Experienced collaborative behaviors in the CS

Fluid and sporadic participation in CS activities. Informants often complained about the sporadic participation of their colleagues to the CS activities, explaining that a typical problem of projects launched in the CS was the gradual decrease of the participation rate over time. Users explained that the first sessions were always very participated. As the project unfolded, sessions became less and less participated, despite participants' continued engagement to participate. This way, teams gradually lost their heterogeneity, which, as explained above, was considered the main strength of the CS approach.

"As far as my project is concerned, I noticed that participations were not constant, or at least, the most constant people were from R&D or from Quality. Others were often absent, be it for work

problems, be it for other reasons, it was obvious that they prioritized their own work and checked in only when they had time" (Informant 1, R&D)

Distributed and/or residual attention to CS activities (multitasking with computer, smartphone, physical presence). Both CS users and the CS management complained about the lack of active participation and attention proven by many CS users, which, in their view, was attributable to their unwillingness or impossibility to remain offline during CS sessions. Specifically, many informants lamented that teammates were unable to break from work technologies as they stepped in the CS. For instance, CS users came in and out of the sessions to answer calls or make quick interventions in other meetings scheduled at the same time. Also, while users usually avoided bringing their laptops in, they often used their smartphones to answer emails or instant message about other work commitments. Thus, the ideal behavior of keeping an offline status while in the CS was often violated and attention to CS activities was often fragmented.

"Sometimes there were problems because next to us there are meeting rooms and there were people coming in and out. Later on, it resulted they were also attending some other meetings, or people going out to answer calls and staying on the hallway for half an hour, or even for hours in a row (…) it's understandable and it happens to everyone but if it distracts the attention from the project activities it becomes slightly disturbing". (Informant 3, R&D)

CS activities as creative improvisation (someone else –i.e., CS manager– comes in prepared)

Additionally, informants complained that CS users usually "*had a hard time doing their homework*" as one of our informants termed it –i.e., respecting commitments taken from one session to another, for instance doing a cost analysis for a potential product to be launched with different scenarios, or contacting customers in emergent markets to ask for feedback about desired product

features. According to the managers of the space, many people came in unprepared because CS sessions were widely seen as exercises in creative improvisation where mere presence and willingness to work with others on new ideas were sufficient conditions for active participation. The organizing aspects, on the other hand, were delegated to the CS managers who had the responsibility to maximize participants' creative outputs. Thus, behaviors such as systematizing, supporting or validating the creative ideas generated during the CS sessions were rarely performed by a project's team members. As some users explained, the CS was often associated to the first phase of the development process (idea generation) and dissociated from more structured activities that belonged to the phase and gate model. Consequently, many users expressed their concern about the gratuitous experience provided by the CS ('CS as play time') which they saw at odds with business usefulness:

"This is really a problem, the fact that they are relying too much on us and on our organization. I feel this is sometimes also an excuse to come in less prepared (…) we are trying to get this message through to everyone who participates in CS sessions (…) Another thing I noticed is that we have an increasing number of visits to the CS, like colleagues bringing in customers and suppliers to say, hey, look at this cool place that FoodCorp developed to encourage innovation (…) It's bringing us a lot of popularity but also feels at odds with what is supposed to happen here". (Informant 11, CS Manager, R&D)

This interview excerpt suggests that also in relation to interactions with external stakeholders, the CS's original purpose to become an aggregation place became distorted during use.

Experienced multiplex boundary work: From boundary blurring to boundary buffering

As described above, we identified a set of discrepancies between the expected and the experienced behaviors of CS users. The misalignment between the two generated a set of consequences for how boundaries were perceived and, subsequently, for how the CS was experienced in terms of

affordances and constraints for internal and external boundary work, respectively. We distinguish between two boundary characteristics: permeability -i.e., extent to which boundaries regulate flow and movement of participants' knowledge and ideas and infrastructuring -i.e., extent to which boundaries align participants' different tools and methods and mobilize them towards a common goal. We show that these two boundary characteristics lead to different types of perceived affordances and constraints for boundary work, which in turn push individuals to enact two different boundary work strategies: boundary blurring for internal projects and boundary buffering for projects with external stakeholders.

Boundary blurring: Confirmed affordances for internal co-generation

High boundary permeability: fluid knowledge exchanges. Users stated that their experiences with the CS were consistent with many of their initial expectations. The CS, through its possibilities in terms of plasticity, informality and centrality, promoted high boundary permeability: fluid exchanges of knowledge and ideas between the organization's business functions. For instance, employees of FoodCorp distinguished the CS experience from that of working in a 'traditional open space'. While the latter certainly allowed fluid knowledge exchanges among colleagues, it did not favor creativity via heterogeneity of backgrounds and expertise because people who stably worked together tended to have similar thoughts and similar mental patterns in problem solving. The CS, by contrast, was not only a think tank, but also a neutral terrain which brought together people from different departments and encouraged them to express their thoughts and opinions fluidly and without constraints. To this purpose, informants often explained to us how the modular layout of the CS and its mobile furnishings allowed them to blur functional and hierarchical barriers and exchange knowledge freely and informally, for instance by sitting down in the CS kitchen in front of a cup of coffee, by creating new

prototypes and recipes during organized cooking sessions, or by retreating in a corner of the CS living area to have more private conversations and resolve divergences:

"We take for granted that we are locked up in functional categories, or that the VP doesn't know what the R&D researcher is doing, and vice versa. But as we moved together in this flexible space, we realized it was not exactly true. Perhaps usually we are not so mixed as we were in the CS, so we don't have the chance to let our armors down. As we got together, each of us could freely talk about his or her own reality and see whether the others understand it nor not. It's a great opportunity for free knowledge and experience exchange, maybe this is the part I like best about the CS". (Informant 5, R&D)

High boundary infrastructuring: common goal mobilization. Internal boundary infrastructuring refers to those tools and methods being mobilized within the CS to focus the collaboration on a common goal. In addition to furnishings designed to stimulate creativity, the space offered many objects for the construction of artefacts and prototypes (for example post-its, Lego blocks, colored pencils, sheets, glue, scissors, twines, etc.). Using tools and artifacts during collaborative sessions increased the perception of cohesion among users coming from different functional areas. As a consequence, informants reported feeling closer to colleagues with whom they worked in the CS compared to colleagues in other functional areas whom they met in other organizational locations (i.e., meetings, open spaces, showrooms). Additionally, they reported having more tools to navigate differences, for instance compromising about product features or development times, or eliminating differences in their approach to product development to focus on the needs of the organization rather than the needs of their own organizational departments.

"The environment (of the CS) is very different from everything else we have in FoodCorp, so it takes you out of the normal logics of the organization. It's a mix of structure and destructuration, even physically speaking, you have many configurations in the same area. This gives you more

flexibility in managing projects and in bringing an individual contribution to the project. I also feel there are lots of tools to help us, like blackboards, monitors and roundtables, and then all the materials used to create something can give a lot of inputs, for sure (…). The positive side is that building a prototype in real time can teach us how to communicate better (...) focus on what the customer or the consumer need, and not on what the Marketing, the R&D or the Finance believe it is best (…)". (Informant 7, R&D)

Boundary blurring: Emergent constraints for co-generation

We also found a set of emergent constraints deriving from users' experiences of the CS versus their initial expectations. Specifically, informants often associated the high permeability and high infrastructuring described above to the risk of losing control on what happened in the CS. Participants perceived the exponentially increasing heterogeneity of the knowledge, projects and interests hosted by the CS as threatening. Interestingly, while affordances were perceived in terms of collaboration opportunities (see section above), collaborative threats were formulated in terms of CS characteristics. Two concerns were voiced: that the CS was becoming a chaotic area ('a maze') and, at the same time, to avoid chaos, that it was becoming a forcedly isolated space ('a cloister').

High boundary permeability: CS as maze. Since space was experienced by internal users as always moving and constantly transforming, it was also perceived as being highly heterogeneous and thus messy, disordered and dispersive. For this reason, it was compared to 'a maze'. In particular, the manifold events hosted were difficult to follow through time, such that projects became black boxes even for the project teams. Additionally, the fact that team compositions were always changing increased the feeling of opacity of what was going on (i.e., *"the CS has much more going on than anyone can keep track of"* as one of the informants termed it), and left users disoriented about who was in charge of what, as exemplified in the following excerpt:

"In my view, there is a lack of privacy and a lack of structure there (in the CS)(…) and I think it's because there's so much going on, people coming in and out, some having private conversations, others having a conference or working on a prototype, groups laughing, screaming, joking, someone else walking down with an important client or even the President… sometimes it's chaotic. The main problem I see is that you can't know what's going on there unless you're there, you don't know if there's some free space, what the others are doing, what projects are going on, you'd need a map to navigate that, so you always need to ask the CS managers". (Informant 12, Quality)

High boundary infrastructuring: CS as cloister. Associated to the above concerns, our informants also voiced the concern that, to avoid chaos, the CS was under the exclusive control of the R&D function. Given the heterogeneity of backgrounds and interests around each project, CS activities needed to be carefully planned and organized. Since the employees from the R&D department had set up the space in an area that previously belonged to their department, they were actively managing the site and all its activities. Additionally, since most CS activities were centered around product innovation topics lwhich were seen as as *R&D competence*, the CS was described by many of our informants as the 'R&D's cloister'.

"Since usually there's so much going on, there's more and more planning behind it [the CS], it seems a bit like the R&D cloister, you always need to go through [name of CS manager] to get access, so spontaneous meetings are rarely the norm (…)" (Informant 18, R&D)

Not only did people outside R&D perceive the collaborative space as owned by R&D, but also people working in R&D identified the space as theirs and instrumental to achieving their work objectives. These dynamics further strengthened the identity of the space like an "R&D cloister" instead of common space for innovation.

Boundary buffering: Confirmed affordances for external co-creation

With respect to external collaboration, participants experienced low levels of boundary permeability and high levels of boundary infrastructuring, with both affording and constraining effects. Even if users felt encouraged to freely exchange knowledge with outsiders and have higher reactiveness to external events, they also felt more exposed to external threats, and thus more vulnerable. This ambivalence led to the strategy of boundary buffering: tearing down external boundaries to enable collective action, on the one hand, while also maintaining control on common activities in order to direct them towards preferred courses of action. As follows, we detail the affordances and constraints of the boundary buffering strategy.

Low boundary permeability: integrated knowledge exchanges with outside. As far as open innovation is concerned, we found that the CS was associated with richer and more integrated exchanges between internal and external stakeholders. However, while in internal collaborations boundaries were torn down (i.e., blurred), the exchanges with external participants were more structured and remined under the control of internal participants. Specifically, FoodCorp employees maintained control over the purpose of each project with external participants, and played also a significant role in setting sub-goals and directions for the latter. For instance, informants explained how they used external stakeholders such as students and panels of consumers to come up with radically new product ideas, or to perform preliminary market researches. Participation, however, was always guided by internal stakeholders who decided if and to which extent to use insights from outsiders. As a consequence, boundaries were never set aside, and roles between internal and external stakeholders were never blurred, but rather ‘buffered’ -i.e., used strategically to reach one’s goals and maintain distinctiveness:

"I found particularly useful having students come in and work on projects. Basically, we give them challenges and some structured conditions and they must come up with some radically new solutions (…) they have a fresh mindset and manage to see things that are invisible to our expert eye. They ask a lot of questions, even if some of them are easy or obvious, they make us think through things we normally take for granted. Having also external experts that know what they are talking about because they have experience in this stuff, has been added value as well". (Informant 15, R&D)

Thus, while inside-outside boundaries were continuously moved during collaboration in the CS, they were also re-established as the project evolved and moved across stages, such that FoodCorp maintained wide control over open innovation projects.

High boundary infrastructuring: reactiveness to external events. Just as in internal collaboration, the modular layout and furnishing of the CS were seen as useful tools for open innovation. There was, thus, a generalized belief that the CS made available tools and methods that encouraged the project team to focus on a common goal. Specifically, users manifested the belief that living the CS and participating in design thinking sessions – including prototyping or conducting market research together – had afforded more consumer-awareness, more user-centric solutions and greater cohesion with people outside the company. Additionally, the solutions were considered more *"ready to use"* and therefore more *"original, fun and creative"*.

Emergent constraints for boundary buffering due to controlled co-creation

Also, in regard to external organizational boundary work, we identified constraint patterns. The following two constraints, CS as a showcase and CS as a silo, were associated to low boundary permeability and high infrastructuring, respectively.

Low boundary permeability: CS as showcase. Since internal participants maintained control over boundaries with outsiders, they also controlled the way in which the latter experienced the CS. For instance, our informants often referred to critical incidents in which FoodCorp's managers brought suppliers and customers for visits in the CS. The goal was to convey the image of FoodCorp as an innovation pioneer, by impressing visitors thanks to the innovative aspect of the CS, but without actually allowing them to get immersed in the CS activities. While most of the informants we interviewed considered that using the CS as a showcase was a superficial and inappropriate practice, they also explained that it continued to be frequently employed:

"We continue to use it as a showroom yes, it's a way of telling others we're not just an ordinary stiff multinational, we are informal and creative because we use post-its all the time (laughs). I will confess something that is really embarrassing, I even had to attach fake post-its a couple of times just to show what they wanted to see". (Informant 11, CS Manager R&D)

High boundary infrastructuring: CS as silo. Similarly, to what happened in internal innovation projects, open innovation projects were perceived as restricted and opaque to the rest of the organization. There was little visibility about which external stakeholders entered the CS, when, and why. Even less was known about the outcomes of the projects in which externals were involved. We appraised that it had never happened that a project challenge was launched by external stakeholders, as it had never happened that a project team was composed by more than one or two external stakeholders. This was also due to the fact that external stakeholders were always invited by internal employees to participate in CS activities (see discussion of low boundary permeability above). Therefore, open innovation projects with external stakeholders often became black boxes for the rest of the organization, or 'silos' as our informants termed it.

"Actually, we are not very informed about what happens in embedded projects and how many we have out there. (Name of CS manager) calls us and asks "Do you want to do some activities in the CS? We discuss together the areas in which we could do something there, perhaps others do the same. But all the other projects with internals or externals, I don't know them, actually, I don't know what people are working on in there at the moment (…) It would be a good idea to let people across the organization know what is happening there, just to break this sort of black box (...)". (Informant 20, HR)

Unbalanced boundary work in the CS: perceived trade-off between internal and external boundary work

The emergent constraints to internal and external boundary work were perceived as complications that required increasing efforts and attention from participants. Both managers and users, internals and externals, argued that the CS was a 'sensitive arena' where boundary work seemed 'unbalanced'. Two elements were frequently mentioned to indicate trade-offs between internal and external boundary work: limited resources for collaborative innovation in general and need for additional time to achieve successful boundary management. The fact that the space was used in unexpected ways (i.e., as maze, cloister, showcase, and silo) made participants acknowledge that increasing efforts were needed to make the CS more congruent to initial expectations. Consequently, they explained that they had underestimated the time and attention resources necessary to perform successful multiplex boundary work. As exemplified by the following field notes, focusing on doing internal boundary work *"the right way*" automatically directed resources in that direction and withdrew them from doing external boundary work. In the same way, as employees focused on external boundary work, they felt they were not able to perform internal boundary work effectively, so they preferred to focus on one at a time because of limited resources available.

"In my opinion the CS is probably now conceived more as a company space and not just an R&D space as it was initially, so we are doing some progress, we are moving ahead but it takes time […] In the beginning [the CS] was more of an alien, now it has involved so many business functions so I would say that in a short time we built a good reputation and also a certain credibility and knowledge of our tools and work practices, so I would say that everyone feels part of the CS or in any case many in the company feel part of the CS. For me it remains that it's a complex tool that when used internally it does not connect us with the outside world, I do not know if it is a limit, but in short [...] it seems that what we give to the internal work it takes away from the external work [...] in any case both surely will require more effort and practice." (Informant 15, R&D)

Also, informants often appeared unsatisfied about the level of progression in both internal and external boundary work. Significantly, at the end of our research project, we conducted a debriefing with the informants and asked for feedback on the findings in our grounded model. While they fully agreed with our findings and indicated internal and external boundary work efforts as a critical issue in how the CS was perceived within the organization, they also appeared convinced that conducting successful collaborative product development took significant time. For instance, they manifested their conviction that the first three years of CS functioning marked just the beginning of a long journey made of trials and errors, in which outsiders and insiders would have learned to know each other better, built on previous successes and failures, and developed more robust and functional collaboration schemes.

"According to me, the physical space is an important aspect and it must provide a lot of support for collaboration, but the interpersonal aspects are the ones that make the difference at the end of the day. If we're not able to work out internal differences, how can we do it with important customers like (name of FoodCorp's retail customer)? Also, as we bring in a client, can we also deal with inter-functional wars successfully? These are things that we must still figure out in the next years, and I believe enthusiasm will play a huge part in making individual efforts come through". (Informant 14, R&D)

Summarizing, we refer to unbalanced boundary work to describe the condition in which an organization attempting to perform product development through multiplex (i.e., simultaneous internal and external) collaborations experienced both internal and external boundary work as more effortful than initially expected. The acknowledgement that multiplex boundary work requires more resources leads to an experienced trade-off between the ability to focus on internal boundary work and the ability to perform external boundary work.

Discussion

Our analysis, summarized in the grounded model of Figure 1, has several theoretical implications. First, we suggest that the affordances and constraints related to an organization's attempts to engage in both internal and external innovation can be better understood when treated together, *as multiplex boundary work*. Our model highlights that the outcomes of highly heterogeneous innovation project teams depend not only on how individuals decide to leverage different types of diversity (i.e., internal and external) but also on the difficulties they encounter in dealing with both simultaneously. Adopting the theoretical lens of boundary work, the study brings to the fore the paramount role of collaborative spaces and of several boundary work mechanisms in individuals' ability to act collaboratively in innovation projects with high diversity. As follows, we comment on each mechanism.

The mediation of Collaborative Spaces in expectation-experience misalignments regarding collaborative innovation

The study highlights a paradoxical mechanism according to which the support tools that an organization makes available to help its members face the complexities of innovation processes may

end up constraining collaboration if participants develop illusionary expectations of success regarding those tools, because expectations could clash with actual experiences. We have shown that material collaborative spaces have the potential to raise expectations of success. In FoodCorp, the image of the collaborative space as 'innovation laboratory' stimulated individuals' expectations about collaborative innovation, projecting them in a future where cross-functional and internal-external boundaries could have been easily dismantled and free knowledge exchanges would have become the norm. However, we also testified the perils and illusions of such mechanism (see the expectation-experience misalignment). We thus conclude that when support tools for collaborative innovation are seen as 'shortcuts' for 'express' collaboration, negative consequences may emerge because of underexplored and underestimated dynamics of actual collaboration.

Studies focusing on the role of co-localization and innovation have concluded that spatially localized collaboration is benefic for innovation because it increases relational capabilities by reducing opportunistic behaviors and improving knowledge transfer between partners (Gulati & Sytch, 2008; Narula & Santangelo, 2009). However, in line with the socio-material perspective in boundary work (Leonardi, 2012; Nicolini et al., 2012; Okhuysen & Bechky, 2009; Orlikowski & Scott, 2008), we draw attention to the grey shades of co-localization and highlight the important but overlooked relation between how *individuals* perceive the material features of a space and how they perform boundary work. While we confirm that co-localization triggers interaction in collaborative innovation projects, and that configurational features of collaborative spaces often emphasized in the innovation literature – e.g., centrality, modularity and plasticity – may stir expectations about successful collaboration (Bechky, 2003; Boscherini et al., 2010; Carlile, 2004; Koskinen, 2005; Ungureanu, Cochis, et al., 2018), we suggest that developing high expectations because of co-

localization may be a risky process. So far, the few innovation studies addressing boundary objects as structuring tools for innovation have either focused on their physical features (Boscherini et al., 2010) or highlighted the ways in which they are interpreted during innovation projects (Koskinen, 2005). The general idea has been that structuring tools are unambiguous and can be univocally set up, planned, and managed to maximize innovation performance (Barley, 2015). By contrast, our study goes beyond the established configurational approach. We draw attention to the ambivalence of collaborative spaces and suggest that collaborative spaces for open innovation often generate both affordances and constraints for collaboration. To this purpose, we emphasize that the material features of the CS act as a 'scaffold' (i.e., container) for individuals' expectations about complex innovation projects, and not as the drivers of innovation themselves (Edmondson & Harvey, 2018). We have shown that expectations about setting up a laboratory for free and fluid knowledge exchanges were in contrast with other four emergent perceptions of the CS: as maze, cloister, silo and showcase. Based on these findings, we argue that the role of collaborative spaces in complex innovation projects may be less straightforward than suggested by innovation studies. For instance, instead of promptly recognizing boundary objects and using them effectively to maximize innovation outcomes (Boscherini et al., 2010; Koskinen, 2005), individuals may often engage in trial and error processes in which objects' usefulness is first imagined (i.e., lab), then undergoes conflicting perceptions (maze, cloister, silo and showcase) and finally becomes actively edited and reconfigured as the collaboration in the innovation project evolves (Bechky, 2003; Carlile, 2002; Edmondson & Harvey, 2018; Edmondson & Nembhard, 2009; Nicolini et al., 2012). While this process of trial and error may eventually turn out benefic for an organization's relational capabilities, our study indicates that it requires time and may be punctuated with moments of delusion and stagnation that the participants may not be ready to handle.

Multiplex boundary work strategies in open innovation projects:

While previous literature on innovation teams paid particular attention to team configurations, we propose an attention shift to *boundary configuration processes*. A main contribution of this study is to explain *how* boundary work happens in innovation projects operating across '*multiplex boundaries'*: collaborative configurations that allow simultaneous work on multiple boundaries with different characteristics. In doing so we also shed light on how different relational capabilities may support and sustain such processes. The study identified two boundary characteristics, i.e. boundary infrastructuring and boundary permeability, and showed that the same collaborative space can lead to the emergence of different perceptions of boundary configurations. While the CS was seen as a viable tool for structuring collaboration across internal *and* external boundaries, internal boundaries were perceived as highly permeable whereas external boundaries were seen as impermeable and thus difficult to cross. As previously pointed out, recently De Silva and Rossi (2018) grouped the relational capabilities identified in the literature into three macro-areas: structuring, alignment, and communication capabilities, showing that they play different roles depending on the degree of collaboration necessary for R&D development. Projects requiring lower degrees of collaboration such as knowledge acquisition projects are particularly facilitated by collaboration structures designed ex-ante such as contracts, collaboration frameworks or platforms. Projects with higher degrees of collaboration benefit significantly from the development of alignment mechanisms, and all projects benefit from communication capabilities (see also Gulati & Sytch, 2008). Our findings contribute to this line of research by discussing collaborative spaces as tools for developing relational capabilities, and by showing why structuring is not sufficient in projects requiring high degrees of collaboration, and especially in projects crossing multiple boundaries simultaneously. First, since internal and

external boundaries require different spanning efforts and capabilities, using the same spanning tool does not cancel such differences, despite participants' hopes and expectations. In our study, while internal and external projects were carried out within the same space, external collaborations were still perceived as more difficult, such that individuals tried to maintain greater control than in internal projects (i.e., boundary buffering versus boundary blurring). The consequence here documented is that simultaneous boundary spanning may create a trade-off between participants' internal and external boundary work resources – i.e., attention and relational efforts. In cases of multiplex boundary spanning, then, focusing on structuring capabilities may not be enough; To accomplish the potential of collaborative spaces for innovation, more effort should be devoted to developing alignment and communication capabilities.

Implications for practice

In terms of managerial implications, our study draws attention to the promises, advantages and disadvantages of collaborative spaces for innovation. This topic has generated high resonance in the managerial world if we consider that demand for flexible workspace solutions from corporate clients increased by 21% in 2018 worldwide and that at the end of the same year 14% of employees at large companies used some sort of collaborative space to manage business processes (Communion Cowork, 2019). Not only do we suggest that managers must pay significant attention to potential misalignments of expectations and experiences of collaboration in complex innovation projects, but we also highlight the dangers associated to considering collaborative spaces as shortcuts for managing diversity in collaborative innovation projects. While we acknowledge the affordances of collaborative spaces for innovation, we also draw attention to the possible pitfall that collaborative spaces, by symbolizing freedom of exchange and informality, may generate high expectations about

collaboration in complex innovation projects. We also draw attention to the importance of foreseeing possible trade-offs between innovation projects developed through cross-functional teams only, and open innovation projects involving also external stakeholders, and suggest that ordering and prioritizing boundary work may be a safer and more viable strategy for organizations that use both innovation methods.

Even if we have documented a trade-off between internal and external boundaries we also suggest that such trade-off is not necessarily a fatal flaw if the organization invests in a complex portfolio of relational capabilities (see also De Silva & Rossi, 2018; Dyer & Chu, 2003). As a collaboration evolves, conditions and partners' needs may change, requiring them to change the direction of the project (Swan et al., 2007). This requires in turn the development of alignment and communication capabilities, above and beyond the capability of getting individuals together and co-localizing them in the same space (i.e., structuring). We have shown that in complex projects with high degrees of heterogeneity organizations may be tempted to overemphasize structuring capabilities at the expense of alignment and communication capabilities that take more time and effort to develop. However, our findings also suggest that it is paramount that organizations dealing with multiplex boundary projects consider all three types of relational capabilities together.

As far as the societal implications of our study are concerned, it has been already recognized that the main societal benefit of sharing economy and sharing platforms is community well-being, by means of the development of social ties and social inclusion, which in turn lead to relational benefits such as users' engagement, trust, solidarity, and commitment towards other members of the community. In other words, be it co-generation by members of a specific organization (employees) or co-creation with external stakeholders such as customers, consumers and the local community, one

of the main beneficial effects of collaborative innovation at the social level is the development of social capital (e.g. Davlembayeva et al., 2019). Accordingly, the collaborative space here analysed can be interpreted as an organizational mean to promote and enhance these sharing mechanisms by leveraging social capital, and reinforcing experiences of participation, inclusion and commitment. Thus, one societal implication of our study is that organizations may promote collaborative innovation processes of and thus contribute to relational benefits and social well-being of both their internal members and their (local) community by embracing the open innovation and co-working approach, thus also opening up to their external environments. However, our study also suggests that such positive societal impacts may be jeopardized if the trade-offs faced by actors involved in multiplex boundary work are left unmanaged. To gain benefits in terms of well-being, both for companies' employees but also, by extension, for external actors, sharing processes of co-creation and open innovation must be supported by organizations with adequate resources. Our findings suggest that support organizational strategies must shift from providing material tools such as spaces, platforms and other infrastructures, to sustaining the development of relational capabilities (i.e., alignment and communication) through adequate mechanisms such as incentives schemes, time and effort management training, organizational climate reinforcement, just to name a few.

Limitations, Future Directions and Managerial Implications

This study is not without limitations. Since our study relied on a single case study in a multinational organization operating in the food industry and having a high focus on innovation, our findings have limited generalizability. We thus call for future research on simultaneous internal and external boundary work in settings that are either highly similar or different from this study (e.g., SMEs, project-based organizations, public organizations, NGOs). We also highlight the promising

direction of investigating boundary processes in open and/or cross-functional innovation projects, rather than the configuration of the project teams itself. Future research on multiplex boundaries are thus highly welcome. In a seminal study, Mary Douglas (2003) discussed boundaries as dangerous areas of tension that are constantly pushed forward by individuals who try to reach safer harbors. We have seen that high diversity can be interpreted as both a sign of danger and as an opportunity. Future studies would need to clarify when and if high diversity always causes trade-offs between different types of boundary work. Also, given that the collaborative space in our study is still undergoing transformation and since most of our informants declared that they *"needed more time and effort to make collaboration work"* (informants' words), we cannot exclude the possibility of a subsequent realignment between expectations and experiences. Further longitudinal research in innovation projects could clarify if the strategies observed in FoodCorp were permanent or marked just a transition stage towards more efficient strategies of multiplex boundary work.

In sum, in line with other studies in the innovation and the boundary work literatures, we have testified an effortful process of boundary work in complex projects of collaborative innovation (Edmondson & Harvey, 2018). The assumption that spanning thick internal and external boundaries simultaneously is worth the effort from team members, while highly plausible, has yet to be fully examined. To this purpose, we need to further our understanding of the contingent benefits of team member interactions during cross-boundary teaming. Correlating collaboration behaviors and collaborative spaces should give us a better picture of the processes that are supporting or impeding multiplex boundary spanning.

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Study 4: How Perceptions of Work-Life Balance and Technology Use impact upon Creativity in Collaborative Spaces

Introduction

Collaborative spaces (CS), such as incubation spaces, social innovation hubs, fab labs, cultural hubs, co-working spaces, and technology parks bring together different actors to favor interactions and knowledge sharing and therefore stimulate creativity in individuals, groups, and organizations. Despite the increased diffusion of collaborative spaces, few studies have empirically investigated what might sustain or impair their outcomes, especially in relation to creativity and innovation. Most of the literature explores how the physical properties of the space (e.g., light, noise levels, furniture, layout, e.g., Dul et al., 2011; Haner, 2005; Kristensen, 2004) impact individual or group creativity (for a relevant exposition see Moultrie at al., 2007). Collaborative spaces are designed and built following the assumption that face-to-face contact has a positive impact on the propensity of individuals with different backgrounds to interact and exchange ideas (Oksanen & Ståhle, 2013), thus favoring the development of a sense of creative community (Garrett et al., 2017). Moreover, the creation of a collaborative space within organizations or in public spaces is often associated to smart work strategies intended to favor individual well-being and work-life balance. For instance, smart work centers and co-working spaces are set up to enhance temporal and spatial flexibility of workers. In these collaborative spaces a variety of potential users, including public and private employees, free-lancers, entrepreneurs, small and micro-businesses, operate taking advantage of several technological resources and services (Errichiello & Pianese, 2018). The ensuing work flexibility is expected to foster work-life balance, with positive implications for individual and group outcomes.

However, there is mixed evidence that the positive resources provided by collaborative spaces increase creativity and innovation (Moultrie et al., 2007; Vignoli et al., 2018). For example, the open spaces that often characterize collaborative spaces can also reduce interactions and increase coordination costs (J., 2018). Exemplar collaborative spaces, such as science parks, face difficulties in actually bringing together different parties and creating breakthrough innovations (Skelcher et al., 2005; Ungureanu, Bertolotti, & Macri, 2018).

In addition, the literature on collaborative spaces rarely takes into account the fact that CSs are used by individuals and groups on a temporary, part-time or irregular basis. For instance, inhabitants of co-working spaces do not typically spend their full working time within the space (Spinuzzi, 2012). In other words, individuals work in and out of collaborative spaces and typically make an intensive use of collaborative technology to keep in touch with the different groups and individuals they work with (e.g., Ungureanu, Cochis, et al., 2018). The literature on collaborative technology use and distributed work describes the challenges posed by the lack of proximity (e.g., reduced trust and knowledge sharing, increased conflict and coordination costs (Crisp & Jarvenpaa, 2013; Gupta et al., 2009; Poliandri et al., 2014). An intense use of collaborative technology, and the associated possible over-connectivity, could also affect the relationship between work-life balance and creativity. More recently, a few authors have started to recognize that the investigation of the impact of creative spaces on innovation cannot ignore the role played by collaborative technology use in everyday interactions between knowledge workers within and outside of collaborative spaces (Cirella & Yström, 2018; Errichiello & Pianese, 2018; Ungureanu, Cochis, et al., 2018). However, it is not clear how on-site experiences and technology mediated interactions interplay in creating affordances and constraints for innovation in collaborative spaces.

The objective of this paper is thus to provide a more nuanced view of creative processes within collaborative spaces by explicitly recognizing the fundamental role of collaborative technology use. In particular, we aim to explore how the positive resources related to wellbeing and work-life balance in collaborative spaces interplay with the use of collaborative technology in affecting individual creativity. In the next sections, we first present our hypotheses on the relationship between work-life balance, technology mediated interactions, and individual creativity in collaborative spaces. Then, we present the survey study we conducted in the collaborative spaces of one of the most industrialized regions in Europe. Finally, we illustrate our preliminary results and discuss their theoretical and practical implications.

Hypotheses Development

Figure 4.1 visually synthesizes the hypotheses that we are going to discuss next.

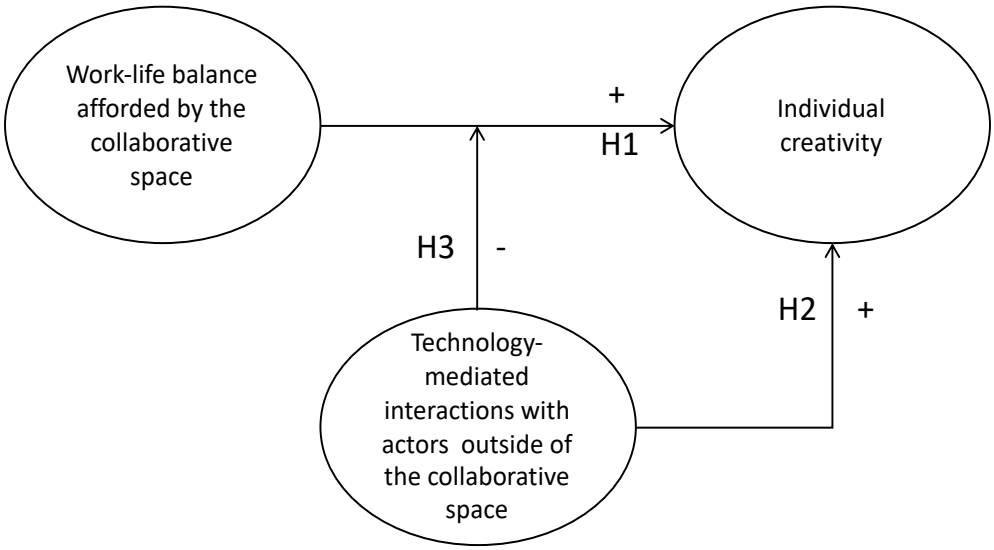

Figure 4.1. Hypotheses.

The effect of work-life balance on creativity in collaborative spaces

Collaborative spaces are designed to offer flexibility to workers in terms of timing (flextime) and location (flexplace) of work (SHRM Foundation, 2001). Flextime refers to the 'ability of rearranging one's working hours within certain guidelines' (Hill et al., 2001, p. 50), while flexplace reflects the degree of control given to workers over where to work (Shockley & Allen, 2007). Flextime and flexplace are resources intended to improve individuals' work-life balance (see Beauregard & Henry, 2009). Work-life balance refers to situations where individuals are equally satisfied and equally involved in their work and their family role (Greenhaus et al., 2003). Perceptions of work-family balance are strengthened by high levels of inter-role facilitation (Frone, 2003) that can be accrued by workers' flexibility in terms of time and space. For instance, the studies of Hammer et al. (1997) and Hill and colleagues (2001), although not conducted in collaborative spaces, found that the perceived flexibility in terms of time and space was associated to higher levels of work-family balance. Providing CS workers with a positive perception of the ability to manage the interface between work and life domains may lower negative emotions and increase workers' perception of control over their work environment (Anderson et al., 2002; Hill et al., 2001; Kossek & Ozeki, 1999; Saltzstein et al., 2001; Thomas & Ganster, 1995). This, in turn, can help individuals to develop more and better ideas. In addition, an increased ability to manage the interface between work and life, thanks to a reduction of stress and perception of overload, has the potential to free individuals' cognitive resources and enhance creativity (Florida & Goodnight, 2005).

We thus hypothesize that the work-life balance experience through the participation in a collaborative space has a positive impact on individual creativity.

H1: The higher the perceived level of work-life balance experienced by participants of the CS, the higher the creativity

The effect of technology mediated interactions on creativity in collaborative spaces

While collaborative spaces offer numerous resources and inputs for individuals to develop creative ideas (e.g., Capdevila, 2015; Moultrie et al., 2007; Vignoli et al., 2018), workers do not carry out their tasks only within collaborative spaces and in collaboration with other members of CSs. They also maintain contacts with individuals outside of the collaborative space, making use of collaborative technology. Research on creativity has long established that 'external' ties have the power to foster innovative ideas. For instance, Perry-Smith (Perry-Smith, 2006) underlines how external connections may offer to individuals a wide range of ideas to draw on when tackling problems and developing solutions, stimulating divergent thoughts and enhancing creativity-related processes. Thus, external connections are expected not only to provide ideas to individuals but also to enhance and enlarge the way individuals think about problems.

Research on the use of collaborative technology has also shown the positive impact of collaborative technology use in getting access to distant resources that can foster creativity and innovation (Gupta et al., 2009; Malhotra et al., 2001; Standing & Kiniti, 2011; Yoo et al., 2010). We thus propose that:

H2: The higher the technology mediated interactions with external actors (outside of the CS), the higher the creativity

The interactive effect of work-life balance and technology mediated interactions on creativity in collaborative spaces

While collaborative technology is deemed fundamental for the new world of work, it also poses serious challenges for individuals and groups in organizations. Literature on the disruptive effect of technology underlines how collaborative technology increases interruptions and disruptions on individuals' work, burdening them with an increased cognitive load (e.g., Karr-Wisniewski & Lu, 2010; Speier et al., 1999). We argue that, if individuals make an intense use of collaborative technology, they will be less able to take advantage of the wellbeing experience provided by the CS. We base our argument on the fact that a high use of technology may fragment one's attention over multiple resources, tasks, and activities, and increase a person's reachability. In relation to the first mechanism, a higher work fragmentation, that has been associated to perceptions of overload (Zika-Viktorsson et al., 2006) can counterbalance the positive effect on creativity coming from a reduced stress and reduced perception of role overload. In addition, the feeling of being always on, engendered by an intense use of collaborative technology, and coupled with the perception of being always available to others' requests, can generate additional perceptions of overload related to the sheer number of requests and the handling of multiple colleagues. Also, this latter mechanism can counterbalance the positive influence on creativity of an enhanced wok life balance provided by the CS. We thus propose that:

H3: The positive relationship between work-life balance and creativity is negatively moderated by technology mediated interactions with external actors

Data and Methods

Context and data

Our study is based on data collected thorough a survey sent to individuals working in the collaborative spaces of an industrialized region of Northern Italy. The survey involved all the collaborative spaces located throughout the region, with greater density in larger cities. The survey reached individuals in different types of collaborative spaces, mainly co-working spaces (55% of respondents), business incubators (8%), science parks (20%), and hybrid spaces (17%). Co-working spaces are collaborative spaces that offer a work environment designed to allow users to work in the same way as they do in a traditional office, but shared with other workers, typically professionals, freelancers, or people who travel frequently. Members of co-working spaces work independently but typically share values and have interest in the synergy that can occur when working in contact with other people. In particular, co-working spaces are designed to promote creativity and productivity, thus combining the economic benefits of a shared office with an environment designed to stimulate innovation (Errichiello & Pianese, 2018). Business incubators or business centers are designed to accelerate the development of companies providing a series of resources to support businesses, services, and a network of contacts. Incubators vary in the way they provide their services, their organizational structure, and the type of customers they serve. Science parks are built to support and to promote technological transfer between universities, public organizations and private companies, and often host incubators of university spin-offs. Among the spaces studied, there are spaces that have features common to several types, i.e., hybrid spaces.

We first created a list of all the collaborative spaces of the region by looking at documents and searching on the web. The main keywords used were: "Name of province + collaborative spaces",

"Name of province + incubator", + "Name of province + innovation hub", "Name of province + coworking", "Name of province + creative space". The initial list included 73 spaces. Since some of the spaces of our first list did not seem fully consistent with our definition of collaborative space (e.g., they appeared more as 'rented office space' than a co-working space), we called a referent person in those spaces to ask for more information. At the same time, we performed an accurate analysis of their website. As a consequence, we eliminated some of the spaces from our research. Our final list included 66 spaces. We then developed a multi-section questionnaire that explores the individual work-related and social experience within collaborative spaces, focusing on constructs such as work-life balance, face to face interactions, work interactions mediated by technology tools, perceptions of innovation climate, and creativity. The questionnaire was initially created in English and then translated into Italian with a translation–back translation procedure (Brislin & Lonner, 1973).

The survey was submitted to individuals working in all selected collaborative spaces. We got responses from 132 individuals working in 27 collaborative spaces (co-working, scientific park, hybrid, hub, business incubator). The average age of respondents was 37 years (s.d. = 8.9) and the majority of the population sample were males (61%). 67% of the population sample declared themselves "self-employed". As far as their education is concerned, most of them had a graduate or undergraduate degree (master's degree 35%, bachelor's degree 20%), 21% held a high school diploma, 11% had a postgraduate degree master, and 5% had a PhD.

Measures and analyses

Dependent variable

To measure creativity, we followed Sue-Chan and Hempel's (Sue-Chan & Hempel, 2016) guidelines and recognized that novelty and usefulness are two components of creativity. Novelty was

evaluated asking the degree of agreement on a 7-point Likert scale with the following statements: “I have original ideas”, “I often have a fresh approach to problems”, “I have a unique perspective”, “I generate unprecedented solutions to a problem”, “My solution is often different from traditional ways of doing a task”, “My solution is out-of-the box” (Sue-Chan & Hempel, 2016). The Cronbach Alpha was 0.89.

Usefulness was evaluated using six elements: “I develop solutions focused on the needs of the user, not on the functions of a product”, “I produce simple solutions to problems”, “I identify opportunities for implementing new products/processes”, “I develop adequate plans for the implementation of new ideas”, “I integrate multiple perspectives in a constructive manner”, “I combine ideas in a constructive manner” (Sue-Chan & Hempel, 2016). The Cronbach Alpha was 0.85.

Considering that Amabile (Amabile, 1982, 1983, 1988), when referring to a product or service, defined creativity as new, appropriate or useful and since most of the studies concerning creativity in organizational field are consistent with the definition of Amabile (e.g. (Oldham & Cummings, 1996; Zhou & George, 2001)) we studied creativity as a composite measure computed as the average of novelty and usefulness (α =0.91).

Independent variables. We measured the individual experience of work-life balance using the scale of Work-life Balance Satisfaction developed by Valcour (Valcour, 2007). Respondents were asked to express their degree of satisfaction (using a Likert scale, from 1 – “very dissatisfied” to 7 – “very satisfied”) with the following items: “The way you divide your time between work and personal or family life”, “The way you divide your attention between work and home”, “How well your work-

life and your personal or family life fit together", "Your ability to balance the needs of your job with those of your personal or family life", "The opportunity you have to perform your job well and yet be able to perform home-related duties adequately". The Cronbach Alpha was 0.94.

The frequency of work interaction with external actors mediated by technology was collected through a 7-point frequency scale where: 1 – "never", 2 – "annually or less", 3 – "many times per year", 4 – "many times per month", 5 – "many times per week", 6 – "many times per day", 7 - "many times per hour", by asking to respondents to answer the following items: "How frequently do you have synchronous, i.e. same time, technology-mediated communication (e.g. phone calls, video conference, instant messaging) with others (e.g., work colleagues or clients who are not members of the CS)?","How frequently do you have asynchronous technology-mediated interactions (e.g. exchange of emails, SMS, voice messages) with others (e.g., work colleagues or clients who are not members of the CS)?". The final variable we used was computed as the mean of the two measures.

Control variables. We used several control variables, i.e., climate for innovation, type of employment, education, and gender. The literature on creativity has shown how the climate for innovation promoted in the environment significantly influences the level of creativity of the outputs (e.g. (Eisenbeiss et al., 2008; West, 1990)). We, therefore, used the climate for innovation as a control variable. We adapted the scale designed by Scott and Bruce (Scott & Bruce, 1994) for traditional organizational contexts to the case of a collaborative space and selected 4 meaningful items. In particular the survey asked to report on a 7-point Likert scale the level of agreement with the following statements: "Creativity is encouraged in this CS", "This CS can be described as flexible and continually adapting to change", "This CS is open and responsive to change", "Assistance in

developing new ideas is readily available in this CS", "There are adequate resources devoted to innovation in this CS". The Cronbach Alpha was 0.92.

We considered that individuals who are self-employed may be more entrepreneurial and creative. Thus, we controlled for the form of employment with a dummy measure in which 0 = Employed and 1 = Self-Employed. We asked respondents to choose the employment status that best described them from a short list - created with 6 items reflecting the types of employment in Italy - and then merging the six collection items into the two macro categories.

The educational level may impact the ability of individuals to develop new ideas in specialized fields (Fasko, 2001). Thus, the educational level was collected asking to choose one of the following items: 1 secondary school, 2 professional qualification, 3 high school Diploma, 4 bachelor's degree, 5 master's degree, 6 master post degree, 7 Ph.D., 8 others.

We also controlled for gender with a dummy variable (coded 0 = female, 1 = male). Although there is no evidence that gender influences creativity, the literature recognizes that female professionals have sometimes fewer access to resources that can be fundamental to initiate and develop creative ideas (Ibarra, 1992).

Age may be a proxy of one's experiences. Previous experiences, especially in terms of breadth can be predictors of one's capability to spot new innovative courses of actions. We thus controlled for the age of each respondent, calculated from year of birth (reference year is 2018, when the data collection was completed).

Analyses

The described variables were used to run OLS models. Models 1 and 2 test the direct effects of the control and independent variables on creativity, through a multiple linear regression analysis. In order to test for moderation, we centered our variables. Model 3 tests the role of moderator of the frequency of work interactions with external actors mediated by the use of technologies, through a moderated multiple regression analysis. We used the variance inflation factor (VIF) to rule out issues of multicollinearity. The maximum VIF was 1.14 and the average VIF was 1.10. Therefore, we do not have reasons to suspect that multicollinearity was a problem. We recognize that common method bias may be a problem in our dataset. However, previous studies on individual creativity have extensively tested models where dependent and independent variables came from the same source, since "employees themselves are best suited to report creativity because they are aware of the subtle things they do in their jobs that make them creative" (Baer, 2012; Dul et al., 2011; Shalley et al., 2009).

In addition, we decided to keep self-reported variables considering the particular context of our study. CSs are mostly attended by self-employed professionals and freelancers, and these professions are practiced in multiple and distinct professional fields, for example, computer programming, design, journalism, etc. Given such heterogeneity, it would have been difficult, if not impossible, to identify a common source of external data on individual creativity (for example the number of awards received, or an evaluation provided by a client or another stakeholder).

Also, it would have been difficult, if not impossible, to ask other individuals (e.g., managers, stakeholders) to evaluate the creative performance of our informants, because many of the individuals

working in collaborative spaces are freelancers and individual contractors. The managers of the CS do not have specific knowledge in all the occupational fields covered by coworkers, and it is difficult for them to have all the necessary information to judge the creativity of inhabitants of a CS.

We thus followed Ng and Feldman (2012), who argue that the presence of individual and/or contextual factors can make the self-assessment of creativity acceptable or more appropriate. According to these authors, using creativity self-assessments is acceptable when the individual's creative changes or performance may not be visible to a third person. To conclude, in agreement with Kaufman (2019), although self-assessment is not the best method to collect measures of individual creativity, it is acceptable when the conditions of research make it necessary.

To contain the effect of common method bias, in our questionnaire we separated the independent and dependent variables (Podsakoff et al., 2003). To further evaluate the problem, we computed the Harman's single factor test in which all items (measuring latent variables) are loaded into one common factor (Podsakoff et al., 2012). The total variance for a single factor was less than 50% (total variance = 0.32), suggesting that common method bias did not affect your data, hence our results.

Results

Table 4.1 presents a correlation matrix and descriptive statistics for all the measured variables. Not surprisingly for collaborative spaces devoted to innovation, the descriptive statistics show high levels of perceptions of climate for innovation (mean = 5.24, s.d. = 1.39). Above average values were also recorded for the perception of the work-life balance satisfaction level (mean = 4.75, s.d. = 1.33) and for the frequency of work interactions with external actors mediated by technology (mean = 4.91, s.d. = 1.63). In accordance with the hypotheses of our study, creativity is significantly and positively

correlated with the level of personal satisfaction about work-life balance, as well as with the climate for innovation. Furthermore, there is also a positive correlation between creativity and frequency of work interaction with external actors mediated by technology.

Table 4.1. Univariate statistics and Pearson correlations among study variables (N = 132).

	Mean	s.d.	Max	Min	1	2	3	4	5	6	7
1. Employed Vs Self-Employed	0.67	0.47	1	0	1.00						
2. Education	4.67	1.40	8	2	0.09	1.00					
3. Gender	0.61	0.49	1	0	-0.01	-0.28**	1.00				
4. Age	36.65	8.93	59	20	-0.18*	-0.15*	0.01	1.00			
5. Climate for Innovation	5.24	1.39	7	1.4	0.21*	-0.06	-0.03	-0.05	1.00		
6. Work Life Balance	4.75	1.33	7	1	0.13	-0.09	0.02	0.03	0.20*	1.00	
7. Work Interactions (ext.)	4.91	1.63	7	1	-0.08	-0.02	0.01	0.21*	0.19*	0.12	1.00
8. Creativity	5.09	0.91	7	1.58	0.14	-0.11	0.09	0.05	0.38***	0.26**	0.19*

$^{*}p<.05$. $^{**}p<.01$. $^{***}p < .001$.

Table 4.2 presents the results of the regression analysis. In model 1, only climate for innovation was significantly related to creativity ($\beta= 0.24$; $p<0.001$). The results of the regression in model 2 show the satisfaction of the individual work-life balance is positively associated to creativity ($\beta= 0.12$; $p<0.05$), providing support for our first hypothesis, H1: The higher the perceived level of work-life balance experience through the collaborative space, the higher the creativity.

Our second hypothesis pertains to the direct effect of frequency of work interactions with external actors to CS, mediated by technology, on creativity. In Model 2 there is not a significant relationship between technology mediated interactions and creativity, suggesting that H2 is not supported.

In model 3 we test the interaction effect of relationship work-life balance experience through the collaborative space and technology mediated interactions with external actors on creativity. Consistently with H3, we find that the moderating effect is negative and significant (β= - 0.10; p<0.001). The plot in Figure 2 shows that, at low levels of technology mediated interactions with external actors, there is a positive relationship between work-life balance and creativity. However, at high levels of technology mediated interaction the effect of work-life balance on creativity seems marginal, if not negative.

Table 4.2. Results of regression analysis.

	Model 1			Model 2			Model 3		
	Estimate	Std. Error	p-value	Estimate	Std. Error	p-value	Estimate	Std. Error	p-value
(Intercept)	3.54	0.57	0.00	2.96	0.61	0.00	0.64	0.90	0.48
Employed Vs Self-Employed	0.17	0.16	0.30	0.15	0.16	0.35	0.22	0.16	0.17
Education	-0.04	0.06	0.47	-0.03	0.06	0.54	-0.02	0.05	0.65
Gender	0.16	0.16	0.32	0.15	0.15	0.32	0.19	0.15	0.19
Age	0.01	0.01	0.37	0.00	0.01	0.59	0.01	0.01	0.44
Climate for Innovation	0.24***	0.05	0.00	0.20 ***	0.06	0.00	0.19 ***	0.05	0.00
Work-life Balance				0.12 *	0.06	0.04	0.61 ***	0.16	0.00
Work Interactions (ext.)				0.06	0.05	0.19	0.52 ***	0.14	0.00
Work-life Balance *Work Interactions (ext.)							-0.10 ***	0.03	0.00
Observations	132			132			132		
R^2	0.17			0.21			0.28		
Adjusted R^2	0.14			0.17			0.23		

Residual Std. Error	0.85 (df = 126)	0.83 (df = 124)	0.80 (df = 123)
F Statistic	5.12 (df = 5; 126)	4.72 (df = 7; 124)	5.90 (df = 8; 123

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

The frequency of work interactions mediated by collaborative technology was investigated through two separate questions asked to respondents: one referring to synchronous technology interaction work (e.g., via conference calls) and the other related to asynchronous technology interaction work (e.g., through emails). By analyzing the data of the single answers, it is possible to further deepen our analysis. We re-ran models 2 and 3, using synchronous technology mediated interactions with external actors and asynchronous technology mediated interactions with external actors. The results of these four new models replicate the results already discussed of model 2 and model 3 in Table 4.2, i.e., there is no different effect on the dependent variable if the technologies that mediate the working interaction are synchronous or asynchronous.

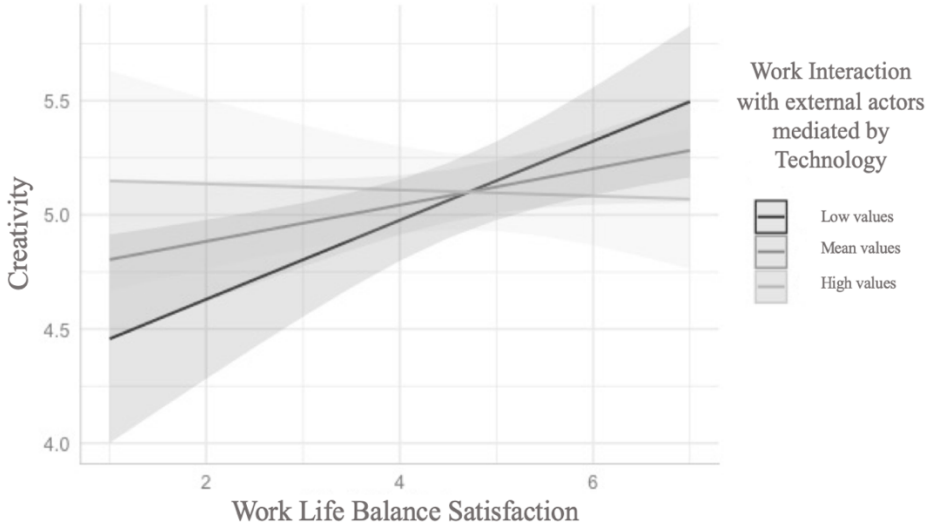

Figure 4.2. Plot of interaction effect between technology mediated interactions with external actors and work-life balance on creativity.

Discussions and conclusions

The aim of this paper was to investigate the experience of professionals working in collaborative spaces, such as co-working spaces and innovation labs, created for enhancing individual and group creativity. We wanted to move beyond the common rhetoric that collaborative spaces impact on creativity by increasing individual well-being and by stimulating face to face interactions (e.g., Errichiello & Pianese, 2018; Khazanchi et al., 2018) and recognize the fundamental role played by collaborative technology in such environments. Our study focused on how the positive resources related to work-life balance in collaborative spaces interplay with the use of collaborative technology in affecting individual creativity.

Our survey analysis, conducted in 27 collaborative spaces in a highly industrialized area of Northern Italy, provides support for our theorizing. In particular, we first hypothesized and found that perceptions of work-life balance are positively associated to increased creativity in collaborative spaces. These results are in accordance with previous literature that has linked the implications of a positive interface between work and life domains to individual success in organizations (Wayne et al., 2017). Most of the literature on work-life balance, however, is based on empirical data collected in traditional work contexts, e.g., large companies, public organizations, small and medium enterprises (Johari et al., 2018), and often does not take into account the changing nature of the workplace. Research has recently started to address the issue of work-life balance in relation to telework, smart work, and flexible work arrangements (e.g., Hilbrecht et al., 2008; Holland & Bardoel, 2016). Our research contributes to this emerging debate by showing the importance of work-life balance for innovation in non-traditional contexts, in particular in collaborative spaces.

Second, we hypothesized that technology mediated interactions with actors outside of the CS are related to increased creativity. In CSs multiple opportunities are offered to interact face to face with other occupants of the space, e.g., meetings, social events, spatial features. Technology mediated interactions are fundamental to get in, or maintain, interaction with external actors. Such external interactions are instrumental to get new ideas, to access resources, and to be exposed to different points of view. However, contrary to our expectations, our second hypothesis was not supported because we did not find a significant effect for the relationship between the aggregated measure of technology mediated interactions and creativity and the same happened when we distinguished between synchronous and asynchronous technology use.

The role and implications of technology-mediated interactions (both synchronous and asynchronous) are further elucidated by the results of our third hypothesis that shows how the effect of work-life balance on creativity is negatively moderated by the frequency of technology mediated interactions with external actors. Thus, our results point out that the ability to exploit the positive resources developed thanks to the experience in CS (in our case in terms of enhanced work-life balance afforded by increase work flexibility) is contingent to the way individuals make use of other types of resources (in our case collaborative technology). Requests and interactions (both in real time or deferrable), arguably through an increase in the perception of role overload, may reduce the positive implications of the wellbeing offered by a collaborative space to creativity, thus providing a more nuanced understanding of how creative processes play out in new flexible and boundaryless workplaces. These results also contribute to understand the implications of collaborative technology on innovative and creative work in general, and in collaborative spaces in particular. Interestingly, very few organizational scholars have specifically taken into account the role of technology mediated

interactions on creativity (see Burkhardt & Lubart, 2010 for a meaningful example) and none have considered the diverse effects provided by different types of mediated interactions. We thus contribute to this emerging field.

This work offers practical implications for designers, managers, and workers of collaborative spaces. First, when designing collaborative spaces, architects and designers should consider the sociotechnical nature of a collaborative space. They should design the physical characteristics of the space taking into account (and possibly integrating within their design) the role played by collaborative technology. Managers of collaborative spaces should be aware of the fundamental role played by collaborative technology in fostering innovation results. They should not just focus on fostering face to face interactions within the space, by also offer additional opportunities for interactions with external actors. For instance, they could institute webinars or offer specific platforms that could be accessed both by members of the space as well as by external constituencies. However, in doing so, they should be careful in not overwhelming individuals with technologies that require them to be always 'on'. Finally, workers should recognize that the wellbeing guaranteed by the space may lead to their increased creativity only when they enact certain interaction patterns. Enacting a targeted and limited use of collaborative technologies with actors outside of the space may be a strategy to get the best out of the flexibility offered by a collaborative space.

This work is not, of course, without limitations. We collected our data in a limited number of spaces and with a limited number of respondents. Although the context of our data collection (a highly industrialized area) is extremely relevant and representative of knowledge intensive contexts, future work should replicate and extend our study in other contexts. Moreover, although the independent variable of perception of work-life balance satisfaction was collected in the survey administered

within CSs, it could be unclear how the role of collaborative spaces is assessed in this measure. There is a strong assumption that the work-family balance arises from the collaborative space, but it is not explicitly collected in the survey's questions. The dataset we have used relies on data coming from a single source. Although we have ruled out possible issues related to common method bias, future studies should explore ways to assess creativity outcomes through other sources (expert evaluations, documents, client's evaluations). Although it is not easy to obtain multi-sources for the detection of individual creativity in the context examined, and, as already discussed in the methodology, there is a theoretical motivation for using self-assessment to measure creativity, we believe it is useful to try to integrate the study with additional measures of creativity coming from other sources, such as opinions of clients and supervisors of freelances or peers. As an alternative measure, it could be interesting to develop a new measure of self-assessment of creativity that incorporates assessments from freelances at different points in time.

Our paper has started to explore the different roles played by different technologies on the work experiences of inhabitants of collaborative spaces. We believe more efforts should be put in place to distinguish the different uses and affordances of collaborative technology in collaborative spaces, for instance by distinguishing different type of technology (e.g., social media, instant messaging system), the provider of the technology (e.g., the individual worker, the collaborative space), and the multiple interpretations that different professionals may develop about the use of a technology (e.g., designers, engineers, creative workers).

Another direction for future research could be investigating whether the type of profession may differentially affect creativity processes in the context of CSs. We propose to distinguish professions into macro-categories, for instance technology-oriented professions and non-technology-oriented

professions. This way we can create a dummy variable that could act as a control variable for the professional background and test if it plays a direct or moderating role.

Another possible avenue could be to investigate how collaborative spaces can reduce the negative effect of technology in relation to the work-life balance of the individual. Indeed, these spaces can offer physical and mental boundaries to the worker, thanks to which workers could better manage their online status, thus becoming more focused on their task, instead of being continually distracted by the invasiveness of technology.

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Conclusion

Discussion

My thesis contributes to the literature on New Ways of Working (NWW) in both theoretical and practical ways. In this thesis, NWW have been defined as a set of practices that promote flexibility and freedom for the worker, made possible by using technology (e.g., Baane et al., 2010; Blok et al., 2011; Gerards et al., 2018). It has been measured as time- and location-independent working: i.e., flextime (Hill et al., 2001) and flexplace (Shockley & Allen, 2007), and through perceived level of work-life balance satisfaction, and the degree of innovative and creative outcomes in context designed to promote NWW, such as collaborative spaces (CS).

Previous research on NWW have underestimated the importance of studying the effects of adopting new working practices on individual creativity and innovation. Many studies have focused on variables known as antecedents of creativity and innovation such as work engagement (e.g., Gerards et al., 2018; Peters et al., 2014; Ten Brummelhuis et al., 2012), motivation (e.g., Di Martino & Wirth, 1990; Gajendran & Harrison, 2007; Manochehri & Pinkerton, 2003), work autonomy (e.g., Bailey & Kurland, 2002; Gajendran & Harrison, 2007; Mann et al., 2000), job satisfaction (e.g., Bakker & Demerouti, 2007; Irawanto et al., 2021) and their relationship with NWW. Other studies have investigated the link between NWW and work performance (e.g., Blok et al., 2011; Eaton, 2003; Kattenbach et al., 2010), worker productivity (e.g., Blok et al., 2011; Di Martino & Wirth, 1990; Kattenbach et al., 2010; Manochehri & Pinkerton, 2003), costs reduction (Blok et al., 2011; Di Martino & Wirth, 1990), and organizational commitment at the team level (e.g., de Leede & Nijland, 2016). Fewer studies have investigated the direct relationship between the adoption of NWW and creative and innovative outcomes (e.g., Medik & Stettina, 2014; Wang et al., 2018).

Understanding the relationship between NWW and creativity and innovation is important because in a world characterized by rapid technological evolution and market complexity, organizations increasingly challenge each other on the innovation level. Managerial literature widely recognized the workers' creativity as one of the main drivers of organizational innovation. Understanding which practices can influence the creative and innovative processes of workers allows to design the working environment to exploit the maximum potential of human resources and at the same time also take care of their wellbeing.

Furthermore, communication technology plays a central role in allowing the adoption of NWW because it allows developing and maintaining social relationships (synchronous and asynchronous) with colleagues and stakeholders (Baane et al., 2010; Bijl, 2009; Harrison et al., 2003; Veldhoen, 2004). Previous management literature investigated the relationship between the position in the work-related social network and the capacity to generate new ideas (Perry-Smith & Shalley, 2003) showing discordant positions and paradoxes related to social network analysis and creativity. On the one hand, the centrality position in the social network brings benefits in terms of knowledge sharing (e.g., Perry-Smith & Mannucci, 2017), shared leadership (e.g.,Small & Rentsch, 2011), and perception of proximity in virtual teams (e.g, Hung et al., 2021), which are factors that affect individual creativity and innovative outcomes (e.g., Hoch, 2013; Hu & Randel, 2014; Leonardi, 2014). On the other hand, managing an extensive work-related social network requires significant investments of energy (Day & Kilduff, 2003; Landis, 2016), time and effort, which can create feelings of overload and stress (Ten Brummelhuis & Bakker, 2012). Understanding how the centrality of workers in the working instrumental network impacts creativity and innovation when the organization implements NWW is essential because it allows to adopt a holistic vision and make NWW adoptions

more effective, highlighting the need to customize flexible working practices according to which node the workers cover in the work network.

Table 1 presents the main findings of each study which composed the thesis.

Table 1 Summary of Findings

Studies	Paper Title	Main Research Questions	Main findings
Study 1	Innovation in globally distributed teams: The role of brokers	R1: How do the various facets of NWW implementation and the position in work-related social networks impact creative and innovative outcomes?	The presence of brokers (i.e., one or more team members, who act as brokers between subgroups) addresses some of the challenges related to subgroups, by increasing perceptions of proximity and knowledge sharing, positively influencing team innovation.
Study 2	How designed work environment and enacted work interactions impact creativity and work-life balance		Flexible work arrangements are positively related to increased work-life balance but not to creativity, whereas the social-organizational work environment designed to promote creativity is associated to an increased level of idea generation, but to a reduction in work-life balance. In addition, centrality in instrumental social networks is also associated to a reduction of work-life balance. Findings thus point to a potential trade-off between structures aimed at increasing creativity and initiatives aimed at engendering work-life balance.
Study 3	Multiplex Boundary Work in Innovation Projects. The Role of Collaborative Spaces for Cross-functional and Open Innovation	R2: How do the elements of NWW in CS impact employee well-being, creativity and innovation?	The relation between expectations and experiences about the collaborative space impact on employees' ability to perform boundary work inside and outside the organization. In addition to the collaborative space's affording role for expectations about hands-on collaborative innovation (space as laboratory), the study also highlights a set of collaboration constraints. These latter are generated by perceived boundary configurations (i.e., degree of boundary permeability and infrastructuring in internal and external collaborations) and by discrepancies between expectations (space as laboratory) and actual collaboration experiences in the space (i.e., space as maze, cloister, showcase and silo).
Study 4	How Perceptions of Work-Life Balance and Technology Use Impact Upon Creativity in Collaborative Spaces		The perceived level of work-life balance satisfaction a positive impact on individual creativity. Furthermore, the relationship between work-life balance and creativity is negatively moderated by technology mediated interactions with external actors. In other words, an intense use of collaborative technology with actors external to the CS can generate perceptions of overload and therefore making the impact of work-life balance on creativity not significant

As shown in Table 1, the work treats some facets of NWW in relation to creativity and innovation inside and outside organizations. In particular, the thesis addresses two main research questions. The first part of the thesis investigated the first research question: *how do the various facets of NWW implementation and the position in work-related social networks impact workers' well-being, creative and innovative outcomes?* This first part is articulated in study 1 and study 2 which investigate the effects of NWW's effects on employees' innovative outputs taking into consideration their role within the structures of their work networks. The research highlights, for example, how the presence of brokers in a globally distributed team increases perceptions of proximity and sharing of knowledge, positively influencing team innovation. On the other hand, study 2 discovers that centrality in instrumental social networks is associated with a reduction in the balance between work and personal life. Furthermore, the study shows that flexible work organization is positively related to a greater work-life balance, but not to creativity, while the socio-organizational work environment aimed at promoting creativity is associated with a higher level of generation of ideas, but to a reduction in the balance between work and life. The results therefore indicate a potential trade-off between structures aimed at increasing creativity and initiatives aimed at generating work-life balance.

The second main research question is: *how do the elements of NWW in CS impact employee well-being, creativity and innovation?* My research highlights that an organizational collaborative space designed to promote open innovation and collaboration practices between inter-functional teams can generate a series of collaboration constraints. The latter are generated by perceived boundary configurations (i.e., degree of boundary permeability and infrastructure in internal and external collaborations) and by the discrepancies between expectations (space as laboratory) and

actual collaborative experiences in the space (i.e., space as labyrinth, cloister, showcase and silo). By studying independent CSs (i.e., spaces that collect freelancers, employees, entrepreneurs who decide to work in a space shared with people outside their sphere of work), study 4 underlines that the perceived level of satisfaction of the work life balance has a positive impact on individual creativity within the CS. However, an intense use of collaborative technology with actors external to the CS can generate perceptions of overload and therefore make the impact of the balance between work and private life on creativity insignificant.

To better understand the contributions of this research to current literature debates Table 2 shows a summary of theoretical implications.

Table 2 Summary of Theoretical Implications

Literature Debates	Studies	NWW facets	Findings	Theoretical Implication	References
NWW-WLB	Study 2	Flexible work arrangements	Positively related to increased work-life balance	Confirmed the positive impact of flexible work arrangements practices agued in literature.	Mackie et al. (2001); Wood and De Menezes (2011)
		Social-organizational work environment	Negatively related to increased work-life balance	Organizational structures designed to support creativity may walk a thin line between commitment and overcommitment to work tasks	Kelly et al. (2008); Thompson and Prottas (2006); Valcour (2007)
		Centrality in instrumental social networks	Negatively related to increased work-life balance	Specific contribution to the literature on work-life balance by proposing a new antecedent of perceptions of work-like balance: centrality in instrumental social networks.	Perrigino et al. (2018)
NWW-individual creativity	Study 2	Social-organizational work environment	Positively related to increased creativity	Confirmed previous studies' organizational structures designed to support creativity	Agarwal and Farndale (2017);
	Study 4	WLB (furthered by Collaborative spaces)	Positive relationship between the perceived level of work-life balance satisfaction and individual creativity.	WLB as the antecedent of creativity: the importance of work-life balance for innovation in non-traditional contexts, such as collaborative spaces	Errichiello and Pianese (2018); Khazanchi et al. (2018) Wayne et al. (2017).
		Frequency of technology mediated interactions with external actors in CS	Negative moderated the relationship between the perceived level of work-life balance satisfaction and individual creativity.	Implications of collaborative technology on innovative and creative work in general, and in CS in particular.	Burkhardt and Lubart (2010)
NWW-innovation	Study 1	Brokerage through mediating effect of knowledge sharing and perceived proximity	Positively related to team innovation	How brokers can help or hinder *teams* in becoming more innovative in social network studies.	Mattarelli et al. (2017); Mell et al. (2021)
	Study 3	Collaborative goals (co-creation; co-generation) Expected impact of collaborative space multiplex boundary work		i) The affordances and constraints related to an organization's attempts to engage in both internal and external innovation, acting in CS, can be better understood when treated together, *as multiplex boundary work*. ii) Recognize the paramount role of collaborative spaces and of several boundary work mechanisms in individuals' ability to act collaboratively in innovation projects with high diversity.	Bechky (2003); Boscherini et al. (2010); Carlile (2004); Koskinen (2005); Ungureanu, et al. (2018)
		Experienced multiplex boundary work in the collaborative space			

In the rest of the chapter, I will further detail theoretical and practical managerial contributions of the thesis. Finally, I will show some of the limitations and illustrate emerging future research opportunities.

Theoretical Implications

Theoretical implications for each study

Study 1 contributes to the literature on brokers and globally distributed teams studying the influence of brokers on team innovation in dispersed settings, which is a timely and relevant topic in the current environment (Mattarelli et al., 2017; Mell et al., 2021) and emergent in NWW literature (e.g., de Leede & Nijland, 2016). Indeed, globally distributed team members must adopt flexible working practices. The team members are distributed all over the world, and flexibility is a key to allow coordination in the work. For example, to schedule a meeting between different time zones, flexibility is required to the participants in terms of time and place. Previous literature on team dynamics has suggested how brokers may help team functioning (Eisenberg & Mattarelli, 2017; Leonardi & Bailey, 2008), but team brokerage has received limited attention in relation to team innovation, and we have a limited understanding of how brokers can help or hinder *teams* in becoming more innovative in social network studies. In the study the effect of brokers on team innovation suggests that brokerage positively influences a team's innovative efforts by facilitating knowledge sharing and perceptions of proximity. In other words, having individuals who emerge (or are formally appointed) as brokers within globally distributed teams can facilitate the exchange of codified knowledge, thus helping the team in developing new and useful products and services. Brokerage also helps overcome the perceptions of distance that often taunt globally distributed teams. Brokers

can distribute a shared awareness about tasks and a sense of alignment in expectations (Halevy et al., 2019), that can facilitate how team members work together towards innovative goals.

Study 2 contributes to the debate about how NWW affect work-life balance and creativity (e.g., Demerouti et al., 2014; Di Martino & Wirth, 1990; Kotera & Correa Vione, 2020; Renard et al., 2021). Existing literature supports a highly optimistic view that organizational work environments designed to enhance creativity may improve both creativity at work and quality of life experienced by employees (Agarwal & Farndale, 2017; Kelly et al., 2008; Thompson & Prottas, 2006; Valcour, 2007). Study 2 cautions that a trade-off perspective should be considered more carefully, given that the very same organizational design can affect positively workers' ability of idea generation but negatively their perceived work-life balance. I also show that if employees are simultaneously embedded in an over-committing relational structure, they may perceive a lack of autonomy or inability to set clear boundaries between life and work commitments. Two mechanisms may be related. Eliciting aspects such as proactivity and interdependency, organizational structures designed to support creativity may walk a thin line between commitment and overcommitment to work tasks. More recent research has shown that HR initiatives, which are intended to facilitate employee wellbeing or autonomy, may fail when employees are not able to fully understand their strategic importance and appreciate the consistency across initiatives (see Ungureanu, Bertolotti, & Pilati, 2019; Wang & Verma, 2012). It is necessary for employees to see organizational workplaces designed for creativity as part of a unitary whole (i.e., design consistency), so they may perceive them as less encroaching on their autonomy or personal lives (Abstein & Spieth, 2014; Ehrhardt et al., 2011; Shalley & Gilson, 2004)

Moreover, previous studies suggest that to the extent to which organizational practices for creativity give workers greater control over their jobs, by promoting work involvement and commitment, they can reduce work-life stress and thus promote better work-life balance (Mackie et al., 2001; Wood & De Menezes, 2011). My findings about the positive impact of flexible work arrangements practices confirm this statement.

As far as enacted interactions are concerned, study 2 highlights that outdegree centrality in advice networks is negatively related to work-life balance. Importantly, this finding makes a specific contribution to the literature on work-life balance by proposing a new antecedent of perceptions of work-like balance: centrality in instrumental social networks. The effect of individuals' position in the enacted social structures represents a novel perspective. Work-family scholars have called for more research on contextual antecedents of the work-family pathways, such as conflict and enrichment (Chan et al., 2016; Greenhaus & Powell, 2006; Wayne et al., 2006). While such literature has been mostly limited to the individual level of analysis (Casper et al., 2007), focusing on social networks provides a contextual variable (e.g. resources perspective, Greenhaus & Powell, 2006) that focuses on interactions among work colleagues, and thus also provides a novel method of analysis for the work-family literature.

The Studies 3 and 4 indagate the role of CS such as place fostering NWW. The CS are physical working spaces that promote NWW and innovation and creativity - (see e.g., Leclercq-Vandelannoitte & Isaac, 2016; Spinuzzi, 2012). Study 3 investigates the role of collaborative spaces as organizational support for internal innovation through cross-functional teams and for open innovation with external stakeholders. In particular, the study focuses on collaborative spaces as tools for multiplex -i.e., simultaneous internal and external- boundary management in innovation projects.

The findings have two main theoretical implications. First, the research suggests that the affordances and constraints related to an organization's attempts to engage in both internal and external innovation can be better understood when treated together, *as multiplex boundary work*. Second, adopting the theoretical lens of boundary work, the study brings to the fore the paramount role of collaborative spaces and of several boundary work mechanisms in the individuals' ability to act collaboratively in innovation projects with high diversity. Study 4 still focuses on NWW interaction in CSs and individual creativity. The study goes beyond the NWW and WLB debate and wants to investigate the WLB as the antecedent of creativity. Some authors showed CSs impact on creativity by increasing individual well-being and by stimulating face to face interactions (e.g., Errichiello & Pianese, 2018; Khazanchi et al., 2018) and recognize the fundamental role played by collaborative technology in such environments. The study focused on how the positive resources related to work-life balance in collaborative spaces interplay with the use of collaborative technology in affecting individual creativity. The first contribute is to emerging debate by showing the importance of work-life balance for innovation in non-traditional contexts, such as collaborative spaces. The second contribution is about the role and implications of technology-mediated interactions (both synchronous and asynchronous). The study finds how the effect of work-life balance on creativity is negatively moderated by the frequency of technology mediated interactions with external actors. These results also contribute to understand the implications of collaborative technology on innovative and creative work in general, and in CS in particular. Interestingly, very few organizational scholars have specifically considered the role of technology mediated interactions on creativity (see Burkhardt & Lubart, 2010 for a meaningful example) and none have considered the diverse effects provided by different types of mediated interactions. Thus, the study contributes to this emerging field.

Practical Implication

This work offers practical implications for organizations, managers, and workers of collaborative spaces. As for organizations, I suggest managers and organizations to appointing brokers to facilitate team interactions and to provide team members, irrespective of their formal position, with tools and opportunities to connect different subgroups to foster team innovation. Second, regarding designing contexts for creativity, organizations should be aware of the trade-offs they may entail. Organizations should pay attention to the paradoxical situations by which tools given to knowledge workers to increase their autonomy at work and at home, and spontaneous processes that are considered beneficial for both domains (i.e., help and advice networks), end up by reinforcing one domain at the expense of the other. To this purpose, managers could precede the actual introduction of designed organizational structures with a prototyping phase aimed at assessing the impact of such structures on workers' perceptions, as well as on a variety of attitudes and abilities related to workplace performance and creativity within and beyond the working sphere (high-commitment work environment, work-life conflict, and perception of conflict versus enrichment). Third, if organizations truly value both creativity and employee wellbeing, this double-ended priority should be communicated to employees coherently and strategically. Last, I propose to organizations to be aware of advantages and disadvantages of internal collaborative spaces for innovation. I suggest that managers must pay significant attention to potential misalignments of expectations and experiences of collaboration in complex innovation projects, and I highlight the dangers associated to considering collaborative spaces as shortcuts for managing diversity in collaborative innovation projects. I also draw attention to the importance of foreseeing possible trade-offs between innovation projects developed through cross-functional teams only, and open innovation projects involving also

external stakeholders, and suggest that ordering and prioritizing boundary work may be a safer and more viable strategy for organizations that use both innovation methods.

The last two studies offer practical implications for designers, freelancers, managers, and workers of collaborative spaces. First, when designing collaborative spaces, architects and designers should consider the sociotechnical nature of a collaborative space. They should design the physical characteristics of the space considering (and possibly integrating within their design) the role played by collaborative technology. Managers of collaborative spaces should be aware of the fundamental role played by collaborative technology in fostering innovation results. They should not just focus on fostering face to face interactions within the space, by also on offering additional opportunities for interactions with external actors. For instance, they could institute webinars or offer specific platforms that could be accessed both by members of the space as well as by external constituencies. However, in doing so, they should be careful in not overwhelming individuals with technologies that require them to be always 'on'. Finally, workers should recognize that the wellbeing guaranteed by the space may lead to their increased creativity only when they enact certain interaction patterns. Enacting a targeted and limited use of collaborative technologies with actors outside of the space may be a strategy to get the best out of the flexibility offered by a collaborative space.

These practical implications find more excellent utility in the pandemic and post-pandemic period we are experiencing. The outbreak of the pandemic from Covid-19 has initiated lockdowns worldwide, making it necessary to safeguard the health of citizens. During the lockdown, workers were not allowed to go to work (except specific cases, for example, doctors, nurses, essential service workers, etc.). Therefore, flexible working practices, often operationalized as teleworking, rapidly spread.

Once the lockdowns are over, many organizations have decided to maintain the flexible work practices imposed by the closure. Therefore, the future of work is hybrid, made up of moments of sharing organizational spaces and moments in which the worker can adopt NWW. Therefore, it is essential for organizations to adopt NWW correctly, paying attention not only to offering the worker flexibility in his/her work but also taking care not to overload the worker through collaborative technologies so as not to cancel the beneficial effect that flexibility offers. I also suggest that organizations focus their attention on CS, which can be alternative workspaces that amplify the beneficial effect of NWW. In particular, organizations could both build internal CSs in order to promote collaboration between different teams on a common project through a space that encourages collaboration and creativity, and secondly create partnerships with CSs outside the organization (e.g., coworking, science parks, fablabs), thus being able to offer its employees the possibility of teleworking not necessarily at home but taking advantage of places designed ad hoc.

Limitations

The thesis is not, of course, without limitations. First, there are limitations due to the contexts in which data were collected. In study 1 and study 2, data were collected in two knowledge-intensive contexts, and the evidence cannot be generalized to other settings. They include a range of technical specialists from predominantly one culture in a limited time. While the advantage of specific context is that it enables to control for extraneous factors, more work is needed to understand the effects of NWW facets studied across multiple industries and over time. As with all cross-sectional studies, the test of the hypotheses precludes from making definitive causal statements. Longitudinal research or experimental studies are required to assess the paths in the proposed models with greater confidence. In addition, a limitation that is common in survey research design is that although we controlled for

education, tenure, gender, position, and location, there may be other uncontrolled variables that affect the dependent variables. Study 3 relied on a single case study in a multinational organization operating in the food industry and focusing on innovation, so the findings have limited generalizability. As for study 4, although data were collected through a survey distributed to multiple contexts (i.e., CSs), the usable data came from in a limited number of spaces and with a limited number of respondents. Although the boarder context of the data collection (a highly industrialized area) is highly relevant and representative of knowledge-intensive contexts, future work should replicate and extend the study in other contexts and other regions.

Second, in the survey studies I used a single source to collect the cross-sectional data. Although I have ruled out possible issues related to common method bias, future studies should explore ways to assess creativity outcomes through other sources (expert evaluations, documents, client's evaluations). Although it is not easy to obtain multi-sources for the detection of individual creativity in the contexts examined, and there is a theoretical motivation for using self-assessment to measure creativity, I believe it is helpful to try to integrate the studies with additional measures of creativity coming from other sources, such as opinions of clients and supervisors of freelances or peers. As an alternative measure, it could be interesting to develop a new measure of self-assessment of creativity that incorporates assessments from freelances at different points in time.

Third, in line with previous studies in the NWW literature, my studies focused on single facets or specific definitions of NWW, such as flexible time and place, new media technologies (see e.g., Hill et al., 2001; Ten Brummelhuis & Bakker, 2012), and increased levels of autonomy (see e.g., Bakker et al., 2011; Mauno et al., 2007) physical workspace designed ad hoc to foster NWW adoptions (see e.g., Cabral & Van Winden, 2016; Spinuzzi, 2012). Investigating these facets

independently was useful to disentangle in which direction (positive or negative) the various facets of NWW contribute to the effect on creativity, innovation, work-life balance, and boundary works, but it cannot catch the overall effect of NWW on these dependent variables. Future research should investigate how the effect of all five facets from Gerards et al. (2018) definition act simultaneously to contribute to the overall effect of NWW on creativity and innovation.

Conclusion and Future research direction

To sum up, the thesis contributes to the NWW literature (see e.g., Aroles et al., 2021; Renard et al., 2021) in multiple ways. First, while the existing NWW literature had already investigated the relationship between NWW and worker well-being, studying variables such as job satisfaction, work engagement, absorption, work pleasure, intrinsic motivation to work, fatigue, exhaustion, and burnout (see e.g., Gerards et al., 2018; Peters et al., 2014; Ten Brummelhuis et al., 2012; Van Steenbergen et al., 2018) this thesis measures employee well-being as perceived satisfaction with work-life balance and demonstrates that flexible work practices (i.e., flexplace and flextime) positively impact perceived work-life balance satisfaction.

Second, the NWW literature studied the effects of NWW on variables such as work performance (e.g., Blok et al., 2011; Eaton, 2003; Kattenbach et al., 2010), worker productivity (e.g., Blok et al., 2011; Di Martino & Wirth, 1990; Kattenbach et al., 2010; Manochehri & Pinkerton, 2003), costs reduction (Blok et al., 2011; Di Martino & Wirth, 1990), and organizational commitment at the team level (e.g., de Leede & Nijland, 2016), but neglected the effects of NWW on teams and in particular on the team innovative performance. The thesis investigates the relationship between NWW and creative or innovative outcomes, showing how there is no direct relationship between the adoption of flexible practices and creativity. The thesis instead shows how the use of environments

designed to promote NWW (CS) improve the perception of work-life balance, thus bringing a better creative performance within the space, or the use of globally distributed teams (which are forced to implement NWW to coordinate and achieve team objectives) improve the increases perceptions of proximity and knowledge sharing, positively influencing team innovation.

The thesis contributes also to the NWW literature by recognizing the importance of studying the worker's position in the work-related social network. I show that being central to work-related social networks could, on the one hand, withdraw the beneficial effects of the adoption of NWW by acting negatively on the perception of the work-life balance; on the other hand, I show how to be broker nodes in a team (i.e., figures who act as a bridge between one team and another) in work-related social networks allows achieving better innovative performances for the team.

The dissertation also contributes to the non-conventional workspace literature. It underlines how CSs are designed to promote flexible working practices, allowing the worker to find the comfort of an office even outside the company building and in different cities. These practices that allow the CS to be a prototypical place of the NWW also allow the workers who live the space to perceive a greater satisfaction with their work-life balance, which positively affects their creativity.

Broadly, I investigate how the NWW diffusion offers several insights for organizations and workers. I also want to understand how some variables can influence the effectiveness of NWW adoption. Each study in this thesis highlights its specific future research directions. Still, I want to add to these specific directions four general areas that warrant future research.

The thesis highlights some aspects that negatively affect the NWW adoption, the dark side of NWW. First, this thesis has underlined the paradox between autonomy and well-being fostered by

NWW through flexible work practices, teleworking ICT enterprise solutions, and the reduction of perception work-life balance levels. I stated that increased autonomy in organizing work could improve the perception of work-life balance, feeling to keep control of one's time. On the other hand, it could cause feelings of overload and the inability to manage time for work and family, thus fueling family conflicts. Further studies are needed to investigate the autonomy-work-life balance perception paradox. These future studies could consider the fundamental role played by technology in these dynamics. Studying and understanding the worker's relationship with work-related collaborative technology allows understanding which mechanisms trigger overload and how the worker manages and moves boundaries work. We could deduce guidelines and suggestions from these analyses to resolve the paradox and make NWW more effective.

Second, the literature has already highlighted isolation among the dark sides of the NWW. NWW and teleworking, in particular, could make the worker feel isolated, mainly if s/he is working from home, without further social contacts. The perception of isolation (as well as the overloaded feeling) is amplified when the NWW adoptions are forced. In this regard, in the last two years, the lockdowns imposed by the Covid-19 pandemic have imposed NWW, mainly working from home (e.g., #stayathome). Therefore, it is necessary to investigate the degree of isolation perceived by workers in the two years of the pandemic. Future studies could focus on how feeling isolated from colleagues and the organization may have negatively impacted the relationship between NWW and workers' well-being, creativity, and innovation. Furthermore, it would be interesting to study whether organizations have foreseen or felt the discomfort of employee isolation and what strategies they have implemented to combat it. Future studies may therefore outline which strategies effectively counter isolation and the sense of loneliness in NWW.

Third, the thesis has underlined the importance of studying the centrality in work-related social networks. Being central in a work-related social network could be one of the variables that would explain the adverse effects of NWW and the feeling of overload. On the other hand, becoming aware of the role in the network of workers could help manage the dynamics of workers inside the network and teams. Future research could continue to explore the role of the individual in the work-related social network in NWW and its consequences in perceptions of work well-being and how it impacts performance, work engagement, motivations, creativity, and innovation outcomes.

Finally, the fourth stream of future research is Hybrid work as the future of work. The spread of Covid-19 has accelerated the spread of NWW. The pandemic has speeded up the adoption of NWW by forcing people to work from home (WFH) (Franken et al., 2021). Future studies could focus on how the previous knowledge on NWW can be extended to WFH during the pandemic and vice versa, what is learned about WFH during the pandemic can inform the current debate on NWW?

As mentioned earlier, many organizations have decided not to fully return to the pre-Covid status quo once the health emergency is over. Instead, these organizations have decided to adopt a hybrid policy, where at least 50% (if not more than) of the working time of knowledge workers is flexible (they can work in smart working). These decisions are dictated by a cost reduction policy, but are they also choices that reflect an organizational cultural change towards hybrid work? It would be interesting to study if the health emergency has also caused and accelerated organizational culture changes. How can these organizational cultural changes counter NWW's dark sides?

In general, any contribution to the NWW literature is crucial, especially today. If a few years ago, when the NWW trend emerged, the theme was central and innovative, now it is essential. As

already widely discussed, the Covid-19 pandemic that broke out in March 2020 forced companies to adopt working practices following the NWW and forced workers to change the way they work. This mandatory nature of change carries essential consequences in the future of NWW and makes it an open line of research awaiting new contributions.

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