Human resource management in the COVID-19 era: New insights and management opportunities

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Human resource management in the COVID-19 era: New insights and management opportunities

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Editorial: Human resource management in the COVID-19 era: new insights and management opportunities

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Editorial on the Research Topic
Human resource management in the COVID-19 era: new insights and management opportunities

Today's human resource management professionals need to deploy a complex set of competencies to deal with different issues that are threatening organizations' performance and even their survival.

The COVID-19 pandemic set off a situation that involves a rupture with the past, which has made HRM's fragility and challenges—some of which already existed—emerge in an explosive and faster way. The current scenario can be defined in terms of ambiguity, uncertainty, precariousness, instability, and new possibilities as it never has been before.

Changes in traditional work processes and conditions have shaped an environment in which human resource management (HRM) is called on to face issues that range from changes in the way people work and interact in the workplace (rapid digitization, remote and virtual environments, groups, and team working) to the deep representations and meanings related to work, to foster productivity, innovation, and wellbeing.

HRM has recently been required to face important challenges because of the increasing complexity of organizations and the multidimensional nature of work. Despite all the advances that have been made in HRM studies, the social and economic effects of the COVID-19 crisis put researchers and practitioners in a position in which they face a lack of framework, procedures, and tools to guide and support professionals' adjustment to all the drastic changes that happened in the work and social environment.

A broader and more interdisciplinary view is required to understand and take on HRM's changes and challenges and to find new and integrated ways through which HRM can safeguard wellbeing, innovation, and productivity in organizations.

This Research Topic aimed to provide a constructive and reflexive debate on HRM, bringing together current advances on the topic from a multidisciplinary perspective. We looked for studies both theoretical and empirical (quantitative, qualitative, or mixed-method approaches), from different domains such as psychology, management, sociology, and related fields. This Editorial aims to provide an overview of the interesting contributions that have been published on the merits of this Research Topic. Thus, the complexity of the topic certainly has encouraged a rich and substantial scientific debate, and thanks to the authors, some enlightening areas for reflection can be outlined, including the importance of complex and multifocal HRM approaches and directing actions and choices toward the employees.

As three of the contributions to this Research Topic point out (Cao et al.; Chen; Fregnan et al.), competencies are a hot topic, not only in terms of the need for more complex conceptualization but also in terms of rethinking and reconfiguring the prospects for their development and capitalization.

If we assume competencies as comprising a combination of knowledge, skills, and experiences that are useful for people in a broader perspective—including conscious participation in every aspect of daily life experience, as well as the creation of a new future dimension with intention and full awareness, it is clear why there is a growing trend toward recognizing employees as a lever for organizational innovation. This implies a new, different perspective in terms of mutual expectations between organizations and employees.

However, the awareness of the value of employees comes with the question of how to capitalize on the skills and knowledge that professionals develop considering the ever-increasing need to reexamine and revive the continuity of the individual–organization relationship.

In regard to this new relationship between employees and organization, five of the contributions published in this Research Topic provide insights that go in the direction of giving attention to the individual, giving voice to every role, and valuing the specificities of each professional in the company (Liu, Liu et al.). Thus, it becomes crucial to identify factors that can support workers' perceptions of self-efficacy and safety (Wang et al.). These include assuming a 360° view of the employee that takes into consideration the person-environment fit (i.e., the development of the person's potential and more relational dimensions than performance alone), the importance of clear boundaries and giving voice/space to workers and their needs (building dialogue and theme of mutual accountability), and the importance of middle management roles, especially from a relationship perspective (Jiang et al.; Mellner et al.; Wang).

The outlined scenario undoubtedly points to the need for a more central and strategic function of HRM roles. The contributions of Liu, Zhang et al., Shan et al., and Zhao et al., emphasize that this complex approach to resource management should combine multiple looks. An approach geared toward promoting worker expression, providing support, developing meaningful relationships, and maintaining a culture of error that does not condemn is a decisive factor in supporting individual creativity.

Research tells us that, for people, the organizational experience can no longer be traced back to (and be limited to) being "just"

executive assets. Employees are looking for (and asking for) meaningfulness that connects purpose, process, and performance. People bring the need to perceive themselves as protagonists in their daily professional lives and to recover a sense of fulfillment in what they do. This is also related to the progressive loss of a sense of belonging to the organization, resulting in an impoverishment of the company's assets.

We believe that for HR practitioners, the question that should permeate functions and planning is: "What is the new meaning of work?" Therefore, in terms of application, it is essential not to take old paradigms for granted but renew the pact with workers and understand what they are looking for beyond economic benefits.

One last piece of food for thought is the thematization of group dimensions and relational connections among employees. In most cases, the desire for enhancement and contact is declined regarding the individual and the individual's relationship with top management. These data tell us, implicitly, to remember that there is a substantial difference between valuing *individuality* and valuing *individualism* and we need to find a balance between the individual and the more systemic dimension and nurture both.

Author contributions

All authors listed have made a substantial, direct, and intellectual contribution to the work and approved it for publication.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Sharing Employee: B2B Employment Model in the Era of Coronavirus Disease 2019 and Implication for Human Resource Management

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With the explosion of coronavirus disease 2019 (COVID-19), the concept of "Sharing Employees" has emerged in China. This study will discuss the background of the formation of the "Sharing Employees," how the "Sharing Employees" model is implemented, the relative risks, and the impact on human resource management. Currently, this virus is spreading worldwide, affecting the economy and increasing the unemployment rate. This study will help other countries to learn from this model and provide suggestions for adopting flexible employment policies to ease employment pressure and increase employment channels through the "Sharing Employees" B2B model.

Keywords: B2B, COVID-19, human resource management, Sharing Employees, employment

INTRODUCTION

The number of sharing economy business models has increased significantly in recent times. The rapid development of the sharing economy and its huge impact on different aspects of the current socio-economic system has stimulated public interest (Cheng, 2016). In the era of coronavirus disease 2019 (COVID-19), it is becoming more and more important to promote more sustainable and more promising sharing forms and use their benefits while avoiding traps (Mont et al., 2020). The form creates sustainable value, that is, increasing social welfare, lessening environmental load, and providing economic benefits, for example, avoiding excessive consumption, allowing more efficient and sustainable use of underutilized resources, establishing deeper social connections between people and changing consumption habits (Laukkanen and Tura, 2020).

With the impact of COVID-19 in China, the concept of "Sharing Employees" came into being. This concept is somewhat like the sharing economy, but what it shares is the labor forces. COVID-19 has caused tremendous damage to work and workers, especially those who are unemployed (Fouad, 2020). Under the ongoing impact of the epidemic, some small and medium-size enterprise (SMEs) that were temporarily unable to restart their businesses dispatched their excess labor to other companies in need of employees on a shared basis. The cooperative employment model effectively alleviated the shortage of temporary workers for companies whose business volume increased during the epidemic.

This study introduces the "Sharing Employees" approach as a B2B model. It differs from the traditional employment approach and therefore poses some challenges to human resource management: how to confirm the labor relationship, how to pay wages, who pays social insurance, and who conducts professional training.

This study proposes a solution to the "Sharing Employees" problem. The employee relationship belongs to the dispatching enterprise and will not be unclear because of their task

assignment. Based on the issue of wage payment, the dispatching enterprise is responsible for paying the basic wage and the "borrowing" enterprise is paid according to the workload; social insurance is borne by the dispatching enterprise; after the shared employees are dispatched, the "borrowing" enterprise is obliged to provide corresponding vocational skills and safety training. This study clarifies the corresponding "shared employee" issue, which helps to delineate the rights and responsibilities of both parties.

In terms of future development, this model can, on the one hand, solve the problem of redundant labor outlets, stabilize the workforce, and avoid layoffs during special periods; on the other hand, it can solve the problem of labor shortage for new retail enterprises, ensure the orderly supply of the market, and win public praise; furthermore, it can build a cross-industry temporary employment ecology under the pandemic (Qing, 2020).

LITERATURE BACKGROUNDS

For most of the past century, work is usually described as a regular, full-time employment mode defined as work performed on a fixed schedule, at the business location of the company under the control of the company, expecting to continue to hire (Spreitzer et al., 2017). In the process of traditional economic development, people are more inclined to formal employment, and the employment relationship exists between enterprises and workers generally. Some scholars put forward that flexible employment is different from fixed full-time employment, which means that enterprises can flexibly hire people according to their respective needs, and the enterprise and the employee do not establish a formal full-time labor relationship. Generally, flexible contracts also have no impact on the overall life satisfaction of the employed (Green and Heywood, 2011). However, the flexibility of the B2B employment model is not embodied in both employees and employers in the same company, but in the transfer of labor from companies with redundant labor to companies with insufficient labor.

According to Spreitzer, the flexibility of work arrangements can be categorized within three dimensions as follows: (a) flexibility in the scheduling of work, (b) flexibility in the location where work is accomplished, and (c) flexibility in the employment relationships (Berber and Slavić, 1999). In the B2B model, the employment relationship is not fixed. During the special period of COVID-19, employees can move between different companies and join them at different times according to their respective labor needs. Flexible employment models include labor dispatch (Purcell and John, 1998), business outsourcing (Purcell and John, 1998), reemployment of retirees, short-term labor contract workers, part-time workers, etc. The recently emerged B2B employment model is an innovative flexible employment method that is different from the previous ones.

The term "sharing economy" first appeared in 2008 and refers to "collaborative consumption" resulting from the activities of exchanging, sharing, and leasing resources without owning commodities (Petrini et al., 2017). In economic transactions, it refers to the use of good physical goods or services whose consumption is broken down into individual parts (Puschmann and Alt, 2016). Consumers always benefit from collaborative consumption (Benjaafar et al., 2019). The "Sharing Employees" model essentially refers to the sharing of labor across different businesses, as it is also an evolution of the "sharing economy" concept. It reflects the exchange of labor between one B (business) and another B (business). In general, companies can hire and share labor flexibly through the B2B employment model, so it is not difficult to find that this model absorbs the advantages of "flexible employment" and "sharing economy."

The essence of B2B is also a kind of flexible employment in the form of "odd job" in China (Daming, 1997). In the 1980s, township enterprises of China began to flourish and faced a shortage of skilled and productive professionals. As a result, township governments and enterprises rehired retired technicians and engineers on Sundays to help the enterprises. This was helpful in achieving an on-demand supply of technical and human resources during the special period. They were referred to as "Sunday Engineers" (Journal, 2020). In fact, this form of "odd job" is common at present. The subtle difference is that the "Sharing Employees" at the time of the COVID-19 crisis was a collective lease relationship established by two companies, not an individual and a company.

Flexible work is also used in international labor standards. Not only has it created a clear employment miracle since the economic crisis but also according to the Organization for Economic Cooperation and Development (OECD), it also provides a model for other European countries to follow (Rubery et al., 2016). Many Internet companies do not require their employees to clock in every day and do not have mandatory working hours. Some people with the appropriate professional skills can also work from home. Many companies need to hire an "odd job" by flexible employment policy during travel and peak seasons of the hotel (Krakover, 2000). In this sense, the concept of the "Sharing Employees" is closer to the "Gig Economy," but the process of the "Sharing Employees" is influenced by both companies rather than individuals.

In general, compared with the traditional employment relationship, the "Sharing Employees" model has the following advantages: first, the sharing of employees has greatly changed the traditional way of employment. The relationship between enterprises and employees is not only the employment relationship but also the relationship of sharing and cooperation; second, "Sharing Employees" solves the problems in the special epidemic period when allocating the labor forces among different enterprises and realizing the reasonable flow and optimal allocation of the labor force; third, the "Sharing Employees" mode avoids the intermediary mode in which the third-party human resource companies allocate the labor demand among enterprises, reduces the labor cost, invigorates the human capital of the enterprise, and enhances the manpower flexibility.

THE FORMING PRACTICAL BACKGROUND OF "SHARING EMPLOYEES"

At the beginning of 2020, due to the continuing impact of COVID-19, some Chinese enterprises that are temporarily unable to renew business are under great pressure to pay basic salaries for their employees (Liu et al., 2020). Companies affected by the epidemic have raised the level of innovation to survive (Wang et al., 2020). At the epidemic time, because of the surging demand for online shopping, there are plenty of vacancies for the position of stores staff and deliverers in online retail enterprises, hence the emergence of the new employment model of "Sharing Employees." From the perspective of the background of "Sharing Employees," it refers to the reasonable allocation of labor resources in different enterprises according to their needs in such a special economic environment of COVID-19, so as to achieve a win-win employment model among manpower dispatching enterprises, manpower "borrowing" enterprises.

The "Sharing Employees" model provides the job chance of more than 4 million catering workers in China. On January 23, 2020, under the influence of COVID-19, Wuhan city of China announced "Closure of the City," and then all provinces and cities in China successively initiated the first-level response to a major public health emergency (Zhao, 2020). Restaurants, hotels, entertainment, department stores, malls, and other business shut down within a few days. On February 3, Hema Xiansheng supermarket announced that it would accept some employees of Yunhaiyao Catering Company to work in the Hema store (Xi, 2020) and admit redundant employees from various industries. These employees will attend induction training and can only work after they pass the training. The decision of Hema was the prelude to a "Sharing Employees" business model in China.

With the online retail industry offering an olive branch to "Sharing Employees" in China, the "Sharing Employees" model has been producing new breakthroughs in various industries, gradually spreading from online retail industry to logistics, manufacturing, and other industries and expanding from Chinese first-tier cities to second- and third-tier cities. On February 8, Lenovo Group provided job positions related to computers, servers, and mobile phone assembling tasks, in an attempt to help small- and medium-sized enterprises survive the "winter" through the "Sharing Employees" model and solve the insufficient manpower in various Lenovo factories (Li, 2020).

The current new coronary pneumonia has caused serious economic consequences globally, and it seems that any country will be affected, which has led to huge changes in business and consumer behavior (Donthu and Gustafsson, 2020). Many developed countries are facing two-digit unemployment rates forcing people to seek unemployment benefits (Bong et al., 2020). As it reaches the low- and middle-income countries, its effects could be even more dire. It is estimated that the reduction in working hours by April 1, 2020 is equivalent to a reduction of 200 million full-time jobs in Europe (Yamin, 2020). The International Labor Organization estimates that in the second quarter of 2020, due to COVID-19, employment has fallen by 10.5%, which means the loss of 309 million full-time jobs (Ceylan et al., 2020).

Fighting a global pandemic requires large-scale cooperation. The problem is that, by definition, collaboration requires people to bear personal costs to benefit others. There is a conflict between short-term self-interest and long-term collective interests. In addition, in this epidemic, there are many groups (for example, family, community, national, and international) that can make cooperative decisions. From an evolutionary viewpoint, expanding self-interest to maintain and promote the welfare of family members should be a small step, because it improves the adaptability of genes. Therefore, a major issue is how to promote cooperation (Van Bavel et al., 2020). In fact, the epidemic has hit western economies with shops closing and more people facing unemployment. Therefore, it is necessary to strengthen the innovative cooperation between different enterprises at a special time. It is highly recommended to refer to the "Sharing Employees" method to relieve the unemployment pressure caused by the impact of COVID-19. On the one hand, this model can help enterprises with a large number of idle employees to relieve cost pressure and ensure cash flow; on the other hand, it can help some enterprises solve the "labor shortage" problem due to the sudden boom of business in the time of COVID-19 (Qian, 2020).

"SHARING EMPLOYEES": MODEL, METHOD, AND RISK

In special times, companies use the employee sharing approach. First, we must analyze the characteristics of the model; second, what methods are used to implement the model; and, in addition, the legal risks associated with the model. **Figure 1** shows the "Sharing Employees" model, methods, and risks.

B2B Model of "Sharing Employees"

The current "Sharing Employees" model on the market is a B2B format, where both the supplier and the recipient of the employee implement a share agreement. This model reflects a direct link between the two organizations. One party oversees the export of labor and the other is responsible for the import of labor. Both parties sign a secondment contract. Of course, they will face a lot of legal issues, such as the confirmation of labor relations, wages, and the responsible party after a work injury.

The first is the demand side, which can be a company or an organization. It can only be a demand party if it has a need and is willing to accept surplus employees from other organizations. After the outbreak, in many industries affected by COVID-19, such as take-out, supermarkets, and travel across the country, some employees could not return to work on time due to the prevention policy. However, many companies, such as Haima Xiangsheng and Suning Tesco, urgently needed more employees because of the surge in business volume. However, it is difficult to recruit suitable workers in the short term. Dozens of "Sharing Employees" demand programs of companies were launched one after another, becoming the main demand side.

FIGURE 1 | "Sharing employees" model, method, and risk.
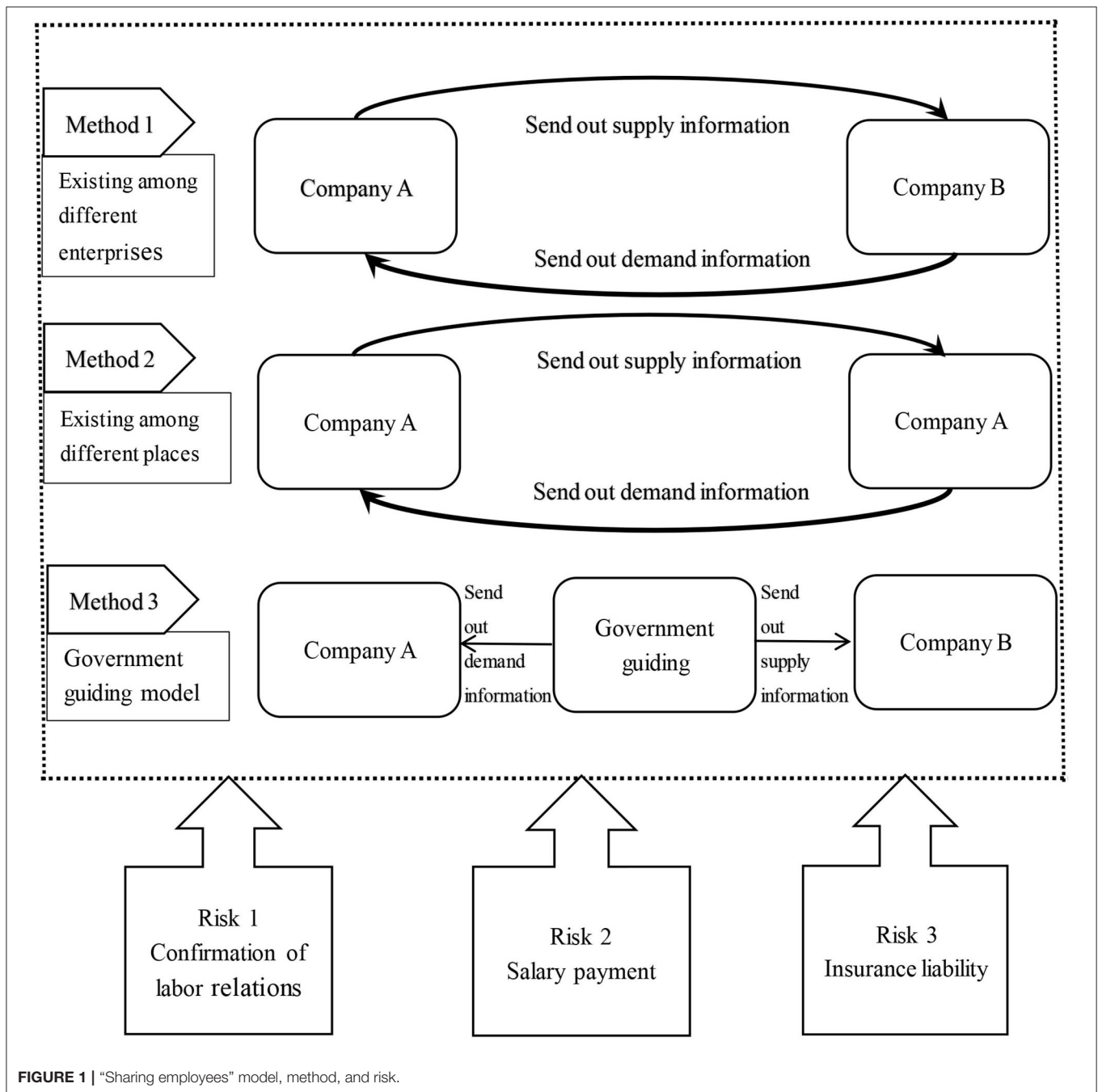
The second is the supply side, which can also be a company or an organization; after COVID-19, employees who are not on assignment stay at home and need to be paid by the company. To reduce labor costs, these companies are eager to join "Sharing Employees" programs, and employees are eager to join to increase their income. Companies with many redundant employees post information on labor supply, including the number of available employees, basic skills, suitable positions, and available hours. Through the exchange of information between the demand side and the supply side, the B2B model is established.

Three Ways to Realize the "Sharing Employees" Model

First, the "Sharing Employees" model exists among different companies. Haier Industrial Park in Hefei, China, an economic development zone, attracts 119 shared employees from other companies (58 from Anhui Century Jinyuan Hotel, 25 from Chotai Security, and 36 from Anhui Jinling Hotel).

Jingdong Logistics of China has also partnered with companies with redundant employees, such as Kawanka and Zhibang Kitchen Cabinet, and has taken on 24 shared employees from these companies.

Second, the "Sharing Employees" model exists in different work locations of the company. For example, Anhui Meiling Company in China had an increase in overseas orders and needed labor for its rapid production demand, but due to the pandemic, there were not enough employees returning. With the support of the local government, Anhui Meiling transferred 598 employees from Sichuan Meiling and 157 employees from Jiangxi Meiling through an internal "Sharing Employees" model. These measures realized the temporary mobility of shared employees in different workplaces within the group.

Third, the government participated in guiding the B2B program. The public administration of the government acted as an intermediary coordinator for the transfer of shared employees between different companies.

Legal Risks of The B2B Model

Confirmation of labor relations. The labor exporting company and its employees still maintain labor relationships, and the labor exporting company and the labor importing company do not need to obtain or pay labor dispatch fees under the B2B model. If the exporting company forcibly requires the employee to participate in the B2B plan, the employee has the right to terminate the labor contract and claim financial compensation; if the labor exporting company terminates the labor contract on the grounds that the employee does not agree to the "Sharing Employees" plan, it is considered as an illegal termination of the labor contract and should compensate the dispatched employee.

Wage payment. Under the B2B model, the main body of wage payment is established according to the agreement between the labor exporting company and the labor importing company. According to the legal secondment relationship, the labor importing enterprise generally pays wages to the labor exporting enterprise first, and the labor exporting enterprise then pays wages to the shared employees. Neither party may withhold wages belonging to the shared employee.

Identification of work-related injury insurance liability. Under the B2B model, the labor exporting company should bear the responsibility of work injury insurance because the labor relationship still belongs to the labor exporting company. After the work injury occurs, the labor exporting company is obliged to assist the employee to apply for work injury insurance treatment.

IMPLICATION ON HUMAN RESOURCE MANAGEMENT

At present, the researcher article is of interest to our current reincarnation as a "strategic partner" in organizations today. Sikora and Ferris proposed that the real problem facing strategic human resource management (HRM) is human resource (HR) implementation (Deadrick and Stone, 2014). The Human Resource Department acts as a strategic partner, focusing on the business operations of the entire company and changes in the

external environment. In the current social context, the spread of the new coronavirus has severely impacted the business of many companies. Some companies are understaffed, while others are overstaffed. Facing the changes in the external environment, HRM should make strategic arrangements and as a key role help their labor force cope with and adjust to their newly altered work environment (Carnevale and Hatak, 2020).

This study will further consider the alignment of HR functions, such as HR planning, recruitment, compensation, and employee relations, based on the B2B employment model. In the B2B model, employees are hired on a temporary basis. Shared employees experience some internal insecurities, such as feeling insecure about their employment, pessimistic about the future arrangement, and worrying about their lack of compensation insurance and pension benefits of workers (Feldman et al., 1994). Therefore, there is a need to regulate human resource management in both labor exporting and labor importing firms and to implement the B2B model. **Tables 1**, **2** provide a description of supply-side and demand-side HRM.

Human Resource Planning

Facing the epidemic situation, the uncertain factors of the future will increase, and human resource planning should be adjusted reasonably. Affected by COVID-19, the business of the company declined and cost-efficiency decreased. Cost-effective strategies tend to reduce production costs and achieve high-capacity utilization (Abdul-Halim et al., 2016). Based on the

TABLE 1 | The description of supply-side HRM.

Human resources planning	It is necessary to make advance human resource planning for redundant employees and contact companies with labor demand by the "Sharing Employees" method.
Salary and performance	Shared employees' wages during the "borrowing" period are borne by the "borrowing" company and paid by the dispatching company. They should be assessed although dispatched employees work mainly in the labor importing company.
Employment relationships	The two companies form a "Shared Employees" cooperation model through secondment method, and must sign a secondment agreement. Labor exporting enterprises should continuously purchase industrial injury insurance for shared employees.
Employee Psychological Counseling	The dispatching company should give psychological comfort to the shared employees. They can still return to the dispatching company after completing the work of borrowing company.
Training and career planning	The dispatching company to provide the previous training list, which can be used as a reference for the "borrowing" company. The acquiring multiple skills is also valuable to the career development of shared employees.
Establishment of sharing information platform	Enterprises with redundant employees deliver information, which can include shared employee's skills, age, and dispatching time
Communication between Dispatching and "Borrowing" Enterprises	The dispatching company should proactively pass past job performance of the shared employees to the "borrowing" company.

Human resources planning	Human resource demand should be planned, and actively seeking to contact companies with redundant employees to meet short-term business needs.
Salary and performance	It is necessary to inform of salary standards. Shared employees' wages during the "borrowing" period are borne by the "borrowing" company and paid by the dispatching company. A judicious assessment of the workforce value is useful.
Employment relationships	Labor importing enterprises purchase commercial insurance and inform them of industry characteristics and job requirements.
Employee psychological counseling	Workforce "borrowing" companies should assuage employee concerns of reasonable wages, fairness in performance assessment, on-job training, and labor security.
Training and career planning	It is necessary to deliver the relative training for shared employees to help familiarize themselves with the new workplace and job positions. Employees of the B2B model have acquired the skills of the dispatching company, and gained new job skills from the "borrowing" company.
Establishment of sharing information platform	"Borrowing" enterprises also actively searches for information about available shared employees by the on-line platform.
Communication between Dispatching and "Borrowing" Enterprises	The "borrowing" company should communicate with the dispatching company about their cultural adaptability, further considering whether to need some workforce reserves.

degree of the epidemic influence and the business decline, the human resource plan should be adjusted and implemented in stages. In the initial stage of COVID-19, epidemic damage was not severe and employees could work at full capacity. It is unnecessary to adjust the human resource management plan because there is no redundant or lack of workforce. As the impact of the epidemic has deepened, some countries, including the largest economy in the world, have required most of the businesses to close, limiting the opportunities for people to gather and move. These preventive actions have a direct and significant impact on both domestic and international companies (Liu et al., 2020). Business shrinkage leads to employee unemployment or reduces working hours, and at the same time, the business of some companies is soaring and urgently needs employees. It is necessary to make advance human resource planning for redundant employees and contact companies with labor demand by the "Sharing Employees" method.

Have a look at the demanding body of the human resources of the model. Surprisingly, because of the impact of the epidemic, the business of some companies has skyrocketed, requiring more employees but unable to recruit large amounts of labor in the short term. Human resource demand should be planned, actively seeking to contact companies with redundant employees to meet short-term business needs. On the one hand, it eases the pressure on short-term workforce shortage; on the other hand, the labor cost of dispatched enterprises is greatly reduced by the B2B method. Therefore, proper human resource planning will achieve a solution where everyone benefits.

Salary and Performance

The efforts of workers depend on their perception of whether they are treated fairly in an efficient wage model (Palley, 1994). Salary satisfaction and salary fairness are the most concerns of employees and employers (Suleiman, 2014). According to the "Sharing Employees" model, dispatched employees do not work in the dispatching company, and their income and benefits should be paid by the labor importing company. However, there is a case that working sometimes in the dispatching company or in the labor importing company. Both companies should calculate their income based on the labor amount. Both companies are obligated to make a reasonable explanation for their employees: the payment method and the calculation method of salary. About the job performance, if part of the working hours is in the dispatching company, the agreeing performance evaluation should also be calculated by the dispatching company. In daily performance evaluation, they should be fairly assessed although dispatched employees work mainly in the labor importing company.

As a labor force importing company, it is necessary to clarify salary standards and performance measurement methods when conducting induction training and stipulating contracts for dispatched employees. Although the labor forces exporting company and importing company belong to different industries, and the salary standards will also be different, it is necessary to inform them in advance. If not, it will cause a deviation from understanding salary policy and possibly form a new employment conflict. A judicious assessment of the workforce value is useful to cooperate better between both companies in the future.

Employment Relationships

In the B2B model, the two companies form a "Shared Employees" cooperation model through the secondment method and must sign a secondment agreement. It is possible that shared employees not only gain lower salaries and benefits than regular employees but also lack mature legal protection for labor relations. At the same time, there are also many disadvantages of recruitment, assessment, rewards, and punishments. A clear employment contract can reduce the factors of inequality, but we should also note that many employees judge the employment relationship through the perceived informal psychological contract rather than external regulatory obligations (Atkinson et al., 2016). Trust plays a central role, and it provides useful insights into modern employment relations.

Both parties must agree on their respective rights, duties, and responsibilities and explain job responsibilities, working time, salary calculation methods, safeguards, legal risks, and liability attribution. For example, labor accidents could occur during the "manpower lending." Labor exporting enterprises should continuously purchase industrial injury insurance for shared employees. At the same time, labor importing enterprises purchase commercial insurance, which is a useful supplement to work injury insurance. Enterprises with short-term workforce demand should present industry characteristics and job requirements to guarantee that the "borrowing" workers can effectively and quickly be competent for vacant positions.

Employee Psychological Counseling

Labor rights activists worry that odd jobs are associated with increased risks of workers, including unstable and demanding employment conditions (Spurk and Straub, 2020). Employees participating in the B2B program share the same concerns that once they participate in the "Sharing Employees" plan, they possibly lose the dispatching position of the company and are unable to adapt to the new position of the "borrowing" company. The dispatching company should give psychological comfort to the shared employees: according to the dispatching agreement, the dispatching plan is temporary rather than permanent, and eventually, they will return to the dispatching company. Workforce "borrowing" companies should assuage employee concerns of reasonable wages, fairness in performance assessment, on-job training, and labor security.

Short working hours can easily lead to these unsuitable working attitudes and low-work efficiency of employees, so influencing normal production. Because of social and family pressure, someone may often choose a long-term and stable job. When the epidemic is over, the enthusiasm of "Sharing Employees" is likely to be diminished (Mengdi, 2020). Furthermore, human resource management may make psychological counseling and health tracking plan to prevent psychological discomfort of employees and negative impact on their work when the shared employee is in service.

Training and Career Planning

It is necessary to deliver the relative training for shared employees to help familiarize themselves with the new workplace and job positions, understand the basic working procedures and work requirements, and operate necessary protection facilities. Staff whose line managers spent time discussing career plans, development opportunities, and training needs felt more engaged, listened to, and valued (Holmes, 2020). Since they have a different understanding of new positions and job procedures, they need to spend a lot of time familiarizing themselves with job responsibilities and products. Fitting training helps them quickly understand the business; otherwise, the operational flexibility should be influenced, and the duties of the position cannot be fulfilled quickly. It is also indispensable for the dispatching company to provide the previous training list, which can be used as a reference for the "borrowing" company, reduce the unnecessary training cost, and increase the training efficiency. Overall, training improves the qualifications, skills, and career development of employees, so it can have a positive impact on shared employees and organizations (Ma et al., 2020).

The COVID-19 epidemic is a career shock for many people across the world (Akkermans et al., 2020). The change of micro and macro boundaries is one of the important mechanisms of COVID-19 affecting individual professional behavior and career outcomes (Cho, 2020). Such training is also comparably valuable for shared employees, who gain additional experience to help pursue their chosen career paths. Workers need to adapt their careers to ever-changing demands and circumstances, a possible challenge for employees of traditionally stable organizations (Der Horst and Klehe, 2019). Employees of the B2B model have acquired the skills of the dispatching company and gained new job skills from the "borrowing" company. They can adapt to the previous company as well as the current company. It should be stated that acquiring multiple skills is also valuable to the career development of shared employees.

Establishment of Sharing Information Platform

"Shared employees" provide a new way to resolve the labor imbalance. Companies whose employees are in short supply cannot exchange workforce with other companies of surplus employees because the information is asymmetric. The peer-to-peer-based activity of sharing the access to coordinated services has been expected to alleviate societal problems (Hamari et al., 2016). The peer-to-peer platform could become an available tool for the purpose of workforce information sharing. The establishment of an information platform for shared employees should generally include the following three factors: idle resources, shared network platforms, and many participants, all of which are indispensable. A mature and perfect platform could match timely, fastly, and accurately workforce supply and demand parties with the help of digital technology and Internet big data.

Once online information platforms are developed well, it is helpful for both companies to use the platform to communicating and sharing employee information. The information platform can be built between enterprises or led by governments and institutions. The purpose of building an information platform is to exchange labor information. Enterprises with redundant employees deliver information, which can include shared skills, age, and dispatching time of employees; companies lacking employees can also post messages, which include the number of people in need, the required skills, salary, and "borrowing" time. Of course, "borrowing" enterprises also actively search for information about available shared employees by the online platform. The "Sharing Employees" platform also needs to establish a credit evaluation mechanism and open the credit scores of enterprises participating in the sharing plan. The mechanism may provide a reference basis for the cooperation between both parties.

Communication Between Dispatching and "Borrowing" Enterprises

There may be cultural in-adaptability of shared employees in the "borrowing" enterprises, which will result in low stability and high management costs. The "borrowing" company should communicate with the dispatching company about their cultural adaptability, further considering whether to need some workforce reserves.

In the traditional work model, performance evaluation is conducted in terms of moral character, knowledge, and ability, but in the "shared" model, the work is short-term and temporary. It is difficult to make an effective evaluation on shared employees, even if they complete the task as scheduled. It is suggested that the "borrowing" company should obtain past job performance of the shared employees from the dispatching company before starting employment.

Both employers need to clarify the rights and obligations in the secondment agreement. It is also required that both parties agree with the salary and payment standards of shared employees to avoid disputes. The "borrowing" enterprise arranges suitable positions according to the skills and job requirements of employees. Wages and benefits of shared employees are determined by working hours or the number of products. The wages of shared employees during the "borrowing" period are borne by the "borrowing" company and paid by the dispatching company.

The "Sharing Employees" model will make the relationship between enterprises and employees more complex, and multilevel labor relations will coexist. The existing labor laws and regulations are obviously insufficient for new-type labor relations and have weak control over possible complex disputes, especially those involving business secrets. If the labor dispute with the "borrowing" company is caused by leakage of business secrets, the "borrowing" company should also promptly give dispatching company feedback and seek a solution (Li, 2020).

PROSPECTS FOR THE B2B EMPLOYMENT MODEL

Starting with the COVID-19 epidemic, the "Sharing Employees" model will persist as the sharing economy evolves. This model contributes to the efficient use of labor and facilitates labor mobility between surplus and deficient labor companies. As the impact of COVID-19 deepens, it will permeate industries, regions, and countries. Currently, COVID-19 is spreading worldwide, with many employees facing unemployment while some industries are in desperate need of employees. This model has a clear effect on countries around the world to better utilize their workforce during the COVID-19 impact. It is foreseeable that the future society is a sharing economy society, and only resource-sharing can promote the maximum benefit of all parties. The labor force is the most valuable resource for enterprises. Labor, as one of the factors of production, can only be maximized by the most effective flow between enterprises. In the future, more people will face the world with flexible and free working conditions.

There is still a long way to go in the development of the B2B model, which may be adapted with a third platform (Mingliang, 2020). Some scholars point out that the B2B model can only be used as a contingency measure if it is only an inter-company labor allocation as being utilized in special periods. Overall, the "Sharing Employees" model has a stronger vitality by integrating social resources, enterprise resources, and employee resources through the online App. Once a networked platform is established, it will accelerate the more effective integration of labor resources. How to establish a third-party network-sharing platform dedicated to serving diversified enterprises and employees will become a new issue.

LIMITATIONS OF THE RESEARCH AND FUTURE RESEARCH DIRECTIONS

The idea of a B2B model of shared employees emerged with COVID-19, so there is not much literature on "Sharing Employees." This also leads to an inadequate exploration of the literature for this study. However, the authors have analyzed the B2B employment model from the sharing economy and flexible work arrangement literature. This study focuses on qualitative analysis, and quantitative analysis on this model is lacking. Due to the pandemic, business development has been affected, and it is difficult to collect and study the underlying business data.

Future research on the B2B employment model is needed. This research on the "Sharing Employees" model is applicable in the current COVID-19 crisis, but in the post-COVID-19 era, there is a need to examine how the model can continue to develop and function in the enterprise. In addition, this model is considered as an inspiration for HRM, and we need to further consider the psychological changes and responses of employees under this model.

CONCLUSION

While the COVID-19 pandemic is affecting economies around the world, the "Sharing Employees" model, which uses flexible employment methods, has eased social production difficulties in special times, and surplus labor has been placed in different industries. The "Sharing Employees" model, as a new and innovative way of employment in the sharing economy, has become a hot topic of social research. The three ways of shared employees effectively help enterprises to use shared labor flexibly, but the corresponding legal risks should not be ignored. The emergence of the sharing model has put forward new requirements for dispatching and "borrowing" companies, including human resource management planning, employee relations, pay and performance, information platforms, psychological counseling, and career planning. In the future, this model will be a long-term one, and it is a trend to realize the "Sharing Employees" model through commercial network platforms.

AUTHOR CONTRIBUTIONS

ZC contributed to conception and design of the study. He also contributed to manuscript revision, read, and approved the submitted version.

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Predicting Work-Life Conflict: Types and Levels of Enacted and Preferred Work-Nonwork Boundary (In)Congruence and Perceived Boundary Control

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In 2020, everyday life changed dramatically for employees worldwide as a result of the outbreak of the Covid-19 pandemic, where an estimated 558 million employees started working from home. The pandemic, therefore, marks a fundamental shift of individuals' work-nonwork boundaries, which can impact work-life conflict. In particular, the interplay between individuals' enacted boundaries (degree to which they separate/segment or blend/integrate work-nonwork), preferred boundaries (degree of preferred segmentation or integration of work-nonwork), and perceived control over work-nonwork boundaries, may relate to work-life conflict. This study, the first to the best of our knowledge, examines whether different types and levels of work-nonwork boundary (in)congruence matter for work-life conflict, and whether perceived boundary control moderates these relationships. Boundary (in)congruence represents the degree of (mis)fit between enacted and preferred segmentation or integration. Several types of (in)congruence are distinguished: "segmentation congruence" (enacting and preferring segmentation); "integration congruence" (enacting and preferring integration); "intrusion" (enacting integration but preferring segmentation) and "distance" (enacting segmentation but preferring integration). Data from 1,229 managers working in public and private organizations in Sweden was analyzed using polynomial regression analysis with response surface modeling and moderation analysis in SPSS Process. Findings showed that "integration congruence" was related with higher work-life conflict than "segmentation congruence." Moreover, a U-shaped relationship between incongruence and work-life conflict was found: the more incongruence, the more work-life conflict. Specifically, "intrusion" was related to higher work-life conflict than "distance." Finally, boundary control mitigated the effect of incongruence (especially "intrusion") on work-life conflict. From our findings, we may conclude that work-life conflict is impacted differently depending on the type and level of boundary (in)congruence. Particularly enacted and/or preferred integration may be problematic when it comes to work-life conflict, rather than just (in)congruence *per se*. Moreover, boundary control can be viewed as a key factor in combating work-life conflict, especially among individuals who

enact integration, but prefer segmentation. Taken together, our study contributes new and substantial knowledge by showing the importance for research and HRM-policies that take into account different types and levels of boundary (in)congruence, as these are associated with different levels of work-life conflict, which, in turn, are moderated by boundary control.

INTRODUCTION

In 2020, everyday life changed dramatically for employees worldwide, resulting from the outbreak of the Covid-19 pandemic. To mitigate the spread of the contagion, large numbers of employees, more or less over a night, made a mandatory transition to home-based telework, i.e., carrying on one's usual work-related duties from home through the use of information- and communication technologies (ICT) (Sullivan, 2003). Recent estimates pointed out that 558 million employees globally worked from home during the second quarter of 2020, accounting for 17.4% of the world's workforce (Soares et al., 2021). During Spring 2020, as a result of the Swedish Public Health Agency's recommendations on homeworking to reduce the spread of Covid-19, the number of employees working from home increased by 400% (Statistics Sweden, 2021a). Today, about 20% of all employees in Sweden work entirely from home, a ten-fold increase compared to before the pandemic. Only half of those had earlier experience with home working (The Swedish Internet Foundation, 2020). Moreover, a total of 42% of all employees now work from home at least part of their working hours (Statistics Sweden, 2021b), a number which is likely to increase in the wake of the pandemic (International Labour Organization [ILO], 2020; The Swedish Internet Foundation, 2020).

The developments in home-based telework clearly mark a fundamental shift regarding individuals' work-nonwork boundaries, carrying both opportunities and challenges (Wajcman et al., 2008; Peters et al., 2009; Allvin et al., 2013). On the one hand, home-based telework empowers workers by enhancing their autonomy to organize their work as to accommodate the demands of work and nonwork in accordance with their own needs and preferences. On the other hand, however, self-organizing may also put increased demands on managing the increasingly blurred boundaries between work and nonwork. Indeed, in connection to the ongoing Covid-19 pandemic where many employees globally started working from home for the first time (Kramer and Kramer, 2020), a loss of control over work-nonwork boundaries has been frequently reported (Fisher et al., 2020).

Studies on the interplay between work and nonwork commonly focus on whether individuals experience a balance between multiple roles, be it work-nonwork enrichment or conflict (Bellavia and Frone, 2005; Greenhaus and Powell, 2006). The latter refers to a form of inter-role conflict (Frone et al., 1997a) that occurs when work and nonwork demands are mutually incompatible (Greenhaus and Beutell, 1985; Geurts et al., 2005), hindering individuals' work and nonwork role

enactment and performance (Frone et al., 1997b; Michel et al., 2011), either due to a lack of time or to strain built up in the work domain spilling over into the nonwork domain (Geurts et al., 2005). This has important implications given that work-life conflict can have serious consequences for stress-related ill-health, particularly in the Scandinavian countries (Finland, Norway, and Sweden) (Borgmann et al., 2019). Ill-health, in turn, has been associated with subsequent productivity loss and societal costs due to increased sickness absenteeism (Schmidt et al., 2019). For example, between 2014 and 2019, levels of long-term sickness absenteeism among managers in Sweden were shown to have sharply increased due to stress-related psychological ill-health, resulting from increased work demands and a loss of control over work-nonwork boundaries (Previa, 2019).

The boundary management literature (Nippert-Eng, 1996; Ashforth et al., 2000; Clark, 2000) offers a fruitful perspective to explain work-life conflict. In this perspective, boundary management strategies are presented along a continuum ranging from high on segmentation (degree of separating work and nonwork) to high on integration (degree of blending work and nonwork). Moreover, it is acknowledged that, due to contextual factors (such as the current Covid-19 pandemic), individuals' actual behavior regarding the degree to which they segment or integrate work-nonwork, i.e., their enacted boundaries, are not always in line with their preferred boundaries, something which can have implications for their work-life conflict (Vaziri et al., 2020). In this context, work-life conflict is related to the degree of (in)congruence, or (mis)fit, between one's enacted and preferred boundaries (Ashforth et al., 2000; Kreiner, 2006; Chen et al., 2009; Ammons, 2013). Several types of (in)congruence can be distinguished: "segmentation congruence" (enacting and preferring a high level of segmentation); "integration congruence" (enacting and preferring a high level of integration); as well as "intrusion" (incongruence in terms of enacting more integration than preferred) and "distance" (incongruence in terms of enacting more segmentation than preferred).

The assumed relationship between (in)congruence and work-life conflict (Kreiner et al., 2009) suggests that congruence between one's enacted and preferred boundaries can reduce work-life conflict, whereas incongruence can increase work-life conflict. In view of this, it has been argued that it is important for individuals to be able to self-manage or self-control the transitions between their work and nonwork domains. This points to the importance of boundary control, defined as individuals' perceptions of control over their work-nonwork boundary transitions (Kossek et al., 2012). Having a high degree

of boundary control is believed to have the potential to reduce work-life conflict (Kossek et al., 2006, 2012).

However, it is not clear from the literature whether both types of congruence, that is, "segmentation congruence" and "integration congruence," have similar effects on work-life conflict. In other words, does it matter for work-life conflict whether congruence relates to segmentation or integration? Moreover, it is not clear whether both types of incongruence, that is, "intrusion" versus "distance," are equally detrimental for individuals' work-life conflict. Also, it is not clear whether or how a particular degree as well as type of incongruence relates to the degree of self-control individuals perceive to have over their work-nonwork boundaries. Perhaps the impact of incongruence on work-life conflict may be less detrimental when individuals perceive that they can control the timing and frequency of their work-nonwork boundary transitions (Kossek et al., 2012). For instance, being able to self-determine whether one is available for work outside formal working hours may mitigate the effect of incongruence on work-life conflict, hence representing a form of psychological empowerment (Spreitzer, 1995) in terms of autonomously motivated integration behavior which may meet an individual's basic psychological need for autonomy (Peters and Blomme, 2019).

This study, the first to the best of our knowledge, aims to contribute to the boundary management and work-life conflict literature by investigating the extent to which different types and levels of work-nonwork boundary (in)congruence relate to work-life conflict, and the extent to which boundary control moderates these relationships. Specifically, we examine whether (1) individuals' segmentation and integration congruence, respectively; and (2) incongruence in terms of "intrusion" and "distance," respectively, differently impact their experience of work-life conflict. In addition, we examine whether (3) boundary control can mitigate the effects of incongruence in terms of "intrusion" and "distance," respectively, on work-life conflict.

Enacted and Preferred Boundary Management

According to boundary theory, individuals' enacted and preferred boundary management strategies can be presented along a segmentation-integration continuum (Nippert-Eng, 1996; Ashforth et al., 2000). At one end of the continuum lies high segmentation, which characterizes individuals who enact and prefer, respectively, relatively strong, or impermeable, work-nonwork boundaries (Ashforth et al., 2000; Hecht and Allen, 2009). At the other end of the continuum lies high integration, which characterizes individuals who enact and prefer, respectively, relatively weak, or permeable, work-nonwork boundaries (Ashforth et al., 2000; Hecht and Allen, 2009). As such, segmentation refers to keeping various aspects of the work and nonwork domains separated from one another, whereas integration refers to the degree to which various aspects of work and nonwork are merged or blended (cognitively, behaviorally, and/or physically) (Nippert-Eng, 1996; Ashforth et al., 2000; Kreiner, 2006). In this context, individuals' role identity salience in terms of the importance they give to each of their multiple

life roles (Thoits, 1992), such as work and nonwork, is a motivating factor in the enactment of their preferred boundaries. Individuals who for instance have a highly salient non-work role are motivated to protect the nonwork domain from work-related permeations, i.e., "protection effect" (Capitano et al., 2017). Therefore, they create less permeable boundaries around the nonwork domain. In other words, they enact segmentation. In contrast, individuals who have a highly salient work role are motivated to enact that role in the nonwork domain, and therefore, create permeable boundaries around the nonwork domain, i.e., "enactment effect" (Capitano et al., 2017). As such, they allow work-related permeations into the nonwork domain, thus enacting integration. Related to this, a recent study showed that the strongest motivating factor for enacting integration was an individual's preference to integrate (Palm et al., 2020).

Both segmentation and integration are acknowledged to bring about costs and benefits. For example, segmentation can be beneficial when it comes to fulfilling work and nonwork roles (Dumas and Sanchez-Burks, 2015) and reducing work-life conflict (Powell and Greenhouse, 2010). However, in some cases, segmentation can lead to more work-life conflict, since integration, although more difficult, sometimes may be necessary in order to combine work and nonwork activities (Ashforth et al., 2000). More often, however, integration has been shown to be problematic, leading to, for example longer weekly work hours, poorer work-life balance (Mellner et al., 2014), more cross-role interruptions (Ashforth et al., 2000), more work-family conflict (Kossek et al., 2006; Matthews et al., 2014), and greater inter-role conflict (Bulger et al., 2007; Hecht and Allen, 2009). Hence, it can be argued that integration can create role blurring and work-nonwork conflict as individuals might find it more difficult to decide which role to pay attention to at a particular moment, which can create negative work-nonwork spillover (Ashforth et al., 2000).

Boundary (in)Congruence

Boundaries can be regarded as social constructions that are shaped both by individuals' desires and preferences and by cultural and institutional norms and practices (Moen and Chermack, 2005). As such, boundaries may or may not be consciously created by individuals, where structural conditions and norms in both the work and nonwork domains influence their enacted and preferred boundaries by offering possibilities, resources, constraints and/or demands which can either enhance or exacerbate perceptions of alignment, or boundary fit (Ammons, 2013). Thus, the boundary fit approach examines individuals' enacted and preferred boundaries, and subsequent perceptions of fit, as shaped by and within the overall environmental context (Ammons, 2013). The only (to the best of our knowledge) study adopting a boundary fit approach (Ammons, 2013) showed that men and parents of young children had better boundary fit than women and those without caregiving responsibilities.

Another approach that has been more widely used in boundary management research is the person-environment P-E (mis)fit perspective (Kulka, 1979; Kreiner, 2006). This perspective focuses on the interaction between the individual and the

environment and how this affects outcomes at the individual level. P-E (mis)fit has been defined as the congruence that occurs when employees and organizations are well matched (Kristof-Brown and Guay, 2011). It is assumed that when environmental conditions, such as workplace practices and norms, align with an individual's boundary preferences, this results in boundary congruence which is associated with lower work-life conflict (Kreiner, 2006; Derks et al., 2016). However, when environmental conditions do not align with individuals' boundary preferences, this results in boundary incongruence, which exacerbates work-life conflict (Ashforth et al., 2000; Kreiner, 2006; Chen et al., 2009; Kreiner et al., 2009). As such, various external (in)congruence sources (e.g., family members, superiors, subordinates, clients, and occupation) can either support or hinder individuals in enacting their preferred boundaries (Kreiner et al., 2009).

The present study looked into boundary (mis)fit, or (in)congruence, in terms of individuals' enacted and preferred boundaries which is in line with the boundary fit approach. As such, we did not take into account external (in)congruence sources (Kreiner et al., 2009) which would be in line with the P-E (mis)fit perspective. However, it can be argued that, as individuals' enacted and preferred boundaries are shaped by and within the environmental context (Ammons, 2013), in particular the ways in which boundaries are enacted can be regarded as a reflection of the possibilities, resources, constraints, and/or demands of the environment. Of course, there can be individual variations to some extent in how these external conditions are perceived and interpreted. This is supported by a recent study showing that the relationship between individuals' preference for permeable boundaries and their permeability behavior was attenuated by pressure from one's manager to prioritize work over nonwork (Capitano and Greenhaus, 2018). Therefore, we built our hypotheses, presented below, based on the concept of boundary (in)congruence (Kreiner et al., 2009) along Nippert-Eng's (1996) segmentation-integration continuum.

From the examples of (external) boundary (in)congruence as related to work-life conflict, it can, on the one hand, be expected that work-life conflict would be lower when there is congruence between individuals' enacted and preferred boundaries, irrespective of whether they enact and prefer segmentation or integration, as this reflects that the individual acts in line with his or her preferences (Kreiner, 2006). This would imply a non-linear relationship between boundary congruence and work-life conflict, such that work-life conflict would be expected to be lower when more congruence between individuals' enacted and preferred boundaries occurs. More specifically, both when individuals enact and prefer segmentation and when they enact and prefer integration, respectively, work-life conflict can be expected to be lower.

On the other hand, although work-nonwork boundary congruence *per se* can be expected to be associated with lower work-life conflict, it could be argued that also the type of congruence may affect the experiencing of work-life conflict. Hence, when there is "segmentation congruence," i.e., enacting and preferring a high level of segmentation, the impact of this type of congruence on work-life conflict may differ from that of "integration congruence," i.e., enacting and preferring a high

level of integration. Given that a large body of research has shown that both enacted and preferred integration can each have negative repercussions on various work-life outcomes (Ashforth et al., 2000; Bulger et al., 2007; Hecht and Allen, 2009; Mellner, 2016), including work-life conflict (Kossek et al., 2006; Matthews et al., 2014; Peters and Van der Heijden, 2019) and work-life balance (Mellner et al., 2014), it can be expected that individuals experience more work-life conflict when there is "integration congruence" in comparison with when there is "segmentation congruence." As such, when individuals enact integration by opting for a high degree of work-nonwork transitions to take place, it can be expected to be associated with higher levels of work-life conflict, as these transitions may create role blurring and individuals may find it more difficult to decide which role to pay attention to at a particular moment. Hence, enacting a high level of integration, even when it is the preferred strategy, can make it more difficult for individuals to prevent negative spillover between the work and nonwork domains. Consequently, this can lead to higher work-life conflict as compared to individuals who both enact and prefer a high level of segmentation. By considering boundary congruence, in line with Nippert-Eng's (1996) continuum, we can position segmentation on the higher end and integration on the lower end of this continuum and propose the following "differentiated boundary congruence hypothesis":

Hypothesis 1: *There will be a negative linear relationship between boundary congruence and work-life conflict, such that work-life conflict will be higher when there is "integration congruence," i.e., a high level of enacted and preferred integration, as compared to when there is "segmentation congruence," i.e., a high level of enacted and preferred segmentation.*

Moreover, individuals do not always enact their preferred boundaries, leading to boundary incongruence which reflects boundary violations in the form of either "intrusion" or "distance" (Kreiner et al., 2009). This raises the question of whether these different types of incongruence associate differently with work-life conflict. However, in line with the P-E (mis)fit perspective, it could be expected that both types of incongruence can be associated with relatively high levels of work-life conflict; when individuals do not act in line with their preferred boundaries, frustration may build up, which can lead to strain that can impact work-life conflict (Kreiner et al., 2009). This would indicate a U-shaped relationship between boundary incongruence and work-life conflict. In other words, the higher the degree of incongruence between the enacted and preferred boundaries, the more strain individuals can be expected to experience, which in turn could be associated with higher levels of work-life conflict. We thus propose the following "boundary incongruence hypothesis":

Hypothesis 2: *There will be a U-shaped relationship between boundary incongruence and work-life conflict, such that work-life conflict will be higher both when individuals experience "intrusion," i.e., enacting more integration than preferred, and*

when individuals experience "distance," i.e., enacting more segmentation than preferred.

The Moderating Role of Boundary Control

Boundary control represents individuals' psychological interpretations of their control over their boundary environment (Kossek et al., 2012). The concept of boundary control can be related to Karasek's (1979) job-strain model which posits that stress is prevalent when job demands exceed the degree of decision latitude needed by the individual to control these demands. Individuals with more boundary control are characterized by believing that they can control the timing, frequency, and direction of work-nonwork transitions to fit their preferences (Kossek et al., 2012). As such, boundary control can be regarded as individuals' perceived ability to manage the boundaries between their work and nonwork domains.

Previous findings have shown that boundary control has the potential to reduce work-life conflict (Chen et al., 2009; Kossek et al., 2012) and may even be more important than individuals' enacted and preferred boundaries, respectively, in relation to various work-life outcomes, such as work-life conflict. For instance, in an early study among teleworkers, Kossek et al. (2006) showed that the degree of boundary control was a stronger predictor of work-family conflict than work-nonwork integration. Another study among employees at a Swedish telecom company (Mellner et al., 2014) found that both a high preference for segmentation and high boundary control were each related to better work-life balance. This was particularly the case when a high preference for segmentation was combined with high boundary control. Moreover, Mellner (2016) showed that both high after-hours availability expectations, as a source of external (in)congruence (Kreiner et al., 2009), and enacted integration, in the form of work-related smartphone use during nonworking hours, were related to difficulties in letting go of work-related thoughts and feelings during leisure time, i.e., psychological detachment (Sonnentag and Fritz, 2007). Boundary control, however, was found to mitigate the effects of both after-hours availability expectations and work-related smartphone use during nonworking hours on psychological detachment (Mellner, 2016).

Currently, however, there is a lack of studies that simultaneously take into account boundary (in)congruence and boundary control. Thus, although previous studies have shown that enacted and preferred boundaries can each be associated with boundary control, and that all three concepts can be associated with work-life conflict, it remains unclear whether and how boundary control interacts with the effects of boundary (in)congruence on work-life conflict. Based on our second hypothesis, boundary incongruence will be detrimental to work-life conflict, and earlier findings regarding the importance of boundary control in relation to both enacted and preferred boundaries for various work-life outcomes, boundary control can be expected to moderate the relationship between boundary incongruence and work-life conflict. Moreover, given that previous findings have shown that integration can have negative repercussions of various work-life outcomes (Ashforth et al., 2000; Bulger et al., 2007; Hecht and Allen, 2009; Mellner et al., 2014), including work-family conflict (Kossek et al., 2006; Matthews et al., 2014; Peters and Van der Heijden, 2019), and that boundary control is an important factor in relation to various work-life outcomes (Mellner et al., 2014; Mellner, 2016), including work-life conflict (Kossek et al., 2006; Peters and Blomme, 2019), boundary control would be expected to mitigate the positive effect of boundary incongruence on work-life conflict especially in the case of "intrusion," i.e., enacting more integration than preferred. For instance, obliging others' (e.g., supervisors, colleagues, clients) actual and/or perceived expectations on being available for work outside of regular work hours when it is not in line with one's preferences for keeping work and nonwork separated, may have less of a detrimental impact on the experience of work-life conflict when it is accompanied by the perception that one can control the timing and frequency of these work-nonwork transitions (Kossek et al., 2012). This kind of situation could be argued to represent a form of psychological empowerment (Spreitzer, 1995) in terms of autonomously motivated integration (Peters and Blomme, 2019). In other words, when individuals feel that they are in control of their work-nonwork boundaries, and thus choose to conform to conditions in their environment by enacting integration even when it does not match their general preference for segmentation, less strain arises that could spill over into the nonwork domain, which in turn can be associated with lower work-life conflict. Based on this, we propose the following "boundary control moderation hypothesis":

> **Hypothesis 3:** *Boundary control will moderate the presumed positive effect of boundary incongruence on work-life conflict, such that when incongruence is accompanied by higher levels of boundary control, work-life conflict will be lower. In particular, the moderating role of boundary control is expected to be especially pronounced in cases of incongruence in terms of "intrusion," i.e., enacting more integration than preferred.*

MATERIALS AND METHODS

Sample and Procedure

A web-survey was anonymously responded to by 1,599 (60% study sample response rate) managers working in the public and private sectors in Sweden. The participants were recruited to the study through their union membership. In Sweden, a majority (72%) of all professionals, including managers, are unionized (Kjellberg, 2019). The respondents in the present study belonged to three different unions: (1) representing occupations within health and welfare (study sample $n = 605$); (2) representing occupations within civil servant organizations (study sample $n = 172$); and (3) representing a large variety of different occupations and organizations within the private sector (study sample $n = 822$). In a first step, the respondents were informed about the survey through their respective union member magazines where the first author of the present study was interviewed about the survey. Next, an email was sent through

the participating unions' internal member email systems to all members who held a managerial position. This email included information about the survey, that the member registry unit at the respective unions would conduct a random selection of managerial members to participate in the survey, and that the members therefore might receive another e-mail from their respective unions with an invitation to participate in the study. This second e-mail, sent to the randomly selected members, included information from the first author of the present study on that participation was voluntary and that the respondents could decide to withdraw their participation at any given moment without explanation, and furthermore, that their participation was anonymous and that the data would be treated confidentially in accordance with the Swedish law on public access to information and secrecy (The Swedish Government, 2009: 400). In this e-mail, there was also a link to the web-survey. This link was independent of the participating unions' network systems, but administered by a company that was also regulated by the Swedish law on public access to information and secrecy. This company provided an electronic web-survey tool. Finally, two reminders were sent via e-mail to all respondents, one after two weeks and one after one month. When the web-survey closed, all respondents' e-mail addresses were erased automatically by the electronic web-tool system, and the questionnaire responses were de-identified and replaced by a code. Hence, there was complete respondent anonymity regarding the participating unions, the web-survey company, as well as the authors of the present study. The participating managers represented different organizational levels (CEO's: $n = 200$; middle managers: $n = 1,288$; and expert managers such as manager of finance or personnel: $n = 111$). The analyses presented in this study included 1,229 respondents with complete data on all the study variables. In the study sample (see **Table 1**), 46% were male, and 39% was between 45 and 50 years old. Approximately 83% were cohabiting, 59% had children living in the household, and 96% worked full time. The questionnaire was in Swedish and all items for the measures used were translated from English by the first author of the present study and later back-translated into Swedish for accuracy verification by a native English- speaking professional translator.

Measures

Work-Life Conflict

The SWING scale (Geurts et al., 2005) was used to measure work-life conflict (9 items). Example item: "How often does it happen that your work obligations make it difficult for you to feel relaxed at home?." A 4-point Likert-type scale (1 = almost never; 4 = almost always) was used. The item response values were summated to create a scale where higher scores corresponded to higher levels of work-life conflict (Cronbach's $\alpha = 0.91$).

Enacted Boundary Management

The first five items from Kossek et al. (2012) work-life indicator scale were used to capture enacted boundary management (EBM), measured on a 5-point Likert-type scale (1 = strongly disagree; 5 = strongly agree). Example item: "I respond to work-related communications (e.g., emails, texts, and phone

TABLE 1 | Bivariate correlations, means, standard deviations, percentages, and alpha reliabilities for all study variables.

	1	2	3	4	5	6	7	8
1. WLC	1							
2. EBM	−0.50**	1						
3. PBM	0.17**	0.33**	1					
4. BC	−0.55**	0.48**	−0.06*	1				
5. Age (45–54)	−0.18**	0.13**	−0.03	0.09**	1			
6. Male	−0.04	−0.12**	−0.17**	−0.04	0.01	1		
7. Single	−0.02	0.02	−0.01	0	−0.01	−0.08*	1	
8. Children	−0.06*	−0.10**	0.01	−0.06*	−0.31**	0.02	0.12**	1
M	1.67	4.36	5.39	3.72	–	–	–	–
S.D.	0.60	1.45	1.54	0.98	–	–	–	–
Per cent	–	–	–	–	38.80%	46%	83%	60%
Alpha	0.91	0.84	0.9	0.91	–	–	–	–

WLC = Work-Life Conflict; EBM = Enacted Boundary-Management (high values = enacted segmentation); PBM = Preferred Boundary-Management (high values = preferred segmentation); BC = Boundary Control.
*p < 0.05; **p < 0.01 (2-tailed).

calls) during my personal time away from work." The item response values were reversed and summated to create a scale where higher scores corresponded to higher levels of enacted boundary management in terms of high enacted work-nonwork segmentation (Cronbach's $\alpha = 0.84$).

Preferred Boundary Management

To measure preferred boundary management (PBM), Kreiner's (2006) four-item scale for capturing desire for segmentation was used, measured on a 7-point Likert-type scale (1 = strongly disagree; 7 = strongly agree). Example item: "I prefer to keep work at the workplace." The item response values were summated to create a scale where higher scores corresponded to higher levels of preferred boundary management in terms of high preference for segmentation (Cronbach's $\alpha = 0.90$).

Boundary Control

The three boundary control items from Kossek et al. (2012) work-life indicator scale were utilized to capture this variable, measured on a 5-point Likert-type scale (1 = strongly disagree; 5 = strongly agree). Example items: "I control whether I am able to keep my work and personal life separate" and "I control whether I combine my work and personal life activities throughout the day." The item response values were summated to create a scale where higher scores corresponded to higher levels of boundary control (Cronbach's $\alpha = 0.91$).

Control Variables

We controlled for four variables: age (1 = under 35, 2 = 35-44, 3 = 45-54, 4 = older than 55), gender (female = 0, male = 1, other = 3, 4 = don't want to answer, where categories 3 and 4 were treated as missing data), marital status (0 = married or cohabiting, 1 = single, 3 = don't want to answer, where category 3 was treated as missing data), and children in the household (0 = no, 1 = yes, 3 = don't want to answer, where category 3 was treated as missing data), in our analyses, as these

variables could be expected to impact work-life conflict as well (Remery and Schippers, 2019).

Analyses

To reduce potential common method bias effects, we conducted several *a priori* analyses. We used a two-step approach, following Podsakoff and Organ (1986), in which we first conducted a one-factor test in which all items measuring the principal constructs were entered into a principal component factor analysis, using the extraction method without rotation for one fixed factor (SPSS version 24 for Windows). The results showed that one factor explained less than 50% of the variance (36.85%), providing an initial indication of no common method variance (CMV) (Harman, 1976). Second, we tested the correlation between the constructs, which should be less than 0.9 (Bagozzi et al., 1991). **Table 1** shows that the highest correlation between any two constructs was −0.55 (between work-life conflict and boundary control). Hence, no indication of CMV was found in the data.

To test the (in)congruence hypotheses, polynomial regression analysis and response surface modeling was used (Edwards and Parry, 1993). The scales were rescaled to use the same scale for both enacted and preferred boundary management, and the scales were also centered to reduce multi-collinearity between the component measures, that is, enacted and preferred boundary management, and their associated higher order terms (Aiken and West, 1991).

To test the boundary control moderation hypothesis, we applied the block variable approach suggested by Cable and Edwards (2004). This involves obtaining a single coefficient that summarizes the effects of a set of conceptually related variables (ibid.). In this study, to test the U-shaped relationship between incongruence based on the preferred (X-variable) and enacted (Y-variable) boundaries and their product term (X*Y) and squared values (X^2 and Y^2), we constructed a block variable by first regressing the dependent variable, work-life conflict, on the five polynomial terms (X, Y, X*Y, X^2 and Y^2) presented above. We then used the respective weights, which were the estimated regression coefficients in the polynomial regression ($b_1X + b_2Y + b_3X^2 + b_4XY + b_5Y^2$) and combined the five terms into a block variable as a weighted composite that summarized the effects of enacted/preferred boundary incongruence on work-life conflict (Edwards and Cable, 2009).

To assess the joint impact of enacted and preferred boundaries on work-life conflict, it is important to take levels of enacted and preferred boundaries into account. Similarity patterns are used to assess different types of similarities between pairs of predictor variables. Such patterns are based on two main assumptions: that there is an optimal match between two variables (such as enacted and preferred boundaries), and that deviation from this optimal match leads to less optimal outcomes, with bigger deviations having more impact on the outcomes. Therefore, by utilizing similarity patterns, it can be estimated whether there is an optimal level of similarity between enacted and preferred boundaries when predicting work-life conflict. Polynomial regression analysis can be used to investigate the linear effects of predictor variables, the quadratic effects of predictor variables, and the effects of the interaction between the predictor variables. Specifically, an intercept (b0), a linear (b1), and quadratic (b3) effect of enacted boundaries, a linear (b2) and quadratic (b5) effect of preferred boundaries, and an interaction between the linear effects of enacted and preferred boundaries (b4) can be estimated.

Due to the combination of quadratic terms and an interaction term, interpretations of polynomial regressions are notoriously difficult. To facilitate interpretation, response surface analysis has been developed (Edwards and Parry, 1993; Rhoades Shanock et al., 2010). Response surface analysis provides a visual representation of the outcomes of polynomial regressions based on similarity and dissimilarity between two variables. In the present study, the x-axis indicates the level of enacted boundaries, the y-axis indicates the level of preferred boundaries, and the z-axis indicates the level of work-life conflict.

Two parameters (*a*1 and *a*2) represent effects along a line of congruence (similarity). In our study, the line of congruence is the line where enacted boundaries and preferred boundaries have similar scores. They indicate a linear slope (*a*1) and a quadratic slope (*a*2) for the effect of congruence between enacted and preferred boundaries on work-life conflict. Thus, a finding of significant effects would indicate that congruence impacts work-life conflict. Other linear (*a*3) and quadratic (*a*4) terms indicate whether there is a dissimilarity effect of enacted and preferred boundaries on work-life conflict, along a line of incongruence. The linear slope effect (*a*3) indicates the likelihood for higher work-life conflict when the enacted boundaries are higher than the preferred boundaries on work-life conflict. The quadratic effect (*a*4) indicates whether work-life conflict is especially likely at high or low levels of dissimilarity. Thus, a finding of significant effects would indicate that incongruence impacts work-life conflict.

Lastly, we conducted moderation analysis using the PROCESS macro (Hayes, 2013) in SPSS, with the block variable "boundary incongruence" as the independent variable, boundary control as the moderating variable, and work-life conflict as the dependent variable. We examined the conditional effects using bootstrap as a bias-correction percentile method with 10,000 samples (Cable and Edwards, 2004) and calculated bias-corrected confidence intervals (Edwards, 2002). The proposed moderation is supported if the confidence interval of the indirect effect does not include zero.

RESULTS

Preliminary Analyses

In **Table 1**, the correlations and descriptive statistics of the study variables are presented.

Hypothesis Testing

Table 2 shows the results of the polynomial regression analysis. Hypothesis 1, the differentiated boundary congruence hypothesis, predicted a negative, linear relationship between boundary congruence and work-life conflict, where levels of congruence were positioned on a continuum from "segmentation congruence" (high) to "integration congruence" (low). The

TABLE 2 | Polynomial regression analysis results of Preferred and Enacted Boundary Management, respectively, and their interaction, i.e., Boundary Management (in)Congruence, predicting Work-Life Conflict.

Outcome variable	WLC
Constant	1.759 (30.51)*
Age (45–54)	−0.09 (−3.95)*
Male	−0.06 (−2.77)*
Single	−0.01 (−0.48)
Children	−0.04 (−1.64)
EBM Centered (x)	−0.51 (−14.23)*
PBM Centered (y)	0.28 (8.92)*
EBM Squared	0.16 (6.24)*
Enacted (x)*Preferred (y) Boundary Management	−0.21 (−5.79)*
PBM Squared	0.05 (1.80)
F	97.17
Df	3–1220
R^2	0.42
Congruence (enacted-preferred congruence line)	
Slope (*a*1)	−0.10 (0.02)*
Curvature (*a*2)	0.01 (0.01)
Incongruence (enacted-preferred incongruence line)	
Slope (*a*3)	−0.33 (0.02)*
Curvature (*a*4)	0.09 (0.01)*

WLC = Work-Life Conflict; EBM = Enacted Boundary Management (high values = enacted segmentation); PBM = Preferred Boundary Management (high values = preferred segmentation); BC = Boundary Control.
*N = 1,229. *p < 0.001; the values reported are standardized beta coefficients; standard errors are in the parentheses.*

congruence line of the response surface for enacted and preferred boundaries had a significant negative linear slope (*a*1) (*b* = −0.10, *p* < .01). This indicates that work-life conflict was higher for "integration congruence," and lower for "segmentation congruence," thus supporting Hypothesis 1. In **Figure 1**, this is visualized by the dashed line running from the bottom left-hand corner, where both enacted and preferred boundary management is low (i.e., "integration congruence"), to the top right-hand corner, where both enacted and preferred boundary management is high, (i.e., "segmentation congruence"). It shows that the "integration congruence" is situated in the area where work-life conflict is higher (ranging from 2 to 3) whereas the "segmentation congruence" is situated in the area where work-life conflict is lower (ranging from 1 to 2). Hence, even though all points along the congruence line represent boundary congruence, "integration congruence" was found to be associated with higher levels of work-life conflict than was "segmentation congruence."

Hypothesis 2, the boundary incongruence hypothesis, predicted a U-shaped relationship between boundary incongruence and work-life conflict. To test Hypothesis 2, we used the computed block variable "boundary incongruence," using the estimated coefficients to predict work-life conflict. As expected, the incongruence line of the response surface for enacted and preferred boundary management had a significant positive curvature (*a*4) (*b* = .09, *p* < .01) (see **Table 3**). This indicates that higher work-life conflict was associated with boundary incongruence toward both extremes of the boundary

management incongruence continuum, that is, both when there was "intrusion" and when there was "distance," thus lending support for Hypothesis 2. This is presented in **Figure 1**, where the continuous line of incongruence runs from the upper left-hand corner, where enacted boundary management is low (high level of enacted integration) and preferred boundary management is high (high level of preferred segmentation), that is, "intrusion," to the lower right-hand corner, where enacted boundary management is high (high level of enacted segmentation) and preferred boundary management is low (high level of preferred integration), that is, "distance." Moreover, it shows that the "intrusion" incongruence is situated in the area where work-life conflict is higher (ranging from 4 to 5), whereas the "distance" incongruence is situated in the area where work-life conflict is lower (ranging from 1 to 2).

The above was further confirmed as, unexpectedly, the incongruence line of the response surface for enacted and preferred boundary management also had a significant negative slope (*a*3) (*b* = −0.33, *p* ≤ 0.01) (see **Table 3**). This implies a linear relationship: work-life conflict was higher for "intrusion" than for "distance." Thus, the findings showed support not only for Hypothesis 2, which predicted that work-life conflict would be associated with boundary incongruence toward both extremes of the boundary incongruence continuum, but they also evidenced what can be labelled as an effect of *differentiated* boundary incongruence on work-life conflict.

Taken together, the overall patterns of boundary (in)congruence are shown in **Figure 2**, which presents the response surface of work-life conflict at different types and levels of boundary (in)congruence. As can be seen in the upper left-hand corner, the highest levels of work-life conflict (ranging from 3 to 5), were found in the case of incongruence in terms of "intrusion," i.e., enacting more integration than preferred, followed by "integration congruence," i.e., enacting and preferring a high level of integration (work-life conflict ranging from 2.5 to 3). Next, incongruence in terms of "distance," i.e., enacting more segmentation than preferred, was associated with work-life conflict (ranging from 1.5 to 2). The lowest levels of work-life conflict (ranging from 1 to 1.5), as can be seen in the lower right-hand corner, were found in the case of "segmentation congruence," i.e., enacting and preferring a high level of segmentation.

Finally, Hypothesis 3 predicted that boundary control would moderate the effect of boundary incongruence on work-life conflict, especially in the case of "intrusion," i.e., enacting more integration than preferred. To examine the moderating effect of boundary control on the relationship between incongruence and work-life conflict, we generated 95% bias-corrected confidence intervals (Preacher and Hayes, 2004) for the hypothesized conditional effects. As can be seen in **Table 3**, the direct effect of the block variable "boundary incongruence" on work-life conflict, before the inclusion of boundary control as moderator, was significant and positive (*b* = 4.70, *p* < 0.001). Furthermore, the effect of the interaction between boundary incongruence and boundary control on work-life conflict was also significant and negative (*b* = −0.34, *p* < 0.05), indicated by the confidence interval from the bootstrap analysis excluding zero

FIGURE 1 | Graphical aid for interpreting congruence and incongruence lines in the response surface.
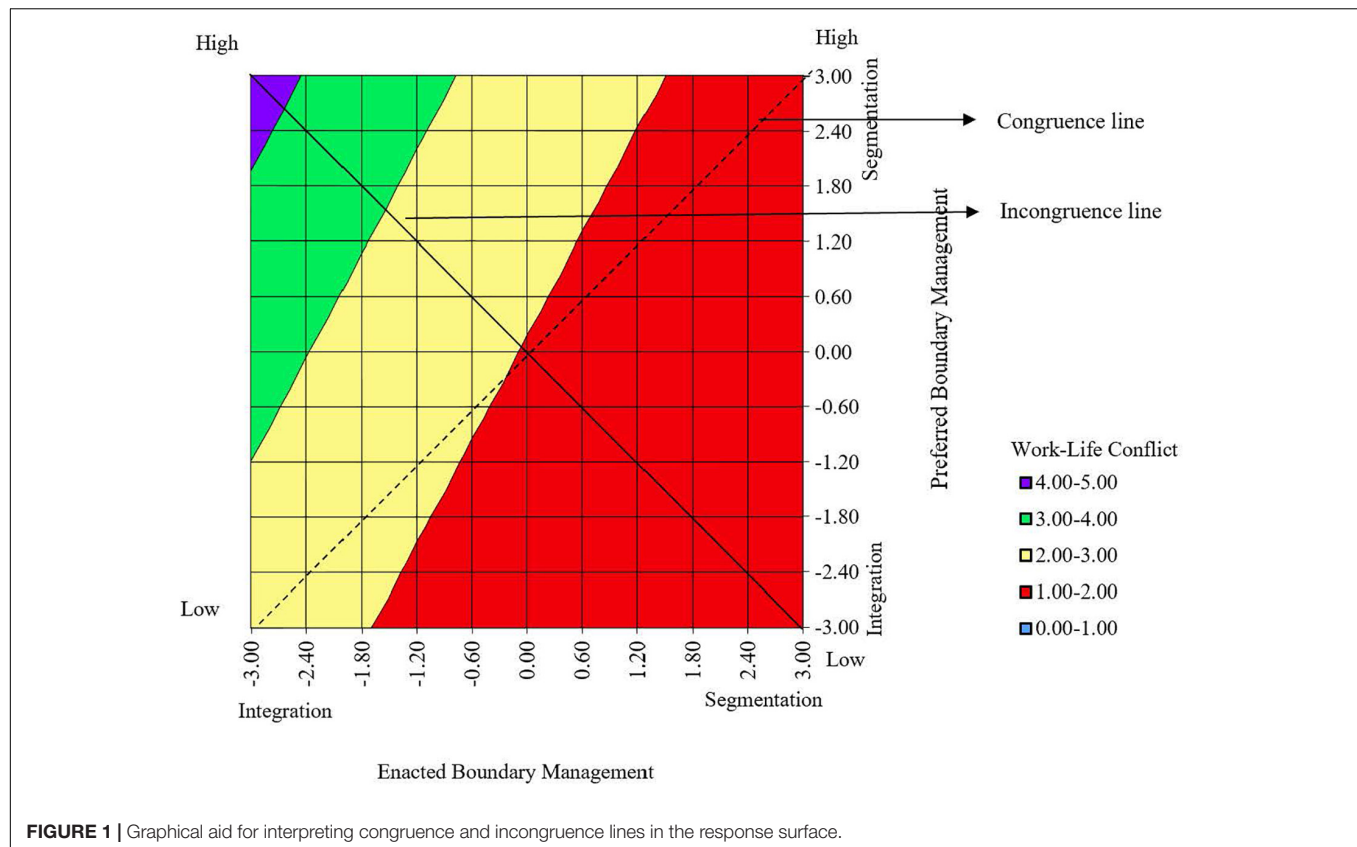
[−0.6268, −0.0481]. These findings lend support to Hypothesis 3 as boundary control was shown to mitigate the effects of boundary incongruence on work-life conflict, especially when "intrusion" was accompanied by high levels of boundary control. See **Figure 3**.

DISCUSSION AND CONCLUSION

The present study examined whether different types and levels of boundary (in)congruence impact differently on work-life conflict, and if different types and levels of boundary incongruence relate to perceived level of self-control with regard to managing work-nonwork boundaries.

Boundary congruence was associated with lower work-life conflict as compared to boundary incongruence. Although it was not specifically addressed in any of our hypotheses, this finding could be expected from a P-E (mis)fit perspective (Kristof-Brown and Guay, 2011), as has also been shown in previous studies (Kreiner, 2006; Derks et al., 2016).

However, as our aim was to move beyond the study of boundary (in)congruence *per se*, we instead focused on whether type and level of (in)congruence played a role in the degree of work-life conflict experienced.

Indeed, as expected from our first hypothesis, "integration congruence" was more positively associated with work-life conflict than "segmentation congruence." Thus, even when there was boundary congruence, this finding reveals that the

specific type of congruence matters, as "integration congruence" was shown to be positively associated with work-life conflict compared to "segmentation congruence." As such, our findings further those of previous studies, which have shown that both

TABLE 3 | Moderation analysis results with the PROCESS macro of the block variable Boundary Management Incongruence predicting Work-Life Conflict, with Boundary Control as a moderator.

Outcome variable	WLC	
Predictor	**B**	**p**
Intercept	2.45 (0.08)	0
BMI	4.70 (0.50)	0
BC	−0.18 (0.02)	0
BMI*BC	−0.34 (0.15)	0.02
Age (45–54)	−0.06 (0.01)	0
Male	−0.08 (0.03)	0
Single	−0.03 (0.03)	0.43
Children	−0.04 (0.03)	0.1
Model R^2	0.49	
F	166.1	0

WLC = Work-Life Conflict; BMI = Boundary Management Incongruence (low = "distance," i.e., enacting segmentation, but preferring integration; high = "intrusion," i.e., enacting integration, but preferring segmentation); BC = Boundary Control.
N = 1,229. The coefficients reported are unstandardized; standard errors are in the parentheses.
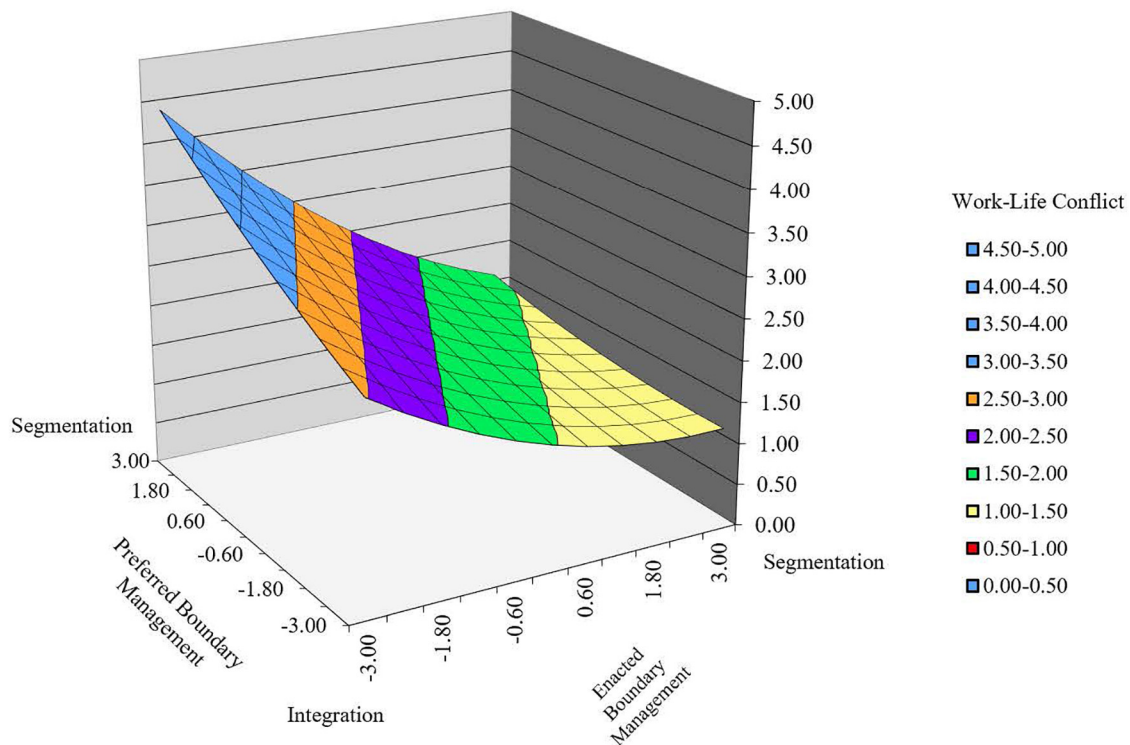
FIGURE 2 | Response surface with associated lines of congruence and incongruence of the polynomial regressions for enacted boundary-management and preferred-management explaining work-life conflict.
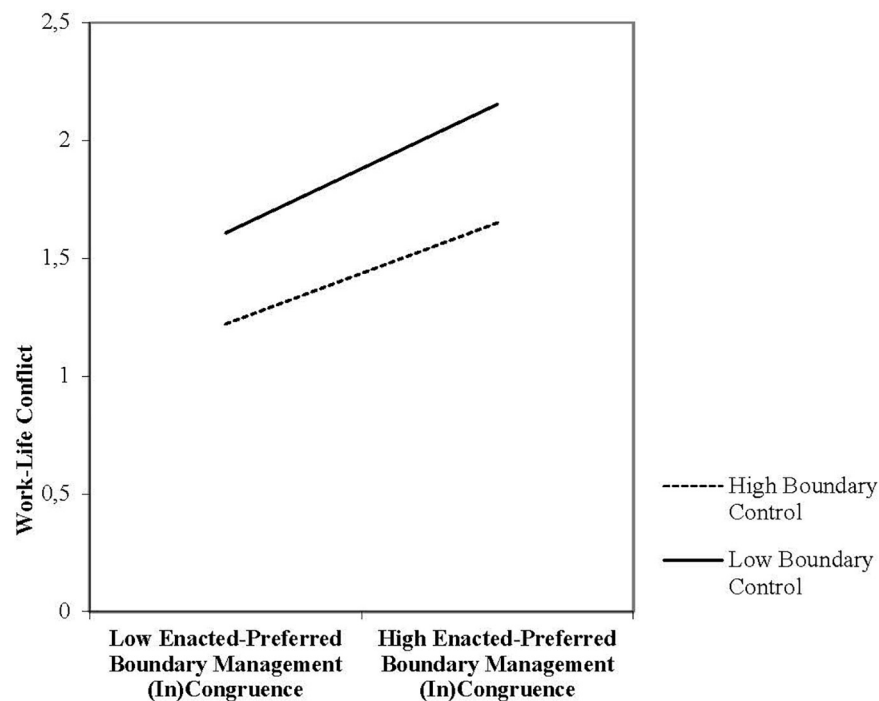
FIGURE 3 | Moderation of the effect of Boundary Management Incongruence (on a continuum from low = "distance" to high = "intrusion") Work-Life Conflict at values of the moderator Boundary Control.

enacted and preferred integration can be associated with negative effects on various work-life outcomes (Ashforth et al., 2000; Bulger et al., 2007; Hecht and Allen, 2009; Mellner et al., 2014; Mellner, 2016), including work-life conflict (Kossek et al., 2006; Matthews et al., 2014; Peters and Van der Heijden, 2019). This was done by showing that enacted integration can be problematic in terms of higher work-life conflict, even when this is in line with one's preferred boundaries, that is, when there is "integration congruence." One explanation that has been put forth regarding the impact of integration on work-life conflict is that integration may create role blurring and conflict between work and nonwork roles, as individuals might find it more difficult to decide which role they should pay attention to at a particular moment, which makes it difficult for them to prevent negative spillover from work into nonwork (Ashforth et al., 2000). Extending this explanation, based on our findings, it seems that the positive association between enacting a high level of integration and work-life conflict, i.e., higher work-life conflict, overrides the negative association between congruence and work-life conflict, i.e., lower work-life conflict, but only in the case of "integration congruence." This was further underscored by the fact that "integration congruence" was associated with some of the highest levels of work-life conflict, whereas "segmentation congruence" was associated with the lowest levels of work-life conflict.

When it comes to boundary incongruence, we found a U-shaped relationship between boundary incongruence and work-life conflict. Work-life conflict was higher in relation to both "intrusion," and "distance." This was in line with our second hypothesis, based on the expectation that when individuals do not act in line with their preferred boundaries, this represents boundary violations that may cause the building up of frustration, which can lead to strain that can increase work-life conflict (Kreiner et al., 2009). Unexpectedly, however, the different types of incongruence were also found to associate differently with work-life conflict. Specifically, "distance" was shown to have a weaker association with work-life conflict than "intrusion." Interestingly, "distance" was associated with the next lowest levels of work-life conflict, after "segmentation congruence." As such, our findings go beyond those of earlier studies, which have shown that both enacted and preferred segmentation are each generally more beneficial when it comes to fulfilling work-nonwork roles (Dumas and Sanchez-Burks, 2015), being associated with lower work-life conflict (Powell and Greenhouse, 2010; Peters and Van der Heijden, 2019) and higher work-life balance (Mellner et al., 2014). More specifically, by taking enacted and preferred boundaries into account simultaneously, it was shown that enacting segmentation, even when doing so was incongruent with one's preferred boundaries, was associated with lower work-life conflict. This suggests that the positive impact of incongruence on work-life conflict, i.e., higher work-life conflict, is counteracted, i.e., managers experienced less work-life conflict when enacting a higher level of segmentation although preferring more integration, i.e., "distance." Hence, although one is not acting in line with one's preferred boundaries, enacted segmentation appeared to be negatively associated with work-life conflict, i.e., lower work-life conflict, which overrides the positive association between incongruence and work-life

conflict, i.e., higher work-life conflict. In contrast, enacting integration, especially when this was incongruent with one's preferred boundaries, i.e., "intrusion," was associated with the highest levels of work-life conflict. This may be explained by that the positive association between boundary incongruence and work-life conflict, i.e., higher work-life conflict, is exacerbated when enacting a higher level of integration although preferring more segmentation, i.e., "intrusion." Thus, when not acting in line with one's preferred boundaries, the detrimental impact of enacted integration on work-life conflict, i.e., higher work-life conflict, seems to make one more vulnerable to the positive impact of incongruence on work-life conflict, i.e., higher work-life conflict.

Finally, in line with our third hypothesis, we found that perceived boundary control mitigated the positive relationship between boundary incongruence and work-life conflict; when incongruence was accompanied by higher levels of boundary control, work-life conflict was lower. This was especially the case with regard to "intrusion" as compared to "distance" – a finding that was also in line with our expectations. Our findings extend those from earlier studies showing that boundary control is important for various work-life outcomes (Mellner et al., 2014; Mellner, 2016), including work-life conflict (Kossek et al., 2006; Peters and Blomme, 2019); low boundary control is associated with enacted integration (Leonardi et al., 2010; Dumas and Sanchez-Burks, 2015; Mellner, 2016); and high boundary control is associated with both enacted (Ashforth et al., 2000; Peters and Blomme, 2019); and preferred segmentation (Mellner et al., 2014). More specifically, although previous studies have shown that enacted and preferred boundaries can each be associated with boundary control, and that all three concepts can be associated with work-life conflict, we simultaneously took into account boundary incongruence and boundary control, by examining whether and how boundary control interacts with the effect of boundary incongruence on work-life conflict. In doing this, we showed that boundary control is an important factor that can reduce the strain associated with boundary incongruence, especially in the case of "intrusion." One potential explanation for this particular kind of situation is that boundary control can reflect a form of psychological empowerment (Spreitzer, 1995) in terms of autonomously motivated integration (Peters and Blomme, 2019). In other words, when individuals feel that they are in control over the timing and frequency of work-nonwork transitions (Kossek et al., 2012), and thus choose to conform to conditions in their environment by enacting integration even when it does not match their general preference for segmentation, less strain arises that could spill over into the nonwork domain, which in turn can be associated with lower work-life conflict.

Strengths, Limitations, and Future Research

The present study can be seen as a strong contribution to the literature on boundary management and work-conflict, as it is one of the first to investigate the interplay between individuals' enacted and preferred boundaries through examining the effects

of different types and levels of boundary (in)congruence on work-life conflict, and the moderating role of boundary control in these relationships. Moreover, our study included 1,229 managers within different occupations and organizations in both the private and public sector. As such, one of the limitations of much work-nonwork research where samples are drawn from one occupation or one organization reducing the generalizability of the findings (Kossek and Ozeki, 1998 in Kreiner, 2006) was overcome. In addition, the inclusion of several occupations and organizations lends the findings additional strength as (in)congruence needs to be investigated in various environments and settings (Ostroff and DuBois, 1993 in Kreiner, 2006).

Despite the contributions of our study, there are limitations that should be acknowledged. First, our study was based on cross-sectional, single source data. However, we employed procedural remedies (Podsakoff et al., 2003) to stave off potential problems that might arise from having a common rater. We also used measures from established questionnaires which were found to have good psychometric properties. Moreover, the items for different measures had different scale anchors. This reduces the risk of adopting a personal response style irrespective of the item content. Second, related to the use of cross-sectional data, longitudinal processes, including causal inferences, cannot be made. Moreover, we did not include measures of role salience identity, i.e., the importance, in terms of norms, values, beliefs, and goals, that individuals attach to their role identities (Thoits, 1992; Settles, 2004), where people may be either "work centric" or "nonwork centric." However, it is reasonable to assume that, in modern working life, with its increasing numbers of dual-earner couples and where many men and women have multiple work and nonwork roles (Ferrarini and Duvander, 2010; Kossek et al., 2012), a large proportion of individuals will be "dual centric," i.e., they identify strongly with both their work and nonwork roles. This can be expected to be the case in the present study as 96% of the participants were working full-time, 83% were cohabiting, and 59% had children living in the household.

Based on the findings of the present study, it would be of interest for future research to focus on identifying factors in the environmental context, such as (actual and/or perceived) possibilities, resources, constraints and/or demands in both work and nonwork, that may be related to different types and levels of boundary (in)congruence regarding individuals' enacted and preferred work-nonwork boundaries. Also, since boundary control can be viewed as a key factor in the relationship between boundary incongruence and work-life conflict, future studies may be concerned with how perceptions of boundary control are associated with the interplay between different types and levels of incongruence and related identified factors in the environmental context.

Moreover, previous research on work-life balance, in terms of both enrichment and conflict (Bellavia and Frone, 2005; Greenhaus and Powell, 2006), has either investigated enrichment or conflict separately or focused on bidirectional associations and used cross-sectional data (LaPierre and McMullan, 2016; Allen et al., 2019). Therefore, it would be of interest for future studies to examine changes of individual profiles of work-life balance, both enrichment and conflict taken together, over time

that account for intra-individual variability (Eby et al., 2016). This kind of research could answer questions concerning whether and how individuals transition between enrichment and conflict, and why some individuals experience lower enrichment and/or greater conflict while others experience increased enrichment and/or reduced conflict in relation to boundary (in)congruence, perceived boundary control, and the environmental context.

Finally, there is a current lack of understanding of the embeddedness of individuals' response patterns regarding conditions of boundary (in)congruence, as well as of perceptions of boundary control, within the context of individual differences. Traditionally, work-nonwork researchers have treated individual differences as control variables rather than as aspects of work-nonwork processes that may be important in their own right (Eby et al., 2005). For instance, in the light of large numbers of employees worldwide having made a transition to mandatory home-based telework during the ongoing Covid-19 pandemic with related reports of loss of work-nonwork boundaries (Fisher et al., 2020), little attention has previously been paid to the association between the interplay between gender, marital status and parenthood taken together, and home-based telework (Asgari et al., 2014; Paleti, 2016). However, one recent study showed that the presence of children at home during voluntary home-based telework increased work-life conflict and aggravated gender differences (Zhang et al., 2020). Thus, one promising avenue for future research would be to utilize more comprehensive models that are able to take individual differences into account leading to findings that may be able to increase our understanding of the individual nature of work-nonwork boundary management processes.

Conclusion and Implications

Several important conclusions can be drawn from of our findings. First, work-life conflict is impacted differently depending on the type and level of boundary (in)congruence, rather than just (in)congruence *per se*. Specifically, enacted and/or preferred segmentation can be regarded as beneficial in terms of reduced work-life conflict. In contrast, enacted and/or preferred integration can be regarded as problematic in terms of increased work-life conflict. Second, when individuals perceive that they have the agency needed to decide how to interact with their own work-nonwork boundaries, i.e., boundary control, the detrimental effects of particularly boundary incongruence in terms of "intrusion" on work-life conflict can be mitigated.

Our study has important implications for human resource practices within organizations, as todays' working life is characterized by increased opportunities as well as challenges related to the self-organization of one's work (Wajcman et al., 2008; Peters et al., 2009; Allvin et al., 2013), including demands on managing increasingly blurred work-nonwork boundaries. This is particularly the case given that telework, which during the current Covid-19 pandemic has been associated with reports of a loss of control over work-nonwork boundaries (Fisher et al., 2020), is expected to be here to stay and even increase (International Labour Organization [ILO], 2020). Our findings clearly indicate that, to combat work-life conflict, organizations would gain from

supporting employees in creating and maintaining strong work-nonwork boundaries. This applies particularly to organizations characterized by a culture where employees are expected to be available on work-related issues during leisure time. Human resource policies may be developed that reflect legitimate segmentation norms (Kok et al., 2015). More specifically, policies need to include the right to undisturbed leisure time, keeping work within contractual work hours, and sufficient recovery time between work shifts. This would protect the work-nonwork boundaries of all employees regardless of boundary preferences, and subsequently, reduce work-life conflict.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the Regional Ethics Committee in Stockholm.

Written informed consent for participation was not required for this study in accordance with the national legislation and the institutional requirements.

AUTHOR CONTRIBUTIONS

CM: conceptualization, methodology, investigation, writing – original draft, writing – review and editing, supervision, project administration, and funding acquisition. PP: conceptualization, methodology, investigation, writing – original draft, and writing – review and editing. MD: methodology, formal analysis, and writing – original draft (statistical analysis). ST: conceptualization and writing – review and editing. All authors contributed to the article and approved the submitted version.

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Individual Creativity in Digital Transformation Enterprises: Knowledge and Ability, Which Is More Important?

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Digital technological innovation is reshaping the pattern of industrial development. Due to the shortage of digital talents and the frequent mobility of these people, the competition for talents will be very fierce for organizations to realize digital transformation. The digitization transformation of China's service industry is far ahead of that of industry and agriculture. It is of great significance to study the organizational management and talent management of service enterprises to reduce the negative impact of insufficient talent reserve and meet the needs of digital development. Based on 378 valid questionnaires from China's service industry, this paper applied polynomial regression and a response surface model to analyze the impact of two kinds of person-environment fit on work engagement and individual creativity. The results show that: (1) under the combination of high morality and high talent, work engagement and individual creativity are the highest; (2) individual creativity is stronger under the condition of high morality and low talent than under low morality and high talent; and (3) work engagement mediates the influence of morality and talent on individual creativity. The research reveals the internal mechanism by which morality and talent cooperatively promote individual creativity, which provides theoretical guidance for management practice of service firms to improve individual creativity in the process of digital transformation.

Keywords: digital transformation, person-organization fit, work engagement, individual creativity, polynomial regression analyses

INTRODUCTION

With the development of informatization, networking, digitization, and intelligence, the world is entering an era characterized by digital productivity. Digital technological innovation has accelerated the transformation of economic and social forms and operation modes. A broader and deeper scientific and technological revolution and industrial transformation are reshaping the global landscape of innovation and the pattern of industrial development (State Information Center [SIC] and Jingdong Digital Technology Research Institute [JDTRI], 2020). The digital transformation of China's service sector is far ahead of manufacturing industry and agriculture, which is benefited from the strong domestic consumer market and the demand for digital transformation of the service sector. According to China Academy of Information and Communications Technology [CAICT], 2019), digital economy, respectively, accounts for 18.3, 35.9, and 7.3% of added value in China's industry, service industry and agriculture in 2018. And a number of Chinese service companies such as BATJ (Baidu, Alibaba, Tencent, Jingdong), TMDP

(Toutiao, Meituan, Didi, Pinduoduo) have entered the top 20 Internet companies in terms of market capitalization. The application of digital technology to the service sector will cultivate new forms of business such as smart logistics, e-commerce and smart finance, and accelerate the high-quality and efficient development of producer and consumer services. However, 30% of technology jobs will be vacant by 2020 due to a shortage of digital talents, which means the competition for talents in the digital transformation of enterprises will be fierce (State Information Center [SIC] and Jingdong Digital Technology Research Institute [JDTRI], 2020). Knowledgeable talents have a strong willingness to flow (Furusawa and Brewster, 2015) and the turnover of this type of talents is relatively frequent. Especially in information technology (IT) industry, the flow of talents is more frequent than that of other industries. Therefore, it is of great significance to study the organization and management of China's service industry enterprises and explore the impact of human-environment matching on employees' work input and creativity, so as to adjust the human resource structure of digitalized transformation enterprises and ensure that digital technology professionals can meet the technical needs of digitalized transformation enterprises. The importance of morality and talent for organizations has always been a controversial topic, especially in China, which is deeply influenced by traditional culture and considers morality to be most important. Influenced by realism, talent has received more attention in theory and practice. In terms of personnel selection, training, inspiration, and retention, organizations pay far more attention to the talents of employees than other aspects. In contrast, morality is not valued as much as it should be. The person-environment fit theory provides a good perspective for studying how individual behaviors contribute to the achievement of organizational goals and has also received much attention. However, research on person-environment fit theory mainly focuses on the fields of health and stress (Edwards and Cooper, 1990), job adaptation, career choice, and organizational culture (Schneider, 1987). In an era of digital economy, in which creativity is becoming increasingly important, the influence mechanism of person-environment fit on individual creativity is important. The theory of person-environment fit provides support for the study of individual creativity. Matching theory (Schneider, 1987) suggests that matching can predict individual outcomes (such as job satisfaction) better than any single component (person or environment). The match between individuals and the environment is a complex, dynamic process (Milliman et al., 2017). Individuals are easily attracted by organizations whose values and goals are similar to their own (Schneider, 1987). The higher the degree of matching between individuals and the environment, the greater individuals' satisfaction and job performance will be, and the lower their work pressure and turnover intention will be. However, research on the impact of values on creativity is insufficient.

Creativity is becoming a core competency for employees, and most modern organizations encourage creativity. Individual creativity is the result of the interaction between individual characteristics and environmental factors. Individual characteristics include intrinsic motivation (Hannam and Narayan, 2015), cognitive style (Wu et al., 2014), goal orientation (Miron-Spektor and Beenen, 2015), and self-efficacy. Environmental factors include organizational culture, group size, task characteristics, and work pressure (Baer and Oldham, 2006). Individual creativity is an important source for organizations to innovate and maintain competitive advantages (Woodman et al., 1993).

Work engagement has become an important topic in the field of human resource management (Alzyoud, 2018) and has an important impact on the competitive advantage of organizations. Employees with a high level of work engagement are physically, cognitively, and emotionally attached to the organization and engaged in work with great enthusiasm. Work engagement has a direct impact on employee productivity, resulting in higher customer satisfaction, higher productivity, and a lower turnover rate, which ultimately translates into the improvement of overall performance (Maslach et al., 2001). Training and using highly dedicated employees is an important means for enterprises to gain competitive advantage.

Based on matching theory, this study applies the response surface regression method to explore how morality and talent affect individual creativity by affecting work engagement. This study compares the impact of different matches of morality and talent on work engagement and individual creativity to provide a reference for service industry organizations in the context of digital transformation to better stimulate individual creativity. The contribution of this study is mainly reflected in the following aspects. First, combined with person-environment fit theory, this study enriches research on the antecedents of individual creativity and reveals the impact of person-environment fit on individual creativity. Second, the paper compares and analyzes the influence of different types of person-environment fit on individual creativity. In this study, the effects of different states of morality and talent on work engagement and individual creativity are compared to better understand the influence mechanism of the interaction between person-environment fit and Individual Creativity. Third, this study explores the mechanism by which morality and talent fit with individual creativity and reveals the mediating role of work engagement in this process. This study provides a reference for further understanding of the relationship between person-environment fit, work engagement and individual creativity.

This paper began with an introduction to the overarching theory that guided the studies and contributed to the formulation of the hypotheses to be tested. Subsequently, we describe the overview of the analysis strategy, data collection, variable measures, and data analysis to test the hypotheses. Finally, this paper is concluded with a discussion of the results, implications, limitations, and future research avenues.

LITERATURE REVIEW AND HYPOTHESIS

Person-Environment Fit Theory

Matching theory suggests that individuals have a natural need to adapt to the environment and to find an environment that suits their characteristics. Individuals hope to exercise control

over their lives, reduce uncertainty, and increase their sense of belonging. For matching theory, relevant areas of study include person-job fit, person-subordinate fit, person-team fit, person-organization fit, and person-environment fit. Among these, person-job fit includes two dimensions, demand-ability fit and need-supply fit (Cable and DeRue, 2002); person-subordinate fit and person-team fit mainly focus on the consistency of values between individuals and their colleagues; and person-organization fit, or consistency fit considers individuals and organizations in achieving the goal of the consistency of values. Person-environment fit includes person-job fit (complementary fit) and person-organization fit (consistency fit) (Kristof-Brown, 2000; Kristof, 2006); among these, consistency fit is the most important factor affecting person-environment fit (Rounds et al., 1987; O'Reilly et al., 1991; Vecchione et al., 2016).

Research on matching theory shows that matched relationships have positive effects on employees' mental health (Caplan, 1987; Hogg, 2000; Deci and Ryan, 2008), personal willingness (Chatman, 1989; Vansteenkiste et al., 2007; Shen et al., 2018), job satisfaction (Gregory et al., 2010), organizational commitment (Milliman et al., 2017), job performance and organizational citizenship behavior (Nye et al., 2012; Marstand et al., 2017), and interpersonal relationships (Hogg, 2000; Edwards and Cable, 2009). In contrast, mismatched relationships have a negative impact on counterproductive work behavior (Van Iddekinge et al., 2011; Nye et al., 2017). It has also been found that matching has the most significant effect on basic outcomes (work attitude, such as satisfaction) (Judge et al., 2002; Steel et al., 2008) but does not have a significant effect on behavioral outcomes (such as performance, turnover rate, and work choice) (Judge and Bono, 2001; Bakker et al., 2014). The weak impact of consistent fit on performance and turnover rate often occurs through work attitude (Arthur et al., 2006).

In reality, however, differences tend to inspire individuals to change (Bandura, 1991; Longua et al., 2009). Therefore, optimal fit rarely exists, and perfect fit may even impair an individual's ability to learn, develop, and adapt. When both personal and environmental attributes are high, optimal results will appear (Slocombe and Bluedorn, 1999; Hecht and Allen, 2005). Studies have shown that changes in individuals' attitudes and behaviors are the result of interactions between individuals and the environment, which cannot be explained by individuals or the environment alone (Edwards, 1996). In previous studies on the impact of fit on results, half of the studies have found a nonlinear relationship between the impact of person-organization fit on results (Lambert et al., 2012; Marstand et al., 2017). These nonlinear relationships mainly depend on the specific attributes of person-organization fit (Crawford et al., 2010; Newton and Mazur, 2016).

The Influence of Morality and Talent Fit on Individual Creativity

Values are a unique way of thinking and a code of conduct formed by an individual, and their influence on individual psychology and behavior is long term and fundamental. The basic beliefs shared by all members of an organization constitute organizational values (O'Reilly et al., 1991). Research shows that the consistency of personal and organizational values has a promoting effect on job satisfaction (Verplanken, 2004; Edwards and Cable, 2009). Choi (2004) found that the consistency of values and demand-ability fit have a positive impact on individual innovation behavior. In terms of traditional Chinese culture, the consistency of values can be called morality, and demand-ability fit can be called talent. Managers hope that the members of the organization have a high level of morality and talent. In a state of high morality and talent, that is, consistency of values and demand-ability fit, individuals are more likely to accurately position their roles and engage in more extra-role behaviors (Yaniv et al., 2010). The consistency of values between individuals and organizations enables individuals to perceive a stronger organizational atmosphere and generate positive emotions, which have a positive impact on the formation of creativity. Demand-ability fit means that an individual's professional skills, knowledge and experience are in line with the requirements of the job (Kristof-Brown, 2000). Individuals feel confident and enthusiastic in their work, which generates positive behaviors (Chatman, 1991; Resick et al., 2007). Therefore, an individual with demand-ability fit has more solid knowledge of the field, a higher sense of creative self-efficacy, and a stronger influence on creativity. Consistency of values and demand-ability fit leads to a more creative organizational atmosphere, more solid professional knowledge, more positive emotions, and more powerful creative motivation and helps employees to be more creative.

Consistency of values is different. Low consistency of values indicates the lack of a correct evaluation of one's role and weak identification with organizational goals and is likely to generate negative emotions (Vandenberghe, 1999), all of which are not conducive to the formation of individual creativity. When demand-ability fit is low, ability exceeds job requirements, or the individual's ability fails to meet the job requirements. Vianen (2018) proved in his research that when individual characteristics are consistent with environmental characteristics, the optimal output can be obtained, which does not have a significant relationship with the individual absolute level. In view of this, individuals who have consistency of values and demand-ability fit with an organization are more likely to show positive work behaviors, which are conducive to the formation of individual role cognition and creative motivation. Individuals with high talent are more likely to break through the shackles of inherent patterns, enhance their creative self-efficacy, and make efforts to improve organizational creativity. In other words, when demand-ability fit is high, individuals will be more comfortable with their work, generate creative motivation, and use their professional knowledge and skills to improve creativity.

With regard to the mismatch between morality and talent when the degree of consistency of values is high and the degree of demand-ability fit is low, the degree of consistency of values means that individuals have high recognition of organizational goals and norms, and these individuals are likely to achieve better relationship performance (Kristof-Brown, 2000). When the degree of demand-ability fit is low, individuals can improve their abilities to meet job requirements or change their cognition

of job requirements to improve the degree of demand-ability fit. When the degree of consistency of values is low and the degree of demand-ability fit is high, it is difficult for individuals to obtain a sense of belonging and support in the organization, which is not conducive to the formation of a creative atmosphere. Based on the above analysis, the following hypotheses are proposed:

Hypothesis 1a: Compared with employees with a morality and talent misfit, employees are more creative when there is a fit between morality and talent.

Hypothesis 1b: Under the condition of morality and talent fit, compared with the state of low morality and low talent level, employees with high morality and high talent level are more creative.

Hypothesis 1c: Under the condition of morality and talent misfit, compared with the state of low morality and high talent level, employees with high morality and low talent level are more creative.

The Influence of Morality and Talent Fit on Work Engagement

Under the condition of morality and talent fit, individuals with high consistency of values are more likely to form higher organizational identity and a sense of belonging, be clearer about their positioning in the organization, and have more positive work behaviors (Yaniv et al., 2010). When demand-ability fit is high, individuals are more skilled in coping with work and experience a sense of accomplishment and control in work. When an individual's ability meets work requirements, he or she will have higher internal work motivation and work involvement (Deci and Ryan, 2008). When there is a misfit between morality and talent, individuals and organizations have low consistency of values, which will lead to higher turnover intention and difficulty in achieving work engagement. A low level of demand-ability fit causes the self-efficacy of individuals in the organization to be low, which affects individual behavior motivation (Bandura and Locke, 2003). Compared with morality and talent misfit, an individual's work engagement is higher in the condition of morality and talent fit.

When there is a morality and talent fit, the degree of consistency of values and demand-ability fit is high. Individuals can experience more enjoyment in their work and will have higher motivation for independent work and a higher level of work engagement. When morality is low and talent is low, individuals' work engagement is mostly related to organizational incentives or punishments, and they passively engage in work. From this point of view, when morality and talent fit, individuals' work engagement is higher when the degree of consistency of values is high and talent is high.

When morality is high and talent is low, due to the identification with organizational values, individuals have a strong sense of their membership, and they will make efforts to align themselves with the needs of the organization and increase their work input. However, it is difficult to feel a sense of support and security in the organization when morality is low and talent is high. Even if individuals' ability meets the needs

of the organization, it is difficult to change their values, which is not conducive to the increase of individual work input. From this point of view, when there is a morality and talent misfit, individuals' work engagement is higher when morality is high and talent is low. Based on the above analysis, the following hypotheses are proposed:

Hypothesis 2a: Compared with a morality and talent misfit, an individual's work engagement is higher when there is a morality and talent fit.

Hypothesis 2b: Under the condition of a morality and talent fit, compared with the state of low morality level and low talent level, an individual's work engagement is higher under the condition of a high morality level and a high talent level.

Hypothesis 2c: Under the condition of morality and talent misfit, compared with the state of a low moral level and a high talent level, an individual's work engagement is higher under the condition of a high moral level and a low talent level.

The Mediating Role of Work Engagement

According to person-environment fit theory, person-environment fit can have a positive impact on individual attitudes and behaviors (Chatman, 1989). For both organizations and individuals, values play a guiding role in behavior. When there is a high degree of consistency between organizational and individual values, there is a close emotional connection between the individual and the organization. Individuals' identification with their own organizational identity encourages them to increase their work engagement and perform more extra-role behaviors. When there is a high level of demand-ability fit, individuals can skillfully deal with problems in work and obtain a high sense of self-efficacy in practice. The higher an individual's self-efficacy, the higher his or her work engagement (Bandura, 1988). Studies have shown that the effects of different matching patterns on individual attitudes and behaviors are not simply additive, and the interaction between them can also affect individual behavior (Kristof-Brown, 2000).

Work engagement describes the mental state of an individual who is engaged in work (Hallberg and Schaufeli, 2006). With a high morality and talent fit, individuals can successfully solve difficulties at work by virtue of their professional knowledge and skills, meet their need for autonomy, competence and relationship in work, and increase work input. Studies have shown that work engagement has positive effects on organizational citizenship behavior (Kataria et al., 2013), job satisfaction (Schaufeli et al., 2006), and low turnover intention (Schaufeli and Bakker, 2004). Individuals with high work engagement are consistently enthusiastic at work and are willing to devote time and energy to things other than work. Individuals with a high morality and talent fit have higher work input. They can use their subjective initiative in the face of difficulties in work, combine existing professional knowledge, cultivate creative thinking, and improve individual creativity. Based on the above analysis, the following hypothesis is proposed:

TABLE 1 | Correlation coefficient matrix.

	Mean value	SD	1	2	3	4	5	6	7
1. Gender	1.540	0.499	1						
2. Age	2.040	0.672	-0.080	1					
3. Education level	1.830	0.775	0.097	0.186**	1				
4. Talent	3.836	0.814	-0.013	-0.004	-0.129*	*0.864*			
5. Morality	3.867	0.849	0.042	-0.033	-0.197**	0.657**	*0.838*		
6. Work engagement	3.938	0.815	0.031	0.011	-0.243**	0.678**	0.787**	*0.771*	
7. Individual creativity	3.920	0.715	-0.077	0.015	-0.069	0.551**	0.606**	0.652**	*0.801*

* and **, respectively, indicate significance at the level of $p < 0.05$ and $p < 0.01$.
The bold values are the square root of average variance extracted (AVE).

Hypothesis 3: Work engagement mediates the relationship between morality and talent fit and individual creativity.

MATERIALS AND METHODS

Data Collection

In this study, a questionnaire survey was used to obtain research data. The link to the designed questionnaire was sent to front-line service workers in enterprises that are in digital transformation to complete. To reduce common method variance, the following measures were taken: (1) the questionnaire was translated into Chinese, and then three professionals were asked to translate it into English to ensure the accuracy of the information; (2) the questionnaires had been tested before they were sent out; (3) the questions were randomly ordered to reduce homologous error; and (4) data samples with short answer time and incomplete data were deleted. A total of 500 questionnaires were sent out and 398 were recovered, with a recovery rate of 79.6%. After eliminating invalid samples, a total of 378 valid questionnaires were received, with an effective rate of 95.0%. According to the results of the statistical analysis, in terms of gender, there were 173 men, accounting for 45.8%, and 205 women, accounting for 54.2%. In terms of age, 71 respondents were under 25, accounting for 18.8%, 228 respondents were 26–35 years old, accounting for 60.3%, 72 respondents were 36–45 years old, accounting for 19.0%, and 7 respondents were over 46 years old, accounting for 1.9%. In terms of education level, 150 respondents had a junior college education, accounting for 39.7%, 141 had a bachelor's degree, accounting for 37.3%, and 87 had a graduate degree, accounting for 23.0%.

Measures

The survey measures included morality, talent, work engagement and individual creativity. All of the measurement scales were well established and drawn from the literature. The survey was administered in Chinese. All items used the same five-point Likert scale format (1 = strongly disagree; 5 = strongly agree).

Morality

Morality was measured by the persistence of values using a 6-item scale developed by Cable and DeRue (2002). Example items

included "I strongly agree with the organization's goals" and "My values are similar to the organization's values." The internal consistency Cronbach's α was 0.951.

Talent

Talent was measured by demand-ability fit using a 3-item scale developed by Cable and DeRue (2002). Example items included "My abilities and training are well matched with the job requirements" and "My personal abilities and education level are well matched with the job requirements." The internal consistency Cronbach's α was 0.921.

Work Engagement

Work engagement was measured using a 17-item scale developed by Schaufeli et al. (2006) using a simplified version with 9 questions. Example items included "I am passionate about my work" and "I am proud of what I do." The internal consistency Cronbach's α was 0.961.

TABLE 2 | Polynomial regression results.

Variables	Work engagement		Individual creativity		
	Model 1	Model 2	Model 3	Model 4	Model 5
Constant term	3.945***	3.963***	4.007***	3.909***	2.212***
Gender	0.040	0.046	-0.140*	-0.140*	-0.159**
Age	0.064	0.062	0.013	0.018	-0.008
Education level	-0.110**	-0.115***	0.056	0.073	0.122***
Morality, $\beta 1$	0.558***	0.576***	0.379***	0.415***	0.168**
Talent, $\beta 2$	0.283***	0.255***	0.229***	0.247***	0.138**
Morality^2, $\beta 3$		0.096**		-0.015	-0.057
Morality × Talent, $\beta 4$		-0.139**		0.118	0.177**
Talent^2, $\beta 5$		-0.029		0.019	0.032
Work engagement					0.428***
Slope: $\beta 1 + \beta 2$	-	0.781***	-	0.662***	0.306***
Curvature: $\beta 3 + \beta 4 + \beta 5$	-	-0.072*	-	0.121***	0.152***
Slope: $\beta 1 - \beta 2$	-	0.321***	-	0.168	0.030
Curvature: $\beta 3 - \beta 4 + \beta 5$	-	0.026**	-	-0.114	-0.202*
$\triangle R^2$	-	0.013**	-	0.025**	0.074***
F	154.794	101.980	53.964	36.981	44.154

*, **, and ***, respectively, indicate significance at the level of $p < 0.05$, $p < 0.01$, and $p < 0.001$.

Individual Creativity

Individual creativity was measured using a 7-item scale developed by Zhou and George (2011). Example items included "I will sell my new ideas and ideas to other colleagues" and "I will strive for the resources needed to realize the new ideas." The internal consistency Cronbach's α was 0.958.

Correlation coefficient matrix is shown in **Table 1**.

Data Analysis Method

In this study, polynomial regression and response surface methods were used to test the hypotheses. This method is suitable for testing the degree of correlation between two predictive variables and their mutual consistency, difference and outcome variables (Edwards, 1994; Edwards et al., 2006). In recent years, it has been widely valued and applied (Harris

FIGURE 1 | Effects of morality and talent on work engagement.

FIGURE 2 | Effects of morality and talent on individual creativity.

et al., 2014; Shanock et al., 2014; Lee et al., 2016; Bar-Kalifa et al., 2017; Weidmann et al., 2017; Yang et al., 2017; Audenaert et al., 2018; Chen et al., 2019; Qiu et al., 2020; Jiang et al., 2021).

$$The\ regression\ model\ is: Z = b_0 + b_1X + b_2Y + b_3X^2$$
$$+ b_4XY + b_5Y^2 + \varepsilon \qquad (1)$$

It can be seen from Eq. (1) that the regression equation needs to calculate the regression coefficients of X and Y, X2, and Y2, and XY. Before analysis, the independent variables X and Y need to be centralized to reduce multicollinearity (Edwards and Parry, 1993).

Response surface technology has three key indicators: fixed point, principal axis, slope and curvature. (1) The principal axis describes the direction of the response surface on the X-Y axis. The first and second principal axes are perpendicular to each other and intersect at a fixed point. The shape of the response surface can be judged according to the spindle. For a convex surface, the curvature will be greatest along the first principal axis, and the second principal axis will have the least curvature. For a concave surface, the curvature downwards along the first principal axis is the smallest, while the curvature along the second principal axis is the largest. (2) With regard to slope and curvature, the consistency line refers to two measurement index

TABLE 3 | Interaction effect analysis of morality and talent (*N* = 158).

Dependent variable	Types	Mean	SD	95% Confidence interval		Comparison
				Lower limit	**Upper limit**	
Work engagement	High M-High T	4.738	0.074	4.593	4.883	High M-High T> High M-Low T> Low M-High T> Low M-Low T
	High M-Low T	4.723	0.318	4.093	5.352	
	Low M-High T	3.776	0.241	3.3	4.251	
	Low M-Low T	2.926	0.075	2.777	3.074	
Individual creativity	High M-High T	4.68	0.074	4.534	4.826	High M-High T> High M-Low T> Low M-High T> Low M-Low T
	High M-Low T	3.965	0.32	3.334	4.596	
	Low M-High T	3.694	0.242	3.217	4.172	
	Low M-Low T	3.286	0.075	3.137	3.435	

M, morality; T, talent.

TABLE 4 | Mediating effect of work engagement.

		Individual creativity				
		Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**
Intercept		2.333[1.837, 2.830]	2.105[1.657, 2.553]	1.495[1.071, 1.918]	1.315[0.908, 1.722]	1.422[1.018, 1.826]
Gender		-0.164[-0.272, -0.056]	-0.148[-0.256, -0.039]	-0.155[-0.265, -0.045]	-0.158[-0.265, -0.051]	-0.163[-0.272, -0.055]
Age		-0.012[-0.093, 0.069]	-0.018[-.100, 0.063]	-0.022[-0.105, 0.060]	-0.021[-0.102, 0.059]	-0.021[-0.102, 0.061]
Education level		0.103[0.030, 0.175]	0.094[0.021, 0.168]	0.112[0.038, 0.187]	0.128[0.055, 0.201]	0.114[0.041, 0.187]
Direct effect	Morality, $\beta 1$	0.211[0.109, 0.312]				
	Talent, $\beta 2$		0.165[0.076, 0.255]			
	Morality^2, $\beta 3$			0.047[0.000, 0.094]		
	Morality $\times$ Talent, $\beta 4$				0.130[0.074, 0.186]	
	Talent^2, $\beta 5$					0.094[0.043, 0.146]
	Work engagement	0.426[0.319, 0.533]	0.484[0.393, 0.576]	0.627[0.553, 0.702]	0.660[0.588, 0.732]	0.641[0.569, 0.712]
Indirect effect		0.314[0.233, 0.409]	0.319[0.235, 0.414]	-.156[-.202, -.089]	-0.191[-0.256, -0.088]	-.148[-0.232, -0.079]
R-sq		0.469***	0.464***	0.451***	0.474***	0.464***
F		65.720	64.497	61.092	67.141	64.375

*** indicates significance at the level of $p < 0.001$.

values that are equal and in the same direction on the X-Y plane (X = Y). An incongruent line is a line in the X-Y plane where two measurement indicators are equal but opposite in direction (X = -Y). By substituting X = Y and X = -Y into Eq. (1), the consistency line and inconsistency line are calculated as follows:

$$Z = b_0 + (b_1 + b_2)X + (b_3 + b_4 + b_5)X^2 + \varepsilon \qquad (2)$$

$$Z = b_0 + (b_1 - b_2)X + (b_3 - b_4 + b_5)X^2 + \varepsilon. \qquad (3)$$

Along the line Y = X, the slope is (b1 + b2) and the curvature is (b3 + b4 + b5). Along the line Y = -X, the slope is (b1-b2) and the curvature is (b3-b4 + b5). When (b3 + b4 + b5), (b3-b4 + b5) is positive and significant, which means that the line is concave (U-shaped); on the contrary, when the value is negative, it is convex (inverted U-shaped).

RESULTS

The analysis results are shown in **Table 2**. First, taking work engagement as the dependent variable, the results of model 1 show the main effects of the control variables. Morality and talent have a significant positive impact on work engagement, but the effect of talent on work engagement is lower than that of morality ($\beta = 0.283 < \beta = 0.558$).

Model 2 shows that the influence of morality and talent on work engagement is significant on the consistency line ($\beta 1 + \beta 2 = 0.781$, $p < 0.001$) and curvature ($\beta 3 + \beta 4 + \beta 5 = -0.072$, $p < 0.05$); that is, when morality and talent are the same, the impact of the two on work engagement is in an inverted U shape, and the size needs to be re-examined. On the inconsistency line, the slope is significant ($\beta 1-\beta 2 = 0.321$, $p < 0.001$) and the curvature is significant ($\beta 3-\beta 4 + \beta 5 = 0.026$, $p < 0.05$); that is, when morality and ability are inconsistent, the impact of the two on work engagement is U-shaped, and the size needs to be re-examined.

Taking individual creativity as the dependent variable, the results of Model 3 show the main effect of the control variables. Morality and talent have a significant positive impact on individual creativity, but the effect of talent on work engagement is lower than that of morality ($\beta = 0.229 < \beta = 0.379$). The results of Model 4 show that the influence of morality and talent on individual creativity is significant on the consistency line ($\beta 1 + \beta 2 = 0.662$, $p < 0.001$) and the curvature is significant ($\beta 3 + \beta 4 + \beta 5 = 0.121$, $p < 0.001$); that is, when morality and talent are the same, the impact of the two on individual creativity is U-shaped, and the size needs to be re-examined. On the inconsistency line, the slope is not significant ($\beta 1-\beta 2 = 0.168$, $p > 0.05$) and the curvature is not significant ($\beta 3-\beta 4 + \beta 5 = -0.114$, $p > 0.05$); that is, when morality and talent are inconsistent, their impact on individual creativity is flat.

To analyze the comprehensive influence of talent and morality on work engagement and individual creativity, a two-way ANOVA was conducted with morality and talent as independent variables and work engagement and individual creativity as dependent variables. The results show that in the model with work engagement as the dependent variable, the interaction between talent and morality is significant, $F = 101.670$, $p < 0.001$, $R^2 = 0.658$ (**Figure 1**). In the model with individual creativity as the dependent variable, $F = 58.75$, $p < 0.001$, $R^2 = 0.525$ (**Figure 2**). According to relevant scholars, the two groups were divided into high and low morality and high and low talent according to the standard of 27%. Taking morality (high and low groups) and talent (high and low groups) as independent variables and taking work engagement and individual creativity as dependent variables, the simple effect was further analyzed, and the results are shown in **Table 3**. Through mean comparison, it can be seen that high morality-high talent > high morality-low talent > low morality-high talent > low morality-low talent, which means that the combination of high morality and high talent can promote the transformation process of work engagement and individual creativity. These results support Hypotheses 1a, 1b, 1c, 2a, 2b, and 2c.

Bootstrapping was used to test the mediating effect of work engagement. If the confidence interval does not contain 0, the mediating effect is significant; otherwise, it is not significant. As shown in **Table 4**, the results of Model 1 and Model 2 show that morality and talent have a significant effect on individual creativity, and their indirect effect on individual creativity through work engagement is significant. The results of Model 3 show that the square term of morality has no significant direct effect on individual creativity but has a significant indirect effect on individual creativity through work engagement. The results of Model 4 show that the product term of morality and talent has a significant direct effect on individual creativity and a significant indirect effect on individual creativity through work engagement. The results of Model 5 show that the square term of talent has a significant direct effect on individual creativity and a significant indirect effect on individual creativity through work engagement. In conclusion, work engagement plays a mediating role in the U-shaped curve of morality and talent on individual creativity. Hypothesis 3 is supported.

DISCUSSION

Conclusion

In this study, polynomial regression and response surface analysis were used to explore the curvilinear effect of morality and ability fit on individual creativity and the mediating effect of work engagement in morality and ability matching relationships on individual creativity. The results showed the following. (1) Morality and talent interact to influence work engagement and individual creativity. With a combination of high morality and high ability, employees have the highest level of work engagement and individual creativity. (2) In the state of morality and ability fit, employees with high morality and ability are more creative than those with low morality and ability. (3) When there is a misfit of morality and ability, employees with high morality and low talent are more creative than those with low morality and high talent. (4) Work engagement mediates the effect of morality and talent fit on individual creativity.

Theoretical Implications

This research contributes to the current research in the following aspects. First, by referring to the theory of person-environment fit, a theoretical model of the influence of morality-talent fit on individual creativity is established. The influence of different states of morality and talent fit and morality and talent misfit on individual creativity is compared, and the influence mechanism of the interaction effect of person-environment fit on individual creativity is clarified. The data obtained through a questionnaire survey verify the reliability of the theoretical model, expand research on the antecedent variable of creativity, and enrich the theory of person-environment fit.

Second, this study compared and analyzed the influence of morality-ability fit on the curve of work engagement, which enriches research on the influencing factors of work engagement. In the past, research on work engagement mainly considered the aspects of leadership style, job characteristics, and employee characteristics but did not consider the perspective of employees' personal morality and ability fit.

Third, this paper discussed the mechanism of morality and talent fit in the process of person-environment fit on individual creativity and revealed the mediating role of work engagement in this process, providing references for further understanding the relationships among person-environment fit, work engagement and individual creativity.

Practical Implications

A diverse workforce in organizational management is an important prerequisite for ensuring organizational vitality. This study emphasizes the importance of person-environment fit in the management of work engagement and creativity in the service industry organizations under the digital background and provides management ideas for managers to realize digital transformation of enterprises.

First, morality is more important than talent, and loyalty is more important than ability. When hiring, it is necessary to evaluate the match between the candidate and the organization's values. At the same time, the organization should distinguish between those who are available and those who must be eliminated. Behind any phenomenon in an organization is the reflection of the way employees think and behave. A company needs to describe what it absolutely cannot tolerate from a cultural perspective. Based on certain principles, the enterprise should define its own cultural standards. If an employee violates these standards and does something the enterprise cannot tolerate, the employee will be eliminated.

Second, it is necessary to enrich the content of incentives to meet diversified demands. In the service enterprises in the process of digital transformation, there are more scientific and technological talents and knowledge talented employees, who want to perform their duties without fear of compromising their individuality, self-worth, and self-esteem. They usually perform better in a supportive, nonthreatening and enjoyable work environment. So the organization needs to provide employees with opportunities to freely express their opinions, establish a trust mechanism among employees, and create an atmosphere in which employees can freely share their emotions and attitudes to promote a high level of devotion to work among employees. In addition, employees should be allowed to participate in decision-making, granted freedom of work and independent decision-making rights, motivated to contribute their talents, and given opportunities to give full play to their values.

Third, it is necessary to provide learning opportunities to improve the ability of employees. Industry digitization takes data as the key element, and under the guidance and support of the new generation of digital technology, digitization upgrading, transformation and reconstruction are carried out for the total elements of the upstream and downstream of the industrial chain. Learning ability of organizations is the base of employee learning, which could promote the growth of employees' knowledge, skills and attributes. When employees feel that their organization is making a serious effort to improve their capabilities, they will demonstrate a high level of work engagement and individual creativity. Therefore, the organization should establish and share a list of capabilities with all departments to better promote

the training of cross-industry and integrated talents who are proficient in supply demand coordination and consumption pattern innovation in the service industry, as well as in digital technology.

Limitations and Discussion

Like any other study, this research also has limitations. First, the sample data are derived from cross-sectional data with no time difference. Furthermore, the measurement of the same subjects by self-reported survey data may have common method deviations. Second, the research is based on samples collected by China's service industry groups and was not extended to different sample groups for comparative study. Third, the quadratic response surface regression method is an indirect measurement strategy that is the result of a cognitive comparison between individual and environment perception. This process is based on the evaluation of subjective comparison and ignores the self-evaluation of the person and environment fit in the comparison process. The impact of these factors will be taken into account in the future for further exploration and improvement.

DATA AVAILABILITY STATEMENT

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author/s.

AUTHOR CONTRIBUTIONS

DJ was responsible for the design of the research. ZC was responsible for the collection of data. SW was responsible for the derivation of theory and hypothesis. TL was responsible for the analysis and collation of data. HZ and QC were responsible for the organization and communication. All authors contributed to the article and approved the submitted version.

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How Determinants of Employee Innovation Behavior Matter During the COVID-19 Pandemic: Investigating Cross-Regional Role *via* Multi-Group Partial Least Squares Structural Equation Modeling Analysis

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The COVID-19 pandemic cropping up at the end of 2019 started to pose a threat to millions of people's health and life after a few weeks. Nevertheless, the COVID-19 pandemic gave rise to social and economic problems that have changed the progress steps of individuals and the whole nation. In this study, the work conditions for employees from Taiwan, Malaysia, and the Chinese mainland are explored and compared, and the relationship between support mechanisms and innovation behaviors (IB) is evaluated with a view of the social cognitive career theory. This study adopts the cross-sectional survey and purposive sampling to collect questionnaires. A total of 623 copies of a questionnaire from Taiwanese, 440 copies from Malaysians, and 513 copies from mainlanders were collected in this study to compare the three groups in developing employees' IBs. Smart-partial least squares for partial least squares structural equation modeling was applied in the structural model to conduct a verification of the hypotheses and comparative analysis in this study. According to the findings, compared with employees from the Chinese mainland, the Taiwanese and Malaysian samples show more significant paths regarding employee employability, IB, prior knowledge, perceived organizational support, self-efficacy, and job performance. Our results will offer more insights and advice concerning theories of human resource.

Keywords: employee employability, innovation behavior, prior knowledge, perceived organizational support, self-efficacy, job performance

INTRODUCTION

In the field of human resource administration, the influence of work surroundings and employee employability on innovation behavior (IB) and job performance (JP) has always been a key focus (Amabile and Pillemer, 2012; Chang and Edwards, 2015; Kurtessis et al., 2017; Liu, 2017; Akgunduz et al., 2018). Organizational innovation, or the origin of intrapreneurship dates from employees

when they ponder something out of framework at work, propose new ideas, sell or support new individual ideas, and try to seek resources to implement their ideas, that is, to show IBs (Yuan and Woodman, 2010; DE Clercq et al., 2016; Shin et al., 2017). To assist employees in focusing on the process of innovation, one of the major research orientations to organizational creativity is to explore elements that promote and inhibit employees' IBs (Anderson et al., 2014; Shin et al., 2017). Most of these studies were carried out in complete work surroundings (Lent et al., 2011; Ahmed and Nawaz, 2015; Lamm et al., 2015; Akgunduz et al., 2018; Liguori et al., 2019). Particularly, most of them have verified the importance of online conferences or SNS advisors. Nonetheless, since the COVID-19 pandemic occurring from January 2020 went viral, countries worldwide have begun to stop trading and exchanges, and economic, tourist, and productive exchanges are included, especially work activities. Many economic activities in countries have been ceased and related halting production dates have been extended to inhibit the diffusion of the pandemic. To make it available for employees to go on working while contending with the pandemic, employees began to engage in online work at home, and employees are able to obtain a salary by virtue of technological carriers. However, the influence that employees' acceptance of working online brings to JP in inadaptable work surroundings remains to be seen (Lamm et al., 2015; Thompson et al., 2017; Akgunduz et al., 2018), especially as each person existing in such an uncertain situation suffers from anxiety and worries (Chang and Edwards, 2015; Schultz et al., 2015; Jemini-Gashi et al., 2019). Thereby, the study aims to explore development of employees' JP in the case of the global COVID-19 pandemic.

Factors that influence work outcomes from employees (Lent et al., 2011; Ahmed and Nawaz, 2015; Chang and Edwards, 2015; Liguori et al., 2019), or the application effect of work factors (Caesens and Stinglhamber, 2014; Akgunduz et al., 2018) have been explored in most studies on organizational behaviors. Some studies for the past few years began to explore the generation of employees' IB from the aspect of organizational psychology (Orfila-Sintes and Mattsson, 2009; Amabile and Pillemer, 2012; Liu, 2017). The appearance of positive psychology leads the psychology into a new direction (Lent et al., 2011; Liguori et al., 2019). When employees have a positive perception of the work environment factors of the organization and consider that the organization supports innovation, employees will lean to the direction expected by the organization in terms of motivation and behaviors (Amabile and Pratt, 2016). Based on this view, scholars agree that work environment factors such as organizational encouragement, encouragement from supervisors, support from teamwork, and work autonomy are conducive to creating an atmosphere that supports innovation, thus encouraging members to engage in work and show IB (Kang et al., 2016; Shanker et al., 2017). However, there are still some factors that must exist in the organizational context, but the influence on employees' IB has not received much attention. Besides, there are diversified ways to comprehend, experience, and seek IB as well in both Western and Asian cultures. For the sake of these, the study aims to explore the enhancement of employees' IB and the influence on JP.

The social cognitive career theory (SCCT) is conducive to establishing a proper research framework to explore the correlation between work activities, environmental influence factors, and psychological demands (Brown et al., 2011; Chin and Rasdi, 2014; Duffy et al., 2014; Chang and Edwards, 2015; Jemini-Gashi et al., 2019). In conformity with the SCCT, Lent et al. (2002) deemed that a triangular relationship of interaction will be formed by personal attribution, environmental influence factors, and intentional behaviors (Lent et al., 2011; Caesens and Stinglhamber, 2014; Lamm et al., 2015; Jemini-Gashi et al., 2019; Liguori et al., 2019; Meyers et al., 2019). Namely, individual behaviors are produced by the interaction of individuals' inner minds, feelings, and surroundings (Brown et al., 2011; Chin and Rasdi, 2014; Duffy et al., 2014; Chang and Edwards, 2015). The SCCT architectural pattern shows that an indirect effect of personal cognitive elements occurs between environmental elements and behavioral elements (Lent et al., 2011; Duffy et al., 2014; Thompson et al., 2016; Jemini-Gashi et al., 2019; Liguori et al., 2019). In other words, when personal cognitive elements are expected to influence employees' IB in a direct way (Ahmed and Nawaz, 2015; Hajizadeh and Zali, 2016; Kurtessis et al., 2017), the effect brought to employees' IB by externally environmental factors becomes inappreciable (Schultz et al., 2015; Thompson et al., 2016; Liguori et al., 2019; Meyers et al., 2019). Self-efficacy is both the belief of employees in their own successful fulfillment and specific behaviors and competence relevant to the organization (Brown et al., 2011; Chang and Edwards, 2015), and an important element that inspires spontaneous participation and involvement in work (Caesens and Stinglhamber, 2014), and also the core of SCCT (Lent et al., 2011; Thompson et al., 2016; Sheu and Bordon, 2017; Jemini-Gashi et al., 2019; Liguori et al., 2019). Thereby, the combination of cognitive elements and the SCCT between self-efficacy and employees' IB is suggested to enrich the current literature in the study. Based on the above arguments, this study aims to investigate the relationship between self-efficacy and IB.

Furthermore, in terms of individual cognitive factors, employees will have better performance when they perceive expectation and affirmation from significant others (Lent et al., 2011; Duffy et al., 2014; Hajizadeh and Zali, 2016; Liguori et al., 2019). It has been found by scholars that the interaction that employees have with significant others, such as supervisors and peers, will influence their occupational interests and JP (Brown et al., 2011; Duffy et al., 2014; Ahmed and Nawaz, 2015; Chang and Edwards, 2015; Lamm et al., 2015; Akgunduz et al., 2018). As the profound impact leads to both individual and organizational factors (Cordova et al., 2014; Chang and Edwards, 2015), it has been put forward in this study that prior knowledge (PK) (Ineson et al., 2013; Williams and Lombrozo, 2013; Li et al., 2015; Hajizadeh and Zali, 2016) and perceived organizational support (POS) (Caesens and Stinglhamber, 2014; Ahmed and Nawaz, 2015; Kurtessis et al., 2017; Akgunduz et al., 2018; Meyers et al., 2019) are regarded as crucial individual and organizational cognitive elements to strengthen employees' skills, and employability is the enhancement of output (Chin and Rasdi, 2014; Cordova et al., 2014; Chang and Edwards, 2015; Akgunduz et al., 2018; Jemini-Gashi et al., 2019; Liguori et al., 2019). It

contains the progress of employees for the sake of employment, the increase of their employability, and so on (Ineson et al., 2013; Akgunduz et al., 2018). Regarding the psychological and sociological traits, the study depends on employees' PK and POS (Ineson et al., 2013; Williams and Lombrozo, 2013; Cordova et al., 2014; Ahmed and Nawaz, 2015; Chang and Edwards, 2015; Li et al., 2015; Jemini-Gashi et al., 2019). Employees' employability (EE) is affected by employees' PK and POS, showing that both elements are the most significant resources for employees in terms of further self-efficacy acquisition and EE enhancement. Thus, this study aims to explore the relationships among PK, POS, self-efficacy, and employee employability.

Not only the disparities arising from the pandemic, but also intercultural perspective can be viewed as significant mediating roles that insist on individual feelings and independence (Rehg et al., 2012; Meyers et al., 2019). As cultural boundaries and differences on a global scale become less prominent, the SCCT model that has been put forward to guide such human resource development is more and more applicable. Chinese mainland, Malaysia, and Taiwan were adopted as the research samples for cross-regional comparison to figure out the correlation among the research variables (Hansen et al., 2012; Rehg et al., 2012; Meyers et al., 2019), to explore the disparities of regions in work activities derived from health crisis and cross-culture (Schultz et al., 2015). Some recent studies set about investigating the disparities of countries. For example, Passos et al. (2020) investigated and compared important factors that affect the mental health of the Portuguese and Brazilians; or some scholars only looked into changes to mental conditions, attitudes, and behaviors of employees during the pandemic in a single region (Guzzo et al., 2021; Stergiou and Farmaki, 2021). A comparative study of distinct quarantine policies and pandemic control can offer more diversified insights and understanding for IB of employees. Thus, the study places emphasis on identifying employees' cognitions of individual and organizational driving elements of EE, self-efficacy, IB, and JP within the organization, and the relationships existing among them (Ahmed and Nawaz, 2015; Akgunduz et al., 2018).

LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

Innovation Behavior

According to reviews from Amabile and Pillemer (2012), the main research orientation of early organizational creativity is to discuss creative people's personality traits or the ability to solve problems with creativity from the aspects of trait or cognitive perspective. Later, social psychologists found from creative people's autobiographies and letters that creative people are more inclined to produce novel and useful ideas in certain social situations. Thus, scholars' assessments for individual creativity also gradually shift from the emphasis on individual cognitive competence to the impact of social situational factors on individual creativity performance or IB (Orfila-Sintes and Mattsson, 2009; Chen and Zhou, 2017). Creativity is interpreted from the view of behaviors, which refers to employees who come up with novel or useful ideas, while IB includes the process in which employees propose, introduce, or utilize new ideas in the workplace, and implement creative ideas in different ways with subsequent purposes (Reade and Lee, 2016; Chen and Zhou, 2017). Creativity means that an individual puts forward novel or useful ideas, problem-solving methods, or processes (Amabile, 2011). However, IB refers to employees who propose, introduce, or apply new ideas at work, which will be further implemented or fulfilled through different ways (Yuan and Woodman, 2010; Reade and Lee, 2016). The difference between IB and creativity of employees lies in the fact that IB focuses on the occurrence and implementation of employees' new ideas. In other words, IB includes creative thinking and concept practice, so creative power or creativity can also be regarded as one of the types of IB (Yuan and Woodman, 2010; Kao et al., 2015). Regarding it from the depth of creativity, it can be divided into big creativity, which changes human life and civilization, and small creativity, which improves the quality of individual work or life and solves daily problems, also known as daily creativity (Conner and Silvia, 2015). Despite members in different professional fields showing unique behaviors of problem discovery and problem solving due to the characteristics of their work situations (Kaufman and Baer, 2005), these behaviors still have common characteristics. For example, employees in daily work ponder something out of framework or reorganize existing ideas, seek or apply new technologies, new procedures, and new approaches at work, figure out creative ideas, sell new ideas to others, and actively strive for resources needed to fulfill new ideas, and plan a timetable to accomplish new ideas (Scott and Bruce, 1994).

For a long time, employees in work surroundings have been struggling with physical and mental stress which keeps employees from coping with learning challenges in a positive manner (Ahmed and Nawaz, 2015). Bewick et al. (2010) argued that British employees were taken as the research object in a study, compared with their peers, they often have considerable pressure on loans, life, and performance, and it was emphasized that scholars are necessarily supposed to shift the focus from work performance to the exploration of employees' psychological issues (Kurtessis et al., 2017; Meyers et al., 2019). Even though scholars have explored employees' IB from different levels, some research gaps still exist which are worthy of being explored and discussed, such as how IB develop, and internal and external elements influencing employees' IB (Reade and Lee, 2016; Chen and Zhou, 2017; Baradarani and Kilic, 2018). Besides, Folkman and Moskowitz (2000) indicated in their study that the subsequent research needs to emphasize the discussion of positive emotions and IB (Kurtessis et al., 2017) as figuring out relevant elements available to keep down psychological health problems arising from stress in as an effective way as possible, if it is not explored from the aspect of positive results (Thompson et al., 2016). Thus, based on the SCCT, the study adopts IB as the outcome variable for the exploration of the effect that correlative factors bring to it. Figuring out different mechanisms conducive to employees' IB is in the interest of organizational behaviors and administrators.

H1: IB plays a positive and significant effect on employees' JP.

Employee Employability

For the past few years, scholars have been more committed to conducting research related to employability (Ineson et al., 2013; Thompson et al., 2016). The concepts and operations of industrial organizations worldwide have been modified by the substantial technological, social, and economic vicissitudes that have sprung up in recent decades (Abbas et al., 2015; Akgunduz et al., 2018; Abbas and Sağsan, 2019). Therefore, the highest standards of human capital development are guaranteed by dynamic organizations, which make contributions to economic progress (Ahmed et al., 2015; Baek and Cho, 2018). Scholars have conducted a study on the implications of EE and the causal relationships between EE and other factors (Hennemann and Liefner, 2010; Thompson et al., 2016; Baek and Cho, 2018) by the ways of research situations and method design, as well as the integration of theoretical and practical analysis (Ineson et al., 2013). Van Der Heijde and Van Der Heijden (2006) stated that EE is the proper application of individual capabilities (Pan and Lee, 2011; Blázquez et al., 2018), constant acquisition and creation of necessary occupational skills to fulfill all the tasks, and adapt to internal and external changes in the job market

(Chang and Edwards, 2015; Akgunduz et al., 2018). Thereby, the demand for a critical and reflective mind, capabilities of solving problems, self-government, learning, and related capabilities are constantly enhanced in an interdisciplinary way (Ineson et al., 2013; Thompson et al., 2016; Makkonen and Olkkonen, 2017). Some previous studies have stated that, besides the influence brought to EE by basic education, elements such as individual conditions, interpersonal relationships, and external elements that are not accessible in human resources need to be taken into consideration as well. Pan and Lee (2011) conducted a survey of the samples in Taiwan and adopted the scale of employment from Andrews and Higson (2008), who suggested that employability necessarily involves the general and professional capabilities required at work, attitude to work, occupational plan capabilities, and confidence. The classification of employability made by Pan and Lee (2011) is taken as the measure for EE in this study.

According to De Cuyper et al. (2008), EE is of great importance in the society of post-industrial knowledge, which constantly updates knowledge to keep competitive in a worldwide market and makes them accessible to handling temporary and subsequent development—new psychological contracts developed by individuals tend to enhance their IB (Lent et al., 2011; Ahmed and Nawaz, 2015; Akgunduz et al., 2018). Besides, with less time, related experience, skills, and knowledge that have been updated, individuals are available to process the same things and tasks in a more effective way (Lent et al., 2011; Chang and Edwards, 2015) —and a social network that has undergone positive development—to increase EE. Abundant time saved will be contributed to life needs and individual planning for future, thus strengthening IB (Thompson et al., 2016). Likewise, higher employability can enable employees to contend with job challenges in the future with a broader view. They not only master the content of organizational tasks, but also show a more precise direction for planning and preparing for tasks to be accomplished (Ineson et al., 2013; Chang and Edwards, 2015), thus keeping down their insecurity and improving IB. Based on the above phenomena, the study proposes the following hypothesis:

H2: EE plays a positive and significant effect on employees' IB.

Self-Efficacy

According to SCCT scholars, both environmental factors and cognitive factors in a certain context, particularly those beliefs leading to success and behavior, will influence individuals' behavioral outcomes (Brown et al., 2011; Chin and Rasdi, 2014; Chang and Edwards, 2015; Liguori et al., 2019). These beliefs are called "self-efficacy" by them, namely a significant cognitive variable in individual factors during accounting for individual behaviors (Caesens and Stinglhamber, 2014), and interaction with the surroundings (Lent et al., 2011; Duffy et al., 2014; Chang and Edwards, 2015; Jemini-Gashi et al., 2019). It can also be regarded as the foundation for the motivation of human behaviors (Cordova et al., 2014), mental health, and individual accomplishments (Lent et al., 2011; Liguori et al., 2019). The field of human resources takes a wide application of self-efficacy to probe into the psychological cognitive factors of

TABLE 1 | Summary of related literatures.

Authors	Variables	Location	Findings
Duffy et al., 2014	Work volition, self-efficacy, outcome expectations, interests, goals	United States	Work volition was a significant moderator in the link of self-efficacy and outcomes expectations and self-efficacy and goals
Chang and Edwards, 2015	Job satisfaction, self-efficacy, coping	Taiwan	Self-efficacy was positively associated with problem-focused coping style and job satisfaction and negatively associated with emotion-focused coping
Lent et al., 2016	Self-efficacy, outcome expectations, social support, conscientiousness, exploration goals, prior engagement, anxiety	United States	Self-efficacy related strongly to outcome expectations, social support, conscientiousness, exploration goals, prior engagement in career exploration, decisional anxiety, and level of career decidedness
Jemini-Gashi et al., 2019	Career self-efficacy, social support, career indecision	Kosovo	Social support was indirectly correlated with career indecision, as career self-efficacy played a mediating role in this relationship
Liguori et al., 2019	Entrepreneurial intentions, entrepreneurial attitudes, entrepreneurial outcome, expectations	United States	The significant role of entrepreneurial attitude in mediating the relationship between entrepreneurial motivation and intention
Li et al., 2019	Protean career orientation, career decidedness, career decision self-efficacy, career adaptability	Hong Kong and the United States	Protean career orientation is positively related to career decision self-efficacy and career adaptability

employees in different situations and their positive impact on task accomplishment and employees' occupational development (Brown et al., 2011; Caesens and Stinglhamber, 2014; Duffy et al., 2014; Jemini-Gashi et al., 2019). To have a clearer understanding of the application of SCCT, major findings of relevant studies are described and summarized as follows in **Table 1**.

Based on the above discussion, it is considered that employees having confidence in their capabilities will lead to behaviors that are more efficient and interpersonal relationships that are better than whose who lack confidence (Brown et al., 2011; Chin and Rasdi, 2014; Chang and Edwards, 2015). As Chin and Rasdi (2014) considered, employees who are highly self-motivated seek resources and opportunities to fulfill tasks existing in a social network (Lent et al., 2011; Thompson et al., 2016). Only by establishing and insisting on network relationships can they achieve their goals. Knowledge and resources are in need (Lent et al., 2011; Jemini-Gashi et al., 2019). Moreover, teamwork can also be viewed as a strong network relationship, and the process in which problem solving and task fulfillment are conducted for employees via teamwork will play a positive effect on their EE (Duffy et al., 2014; Chang and Edwards, 2015). Given the above, this study puts forward H2 as follows:

H3: Self-efficacy plays a positive and significant effect on EE.

Some scholars have attached their research to the concerns for psychological health, POS (Chin and Rasdi, 2014), and lifestyles for employees (Lent et al., 2011). Nonetheless, few studies yet have addressed general self-efficacy and IB in this population. Research results from Jemini-Gashi et al. (2019) showed that individuals express a lower support level, limited sources that support comes from, and low perceived support (Brown et al., 2011). According to Caesens and Stinglhamber (2014), employees who have a high level of self-efficacy are inclined to gain diversified benefits at work which eventually give rise to a higher level of work satisfaction. It indicates that employees' failure to receive timely and necessary mental support when encountering work pressure leads to the deduction in employees' general self-efficacy and IB (Thompson et al., 2016). Besides, it might be conducive to unique stressors. On the contrary, employees owning higher self-efficacy show a higher level of IB. In a word, the study deduces H4:

H4: Self-efficacy plays a positive and significant effect on employees' IB.

Developing Innovation Behavior in Human Resources

Two causal mechanisms are conducive to the development of IB in human resources, and they are PK, as well as POS. With support for IB establishment, organizations or supervisors have access to devising the organizational context, including individual and organizational factors (Chin and Rasdi, 2014; Chang and Edwards, 2015; Thompson et al., 2016; Liguori et al., 2019) to improve the efficiency and responsiveness of knowledge acquisition. According to scholars, organizations or supervisors claimed to make use of, integrate, and rearrange individual and organizational elements to establish

an optimal organizational environment for building employees' IB (Lent et al., 2011; Chin and Rasdi, 2014; Ahmed and Nawaz, 2015; Kurtessis et al., 2017; Akgunduz et al., 2018). Organizations or supervisors carry out a range of support activities to identify individual and organizational elements (Thompson et al., 2016; Liguori et al., 2019), where PK focuses on perceiving knowledge and skills that internally exist (Ineson et al., 2013; Williams and Lombrozo, 2013; Cordova et al., 2014; Li et al., 2015; Hajizadeh and Zali, 2016) and POS focuses on offering tangible and intangible resources to accelerate employees' capabilities to fulfill their tasks or goals (Caesens and Stinglhamber, 2014; Ahmed and Nawaz, 2015; Lamm et al., 2015; Liguori et al., 2019). In this study, a better way to construct IB to make support activities adapted to PK and POS is considered.

Building a Support Mechanism for Innovation Behavior: Prior Knowledge

People's interpretation of existing situations and information relies on self-perception. Based on self-perception, people are accessible to identifying things and the environment in which they are living (Chang and Edwards, 2015). Self-perception assists learners while they are learning, but the learners may not realize it (Ineson et al., 2013; Thompson et al., 2016). The prior capability makes the learner available to comprehend external knowledge and information and then integrate the knowledge connotation obtained with the learner's prior capability (Williams and Lombrozo, 2013; Li et al., 2015), thus producing more abundant basis of prior capabilities (Ineson et al., 2013; Cordova et al., 2014). Thus, the prior capability is not immutable, but can enhance over time, revealing path-dependent characteristics (Williams and Lombrozo, 2013; Li et al., 2015), and the PK can be enhanced with the attitude to learning and the learner's motivation (Ineson et al., 2013; Cordova et al., 2014; Hajizadeh and Zali, 2016; Liguori et al., 2019).

Based on various theories, the effect of PK has been explored by scholars in studies on PK (Cordova et al., 2014; Hajizadeh and Zali, 2016). Despite some empirical studies that stated that the effect brought to employee performance by PK does not exist, some scholars still consider that PK is significantly correlated with learning (Cordova et al., 2014). Referring to the theory of cognitive load, Amadieu et al. (2009) have explored the effect of staff's PK in acquiring electronic documents that are internal within the organization (Williams and Lombrozo, 2013). It is concluded that a high degree of PK can make the staff more capable of information processing and learning route arrangement with their own mental model (Williams and Lombrozo, 2013; Hajizadeh and Zali, 2016; Liguori et al., 2019). In addition, a high degree of PK can make the staff unlikely to contend with work confusion than those who have a low degree of PK (Ineson et al., 2013; Liguori et al., 2019). It is possibly attributed to the fact that the explicit and written knowledge is of limited use, even though the staff has a high degree of PK of this kind (Williams and Lombrozo, 2013; Hajizadeh and Zali, 2016). However, the implicit and complicated knowledge will facilitate the employees who have a high degree of PK as such kind to probe into the knowledge connotation in a more careful and deep way (Cordova et al., 2014), which contributes to shifting this

process of exploration into their own EE. In a word, the study puts forward hypotheses as follows:

H5: PK plays a positive and significant effect on EE.

Employees who have more PK drive themselves to gain more external knowledge to figure out work problems and challenges, thus fulfilling individual goals and strengthening the individual perception of accomplishment (Williams and Lombrozo, 2013; Cordova et al., 2014). In other words, employees who strengthen their own capabilities by learning, perceiving, and combining diversified knowledge possess more PK during fulfilling tasks (Ineson et al., 2013; Hajizadeh and Zali, 2016). This contributes to enhancing individual feelings of IB. Employees who own more PK will have access to the identification of valuable and helpful information and knowledge to handle more business in the external environment, thus playing an effect on work satisfaction and efficiency. In some past studies, it is stated that expecting there to be significant and immediate self-efficacy change makes sense (Ineson et al., 2013; Liguori et al., 2019), accompanied by vital improvement of PK as time passes for employees (Cordova et al., 2014). Similarly, faced with negative environmental events or the need of assistance, employees can alleviate the influence arising from negative environmental events by means of the accumulated knowledge or resources (Hajizadeh and Zali, 2016). When intense pressure comes to employees, and they feel vital resources are lost, an effect brought to employees' estimation of stress situations will occur if they have adequate PK, thus resulting in the reduction of adaptive strategies for negative feelings and inappropriate utility (Ineson et al., 2013). Thus, H6 is proposed in this study as follows:

H6: PK plays a positive and significant effect on employees' self-efficacy.

Building Support Mechanism for Innovation Behavior: Perceived Organizational Support

Perceived organizational support (Ahmed and Nawaz, 2015; Akgunduz et al., 2018) refers to how employees perceive whether an organization is concerned with their IB and dedications (Gillet et al., 2012; Caesens and Stinglhamber, 2014; Demir, 2015) or whether the organization assists them in fulfilling professional and individual goals (Uppal and Mishra, 2014; Kurtessis et al., 2017; Liguori et al., 2019). When positive organizational support comes to employees, more job security and involvement in work come to them (Kose, 2016; Kurtessis et al., 2017). POS has a strong correlation with many positive traits and behaviors in the workplace, and a positive organizational atmosphere (Ahmed and Nawaz, 2015; Kose, 2016; Jemini-Gashi et al., 2019) and a positive organizational citizenship behavior are included (Caesens and Stinglhamber, 2014; Demir, 2015; Lamm et al., 2015; Akgunduz et al., 2018). These associations mostly seem to be correlated with other variables in this study (Meyers et al., 2019). For example, according to Kose (2016), organizational citizenship behavior is regarded as an intention for employees to assist others beyond the range of their assigned responsibilities, and it seems to be approximated to a social dimension of self-efficacy and EE.

There is a crucial relationship between POS and self-efficacy which has been discussed in past studies (Caesens and Stinglhamber, 2014; Kose, 2016). When employees feel as if the organization cares about their well-being, they provide their contributions in exchange. POS also enhances employees' sense of belonging (Demir, 2015; Lamm et al., 2015; Akgunduz et al., 2018). Regarding the relationship between POS and self-efficacy, Kose (2016) stated that employees with the perception of organizational support frequently feel security in their positions and consider that their organizations care for their professional advancement (Lent et al., 2011; Uppal and Mishra, 2014; Schultz et al., 2015; Kurtessis et al., 2017). It is reasonable that employees considering their organizations are concerned about their individual and professional life would have an intention of searching for more resources to accomplish tasks or obtain more duties (Akgunduz et al., 2018), which are shown as dimensions of self-efficacy and EE (Lent et al., 2011; Caesens and Stinglhamber, 2014). POS is positively correlated with organizational citizenship behaviors (Demir, 2015; Meyers et al., 2019), and it offers a prediction of more helping behaviors within an organization.

For employees, POS is viewed as the most direct and efficient support source (Akgunduz et al., 2018). Organizations offer assistance to employees when it comes to job demands and problem solving, as well as anxiety led by the utilization of technological tools at work (Lent et al., 2011; Lamm et al., 2015). In addition, by means of the support for effective work from the organization, the state of job engagement will be enhanced, and the employees' successful accomplishment of tasks will be improved (Kurtessis et al., 2017; Jemini-Gashi et al., 2019; Liguori et al., 2019). Akgunduz et al. (2018) stated that employees with adequate competence and motivation are able to fulfill their organizations' targets and perform as required when no manager supervises (Meyers et al., 2019). POS shows a relationship with theories of social interaction (Ahmed and Nawaz, 2015; Kurtessis et al., 2017). Favorable work environments, which are integrated with psychological characteristics of employees, can be generated to provide employees with more confidence in job task accomplishment (Caesens and Stinglhamber, 2014; Liguori et al., 2019). Employees will have more motivation to participate in work targets and get to know values and insights derived from task fulfillment and problem solving (Lent et al., 2011; Ahmed and Nawaz, 2015), thus enhancing employee self-efficacy, if they feel that the POS from supervisors and peers has built the positive psychological surroundings. Thus, H7 is proposed in this study as follows:

H7: POS has a positive and significant effect on employees' self-efficacy.

Furthermore, the POS, accompanied by its relationship with EE, contributes to accelerating the work interest for employees and the utilization of their occupational skills (Caesens and Stinglhamber, 2014; Ahmed and Nawaz, 2015), and further strengthening employees' capabilities (Lent et al., 2011; Liguori et al., 2019). When employees encounter practical problems, like critical analysis, problem resolution, and reflection, they can exhibit better attitudes to work and capabilities of a critical mind

(Schultz et al., 2015; Jemini-Gashi et al., 2019). Akgunduz et al. (2018) claimed that employees obtain support that supervisors or organizations offer, and the support can accelerate the creativity for employees, thus accelerating their employment skills (Gillet et al., 2012; Caesens and Stinglhamber, 2014). Mulholland and O'Connor (2016) presented a confirmation that employees taking in the POS pattern will alter their occupational skills, attitudes, and behaviors to strengthen their critical mind, autonomy, and capabilities related to employment. Thus, H8 is proposed in this study as follows:

H8: POS plays a positive and significant effect on EE.

Given the above hypotheses, this study puts forward the research framework in **Figure 1** as follows.

METHODOLOGY

Sampling

The purpose of this research is to explore the employee IB, and to analyze the impact of internal and external factors provided by the organizations and individual knowledge base. The research sample in this study comprised employees. Purposive sampling was adopted. However, this sampling suffers from several disadvantages. Vulnerability to errors in judgment by researchers, low level of reliability and high level of bias, and inability to generalize research findings are three main disadvantages. To avoid these disadvantages, some conditions were set during sampling in this study to make the samples obtained better conform to sample reliability and to improve the generalization of the study. The results indicated that subject did not significantly impact the research variables, and so did not need to be included as an independent variable in subsequent analyses. To discuss IB of employees in a more clarified manner, not all the employees are regarded as the study population, but only the employees in the information service industry. Moreover, while filling the questionnaire, all the samples were already at work, rather than being isolated at home. In the questionnaire, participants

were informed of the research purpose, research ethics, and low risks, and the questionnaire information was processed in an anonymous way. The response period ran from May 2020 to August 2020. Since different pandemic prevention policies were adopted in Taiwan, mainland China, and Malaysia, we try to explore whether these pandemic prevention policies have had a different impact on attitudes and behaviors of employees during this period. This study constructed a structural model to explore the correlations among POS, PK, self-efficacy, EE, IB, and JP. It sampled from Taiwanese, Malaysian, and mainland China companies. This study selected more than 20 Taiwanese, Malaysian, and mainland China companies, and then sent 1000 questionnaires to each of them. Finally, a total of 640 Taiwanese questionnaires, 450 Malaysian questionnaires, and 568 mainland China questionnaires were returned, for an effective response rate of 64.0, 45.0, and 56.8%. In the Taiwanese sample, most are men (61.8%), whose level of education is mostly undergraduate or above (78.9%), and most of them are between 30 and 40 years old (77.3%) with an average working year of 3.9. In the Malaysian sample, most are men (55.4%), whose level of education is mostly undergraduate or above (68.4%), and most of them are between 35 and 40 years old (43.2%) with an average working year of 5.2. In the sample of mainland China, most are men (62.1%), whose level of education is mostly undergraduate or above (66.9%), and most of them are between 30 and 35 years old (53.8%) with an average working year of 4.3.

This study hid the names of constructs and assigned the question items randomly to prevent common method variance (CMV). The Harman one-factor analysis method as used to test for CMV. The explained variance in one factor was 35.27%, which is smaller than the recommended threshold of 50%. Therefore, CMV was not problematic in this study (Podsakoff and Organ, 1986). Before conducting hypotheses testing, this study must ensure that the values of the variance inflation factor (VIF) are less than 5, but the research results showed that the VIF values were between 1.332 and 2.723. Thus, there were no multicollinearity problems among the latent variables (Hair et al., 2017).
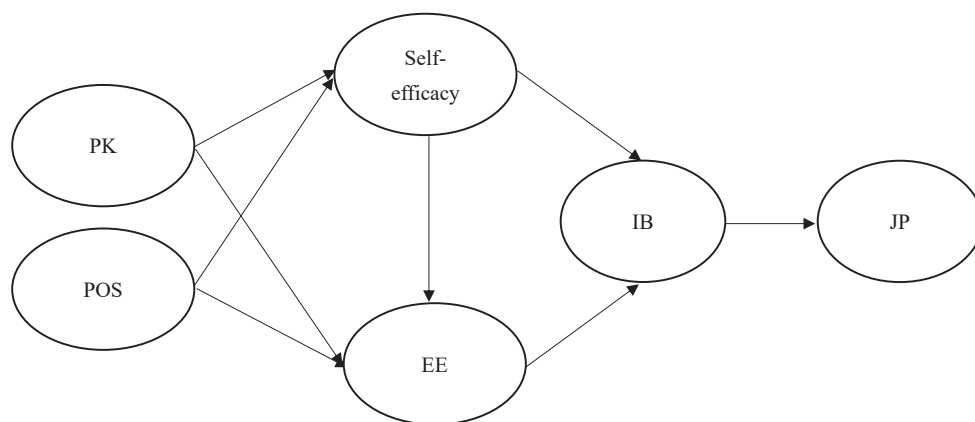
FIGURE 1 | Research framework. PK, prior knowledge; POS, perceived organizational support; EE, employee employability; IB, innovation behavior; JP, job performance.

TABLE 2 | Instruments description.

Construct	Variables	Items
Prior knowledge	Prior knowledge	Enough knowledge to solve problem
		Enough knowledge to plan
		Self-awareness
		Enough knowledge to make critical analysis
		Enough knowledge to make decision
		Self-management
		Global awareness
		Enough knowledge to apply subject understanding
		Teamwork
		Willingness to learn
Perceived organizational support	Supervisor and colleague support	My boss regularly gives me feedback about my performance.
		My boss makes sure that I can learn on the job by giving me challenging assignments.
		My colleagues regularly give me feedback about my performance.
		My boss makes sure that I develop the competencies that I need for my career.
	Organizational support	I get the necessary time and means to further develop my competencies.
		I can make use of a personal development plan to know what competencies I need to develop and how I can develop them best.
		My organization provides new and creative training opportunities.
		I can regularly change jobs within my company (without promotion) to develop new competencies.
		All information about career opportunities in the organization is readily available.
		I have been given tasks that develop my competencies for the future.
		I have been given a personal development plan to better understand my possibilities within the organization and the competencies I need to fully exploit them.
		I have been given the possibility within my organization to develop the competencies I need to get a promotion and move to a function at a higher level of the organization.
Self-efficacy	Self-efficacy	I can remain calm when facing difficulties in my job because I can rely on my abilities.
		When I am confronted with a problem in my learning tasks, I can usually find several solutions.
		Whatever comes my way in my learning tasks, I can usually handle it.
		My past experiences in my learning tasks have prepared me well for my occupational future.
		I meet the goals that I set for myself in my learning tasks.
		I feel prepared for most of the demands in my learning tasks.
Employability	General ability for work	Expression and communication.
		Time management.
		Leadership.
		Innovation.
		Teamwork.
		Native language.
		Foreign language.

(Continued)

TABLE 2 | (Continued)

Construct	Variables	Items
	Professional ability for work	Stability and pressure resistance.
		Professional knowledge and skill.
		Computer literacy.
		Application of theory to work.
		Problem finding and solving.
	Attitude at work	Learning desire.
		Plasticity.
		Understanding of professional ethics.
	Career planning and confidence	Understanding and planning of individual career development.
		Understanding of environment and development of industries.
		Job search and self-promotion.
Innovation behavior	Innovation behavior	I often come up with new and practical ideas to improve performance.
		I often develop new methods for work implementation.
		I often use new technologies, processes, and techniques in information service.
Job performance	Job performance	I always complete the duties specified in my job description.
		I fulfill all responsibilities required by my job.
		I never fail to perform essential duties.
		I never neglect aspects of the job that I am obligated to perform.
		I meet all the formal performance requirements of the job.

Measures

Most of the scales in the questionnaire are adopting previous studies and modified to suit the research context. In PK, 10 items were developed based on a prior scale proposed by Silva et al. (2013). To divide POS into supervisor and colleague support (four items) and organizational support (eight items), we adopted the scale proposed by De Vos et al. (2011). In employee employability, the scales proposed by Pan and Lee (2011) were adopted, including general ability for work (GAW) (eight items), professional ability for work (PAW) (four items), attitude at work (AW) (three items), and career planning and confidence (CPC) (three items). For self-efficacy, the scale is revised and integrated with six items developed by Rigotti et al. (2008). IB was measured using Kao et al.'s (2015) instrument, which comprehensively assesses IB in three items. For JP, five items were selected based on Janssen's (2001) scale. All items were measured with a 5-point Likert scale (1 = totally disagree; 5 = totally agree) and are shown in **Table 2**.

RESULTS

Evaluation of the Measurement Model

All scales used in this study were found to be reliable, with Cronbach's α ranging from 0.83 to 0.96. **Table 3** shows the reliability of each scale, and the factor loadings for each item therein. To gauge validity, this study employed confirmatory

TABLE 3 | Measurement properties.

	1	2	3	4	5	6	7	8	9	12
(1) PK	*0.817*									
(2) Organization	0.525	*0.837*								
(3) Supervisor	0.501	0.866	*0.877*							
(4) Self-efficacy	0.405	0.537	0.508	*0.779*						
(5) GAW	0.389	0.345	0.333	0.391	*0.718*					
(6) PAW	0.529	0.347	0.322	0.389	0.538	*0.832*				
(7) AW	0.599	0.439	0.414	0.442	0.525	0.767	*0.834*			
(8) CPC	0.681	0.518	0.487	0.430	0.450	0.614	0.713	*0.895*		
(9) IB	0.446	0.658	0.603	0.521	0.308	0.331	0.417	0.434	*0.896*	
(10) JP	0.512	0.736	0.665	0.526	0.330	0.353	0.419	0.471	0.643	*0.789*
Mean	3.572	3.750	3.658	3.793	3.568	3.691	3.685	3.624	3.933	3.833
SD	0.692	0.729	0.754	0.544	0.606	0.671	0.673	0.731	0.714	0.659
α	0.944	0.939	0.900	0.872	0.817	0.852	0.780	0.876	0.923	0.836
AVE	0.668	0.701	0.770	0.607	0.515	0.692	0.695	0.801	0.803	0.623
CR	0.952	0.949	0.962	0.902	0.863	0.900	0.872	0.923	0.913	0.889

The italized values mean squared root of AVE values.

factor analysis (CFA) using AMOS 23.0 to verify the construct validity (both convergent and discriminant) of the scales. According to Hair et al.'s (2010) recommended validity criteria, CFA results show standardized factor loading of higher than 0.5; average variance extracted (AVE) ranges between 0.514 and 0.803; and composite reliability (CR) ranges between 0.863 and 0.962. All three criteria for convergent validity were met, and correlation coefficients were all less than the square root of the AVE within one dimension, suggesting that each dimension in this study had good discriminant validity.

Inner Model Analysis

Before proceeding to examine the structural model, we first tested model fit. Henseler et al. (2015) proposed three model fitting parameters: the standardized root mean square residual (SRMR), the normed fit index (NFI), and the exact model fit. In this study, the SRMR value was 0.054 (<0.08) and the NFI was 0.932 (>0.90) and the d_{ULS} < bootstrapped HI 95% of d_{ULS} and d_G < bootstrapped HI 95% of d_G indicating the data fits the model well. Partial least squares structural equation modeling (PLS-SEM) was adopted to construct the structural model; specifically, verification of the structural model was performed using SmartPLS 3.0 (path analysis). To assess the structural model, Hair et al. (2017) suggested looking at the R^2, beta (β), and the corresponding t-values via a bootstrapping procedure with a resample of 5000. They also suggested that in addition to these basic measures, researchers should also report the predictive relevance (Q^2) as well as the effect sizes (f^2). Prior to hypotheses testing, the values of the variance inflation factor (VIF) were determined. The VIF values were less than 5, ranging from 1 to 1.914. Thus, there were no multicollinearity problems among the predictor latent variables (Hair et al., 2017).

Figures 2–4 show the results of the hypothesized relationships and standardized coefficients in Taiwanese and mainland China samples. The results showed that IB was positively and significantly related to JP (β$_{Taiwan}$ = 0.601, f^2 = 0.566, p < 0.001;

β$_{China}$ = 0.736, f^2 = 1.185, p < 0.001; β$_{Malaysia}$ = 0.471, f^2 = 0.285, p < 0.001), supporting H1; respectively, we have found comparable results with Baradarani and Kilic (2018). Self-efficacy (β$_{Taiwan}$ = 0.535, f^2 = 0.399, p < 0.001; β$_{China}$ = 0.363, f^2 = 0.159, p < 0.001; β$_{Malaysia}$ = 0.523, f^2 = 0.353, p < 0.001) and EE (β$_{Taiwan}$ = 0.276, f^2 = 0.106, p < 0.001; β$_{China}$ = 0.182, f^2 = 0.040, p < 0.001; β$_{Malaysia}$ = 0.221, f^2 = 0.063, p < 0.001) were also positively and significantly related to IB, supporting H2 and H4. The findings of this research confirm consistent with findings of Wei et al. (2020) that self-efficacy plays a significant role in the development of IB.

In addition, self-efficacy (β$_{Taiwan}$ = 0.330, f^2 = 0.106, p < 0.001; β$_{China}$ = 0.049, f^2 = 0.040, p < 0.1; β$_{Malaysia}$ = 0.302, f^2 = 0.063, p < 0.001) was positively and significantly related to EE in Taiwanese and Malaysian samples rather than in the mainland China sample, partial supporting H3. This is consistent with the results of Liu et al. (2020) and Zhao et al. (2021) that found a positive effect of self-efficacy on employability. Similarly, the paths of PK → self-efficacy (β$_{Taiwan}$ = 0.271, f^2 = 0.104, p < 0.1; β$_{China}$ = −0.052, f^2 = 0.003, p > 0.1; β$_{Malaysia}$ = 0.302, f^2 = 0.110, p < 0.001) and POS → EE (β$_{Taiwan}$ = 0.128, f^2 = 0.016, p < 0.1; β$_{China}$ = 0.036, f^2 = 0.003, p > 0.1; β$_{Malaysia}$ = 0.218, f^2 = 0.069, p < 0.001), showed that the relations were positive and significant in Taiwanese and Malaysian samples rather than in the mainland China sample, therefore, partially supporting H6 and H8. A similar result was found in a study of United Kingdom, Australia, and Switzerland institutions, where PK was found to have a positive influence on self-efficacy (Ineson et al., 2013).

Finally, the paths of PK → EE (β$_{Taiwan}$ = 0.271, f^2 = 0.150, p < 0.1; β$_{China}$ = −0.052, f^2 = 0.945, p > 0.1; β$_{Malaysia}$ = 0.302, f^2 = 0.179, p < 0.001) and POS → self-efficacy (β$_{Taiwan}$ = 0.512, f^2 = 0.370, p < 0.1; β$_{China}$ = 0.504, f^2 = 0.306, p > 0.1; β$_{Malaysia}$ = 0.318, f^2 = 0.122, p < 0.001) showed that the relations were positive and significant in both samples, supporting H5 and H7. The Stone–Geisser Q2 values obtained through the blindfolding procedures for self-efficacy (Q^2 = 0.178), EE
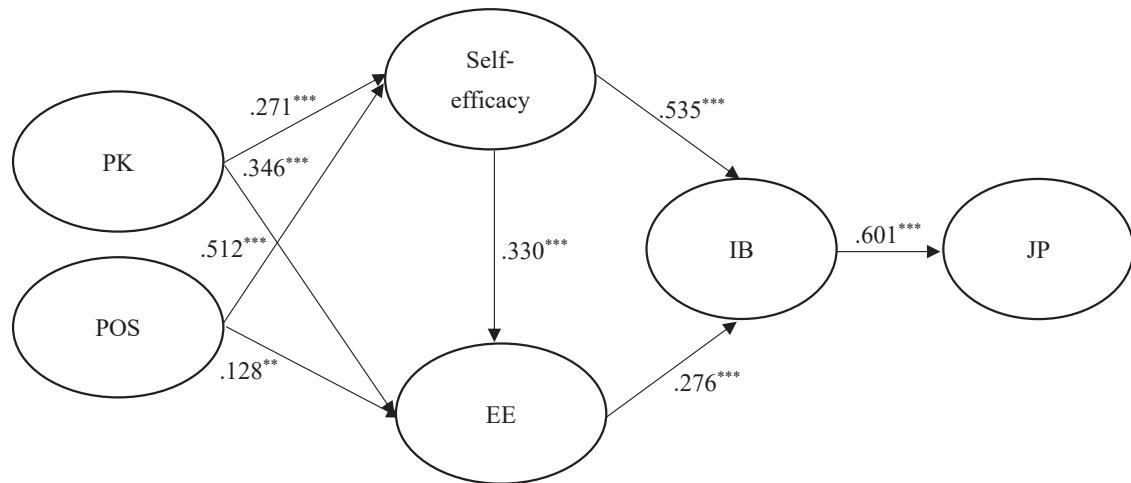
FIGURE 2 | Structural model on Taiwanese employees. PK, prior knowledge; POS, perceived organizational support; EE, employee employability; IB, innovation behavior; JP, job performance. ***p < 0.001.
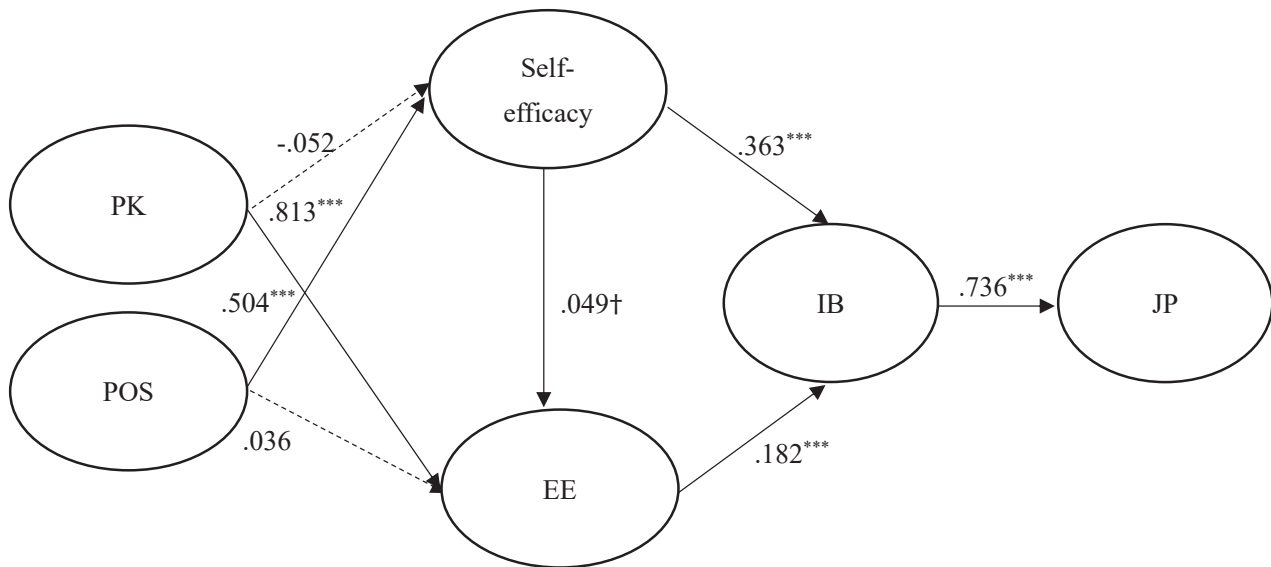
FIGURE 3 | Structural model on mainland China employees. PK, prior knowledge; POS, perceived organizational support; EE, employee employability; IB, innovation behavior; JP, job performance. ***p < 0.001 and [†]p < 0.1.

(Q^2 = 0.335), IB (Q^2 = 0.352), and JP (Q^2 = 0.303) were larger than zero, supporting the model has predictive relevance (Hair et al., 2017).

Multiple Group Analysis: Taiwan, Mainland China, and Malaysia

It was confirmed that the measurement pattern was stable. However, to avoid overgeneralizing the data-driven patterns and theories, the study followed the suggestion of Hair et al. (2010) to divide the sample data into three groups based on regions (623 Taiwanese, 440 Malaysian, and 513 mainland China employees, respectively). The partial measurement invariance

was established that was the basic requirement to compare as well as interpret the PLS-SEM's findings for examining the specific Multiple Group Analysis (MGA) group's differences (Henseler et al., 2016). **Table 4** indicates the structural models' results and MGA by using non-parametric methods including Henseler's MGA as recommended by Henseler et al. (2009). Despite several differences in terms of significant path estimates between the groups, as indicated in **Table 4**, the multi-group permutation tests (right column) showed there are seven significant differences between the two groups on all paths. The results signify that the region plays a moderating role on the relationship among PK, POS, self-efficacy, SE, IB, and JP (Hair et al., 2017). The differences in paths comparison among Taiwan vs. mainland

FIGURE 4 | Structural model on Malaysian employees. PK, prior knowledge; POS, perceived organizational support; EE, employee employability; IB, innovation behavior; JP, job performance. ***$p < 0.001$.
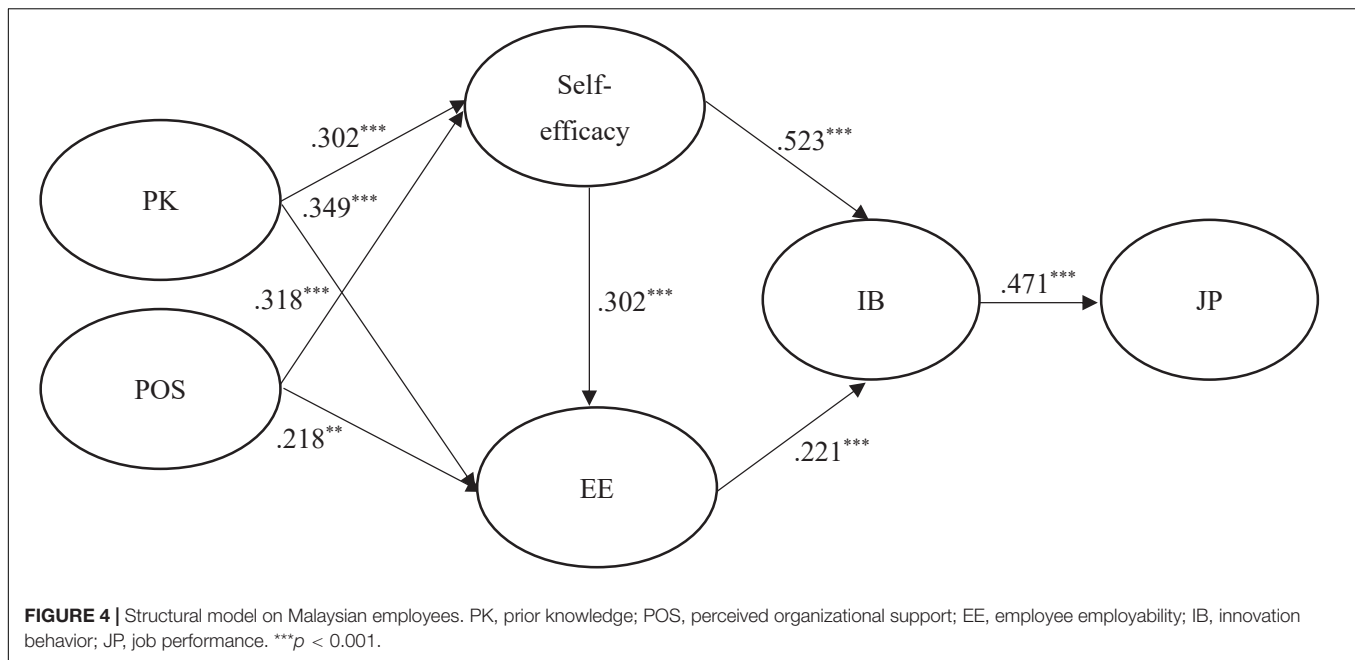
TABLE 4 | Multi-group analysis result.

Paths	$|\beta_{Taiwan} -\beta_{China}|$	p-value Henseler's MGA	$|\beta_{Taiwan} -\beta_{Malaysia}|$	p-value Henseler's MGA	$|\beta_{Malaysia} -\beta_{China}|$	p-value Henseler's MGA
H1: IB → JP	0.135	0.000	0.129	0.019	0.264	0.000
H2: Self-efficacy → IB	0.172	0.999	0.012	0.421	0.160	0.996
H3: Self-efficacy → EE	0.281	0.000	0.027	0.328	0.254	0.000
H4: EE → IB	0.095	0.750	0.055	0.183	0.040	0.750
H5: PK → EE	0.468	0.000	0.003	0.513	0.465	0.000
H6: PK → Self-efficacy	0.324	0.000	0.031	0.700	0.355	0.000
H7: POS → EE	0.094	0.999	0.090	0.928	0.184	0.999
H8: POS → Self-efficacy	0.009	0.564	0.194	0.001	0.185	0.002

China, Taiwan vs. Malaysia, and Malaysia vs. mainland China show that four paths, two paths, and five paths were significant sequentially. These results imply that the research framework did differ among the three regions.

DISCUSSION AND CONCLUSION

In this study, employees from Taiwan and Chinese mainland were adopted as research samples to examine the correlations among PK, POS, self-efficacy, SE, IB, and JP by means of the SCCT. The study contributes to filling the theoretical gap while applying Western theories in an Eastern context (Lent et al., 1994; Brown et al., 2011; Chang and Edwards, 2015), and increasing the generalization of the theory. Based on our results, this study is aimed at offering the following. First, there are few studies that have given a verification of employees' IB based on an enormous environmental challenge (Thompson et al., 2016). In the study, the process of strengthening employees' competence and IB in the context of the global pandemic have been investigated, and practical implications have been intended for

corporate management. Second, despite most previous studies on SCCT accounting for the significance of environmental elements (Brown et al., 2011; Hansen et al., 2012; Duffy et al., 2013; Chang and Edwards, 2015; Liguori et al., 2019), merely a few studies showed essential contributions from worldwide environmental factors. This study intends to fill the theoretical gap and enrich the theoretical foundation of SCCT. Third, in addition to verifying the research framework established by SCCT in the Asian context, this study also provides intercultural perspective to compare differences among Taiwan, Chinese mainland, and Malaysia. There are more insights and advice regarding theories of human resources supplied by our results.

According to the results, the PK and POS of employees from Taiwan and Malaysia have a positive correlation with their self-efficacy and EE, but there is no significant effect on the paths of PK → self-efficacy and POS → EE on employees from Chinese mainland. These findings are in accord with those from Hansen et al. (2012), Lent et al. (2016), and Meyers et al. (2019); based on the SCCT, they consider that employees' working state and attitudes can be affected by environmental deviations (Rehg et al., 2012), resulting in differences in the acquisition of capabilities

and skills. Our results are consistent with those from previous studies to a substantial extent, which support the availability of the SCCT models in regions within a certain range (Hansen et al., 2012). Besides, as it is difficult for employees to be accessible to adequate psychological support provided by organizations (Schultz et al., 2015), supervisors or colleagues guided by the stagnation of business activities that develop proper EE and confidence for task fulfillment, inessential correlations may exist between the paths of PK → self-efficacy and POS → EE on employees from the Chinese mainland.

Furthermore, the positive correlations between the paths of PK → EE and POS → self-efficacy for employees from Taiwan, Malaysia, and the Chinese mainland have been revealed. It is also notable that according to the individual and organizational support mechanisms, employees possessing more PK and POS from organizations or supervisors are inclined to be more committed to the work surroundings and actively engaged in task activities, thus acquiring capabilities and confidence of task fulfillment, such as developing systematic/integrative minds and skills of resolving problems. The results are consistent with those from some previous studies (Schultz et al., 2015) which support the relationship existing between support mechanism and self-efficacy. Even though researchers have started with the examination of the connection among POS, work conditions, and work impetus in conformity with motivation theory (e.g., Schultz et al., 2015), and as far as we know, there are few previous studies which have investigated the influence brought to psychological and capability needs by individual or organizational factors. Therefore, the current research shows for the first time that the more the employees perceive a high level of the construction mechanism for IB (Gillet et al., 2012), the better they will meet their self-efficacy and EE.

In addition, it is shown that self-efficacy and SE make mass contributions to IB for employees from Taiwan, Malaysia, and the Chinese mainland. Moreover, self-efficacy plays a significant mediating function when it comes to the research model of SCCT. These results go in line with those from Lent et al. (2016) and Meyers et al. (2019) to a great extent, who conducted a cross-sectional verification of the IB model with diversified samples of employees (Hansen et al., 2012). Moreover, differing from the study made by Meyers et al. (2019), in this study, a comparison of samples from diversified regions with the same model, such as employees from Germany, Indonesia, Holland, Romania, and South Africa, is made, and a good comprehensive model-data fit in both samples is reported (Taiwan and Chinese mainland), and direct and indirect effects that self-efficacy generated in the IB model of SCCT bring to IB are verified. Nonetheless, different from the studies made by Lent et al. (2016) and Meyers et al. (2019), in this study, effects on the psychological aspect derived from worldwide environmental events are taken into consideration, and the theoretical model and SCCT of IB based on the regional analysis are enriched. Besides, the findings show that IB is found to have a positive and significant relationship with JP for employees from both Taiwan and the Chinese mainland. The result indicates that employees are significantly driven to enhance their JP in diversified work surroundings, particularly in a difficult situation,

by positive psychological attitudes. The positive influence that IB brings to JP is consistent with the results from prior studies, which may enhance the utility of explanations and cultural associations of SCCT models to individuals living in various countries and cultures.

Through examining the extent to which regions where employees exist (Taiwan, Malaysia, as well as Chinese mainland) influence the correlations among POS, PK, self-efficacy, EE, IB, as well as JP, a theoretical contribution has been provided by the study. This goes in line with recent work done by Sheu and Bordon (2017), presenting that more attention has been offered to contextual support in international research on SCCT. It is found from the geographic distribution of international research on SCCT that Asian and European countries are still in need of more empirical attention. According to Sheu and Bordon (2017), cross-regional and cross-cultural differences are suggested to be included and explored in subsequent research. Through the test of a structural model across three groups, the structural relationships existing among the constructs are predicted to be stronger for transnational business administrators who have employees from Taiwan, Malaysia, and Chinese mainland. Nevertheless, the success of the PLS-SEM multi-group analysis indicates that the work surroundings are viewed as a moderator variable, showing that offline offices exist to enhance the relationships among PK, POS, self-efficacy, SE, IB, and JP.

Practical Implications

Based on our results, this study suggests some significant practical implications to improve the quality of human resources. First, POS and PK were equally significant and predictive for employees' own perceived degree of self-efficacy and EE, thus having an effect on IB. Building mechanisms of mentality that are individual and organizational are conducive to employees in terms of acquiring more resources and psychological support, which provide conditions essential for IB improvement. Thereby, as countries and regions worldwide are undergoing a struggle with the COVID-19 pandemic at present, when facing such similar events, organizations need to facilitate supervisors to establish a positively close connection with employees, set up platforms for communication via technological media and information technology devices, and offer real-time tasks or psychological support.

Second, external environmental elements, the worldwide pandemic of COVID-19 in particular, may affect employees' work state. Thus, the examination for a sense of risk management is essential for managers. Based on this, companies or organizations are suggested to turn to preventive measures for risk management in this study to contend with threats and challenges arising from adaptive risks when encountering similar events. Even though all employees are prompted to engage in online working due to this event, not all employees possess technological media or information technology devices which are required. As a result, it is a necessity for managers to keep statistics on how many employees own information technology devices first and then figure out whether work tasks can be accomplished via online working; then the work tasks that fail to be accomplished via online work need to be rearranged in accordance with a schedule.

Third, in view of the structural patterns for three regions, IB originating from self-efficacy of employees from Taiwan and Malaysia is superior to that of employees from Chinese mainland. It is found that working online will influence employees. In regions that have been blocked for a longer time, employees are likely to feel more helplessness, disability, and anxiety. Even though employees are confident in task accomplishment, they are suffering from negative energy led by blockage. In this study, managers are suggested to provide support in other ways, such as opportunities, resources, and autonomy, to assist employees in conquering the threats and challenges from their surroundings and participate in their IB.

Research Limitations

The research findings make contributions to the literature concerning employees in specific regions, SCCT, and employees' IB. However, there are still some limitations existing and representing subsequent research directions. First, there is considerable status for SCCT in the field of psychology, but merely a few studies have taken the relationship between building mechanism and IB of employees into consideration. Despite this study referring to the SCCT and establishing the building mechanism, and significant organizational theories are available to be drawn from the findings, other motivation theories, including the theories of organizational learning, self-efficacy, and hierarchy needs, still apply to explaining how to stimulate IB for employees in a specific region. Therefore, subsequent research is suggested to apply diversified theoretical models to identifying related psychological dimensions that play an effect on employees' IB. Second, employees are required to do a self-report of details regarding their mental building mechanism as the indicator in the study, which is largely attributed to the actual data that is confidential and not accessible in an easy way. Nonetheless, there may be errors occurring in employees' self-statement of mental conditions. If the actual mental conditions of employees are assessed, the connection between building mechanism and IB may be better understood, considering research ethics. In addition, subsequent researchers are suggested to include contents of interviews and employees' observations of work state into their studies to sustain the research findings and draw a comprehensive judgment. Third, restricted by time and space, a total of 1576 valid copies of the questionnaire were sampled. The research objects were classified into employees from Taiwan and Chinese mainland. Subsequent research can be made to both expand the quantity of samples and research representativeness, and conduct an exploration and comparison of other groups, so that extra insights related to organizational behavior management are offered.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by Academic Committee of School of Economics and Management of Foshan University and University of Taipei. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

MP contributed to conception and design of the study. YX organized the database. CC performed the statistical analysis. MP wrote the first draft of the manuscript. All authors contributed to manuscript revision, read, and approved the submitted version.

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The Multilevel Study on the Impact of High-Performance Human Resource Practices on Employees' Voice Behavior: A Moderated Mediation Model

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Based on the social identity theory, the relationship and influencing mechanism between high-performance human resource practices (HPHRPs) and employees' voice behavior were explored by constructing a moderated mediation model, and the relationship between the field of human resources and the field of organizational behavior was also established. Through 1,178 paired samples of supervisor-employee survey and multilevel linear model analysis technology, it was found that (1) HPHRPs had a positive impact on employees' voice behavior; (2) perceived insider status played a mediating role between HPHRPs and voice behavior; (3) voice efficacy played a moderating role between perceived insider status and voice behavior; and (4) voice efficacy played a mediating role in the relationship between "HPHRPs-perceived insider status-voice behavior."

Keywords: high performance human resource practices, voice behavior, perceived insider status, voice efficacy, multi-level

INTRODUCTION

In the current complicated business environment, ideas and information provided by the employees have been considered important ingredients for managers to make better decisions for the success of the organizations (Liang et al., 2012). The employees' voice behavior, which has been conceptualized as constructive and challenging ideas and exchanges, has attracted more and more attention by managers due to its feasibility to help organizations identify possible ignored issues, promote organizations to make innovations, and adapt to the dynamical and rapidly changing business environment as well (Yin et al., 2018). Nevertheless, since the voice behavior is not always considered positive, it is a challenge to the current status and might lead to risky consequences, such as the failure of interpersonal relationship. Thus, the employees may feel uneasy and hesitant when expressing their inner thoughts and are not always willing to share their suggestions or opinions with the organization (Detert and Edmondson, 2011). The as-described phenomenon should be

paid special attention for the reason that concealing one's suggestions will be harmful to achieve a "win-win" outcome for both sides of the employers and employees.

At present, extensive studies, regarding the situations and psychological factors that promote or hinder employee's voice behavior, have been conducted because of recognizing the importance of employees' voice behavior. However, scholars in the field of human resources and employee relations pointed out that importance should be attached to the micro-process in the study of taking voice as an individual's pro-social and caring behavior (Barry and Wilkinson, 2015). Barry and Wilkinson (2015) believed that employees' voice in organizational behavior was unlikely to provide opportunities to challenge macro-level management due to the emphasis on individual discretionary power at the micro-level (Barry and Wilkinson, 2015). Regarding this aspect, scholars in the fields of employee relations and human resources have reached a consensus. They believed that macro-level factors need to be considered, such as high-level strategies, organizational goals, and human resource management practices, in order to have a more comprehensive understanding of employees' voice (Weller et al., 2019). With the emergence of the strategic human resource management paradigm, high-performance human resource practices (HPHRPs) have become a dominant subject in the discipline of human resource management. HPHRPs regarded the conventional human resource practices as an overall "bundle" or system, rather than fragmented modules, which represented the expression of employees' collective interests (Ramdani et al., 2014). As a consequence, it is highly necessary to establish a connection between the field of human resources and the field of organizational behavior and integrate the macro- and micro-levels to study voice. Such integration may contribute to coming up with relatively novel insights that help us understand how macro factors drive the psychological mechanism and encourage people to make voice (Mowbray et al., 2015).

According to the social identity theory, everyone has a need for identity. The flexible HPHRPs have the ability to make employees feel the care and attention from the organizations, thereby enhancing the level of perceived insider status. For those individuals with identity, they always regard themselves as the "master" of the organizations, provide positive evaluations to their affiliations, and are willing to put forward voices and suggestions for the development of the organizations (Li et al., 2017). In contrast, there is still a certain gap in the transformation of willingness into behavior. In addition, whether the willingness of employees' perceived insider status can eventually be transformed into practical voice behavior is also related to the level of individual confidence. The voice efficacy reflected the individual's confidence in completing the voice behavior, and the people with a high sense of voice efficacy are more willing to transform the identity of the organization into practical voice action.

In this article, a new macro-management factor was explored, taking China as the research background. This factor could not only psychologically drive the voice mechanism but also increase the possibility of employees' voice behaviors. Specifically, a multilevel mediation model, linking the HPHRPs in the field of strategic human resources with the voice behaviors in the field of organizational behavior, was established. Moreover, the "black box" mechanisms of the two aspects were also investigated from the perspective of social identity.

LITERATURE REVIEW AND RESEARCH HYPOTHESIS

High-Performance Human Resource Practices and Employee Voice

Strategic human resource management is a mode of planning human resource deployment and activities, which aims to promote the organizations to achieve the goals. As a result, strategic human resource adopts systematic viewpoints to test the effects of a series of human resource practices. By this method, the view of strategic human resource management research and the view of traditional human resource function could be well-distinguished (Takeuchi et al., 2010). In the research on strategic human resource management, the concept of HPHRPs has evolved to be a core structure, including the degree to which enterprises invest in attracting, selecting, managing, and retaining the best human capital. At present, under the condition of high demand and competition for employees and management talents, more and more attention has been paid to the potential benefits of employing HPHRPs as an approach to maximize the competitive advantages of enterprises. HPHRPs refer to the combination of a series of separate but closely related human resource management practices, including comprehensive recruitment and selection, widely participated training opportunities, and fully motivated salary system. This series of human resource practices collectively form human resources "bundles," which aims to improve the performance and the competitiveness of the company *via* enhancing employees' abilities, attitudes, and motivations (Chadwick and Li, 2019).

Voice behavior, as an informal, autonomous, and upward communication of employees' thoughts, solutions, or concerns about work-related problems, is a proactive work behavior with the aim of improving the current situation (Jia et al., 2020). Employees' voice behavior is positively correlated with the expected results, such as personal work performance and organizational effectiveness (Frazier and Bowler, 2015).

Social identity theory illustrates that individuals possess a series of open identities, including personal, organizational, and social identities (Tajfel and Turner, 1979). Each identity reflects one's sense of self-worth and self-esteem, which in turn act as the basis of cognitive, emotional, and motivational processes. When employees realize that they are a member of the organization, they will give positive assessments and are willing to engage in behaviors that are beneficial to the organization (e.g., voice behavior), even if these behaviors are risky and challenging (Hu and Jiang, 2016). Employees' perception of the care from the organization lies on the related policies, human resource management practices, as well as the treatment they have previously experienced in the organization. HPHRPs could benefit employees by presenting a fair and open competitive

environment, providing opportunities to actively participate in decision-making, and helping them perfect their career planning. Supportive human resource management practices could be regarded as an indication that the organization takes care of its employees. These employees who feel the organization's care emphasize the common interests, collective welfare, and common goals which inspire the employees to generate identification with the organization. Therefore, it may stimulate employees to actively voice in order to give feedback (Zhu and Akhtar, 2017). Based on the abovementioned statements, the following hypothesis was proposed:

> Hypothesis 1: There is a significant positive correlation between HPHRPs and employees' voice behavior.

Mediating Role of Perceived Insider Status

With the growing concern for the concept of organizational identification in the field of organizational management, the concept of employees' perceived insider status has been the research focus by researchers and practitioners. Perceived insider status refers to the extent to which employees regard themselves as a member of a specific organization (Stamper and Masterson, 2002; Li et al., 2018). Although employees' cognition of the employee-organization relationship was involved in many dimensions, perceived insider status focuses on the degree of employees' perceived ownership of the organization, which makes up a part of personal social identity (Armstrongstassen and Schlosser, 2011). In reality, existing in the organization and perceived insider identity are two completely different concepts, indicating that employees who are traditionally regarded as "outsiders" by other organization members due to their status (e.g., part-time workers and ethnic minorities) may also feel that they are part of organizational communication. On the contrary, individuals who are currently included in the organization (e.g., full-time employees) may not feel that they are the insiders. It can be learned that employees' perceived insider status could be changed. Research indicated that both the organizational level [e.g., perceiving the organizational supports (Lapalme et al., 2009) and caring ethical atmosphere (Tan and Liu, 2017)] and the group level [e.g., supports from the leader (Liu et al., 2018) and perceived supports from colleagues (Lapalme et al., 2009)] would be conducive to cultivating employees' cognition of the identity of insiders.

Social identity theory holds the viewpoint that everyone should seek opportunities to evaluate themselves positively in order to form the qualification of individual group membership or social identity. Social identity contains three parts, namely, social classification, social comparison, and active distinction. Social identity is considered as a kind of cognitive tool, by which, people tend to distinguish and classify the subjects in the surrounding environment, thereby better creating and defining their own positions in the society and making more positive comments on the group that they belong to. Supportive HPHRPs from the organizational level would be beneficial to cultivate employees' perception of the insiders' status. Those employees are more likely to behave like citizens and contribute to the success

of their teams when they feel that they are well-valued in the work environment (Ma et al., 2019). The reason is that they regard themselves as ingredients of the organization, and they will pay additional attention to the issues to be improved and put forward corresponding constructive suggestions (Chen et al., 2017; Liu et al., 2018). Based on the abovementioned statement, the following hypothesis was put forth:

> Hypothesis 2: Perceived insider status plays a mediating role between HPHRPs and voice behavior.

Moderating Effect of Voice Efficacy

Self-efficacy, an important concept in the field of self-cognition, reflects the confidence in one's ability to achieve the set goals and represents the degree of individual persistence, effort, and willingness (Bandura, 1986; Koc, 2021). Self-efficacy has the characteristic of domain specificity, and it can be divided into general efficacy and self-efficacy for a specific field (e.g., innovation efficacy and voice efficacy) based on the differences of tasks among different domains. Kish-Gephart et al. (2009) came up with the concept of voice efficacy from the perspective of internal motivation when studying why employees remain silent (Kish-Gephart et al., 2009). The voice efficacy originates from self-efficacy, which is the belief of employees on whether their voice behaviors can be successful, especially whether employees firmly believe that their suggestions will be adopted by the supervisors and contributed to the improvement of organizational performance.

Employees with a relatively stronger sense of voice efficacy always possess strong self-confidence in their behaviors and have strong self-control over things, so they are willing to take the initiative to do their work (Tian and Huang, 2014). After perceiving the sense of "master" of insider identity, employees with a relatively strong sense of voice efficacy will be more eager to voice, so as to improve the disadvantages and deficiencies existing in the current status. Moreover, they will not remain silent because of the decline of their opinions or the ridicules from their workmates. The reason is that they are full of confidence in their voice behaviors, believe that their opinions are constructive and beneficial, and are able to well handle complicated interpersonal conflicts. In contrast, employees with a relatively low sense of voice efficacy are not confident in their suggestions, and they are afraid that their suggestions will be useless or bring troubles to the organizations. Even if they feel that they are part of the organization, they hold extremely resistant or hesitant attitudes to voice behaviors. Based on the abovementioned statements, the following hypothesis was put forth:

> Hypothesis 3: Voice efficacy plays a moderating role between perceived insider status and voice behavior.

Furthermore, voice behaviors act as a kind of driving force to make organizational performance realize the efficiency of $1 + 1 > 2$. Unfortunately, employees tend to hide their personal thoughts in practical work for their own interests (Zhu and Akhtar, 2017). Not only HPHRPs include specific management measures, but they also pay more attention to

the personal feelings of the employees and the formation of a good working atmosphere (Muduli, 2015). With the help of HPHRPs, employees could acquire a fair competitive environment, extensive opportunities to participate in decision-making, reasonable promotion channels, and so on. Individuals with a high sense of voice efficacy would like to trust that their voices could bring fair returns to the organization rather than prejudices or punishments. Besides, after perceiving the created friendly atmosphere, they are more willing to regard themselves as an inside member and make contributions to the development and progress of their organizations. Based on the abovementioned statement, the following hypothesis was put forth:

> Hypothesis 4: Voice efficacy plays a mediating role in the process of influencing voice behavior through perceived insider status in HPHRPs.

According to the above analysis, a multilevel moderated mediation theoretical model was proposed, i.e., the HPHRPs at the organizational level affect the employees' voice behavior by influencing the perceived insider status. This demonstrates that the perceived insider status plays a mediating role between HPHRPs and the employees' voice behavior. In the meanwhile, the sense of voice efficacy plays a moderated role in the second stage and the whole mediating process. The overall research model is shown in **Figure 1**.

RESEARCH DESIGN

Research Samples

This study investigated the enterprises in Beijing, Shanghai, Wuhan, Guangzhou, and other places, involving enterprises with attributes, such as production, operation, and construction. To avoid the homologous deviation, the supervisor-employee paired method was employed to collect data, and two questionnaires were also designed. Questionnaire 1 was filled by the employees,

including the perception of HPHRPs, perceived insider status, and voice efficacy; Questionnaire 2 was filled by the employees' direct supervisors, in which the employees' voice behavior was evaluated by the supervisors. The two sets of questionnaires were numbered and recovered at the same time. In this study, a total of 1,500 paired questionnaires were issued to 60 companies, and finally, feedback from 51 companies was received; 1,178 paired questionnaires were recovered, with a recovery rate of 78.53%.

As can be observed from the investigated employee samples, there were 53.74% of men and 46.26% of women. In the aspect of age, those who aged below 25 years accounted for 20.29%, those who aged in the range of 26–30 years accounted for 21.48%, those who aged in the range of 31–35 years accounted for 20.63%, those who aged in the range of 36–40 years accounted for 16.64%, those who aged in the range of 41–45 years accounted for 13.50%, and those who aged more than 46 years accounted for 0.47%. In the aspect of marital status, married couples accounted for 60.02%, unmarried people accounted for 35.82%, and others accounted for 4.16%. As for the educational background, 23.17% of the investigated employees were below undergraduates, 49.66% of them were undergraduates, 25.72% were post-graduates, and 1.44% were above post-graduates. Regarding seniority in working, 15.79% of the surveyed samples had an experience within 3 years, 38.62% had 3–6 years of experience, 34.04% had 6–9 years of experience, and 11.55% had an experience of more than 10 years.

Research Tools

In this study, the research scale developed by well-known foreign scholars was adopted. After the translation-back translation process of two PhDs in organizational behavior and the calibration by a professor in organizational behavior, the items with unclear semantics and ambiguities were conducted localized modification, so as to ensure that all the items in the scale could be understood by the survey participants. The five-point Likert-type scale was used in this study (one represented completely disagree and five represented fully agree).

FIGURE 1 | Schematic of the research model.
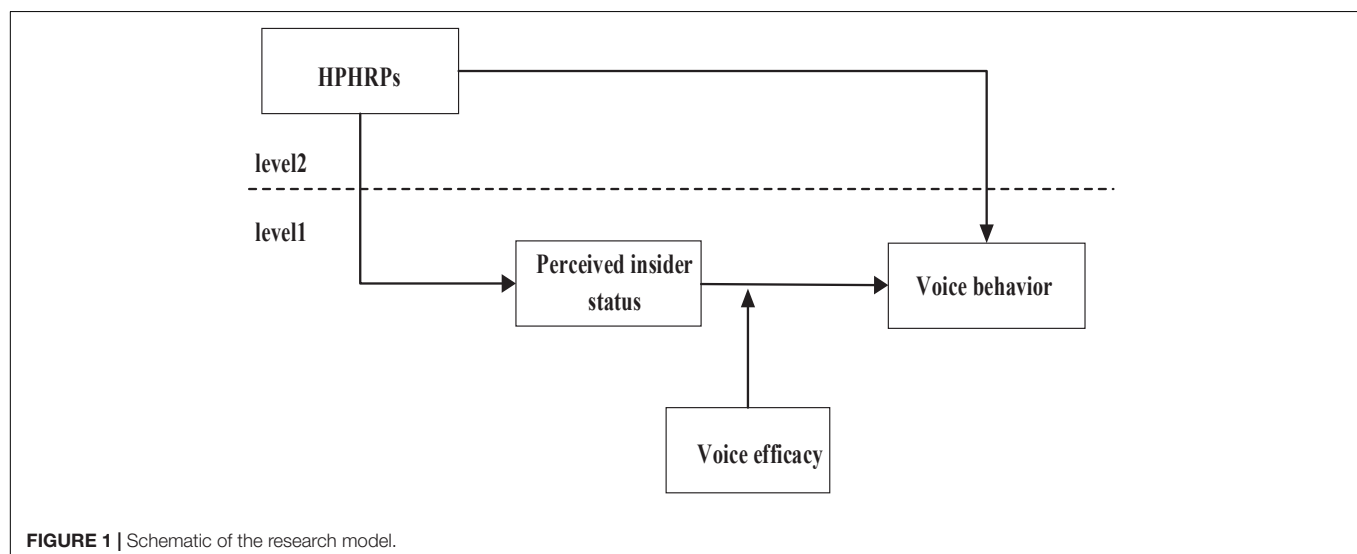
High Performance Human Resource Practices

The 28-item scale developed by Su (2010) for Chinese management scenario was adopted, including eight aspects in the scale, e.g., strict recruitment and selection, extensive training, and timely information sharing (Su, 2010). In this study, the internal consistency of the scale Cronbach's α was 0.85, indicating that it possessed good credibility.

Perceived Insider Status

The six-item scale developed by Stamper and Masterson (2002) was adopted, and the topics include "I think I am a member of the company" and "I don't think I belong to the company" (Stamper and Masterson, 2002). In this study, the internal consistency of the scale Cronbach's α was 0.86, indicating that it had good credibility.

Voice Efficacy

The seven-item scale developed by Duan and Wei (2012) was used, and the topics include "I can seize the opportunity to propose suggestions to the managers" and "No matter in what occasion, I can always express my opinions on the issues in the organization" (Duan and Wei, 2012). In this study, the internal consistency of the scale Cronbach's α was 0.83, indicating that it had good credibility.

Voice Behavior

The 11-item scale developed by Duan and Ling (2011) was employed, which included two dimensions, namely, voice considering the overall situation, and self-aggressive voice (Duan and Ling, 2011). In this study, the internal consistency of the scale Cronbach's α was 0.81, indicating that it had good credibility.

Control Variables

To control the impact of demographic variables on this study, gender, age, marital status, educational background, and working seniority were considered control variables.

Data Aggregation

In this study, the HPHRPs are an organization-level variable measured by individual units, and it is necessary to aggregate the data at the individual level to the team level. Therefore, the intragroup reliability (r_{wg}) and intragroup correlation coefficient (ICC) were employed to check the compatibility of data aggregation. The results indicated that the intragroup consistency r_{wg} of HPHRPs was 0.91 (>0.70), the intragroup explanatory variance ratio ICC(1) was 0.08 (>0.05), and the average score reliability of group members ICC(2) was 0.73 (>0.70); all the values reached the acceptable range. The results indicated that the organizational level of HPHRPs aggregated from the individual level was appropriate.

RESULTS

Descriptive Statistics and Correlation Analysis

The mean, variance, and correlation coefficient of the four main variables were analyzed using SPSS 22.0 software, and

the results are shown in **Table 1**. It can be seen from the table that HPHRPs were significantly correlated with perceived insider status ($r = 0.22$, $p < 0.01$) and voice behavior ($r = 0.50$, $p < 0.01$), and perceived insider status was significantly correlated with voice behavior ($r = 0.41$, $p < 0.01$). The obtained results preliminarily supported our research expectations.

Confirmatory Factor Analysis

To test the discriminant validity among the variables and the fitting degree of the model, Mplus 7.0 software was used to perform confirmatory factor analysis on the four main variables, and the results are listed in **Table 2**. The results illustrated that the fitting degree of each indicator of the four-factor model was obviously better than that of other models ($\chi^2/df = 2.68$, Tucker Lewis index (TLI) = 0.91, comparative fit index (CFI) = 0.92, root mean square error of approximation (RMSEA) = 0.06, standardized root mean square residual (SRMR) = 0.06), which demonstrated that the four main variables possessed good discriminant validity.

Hypothesis Test

Since a multilevel model was constructed in this study, HPHRPs belong to the organizational level variable, while perceived insider status, voice efficiency, and voice behavior belong to individual-level variables. Therefore, Mplus 7.0 software was employed to test the direct and indirect relationships among the variables using the hierarchical linear modeling technology.

(1) Zero model. Zero models with perceived insider status or voice behavior as the dependent variable were set to test the between-group variance and within-group variance. The results indicated that the within-group variance of perceived insider status was 0.31, the between-group variance was 0.39, and the between-group variance accounted for 55.71% of the total variance (Model M1); the within-group variance of perceived insider status was 0.43, the between-group variance was 0.37, and the between-group variance accounted for 46.25% of the total variance (Model M4). Therefore, a multilevel regression analysis could be conducted.

(2) Main effect. The analysis results of the hierarchical linear model (HLM) are shown in **Table 3**. It can be seen from Model M6 that after controlling the control variables, such as gender, age, marital status, educational background, and working time, HPHRPs at the organizational level exhibited a significant positive impact on individual-level

TABLE 1 | The mean, variance, and correlation coefficient of the variables.

Variables	M	SD	1	2	3
1. HPHRPs	3.36	0.24			
2. Perceived insider status	3.46	0.46	0.20**		
3. Voice efficacy	3.64	1.03	0.22**	0.55*	
4. Voice behavior	3.40	0.95	0.26**	0.41**	0.73**

*$p < 0.05$, **$p < 0.01$.

TABLE 2 | Results of confirmatory factor analysis.

Model	χ^2	df	χ^2/df	TLI	CFI	RMSEA	SRMR
Single factor model (HPHRPs + PIS + VE + VB)	1023.45	132	7.75	0.65	0.61	0.14	0.14
Two-factor model (HPHRPs, PIS + VE + VB)	853.05	131	6.51	0.73	0.77	0.12	0.13
Three-factor model (HPHRPs, PIS, VE + VB)	543.34	130	4.18	0.81	0.83	0.11	0.11
Four-factor model (HPHRPs, PIS, VE, VB)	345.63	129	2.68	0.91	0.92	0.06	0.06

HPHRPs, High-performance human resource practice; PIS, Perceived insider status; VE, Voice efficacy; VB, Voice behavior; " + " means that the factors are merged into one factor.

voice behavior ($\beta = 0.30$, $p < 0.001$). Thus, Hypothesis 1 could be supported.

(3) The mediating role of perceived insider status. Baron and Kenny's three-step method (1986) was used to test the mediating role of perceived insider status between HPHRPs and voice behaviors. In the first step, the main effects of HPHRPs and voice behaviors have been determined. In the second step, it can be seen from Model 3 that HPHRPs had a significant positive impact on the perceived insider status ($\beta = 0.20$, $p < 0.001$). In the third step, it can be seen from Model 7 that when HPHRPs and perceived insider status entered the equation simultaneously, the impact of HPHRPs on voice behavior changed from $\beta = 0.30$ ($p < 0.001$) to $\beta = 0.21$ ($p < 0.05$). As a result, the mediating role of perceived insider status was tenable. Furthermore, it was not appropriate to use the bootstrap CI estimation method with replacement sampling because the presented model was a multilevel model. Therefore, the mediation

effect would be tested again by 20,000 times repeating the Monte Carlo simulations and estimating the CI using R language software. The results illustrated that the 95% CI of perceived insider status was (0.04, 0.09), excluding 0. Based on the above results, Hypothesis 2 could be supported.

(4) The moderating effect of voice efficacy. The moderating effect of voice efficacy between perceived insider status and voice behavior was tested by constructing the interaction items of voice efficacy and perceived insider status. It can be seen from Model 8 that the interaction coefficient of perceived insider status and voice efficacy was significant ($\beta = 0.67$, $p < 0.001$). To further demonstrate the moderating function, a diagram of the moderating effect is drawn. As shown in **Figure 2**, when the voice efficiency was high rather than low, the perceived insider status exhibited a positive effect on the voice behavior. Therefore, Hypothesis 3 could be supported.

(5) Mediating effect with moderation. It can be seen from **Table 4** that when the perceived insider status was at a

TABLE 3 | Multilevel analysis results.

Variable	Perceived insider status			Voice behavior				
	M 1	M 2	M 3	M 4	M 5	M 6	M 7	M 8
Intercept term	2.43	2.45	2.21	2.12	2.51	2.36	2.41	2.68
Level 1								
Gender			−0.01		0.03	0.01		0.02
Age		0.10*	0.01		0.04	0.05	0.04	0.03
Marital status		−0.17**	−0.08*		−0.02	−0.01	−0.08	−0.01
Educational background		−0.02	−0.04		−0.03	−0.10	−0.13	−0.04
Working time		−0.05	0.04		0.04	0.05	0.05	0.05
perceived insider status							0.29***	−0.27
Voice efficacy								−0.03
Perceived insider status * Voice efficacy								0.67***
Level 2								
HPHRPs			0.20***				0.30***	0.21*
Within group variance (σ^2)	0.43	0.37	0.43	0.57	0.52	0.34		0.25
Between group variance (τ_{00})	0.10	0.14	0.37	0.14	0.13	0.34		0.39

*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.
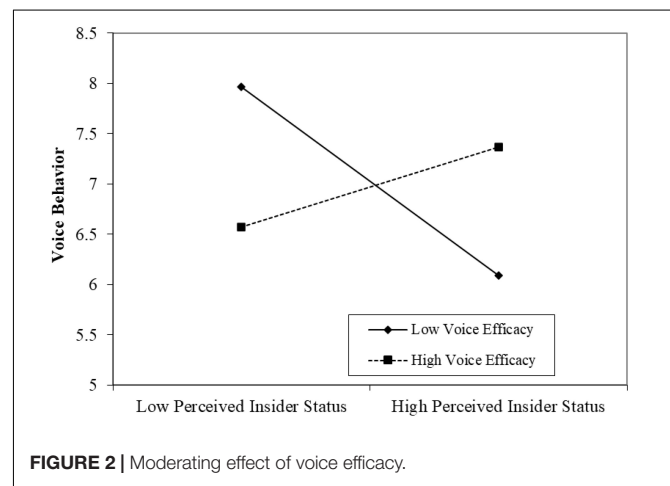
FIGURE 2 | Moderating effect of voice efficacy.

TABLE 4 | Moderated mediating Monte Carlo test.

Moderated variable	Moderated effect	Estimate	95% Confidence interval	
			Upper limit	Lower limit
Voice efficacy	Low perceived insider status	0.32	0.03	0.12
	High perceived insider status	0.17	0.14	0.35
	Difference	0.32	0.06	0.25

low level (less than 1 SD), the 95% CI of the moderating effect of voice efficacy was (0.03, 0.12); when the perceived insider status was at a high level (higher than 1 SD), the 95% CI of moderating effect of voice efficacy was (0.14, 0.35). Similarly, it was found by Monte Carlo simulations that when the perceived insider status was at a high or low level, there were differences in the mediating role of the perceived insider status between HPHRPs and voice behavior [CI (0.06, 0.25), excluding 0]. Based on the above results, it can be seen that the voice efficacy played a significant moderating role between the indirect effects of "HPHRPs-perceived insider status-voice behavior," so Hypothesis 4 could be supported.

CONCLUSION AND DISCUSSION

Conclusion

The presented research aims to explore the impact of HPHRPs at the organizational level on employees' voice behavior at the individual level and, in particular, explore the mediating role of perceived insider status and the moderating role of voice efficacy based on social identity theory. Based on the paired questionnaire survey of 1,178 supervisors and employees from 51 companies, the following conclusions could be drawn.

(1) High performance human resource practices had a positive impact on employees' voice behavior; (2) the perceived insider status acted as a mediating role between HPHRPs and voice behaviors, i.e., HPHRPs promoted the voice behavior by enhancing employees' perceived insider status; (3) the voice efficacy played a moderating role between the perceived insider status and voice behaviors, namely, the higher the individual's voice efficacy was, the better the promotion effect of perceived insider status on voice behavior would be; and (4) voice efficacy played a moderating role in the relationship of "HPHRPs-perceived insider status-voice behavior," i.e., compared with the individuals with low voice efficacy, those with high voice efficacy were more likely to generate perceived insider status under the influence of HPHRPs, so they were more inclined to produce voice behavior.

Theoretical Significance

The theoretical contributions of the presented work were listed as follows. On the one hand, a macro factor influencing voice behavior was reported. Scholars in the field of organizational behavior have discovered many personal and organizational factors affecting voice behavior, such as personality, emotion, leadership, and atmosphere perception. In response to the recent calls to consider relatively macro-organizational or management factors to understand employees' voices (Mowbray et al., 2015), HPHRPs, a representative area of strategic human resource practices, were introduced into the research on individual voice behavior, so as to establish a connection between the field of human resources and the field of organizational behavior (Liu et al., 2017).

On the other hand, the mediating mechanism of HPHRPs affecting voice behavior was proposed from the perspective of

social identity. Social exchange theory was mostly adopted in the research on HPHRPs and employees' initiative behaviors (Miao et al., 2013; Hu and Jiang, 2016). Consistent with these reported outcomes, our study also demonstrated the promotion effect of HPHRPs on employees' voice behavior. In addition, our study indicated that the perceived insider status could mediate the relationship between HPHRPs and voice behavior from the perspective of social identity. In other words, the integrated HPHRPs could indirectly influence the employees' voice behavior by enhancing the perceived insider status. Therefore, the influence process of human resource practices on employees' behavior was not only a social exchange but also a process of self-categorization and self-identification. In the meanwhile, the support of self-voice belief was indispensable when employees chose their own voice tasks. As a proactive behavior, the occurrence of voice required a certain internal push force, which came not only from the reciprocal emotional factors but also from self-identity recognition and self-confidence level assessment. This viewpoint has deepened people's understanding of the internal effect mechanism of organizational macro factors and employees' behavior.

Practical Significance

This study is of important practical significance. First, the organizations should be aware that employee-oriented integrated human resource practices could induce positive responses from the employees. Our results demonstrated that HPHRPs could be regarded as a kind of support to employees and possessed the potential to enhance employees' voice behavior. For employees, expressing opinions on organizational improvement would be beneficial to formulate and implement human resource practices that could promote personal development (e.g., training, counseling, and other professional development plans) and meet their family needs (e.g., family care plans and other procedures for resolving work-life conflicts).

Second, our findings illustrated that perceived insider status played an important role in transmitting the function of organizational human resource practices to promote voice behavior. This evidence suggested that the managers should think highly of the establishment of employees' personal identity in the organization, which can be operated through a series of employee-oriented HPHRPs. More importantly, the organization should aware that the voice behavior was risky. For those employees who dared to speak frankly and bluntly, the organization should convey to employees a belief that the value of each employee would be valued and each employee was the "master" of the organization. This sense of recognition was enough for them to bear the risk of voice.

Third, to maximize the effectiveness of HPHRPs, individual differences among employees should be taken into consideration. Our results indicated that voice efficacy significantly distinguished the effectiveness of HPHRPs in establishing perceived insider status and further enhancing voice behaviors. When formulating human resource management of the enterprise, the employees' voice efficacy should be assessed to evaluate the results caused by these practices. This strategy

is conducive to helping the organizations adjust management practices to cater to different groups of employees.

Limitations and Outlook

Although the proposed hypotheses have been supported to some extent, there are still some limitations in this study. On the one hand, it is related to the cross-sectional design in this study. HPHRPs could influence employees' voice behavior through perceived insider status, but it takes time for this influence to develop. Moreover, other conclusions could not be excluded even if our research results were consistent with the theoretical hypotheses, and the multisource data (e.g., upper and lower binary paired data) were employed to solve the problems caused by the common method variance to a certain extent (Ye et al., 2020). Therefore, the longitudinal design is recommended in the future study, which may better determine the causal basis of the investigated correlations.

On the other hand, the recent studies regarding voice behavior could be classified into two types, namely, promotional voice and inhibitory voice. The current research focused on voice behavior in a single dimension, while Liang et al. (2012) reported that the risk of inhibitory voice was greater (Liang et al., 2012). Would it have a stronger relationship with management support? This issue is worthwhile to clarify, so as to study whether HPHRPs would exert different effects on promotional or inhibitory voices.

DATA AVAILABILITY STATEMENT

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

AUTHOR CONTRIBUTIONS

YL and SL contributed to the idea and wrote the full manuscript. DL and HD collected the data and run the data. XZ revised the full manuscript and proposed improvements. All authors contributed to the article and approved the submitted version.

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New Working Capabilities for Coping With COVID Time Challenges

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The COVID-19 pandemic played as a booster to the cultural, social, and economic transformations triggered by the 4.0 Industrial Revolution, increasing the diffusion and employment of technological devices and requiring to reconsider the traditional approach to work and organization. Dealing with an emblematic organizational case, the article highlights the main key capabilities requested to face the current scenario, suggesting transformed attitudes needed to cope with the unfolding complex, uncertain, changing digital and blended world. The findings, gathered through an extensive survey involving 500 people who started working at a distance during the 2020 lockdown period, underline the main actionable skills to be achieved for enhancing agile work, hybrid professional roles and new work, and organizational and managerial cultures.

Keywords: digital transformation, pandemic crisis, work and organizational culture, managerial competences, actionable skills, agile work

INTRODUCTION

During the past centuries, the world we live in has faced several phases that significantly impacted every aspect of human life: culture, society, and economy. There has always been a strong connection between human beings and technology, as starting from the First Industrial Revolution progress and innovation have played a crucial role in originating new conceptions of society, from rural/feudal to industrial/capitalist and then to industrial/tertiary. The key drivers at the core of such transformations have always been automation and connectivity, allowing to increase the productivity at the global level (Blinder, 2008; Prisecaru, 2016; Schwab, 2016; Corazza, 2017; Park, 2017; Caravella and Menghini, 2018). Furthermore, the last decades have experienced a new set of changes, mainly originated by the digital revolution, that has introduced artificial intelligence, big data, robotics, and Internet of Things as its peculiar elements (Schwab, 2016; Caruso, 2017), with repercussions on the physical (e.g., autonomous vehicles, 3D printers, advanced robotics), digital (e.g., IoT, platforms, IoS), and biological spheres (e.g., artificial intelligence for genetics, biology, and related applications). This new phase is increasingly transforming our lives and has been recognized as the Fourth Industrial Revolution since when the World Economic Forum (WEF) focused its attention on it in 2016 (World Economic Forum [WEF], 2016). We are not fully aware of its potential and how to deal with it yet, but many debates are discussing the current situation, highlighting both the advantages and risks it implies.

A first remarkable point is that there is no general agreement on this definition to describe the current scenario. According to several authors, we are, in fact, just experiencing the effects of the Third Industrial Revolution, and its evolution is imminent (Blinerd, 2006; Rifkin, 2016). Schwab identified three criteria at the basis of a future revolution we are going to live

(Schwab, 2016): speed (thanks to technologies in continuous development - our heterogeneous world is vastly interconnected), range and intensity (each dimension of our life constantly changes due to innovative combinations of different technologies), and impact on the systems (such a radical transformation can impact on systems at many levels, transforming even countries and the global society itself). Moreover, there is some controversy surrounding the long-term effects generated by the Fourth Industrial Revolution. Optimist authors came to the conclusion that the damages caused by new technologies will be then reabsorbed in the long term, thanks to the increased opportunities originated by digital innovations. Their analysis has not found general acceptance from the pessimist authors, who predict an unstoppable fall that will lead us to the end of work and, consequently, to ever larger inequalities at both global and intra-national levels (MacCarthy, 2014).

Undoubtedly, the world of work requires a new approach, and Industry 4.0 is characterized by a renewed conception of the manufacturing processes, decentralized and adopting systems based on information and communications technologies (TIC) (Park, 2017). The inevitable purpose of organizations in such a challenging context is both to survive and grow in the long term, remaining competitive and innovative, adapting to a number of situations never experienced before to a similar extent.

An additional element introduced by the literature (Kovacova and Lăzăroiu, 2021; Nemţeanu and Dabija, 2021; Riley et al., 2021; Wade and Vochozka, 2021) is the relationship between sustainable Industry 4.0 wireless networks and big data-driven decision-making processes in sustainable organizational performance. In fact, it has been noted that Internet of Things and artificial intelligence data-driven systems are able to support a sustainable Industry 4.0 wireless network and a digitized mass production in cyber-physical smart manufacturing (Wade and Vochozka, 2021). Specifically, a wireless communication system supports deployment through real-time supervision of production resources and tools (Kouhini et al., 2021). This data-driven monitoring and the predictive analysis ensure product traceability, production maintenance, and performance improvement (Kovacova and Lăzăroiu, 2021). Deep learning processes arise and lay the ground for cyber-physical production networks and intelligent planning in a sustainable Industry 4.0 (Kovacova and Lăzăroiu, 2021; Riley et al., 2021).

Employees are constantly being demanded to be more and more flexible, fast, and ready to deal with the effects of technological progress, impacting the complexity and dynamicity of their working activity (Carroll and Conboy, 2020). The traditional approach to work has to be reconsidered; new competences and tools are needed to deal with "digital employees," "digital management of workforce" and "digital work" (Strohmeier and Parry, 2014).

While trying to cope with such a challenging scenario, in 2020, we had to face a sudden and unexpected event causing a global crisis that is still destabilizing our world at economic, social, and cultural levels. Besides all its dramatic consequences, the COVID-19 pandemic is also heavily accelerating the diffusion and employment of technological devices (smart work, apps, analytics, etc.) to respond in a time of emergency (Davison, 2020; Philips, 2020). Aiming to find a new balance in every aspect of the current surrounding context, characterized by bewilderment, confusion, and concern, it is essential to explore some key issues at stake in such a renewed work environment.

The paper refers to the new capabilities that the pandemic has revealed as necessary to deal with a profoundly changed work environment in a very short time frame in order to investigate if their potential can contribute to the transformed attitude needed to face the present scenario, as well as in the future when the pandemic can be considered overcome. The article aims to answer the following research questions:

- *What key capabilities have emerged as necessary as the result of a sudden and radical transformation as the COVID-19 pandemic outbreak?*
- *Can these capabilities represent the key elements of a new culture of work for the future, even after the pandemic?*

The first section of this study proposes an analysis of the theoretical framework related to the new culture of work and the capabilities identified as its distinguishing elements, describing the need to implement new approaches, to be more flexible, and to find innovative solutions in order to adapt to an unexpectedly transformed scenario. The actions undertaken to collect empirical evidence are then described, focusing both of an external desk-based analysis about the impact of the COVID-19 pandemic and a survey involving 500 workers who experienced remote working during the 2020 lockdown period. The conclusions are drawn in the final section, where some considerations, comments, limitations, and hints for future research are provided.

NEW WORK CULTURE AND CAPABILITIES: THEORETICAL FRAMEWORK

Taking into consideration its effects at different levels and noticing how interconnected and automated the industrial production has become, thanks to digital technologies, it is understandable why the current scenario has been identified as a new phase of industrial revolution. The Industry 4.0 belongs to a new system that is dynamic and ever-changing, no longer based on a linear logic of cause/effect, rather on the connection of technology, immaterial features, and human beings, possible thanks to cyber-physical systems (CPS), combining the physical and digital fields (Chung and Kim, 2016; Park, 2017). The most recent technologies are radically changing our society, creating new needs and perceptions as consumers (Prisecaru, 2016; Daemmrich, 2017; Makridakis, 2017); inevitably, our constant connection is modifying the ways in which we communicate and relate to other people, creating the conditions for a deep identity crisis (Schwab, 2016). It is expected that, in the future, relationships will be increasingly

characterized by the hybrid nature of the involved interlocutors (either human or artificial) and environments (either real or simulated), requiring a redefinition of our social attitudes (Falcone et al., 2018).

In a similar scenario, the future of labor can only be perceived as unclear; nevertheless, what is certain is that a new culture of work is needed to face the challenges emerging from the constantly changing globalized reality, where we are all interconnected and influenced from the outside environment (Fregnan et al., 2020). For many decades, organizations have been characterized by a solid structure functioning, thanks to rigorous processes and strict procedures, where each role corresponded to specific tasks and a well-defined position, requiring hard and soft skills, rarely undergoing significant changes. Today, developing a set of established competences is not enough to be an efficient member of a successful organization, as companies are becoming more and more liquid entities, constantly modifying their nature to react to the surrounding solicitations and asking their workforce to act accordingly, acquiring agility and renewed capabilities.

As already illustrated in the introduction, the very nature of the Fourth Industrial Revolution and its consequences in the long term sees opposed positions in the scientific literature; in each case, the attention is constantly focused on the human factor. Undoubtedly, the implementation of automated processes will increase the demand for highly qualified workers able to control new production devices in smart factories, robots will become real assistants for human beings, and machines and persons will represent the workforce of the future, cooperating as never seen before (Bloem et al., 2017). If the technological process is unstoppable, we have on our side the power to raise consciousness of its impact on our daily life (Chung and Kim, 2016; Schwab, 2016; Butera, 2017; Makridakis, 2017). People and organizations have, therefore, to learn how to put together their efforts in a new way, facing a context that is so different and demanding, both aware of the need to learn to work in a different way, as well as to develop a set of new capabilities and attitudes, allowing us to express our potential without suffering the change but being active subjects of the upcoming future.

If in the past the role of each worker required a set of hard and soft skills to be then combined with other roles within an organization, nowadays, job profiles are not enough to identify the competences useful to be active components of the flux in which the company moves. What is missing in this scenario is represented by the capabilities intended as those characteristics, allowing to deal with the current world of work, constantly changing and presenting new challenges at every level. Everyday, working activities are already demanding for a renewed attitude, emerging from the need to act in a smart and agile way, finding innovative solutions and effective procedures to meet the market demand (Garrett, 2013; Chung and Kim, 2016; Schwab, 2016; Morrar et al., 2017; Park, 2017). This phenomenon is also the direct consequence of such a hyper-connected and liquid world (Bauman, 2000), and, for the same reason, it requires an adjustment of the educational system; that should guarantee the possibility to acquire new capabilities in an immersive way by

means of meaningful training experiences where the awareness is raised and shared.

The Capabilities in question can be described as a combination of knowledge, ability, and experience to be used by people not just at work but in every aspect of daily life to participate consciously to the era they are living, as well as to build a new future with both intention and full awareness. This is strictly related to the European Reference Framework of Key Competences for Lifelong Learning, required for achieving employment, social inclusion, and active citizenship.

What distinguishes the transfer of this kind of Capabilities relates to a logic of continuous learning (Delors, 1997) and to the active role of learners, cultivating and developing their identity firsthand. At the organizational level, this also means the possibility for the employees to really act on their professional growth, making their voices heard to demonstrate a more self-aware attitude. This appears to clearly indicate that the Capabilities can be considered an integral part of the development of a new culture of work, resulting from the significant transformations taking place in the context of the Industry 4.0. Such a perspective implies interpreting the professional development in global terms, which goes beyond the career path, but impacts the personal development too (Lambert et al., 2012; Zimmermann, 2017).

The Key Elements of the New Work Culture and Related Capabilities

Seeking to explore how to dwell within the Fourth Industrial Revolution, Ivaldi et al. (2021) highlight the need to link new technologies and sustainability, pointing out the challenge to deal with the spreading digital revolution. Hecklau et al. (2016) underpin four categories of new skills:

- technical (state-of-the-art knowledge, process understanding, media skills, coding skills, IT security);
- methodological (creativity, entrepreneurial thinking, problem-solving, conflict resolution skills, decision-making, analytical skills, research skills, and efficiency orientation);
- social (intercultural skills, language skills, communication skills, networking skills, teamwork skills, ability to compromise and cooperate, knowledge transfer skills, leadership skills);
- personal (flexibility, ambiguity tolerance, motivation to learn, ability to work under pressure, a sustainable mindset, and compliance).

At stake is the need to cope with the transformation of work as an impact of 4.0 Industrial Revolution, accelerated by the pandemic scenario, going beyond the traditional distinction between hard and soft skills, achieving concrete and actionable skills as, peculiarly, human abilities, which represent the great qualitative difference between man and machines, enhancing sustainable hybrid professional and managerial cultures (Fregnan et al., 2020) and ad-hocratic and agile organizational systems (Mintzberg, 2009).

An agile approach to work is particularly foreseen, as representing the more suitable one identified to react the high level of chaos, complexity and uncertainty originated by the general context (Sletholt et al., 2011). Such approach requires adaptability (changing and adjusting a project during the different phases of its lifecycle), visibility (to allow the stakeholders to be aware of all the involved aspects and of the level of complexity), generation of value (essential during the whole process, including the concept of value not only from the economic perspective but also from the ethical, sustainable, and eco-friendly ones) and focus on risks (a reconfiguration of purpose, time and cost are required to manage and reduce them; a joint intervention of institutions, industrial and academic world is essential to guide the technological progress toward the community needs).

In order to explore a relevant example of the capabilities required to face the current scenario, deeply transformed by the digital revolution and the pandemic that made clear the need for their application to the workplace, accelerating a process that was still in its infancy, this article refers to a situated organizational case: Comau, an Italian multinational leading company operating in the automotive sector whose activities are strictly connected to the innovative promotion of new capabilities and organizational culture. The Comau experience (Fregnan et al., 2020; Ivaldi et al., 2021) identified a set of seven capabilities as a contextualized interpretation of the theoretical framework (Hecklau et al., 2016) and as a transfer into practice of the new culture of work, essential elements to fill the gap that has emerged since the pandemic outbreak:

- *Deal with humans*: Living in a world so deeply influenced by technology, the human dimension plays an essential role for both persons having to adapt to the surrounding reality and companies having the intention to survive change. The human nature, along with its needs, has to be put at the center.
- *Deal with technology*: As a natural consequence of the digital revolution, today, it is essential to be familiar with the new technologies, taking advantage of the opportunities they offer. It is an unavoidable requirement for workers as well as it is for organizations to implement them in their processes.
- *Agility*: A new culture of work implies open-mindedness and flexibility; it is fundamental to react quickly and think out of the box, in a creative process that often includes the client/consumer itself.
- *Engagement*: Feeling highly involved, properly balancing passion and rationality, being curious and proactive; all of these elements allow to add something personal to each activity or experience, its true driving force.
- *Collaboration*: Complex activities require the cooperation between people that represent the possibility to increase the effectiveness of a performance both qualitatively and quantitatively.
- *Interdisciplinarity*: The new work culture promotes the integration of different kinds of knowledge in order to broaden perspectives and solutions.
- *Innovation*: Fast and unpredictable changes are constantly produced by the new technologies; therefore, it is indispensable to conceive innovation being always open to the introduction of something fresh, to the experimentation of different solutions, and to the combination of data and information. Today, just imagining new ways can lead to the generation of value.

The above capabilities may represent a suitable and actionable expression of the new culture of work under some relevant elements: people and their needs at the center (*Deal with Human*); the confidence with new technologies (*Deal with Technology*); the importance of being open-minded and flexible (*Agility*); the need of a real passion (*Engagement*); the ability to cooperate with other persons (*Collaboration*); the relevance of combining different kinds of knowledge (*Interdisciplinarity*); and the constant search for new possibilities and solutions (*Innovation*).

Capabilities in the Time of COVID-19

The progressive development of a new culture of work has suddenly accelerated in 2020 due to the COVID-19 pandemic that put a strain on many working environments not always ready to react in such a short time. The unexpected emergency and the consequent lockdown imposed to contain the infection obliged most of the worldwide population to switch the traditional organization of the activities from working "in presence" to working "at a distance," entailing a relevant effort both at technologic and organizational levels.

Recent publications have highlighted how the social and organizational evolutions, linked to the COVID-19 pandemic, involve new challenges, concerning the relationship between product decision-making information systems (Nica and Stehel, 2021; Novak et al., 2021) and smart factory performance (Hawkins, 2021) in teleworking-related sustainable Industry 4.0 (Nemțeanu et al., 2021). In fact, as Nemțeanu et al. (2021) argue, the need for social distance implied by the COVID-19 pandemic has generated relevant changes in the work sphere (Nemțeanu and Dabija, 2021), expressed in a massive diffusion of telework, which has enhanced the conditions of social distance and isolation of workers. The authors (Nemțeanu et al., 2021) point out that the dimensions of autonomy and reduced interaction, typical of teleworking, have a significant influence on the ability of self-regulation, task and contextual performance, professional isolation, and counterproductive work behaviors. While it has been noted that marketing and internal communication can increase worker satisfaction and improve performance (Nemțeanu and Dabija, 2021), on the other hand, a good management of the dimensions of autonomy and reduction of social interaction, typical of teleworking, can lead to a performance improvement and to a limitation of counterproductive behaviors. In order to guarantee the same efficiency with respect to the usual one, remote working requires above all familiarity with technical devices but also flexibility, proactivity, and adaptability, in a context where you have to communicate with people despite of the physical distance. In relation to these issues, the literature (Hawkins, 2021;

Nica and Stehel, 2021; Novak et al., 2021) highlights the role of product decision-making information systems for a sustainable smart factory performance (Hawkins, 2021) in teleworking-related sustainable Industry 4.0 (Nemțeanu et al., 2021). In particular, the most relevant information systems concern Internet of Things, big data decision-making, and analytic algorithms driven by artificial intelligence (Nica and Stehel, 2021; Novak et al., 2021), real-time sensor networks, and cyber-physical manufacturing (Hawkins, 2021).

The recent crisis has, therefore, forced persons to leave their comfort zones, experimenting new approaches to both their working activity and their relationships, contributing to that diffusion of a new culture of work that had already started in the previous years. A deep cultural change is perceived as needed like never before, with a direct impact on the enterprises that are required to invest significantly in the promotion of both organizational and professional learning. Direct experience and practical knowledge will play a crucial role in such a learning process, allowing to introduce, develop, and integrate innovative technologies, as well as to combine both the exploration and the valorization of knowledge (Lanzara, 2006).

Today, workers and professionals are frequently experiencing uncertainties and contradictions during their daily working activity, and, at the same time, they have to look for and create new solutions and possibilities to act. Such context can well represent both a litmus test and a situational organizer not only to encourage the introduction and diffusion of technical devices but also to drive the cultural change at different levels, aiming to face challenging social issues (Engeström, 1987).

This is exactly the focus of the research: Taking into consideration the COVID-19 pandemic and the sudden and radical transformation it has originated on the work context, we sought to investigate if the seven Capabilities emerged as key elements of this peculiar situation can represent an effective answer even once the pandemic can be considered over. The following section illustrates the methodologies adopted to analyze the current emergency scenario, characterized by such significant changes at every level of our life before moving on to the discussion of the key findings and, finally, to the conclusions.

RESEARCH DESIGN, CONTEXT, AND METHODOLOGICAL APPROACH

In order to investigate the current scenario, deeply transformed by an unexpected and sudden event such as the COVID-19 emergency, the study illustrated in this article has focused on two main knowledge objectives: a careful analysis of some impacts generated by the pandemic in question and an observation of the perception related to the key elements of the new work culture during this abrupt crisis.

The adopted methodology has been, therefore, implemented at two different levels:

(I) External desk-based research to explore the surrounding context during a peculiar situation and its consequences on the world of work;

(II) A survey involving workers belonging to different areas who have experienced working at a distance during the 2020 lockdown period.

The external desk-based research has been conducted, taking into consideration the interval of time between December 2019 and May 2020, referring to different kinds of sources: books, magazines, newspapers, scientific papers, online news, and informative websites (Eurofound and the International Labour Office, 2017; AstraRicerche and ManagerItalia, 2020; Baldini and Gori, 2020; Banca d'Italia, 2020; Dattoli, 2020; Europea, 2020; Galli and Tucci, 2020; Gavi, 2020; Il Sole 24 Ore, 2020; Kamps and Hoffmann, 2020; L'Eco di Bergamo, 2020; Simon-Kucher Partners Strategy Marketing, 2020; Telelavoro, 2020; Tessa, 2020).

Aiming to a greater understanding of the examined historical period, the research criteria have resulted in the selection of materials and news, dealing with the same events, recurring in several online and offline sources, as well as mentioned among the data provided by official sources. The final purpose has been to outline a reference framework concerning an unforeseen phenomenon that is generating a significant impact on both production and social systems at the global level.

The second moment of research aimed to put to test the seven Capabilities whose development has been accelerated by the pandemic, verifying their validity in the context of a sudden transformation and, possibly, in the future by means of a survey involving people who have personally experienced relevant changes in their own organizational and working environment. The sample has, in fact, included 500 workers who had to start working at a distance in the months of March, April, May and June 2020, from their home or elsewhere, in a teleworking or remote working mode. The survey intended to collect their impressions and to investigate their points of view in order to find out which Capabilities were shown to be more useful and suitable with the objective of being efficient at work despite the de-contextualization resulting from the enforced isolation.

Starting from a focus allowing to outline the profile of the participants in terms of both their age and working activity, the survey moved then toward the evaluation of the remote working experience from different perspectives, aiming to highlight the differences between professional and personal points of view. The seven Capabilities were then at the core of the investigation in order to examine their role in such a peculiar scenario and to identify possible discrepancies between the working context lived in presence or at a distance, as well as analyzing relevant correlations in the answers given by the participants belonging to different generations. The questionnaire also included two scales for the Capability assessment, contextually described so as to obtain information about the order of importance of these in a relative as well as absolute sense, always referring to the two working experiences under investigation. Finally, the survey aimed to collect practical examples related to the application of the seven Capabilities, as well as to identify if further skills have been perceived by the interviewed as important during the remote working experience.

The survey (**Table 1**) included 17 questions and was spread out through e-mail channels (shared by means of different

TABLE 1 | Questions of the survey: *remote working experience during the COVID-19 emergency.*

(1) When were you born?
○ 1995–2009 (Z Generation)
○ 1980–1994 (Y Generation)
○ 1965–1979 (X Generation)
○ 1946–1974 (baby Boomers)

(2) What is your job?
○ Manager
○ Employee
○ Teacher/Trainer
○ Working Student
○ Independent Contractor
○ Other

(3) How would you evaluate your remote working experience?
○ From a personal point of view
○ From a professional point of view
Options: Totally Negative\Negative\Quite Negative\Neutral\Quite Positive\Positive\Totally Positive

(4) Evaluate the following statements:
○ "I like working at home, I can balance my job and my personal life successfully"
○ "I like working at home, but I'm exhausted as I work more than enough, at the expense of my personal life"
○ "I like working at home, but I perform less efficiently than working on site"
○ "I don't like working at home, I feel alone and unmotivated"
Options: I Totally Disagree\I Partially Disagree\I Disagree\Neutral\I Agree\I Partially Agree\I Totally Agree

(5) Given the choice, would you continue working remotely in the future?
○ Yes, every day
○ Yes, more than two days a week
○ Yes, two days a week
○ Yes, one day a week
○ Yes, just if necessary
○ No

(6) Evaluate the importance of the "Deal with Technology" Capability (*being able to use easily and frequently the opportunities offered by new technologies; being familiar with the technological dimension***) in the following situations:**
○ During the traditional working activity on site
○ Working remotely
Options: Totally Useless\Useless\Quite Useless\Neutral\Quite Useful\Useful\Very Useful

(7) Evaluate the importance of the "Deal with Human" Capability (*being empathic, able to put people at the center; constant attention to the people's needs***) in the following situations:**
○ During the traditional working activity on site
○ Working remotely
Options: Totally Useless\Useless\Quite Useless\Neutral\Quite Useful\Useful\Very Useful

(8) Evaluate the importance of the "Engagement" Capability (*passion and involvement for the performed activity; "adding something of your own," act with curiosity and proactivity***) in the following situations:**
○ During the traditional working activity on site
○ Working remotely
Options: Totally Useless\Useless\Quite Useless\Neutral\Quite Useful\Useful\Very Useful

(9) Evaluate the importance of the "Collaboration" Capability (*being able to work together with other people, cooperating valorizing diversity***) in the following situations:**
○ During the traditional working activity on site
○ Working remotely
Options: Totally Useless\Useless\Quite Useless\Neutral\Quite Useful\Useful\Very Useful

(10) Evaluate the importance of the "Agility" Capability (*being flexible, reactive, mentally and operationally open, managing non-liner processes in a creative way; being fast in reasoning***) in the following situations:**
○ During the traditional working activity on site
○ Working remotely
Options: Totally Useless\Useless\Quite Useless\Neutral\Quite Useful\Useful\Very Useful

(11) Evaluate the importance of the "Innovation" Capability (*being able to innovate and experiment new solutions; conceiving new possibilities abandoning the traditional way***) in the following situations:**
○ During the traditional working activity on site
○ Working remotely
Options: Totally Useless\Useless\Quite Useless\Neutral\Quite Useful\Useful\Very Useful

(12) Evaluate the importance of the "Interdisciplinarity" Capability (*being able to integrate different kinds of knowledge belonging to diverse disciplinary fields, multidisciplinarity; creating connections between different disciplines***) in the following situations:**
○ **During the traditional working activity on site**
○ **Working remotely**
Options: Totally Useless\Useless\Quite Useless\Neutral\Quite Useful\Useful\Very Useful

(13) Referring to the traditional working activity on site, arrange the following Capabilities from 1 (the most important) to 7 (the least important).
○ **Deal with Human** (*being empathic, able to put people at the center; constant attention to the people's needs*)
○ **Engagement** (*passion and involvement for the performed activity; "adding something of your own," act with curiosity and proactivity*)

(Continued)

TABLE 1 | (Continued)

○ **Interdisciplinarity** (*being able to integrate different kinds of knowledge belonging to diverse disciplinary fields, multidisciplinarity; creating connections between different disciplines*)

○ **Agility** (*being flexible, reactive, mentally and operationally open, managing non-liner processes in a creative way; being fast in reasoning*)

○ **Innovation** (*being able to innovate and experiment new solutions; conceiving new possibilities abandoning the traditional way*)

○ **Deal with Technology** (*being able to use easily and frequently the opportunities offered by new technologies; being familiar with the technological dimension*)

○ **Collaboration** (*being able to work together with other people, cooperating valorizing diversity*)

(14) Referring to working at a distance, arrange the following Capabilities from 1 (the most important) to 7 (the least important).

○ **Engagement** (*passion and involvement for the performed activity; "adding something of your own," act with curiosity and proactivity*)

○ **Interdisciplinarity** (*being able to integrate different kinds of knowledge belonging to diverse disciplinary fields, multidisciplinarity; creating connections between different disciplines*)

○ **Deal with Technology** (*being able to use easily and frequently the opportunities offered by new technologies; being familiar with the technological dimension*)

○ **Deal with Human** (*being empathic, able to put people at the center; constant attention to the people's needs*)

○ **Agility** (*being flexible, reactive, mentally and operationally open, managing non-liner processes in a creative way; being fast in reasoning*)

○ **Innovation** (*being able to innovate and experiment new solutions; conceiving new possibilities abandoning the traditional way*)

○ **Collaboration** (*being able to work together with other people, cooperating valorizing diversity*)

(15) Taking into consideration the seven identified Capabilities, choose one or more of them that you find relevant and describe a concrete example in which it has been important during your remote working experience.

(16) In your opinion, how important will this Capabilities be in the future, at the end of this emergency?

Options: Totally Useless\Useless\Quite Useless\Neutral\Quite Useful\Useful\Very Useful

(17) Are there other Capabilities, in addition to the mentioned ones, that you perceived as relevant? If so, what are they?

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corporate communication tools) and social networks (Instagram and Facebook), with the goal of achieving a sample being as diverse as possible, to make the results both balanced and objective. The first section (questions 1 and 2) focused on profiling to classify the participant depending on his/her working activity as well as his/her age, associating the person to one of the 4 proposed generations. The following questions (3, 4, and 5) asked to evaluate the appreciation of the working experience at a distance on the whole from both the professional and personal perspectives to examine at the same time the propensity for a future application. The central part of the survey (questions 6–12) dealt with the evaluation of the seven Capabilities identified, exploring how important each of them was perceived by the individual if related to the working activity on site and at a distance. A couple of questions (13 and 14) asked then to express a preference order for the seven presented Capabilities by means of an evaluation scale, referring to the traditional working context in presence first and then remotely, aiming to collect additional information about the relevance order not just in absolute sense but relative too. The final section of the survey (questions 15, 16, and 17) included two open questions and a Likert scale, all related to the practical application of the Capabilities to obtain a deeper insight. The first open question asked to indicate a concrete example of application for one of the seven Capabilities and to motivate why it was felt as important; the Likert scale was related to the perceived relevance degree of the illustrated Capabilities for the future; the last open question investigated the existence of other competences and skills, not included in the shared list of seven Capabilities, that contributed to making the remote working experience more efficient and effective.

Concerning the sample involved in the survey, it included a very heterogeneous population composed by 500 individuals of different ages, belonging to different working environments and coming from various training and geographical backgrounds, covering both Italy and foreign countries.

More in detail, the 500 participants in the survey can be classified in **Figures 1**–**3**.

The results of the research will be presented and discussed in detail in the following section of the article.

KEY FINDINGS AND DISCUSSION

The external desk-based research provided a significant insight into the main phases of the COVID-19 emergency, highlighting its consequences not only at the economic level but drawing particular attention to the deep transformation affecting the way of working worldwide. Such analysis of the impacts of the pandemic helped describe effectively the scenario where workers had to adapt to a new reality, imposing distance above all, creating an unusual context and generating unexpected challenges. A similar situation has proved to be a suitable background for the investigation related to the seven Capabilities of the new work culture, which most of the 500 participants in the survey have recognized as useful elements to be implemented during the current emergency in order to react proactively.

Findings of the External Desk-Based Research

Aiming to better understand the extent of the COVID-19 pandemic and, in particular, to identify the main impacts of such a phenomenon on the world of work, the external desk-based research has analyzed different sources, combining the data they provided to raise awareness about the context of this study. Both online and offline materials have been examined, including scientific papers, online news, informative websites, magazines, newspapers, and books, focusing on the Italian situation as well as on the global scenario (Eurofound and the International Labour Office, 2017; AstraRicerche and ManagerItalia, 2020; Baldini and Gori, 2020; Banca d'Italia, 2020; Dattoli, 2020; Europea, 2020; Galli and Tucci, 2020; Gavi, 2020; Il Sole 24 Ore, 2020;

FIGURE 1 | Sample involved in the survey – age.

FIGURE 2 | Sample involved in the survey – job.
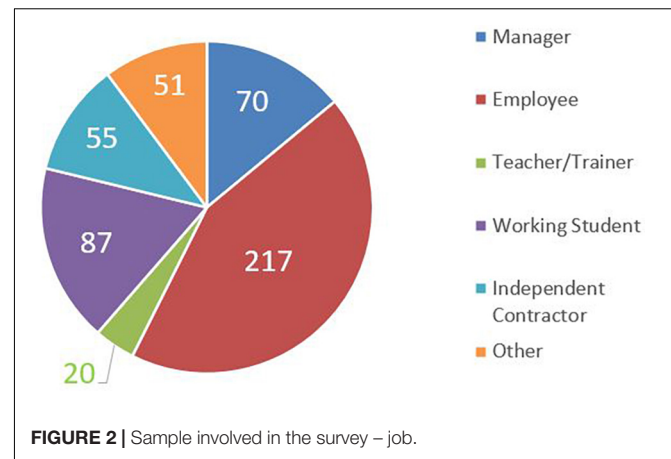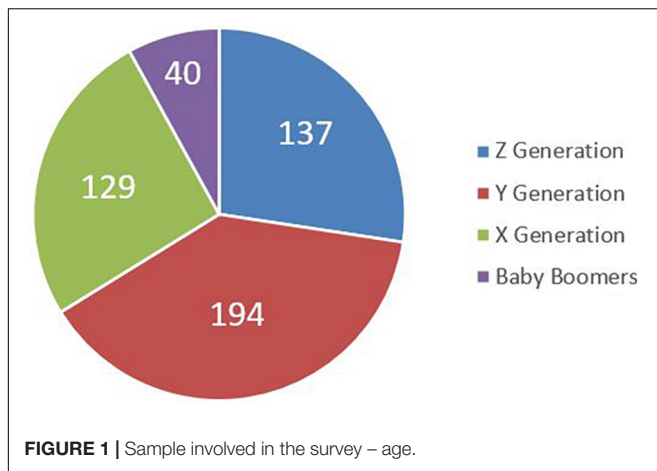
Kamps and Hoffmann, 2020; L'Eco di Bergamo, 2020; Simon-Kucher Partners Strategy Marketing, 2020; Telelavoro, 2020; Tessa, 2020).

We started to hear talking about the *Coronavirus* in December 2019, referring to an anomalous pneumonia in Wuhan, a city in central China; the contagion extends rapidly and many people die, but the risk is underestimated, and the contamination seems isolated. In the middle of January 2020, a first case is recorded out of the Chinese borders and, by the end of the month, the infection reaches Italy; as the virus can be transmitted from a human being to another one, China starts a lockdown period, imposing the use of surgical masks and prohibiting gatherings of people. Italy declares a state of health emergency; it is the first European country, identifying the COVID-19 as different from the common flu. In February and then March, the situation got worse and worse; the hospitals were close to collapse due to the quick spread of the contagion, and the government decided to "close" the whole country in a lockdown period. By the end of March, the virus reached most European and overseas countries; the United States is the most affected nation, while some emergency initiatives start being adopted to counteract the negative effects at the economic level. Some improvements in the number of infections were first recorded during April and then in May, when Italy entered "Phase 2" and a gradual re-opening allowed the recovery of some activities, always maintaining the safety measures related to the use of surgical masks and the respect of minimum distances.

An analysis of the impacts of the COVID-19 pandemic on the global economy, conducted by the *Simon-Kucher and Partners Strategy and Marketing* global consultancy agency[1], indicated that just 11% of world economy is flouring, while 58% is in danger. The safer sectors are obviously the pharmaceutical one, as well as those dealing with software, telecommunications, media, and Internet; due to the evident need, the emergency has considerably increased their demand, acting as enablers. The most affected in a negative way have especially been the transport, automotive,

FIGURE 3 | A sample involved in the survey – nationality.
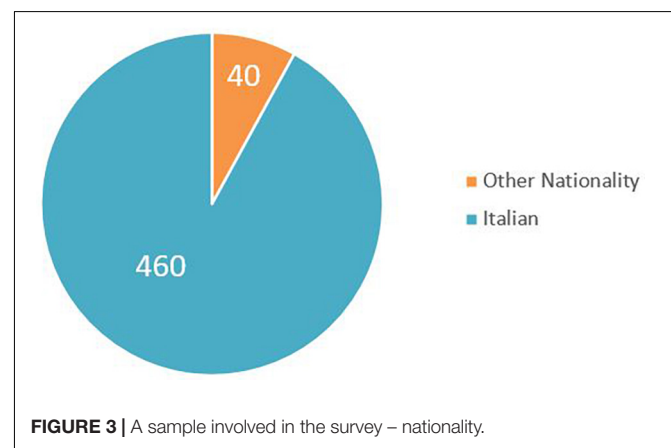
and travel sectors, but a significant crisis is also interesting the manufacturing, logistics, advertising, expeditions, constructions and non-essential consumer goods' industries. Another 17% of enterprises are recording strong positive trends together with difficulties at the operation level. A final result emerging from the same study concerns the remaining 14% of organizations, belonging to the chemical and metallurgic sectors, as well as gas, oil, and energy producers, which are undergoing an overload due to both a decrease or a change in the market demand.

Undoubtedly, the next 2 years will put a strain on the enterprises at the worldwide level, as the expected scenario will be certainly unpredictable and fluctuating; the lockdown period imposed in many countries has seriously compromised the global economy, whose emergency situation has developed in parallel to the health one. Several areas of the world already affected by the food crisis (Middle East, Asia, Latin America, etc.) will be among those to suffer most the consequences of the pandemic, having to manage it among their starving population. All the available examined information also agrees on the fact that the workers involved in the areas that are experiencing greater difficulties are those included in the weaker employment groups, in particular young workers, fixed-term or part-time ones. Such data have

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[1]https://www.simon-kucher.com/it/about/media-center/coronavirus-11-world-economy-thriving-alarming-58-threatened

also been confirmed by the Bank of Italy[2], stating that, over the medium term, the COVID-19 emergency will mainly impact the weaker social classes because of the highest number of low-income workers in the most affected sectors, therefore predicting a significant increase in the risk of poverty.

Among the repercussions of this phenomenon, the cultural switch imposed to companies and organizations has accelerated the digital transformation already underway: the emergency management defined new priorities, including health prevention, containment of the anxiety caused by the uncertainties of this crisis, and continuous reorganization. Remote working, e-commerce, e-learning, and robotics have become the only applicable solutions in a context that required sudden evolution, growth, and adjustment to meet the renewed system demand; without warning, millions of workers have started participating in huge smart working and a social collaboration experiment that modified the orientation of our global asset. With people working at home, in many cases, having to take care of their children because of the closure of schools, enterprises had to implement flexible working plans in order to improve their operational processes and facilitate their employees' life.

It goes without saying that those organizations whose structure was still very traditional and old-school, for instance, several administrations not yet digitalized and mainly using paper documents were unprepared to react timely and consequently suffered the most; at the same time, start-ups and companies that were already implementing the Industry 4.0 attitude, working online from the very beginning, are growing even further or, in the worst cases, did not experience remarkable changes.

If in the past years the digitalization process was considered something probably unavoidable but to be gradually introduced in the world of work, the COVID-19 emergency transformed that slow process of change into an impending need to be put into practice during just few days. Today, we are witnessing an actual revolution of the world of work, which is impossible to prevent at every level, but that, to stay in the game, everybody must accept, allowing technology and innovation to enter our daily activities and change our society, as well as our perception and understanding.

The traditional working mode has to be redefined, taking into consideration that new parameters are, first of all, affecting the whole organizational structure; flexibility and decentralization impose to focus on the effective spread of knowledge and information, a more organic approach is needed to manage complex realities in order to find innovative solutions by means of both the involvement and collaboration of different people (Burns and Stalker, 1961). The management system has, therefore, to move toward the needs of the individuals, who are becoming active participants in the flow, not just performing tasks but also coordinating, understanding, and creating on their own.

This research has focused on working at a distance, including each kind of activity carried out in a place that is not the traditional one, but different naming is used to identify specific situations:

- *Remote working*, or *teleworking*, refers to the possibility of performing the working activity at a distance, maintaining the same working schedule and tasks, using suitable computer tools and portable personal computers connected to the corporate services.
- *Smart working* is instead a sort of evolution of teleworking, indicating a flexible working mode without limitations in terms of time and space; the organization of the activities is, in this case, agreed between an employee and an employer, developed in phases, cycles, and objectives, implemented by means of improved processes and functional technologies.

Working at a distance can obviously have several implications, impacting at the same time on both the individual who performs it and the organization, even reaching the surrounding context with significant impacts on the whole social system.

Advantages for the worker: autonomous management of the daily schedule, reduction of time spent, moving toward the corporate location, more free time and better balance between private and working life, being closer to family and friends, having the possibility to choose the place to live and work.

Advantages for the organization: increased productivity, reduction of costs, more flexibility for the whole enterprise, motivational improvement for some employees.

Advantages for the social system: reduction of traffic and, therefore, of pollution, greater individual productivity and freedom, reduction of costs, and optimization in the space dimension of enterprises.

Disadvantages for the worker: isolation and less direct relationships, risk of workaholism, reduced visibility and consequent less chance to emerge, minor support and guidance received, and loss of separation between the working and the private spheres.

Disadvantages for the organization: redefinition of the corporate structure, difficulty in managing distant workers, increase in the expenses for training and telecommunication, cultural transformation of working processes, and many contracts to deal with.

A first essential condition for an effective implementation of working at a distance is, undoubtedly, the availability of a solid infrastructure network able to meet the current needs; Finland and Sweden are the most digitalized among European countries, while the Italian network is widespread but really slow. Before the COVID-19 pandemic, in 2017, a Eurofund report[3] had placed our country at the bottom of the list, indicating the percentage of employees who started experiencing teleworking in the EU: Italy, 7%; Germany, 12%; France, 25%; and United Kingdom, 26%. A 20% increase of their number has been recorded for Italy in 2019, which rapidly adjusted its production system in 2020 in order to adapt to the unexpected emergency scenario; such abrupt transformation forced the national economy at every level, imposing the introduction of remote working also

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[2]https://www.bancaditalia.it/pubblicazioni/note-covid-19/2020/Nota-COVID-Statistiche-2020.10.22.pdf

[3]https://www.eurofound.europa.eu/publications/report/2017/working-anytime-anywhere-the-effects-on-the-world-of-work

in the cases of enterprises not yet planning its application. Italy might not represent one of the most advanced countries of the world, concerning the diffusion of teleworking, but we have witnessed a significant reaction to the sudden transformation originated by the pandemic during the last months, with the adoption of relevant improvements at both technological and organizational levels.

Findings of the Survey on the Capabilities

The results of the survey involving 500 workers who experienced working at a distance in 2020 have been carefully analyzed in order to investigate how the seven Capabilities implemented as necessary elements of the working scenario during the COVID-19 pandemic are perceived, and if they will be useful also in the future post-pandemic work culture. As the sample included a fairly wide and heterogeneous group of individuals, both from the generational aspect and the kinds of performed activities, such results can be considered an interesting description of the phenomenon, albeit provisional and to be developed; the following paragraphs, therefore, examine in detail the findings emerging from the different sections of the questionnaire.

The question about the usefulness of such Capabilities in the future provided some first relevant results, as an average 90% of the participants answered that those skills will be useful (quite useful/useful/very useful); it is an early provisional support of the research hypothesis, assuming that *Deal with Technology*, *Deal with Human*, *Engagement*, *Agility*, *Collaboration*, *Innovation*, and *Interdisciplinarity* may represent a suitable attitude to act effectively in the post-pandemic working context. The data referring to this question have been collected by means of a Likert scale, composed by seven preference levels, evaluated by the 500 participants as follows in **Figure 4**.

It is interesting to further analyze the answers focusing on the interviewed generations, which confirm how in all cases the majority of the participants evaluated the Capabilities as useful/quite useful/very useful; just Baby Boomers differ numerically with a slightly lower percentage, which exceeds in any case, 80%.
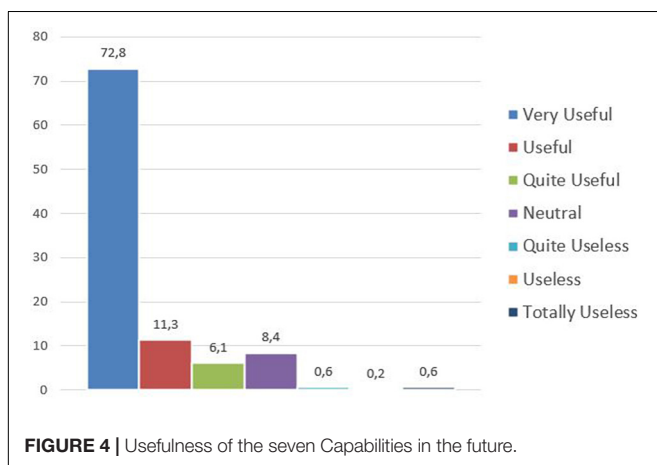
	Z Generation	Y Generation	X Generation	Baby Boomers
Very useful	77.3%	70.5%	73%	72.2%
Useful	8%	13%	13.5%	8.3%
Quite useful	5%	7%	4.8%	2.8%
Total	90.3%	90.5%	91.3%	83.3%

The remaining 10% includes 8.6% of the participants who declare neutral and 1.4% distributed among the options useless/quite useless/totally useless, confirming as the only remarkable difference a lower enthusiasm on the part of the older generation of Baby Boomers.

	Neutral	Quite useless	Useless	Totally useless
Z Generation	8%	0.6%	0%	0.9%
Y Generation	8%	0.6%	0%	0.9%
X Generation	9.3%	0.6%	0.6%	0%
Baby Boomers	9.3%	0.6%	0.6%	0%
Average	8.6%	0.6%	0.2%	0.6%

Taking into consideration the current situation, a dedicated set of questions of the survey asked then the involved sample to evaluate the importance of each specific Capability in absolute sense, first referring to the working activity on site and then at a distance. The same Likert scale above mentioned, composed by seven preference levels, has been used also in this case to investigate the present scenario articulated in the two proposed working modes.

With regard to the traditional working activity *on site*, an average 87.4% of the participants think that the seven Capabilities will be quite useful/useful/very useful (**Figure 5**).

Concerning working *at a distance*, an average 81.1% of the participants evaluate their levels of importance as quite useful/useful/very useful (**Figure 6**).

FIGURE 4 | Usefulness of the seven Capabilities in the future.

FIGURE 5 | Usefulness of the seven Capabilities during the current situation – working on site.

FIGURE 6 | Usefulness of the seven Capabilities during the current situation – working remotely.
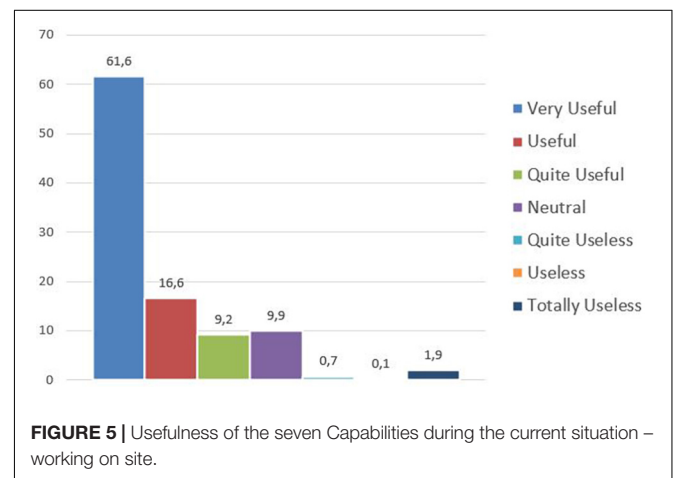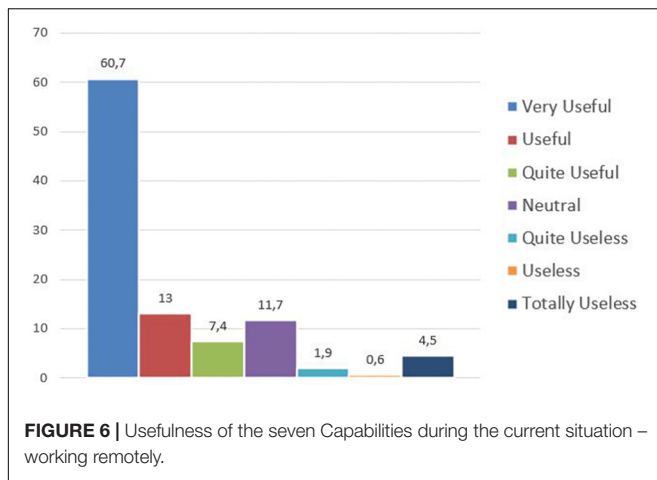
Without making a distinction between working remotely or on site, an average 84.3% of the sample considers the seven Capabilities as quite useful/useful/very useful.

Further analysis of the collected data referring to the Capabilities has interpreted the seven levels of the Likert scale as points on a range from 1 to 7 in order to investigate how useful each of them is perceived by the workers.

Referring to the traditional working activity *on site*, the following rankings emerge:

Collaboration	6.33
Deal with human	6.32
Agility	6.28
Engagement	6.26
Interdisciplinarity	6.14
Innovation	6.08
Deal with technology	6.01

Taking instead into consideration working *at a distance*, the following rankings emerge:

Deal with technology	6.43
Agility	6.15
Innovation	6.11
Engagement	6.09
Interdisciplinarity	5.93
Collaboration	5.73
Deal with humans	5.47

It is not surprising that the Capabilities considered most useful referring to the traditional working activity on site are the ones concerning human relationships and the human factor, highlighting the increasing importance attributed to team working as essential condition to achieve common corporate goals. At the same time, the technological dimension is perceived as less useful, probably due to the possibility of involving

colleagues in solving difficulties with the employed devices as well as to the marginal role technology plays, if compared to the direct contact with other people. Such reflections are confirmed by the opposite positions occupied by the same Capabilities when referring to remote working; being able to deal with technology in order to maintain the same efficiency during the working activity at a distance is, in this case, fundamental. Agility and innovation are the other two Capabilities the participants have indicated as most useful working remotely, emphasizing how such new dimension requires both flexibility and adaptability, as well as the ability to implement innovative approaches and solutions, abandoning the comfort-zone and opening up to new ways. The imposed distance also impacts the human relationships, as this estranging working method forces to put into practice a more autonomous and independent management of the activities.

Without making distinctions concerning the type workplace, it can be observed how the rankings reflect the situation of the working *at a distance* scenario, stressing how the crucial role played by new technologies cannot be ignored:

Deal with technology	6.22
Agility	6.21
Engagement	6.17
Innovation	6.09
Collaboration	6.03
Interdisciplinarity	6.03
Deal with humans	5.89

Furthermore, observing the evaluations provided by the participants belonging to different generations offers interesting insights into how the Capabilities are perceived:

Z-Y Generations		X Generation – Baby Boomers	
Deal with technology	6.20	*Agility*	6.30
Agility	6.15	*Engagement*	6.27
Engagement	6.13	*Deal with technology*	6.26
Innovation	6.11	*Interdisciplinarity*	6.15
Collaboration	6.04	*Innovation*	6.08
Interdisciplinarity	6.00	*Collaboration*	6.04
Deal with humans	5.94	*Deal with humans*	5.80

It can be noticed how the younger generations assign higher evaluations to *deal with technology*, *innovation* and *collaboration*; on the contrary, the older generations place higher in the list *agility*, *engagement*, and *interdisciplinarity*. This is not surprising, as the Z-Y Generations are actually made up of individuals who have grown up in close contact with new technologies, an element that has always been part of their lives, and, at the same time, they are more used to working with others, in teams. Baby Boomers and the X Generation include on the other side people who are less accustomed to new techniques and innovative methods, who tend to maintain a more traditional working approach, regardless of generation is assigned a prominent position to both

Agility and *Engagement*, proving that adaptability, flexibility, and passion are driving factors recognized as indispensable. It is interesting that *Interdisciplinarity* is ranked higher by the mature generations; this could be explained as a consequence of their less confidence with innovative technologies, requiring to be prepared on multiple fronts to be able to handle different issues in case of need.

Combining the answers of the different generations with the working locations, it can be observed how the priority of some Capabilities changes according to the situational context, reflecting, in any case, the abovementioned participants' preferences and needs.

One of the open questions included in the survey provided additional relevant findings about the seven Capabilities in the context of the remote working experience, as it asked the participants to choose one of them and describe its effective application, mentioning a concrete example. The fact that most of the 500 workers talked about *Deal with Technology* confirms the abovementioned results, acknowledging that the technological dimension is essential and unavoidable working at a distance; video conferences, printing, scanning, using a personal computer, and the email are some things that, today, cannot be avoided to carry out every kind of working activity. Similarly, the examples provided concerning *Agility* support the already illustrated findings, as the participants highlighted the importance of being flexible and open-minded to solve complex problems and to adapt in order to meet new challenging requests. It cannot be denied that the surrounding environment has a deep impact on the working activity, which, if performed remotely, may undergo negative effects as the loss of both motivation and concentration; this has emerged from the words of those who chose an *Engagement* episode. *Cooperation* is then a Capability with a strong emotional component, recognized as fundamental from both the professional and personal perspectives; mutual support is pursued to overcome the physical distance and to obtain common positive results. Feeling part of a team, keeping the human aspect alive, is another recurring need expressed by the workers, who talked about the *Deal with Human* Capability, describing the difficulties generated by the imposition of a filter between individuals. A transformed surrounding scenario requiring new approaches and solutions, no more accepting the traditional ones, was then described by the participants who decided to share the implementation of *Innovation*. Just a

minority talked about *Interdisciplinarity*, emphasizing the need to face complex situations in an autonomous way, being able to deal with different competence areas just relying on your own competences and experiences.

- ○ 26.9% <u>Deal with Technology</u>: "*Indispensable to work remotely; indispensable to keep in touch with the colleagues; it allows to be in more place at the same time.*"
- ○ 17.7% <u>Agility</u>: "*Ability to adapt to new requests, to be flexible, to define priorities; being able to balance your working and private life.*"
- ○ 16.8% <u>Engagement</u>: "*Passion for your work stimulates motivation; to add something of your own is essential, aiming to obtain good results.*"
- ○ 15.5% <u>Collaboration</u>: "*Essential for the creation of synergies, coordination, technical support; supporting and being supported, being patient.*"
- ○ 12% <u>Deal with humans</u>: "*Good communication is crucial; maintaining positivity and humanity, being emphatic, being able to reassure; feeling part of a group, motivated.*"
- ○ 9.5% <u>Innovation</u>: "*A new approach to face daily problems, reinventing yourself, abandoning the traditional ways.*"
- ○ 1.6% <u>Interdisciplinarity</u>: "*Because of the distance, it is essential to be autonomous, being able to move from a topic to another without difficulties.*"

The survey also allowed the 500 participants to indicate other Capabilities they perceived as useful during their remote working experience; just 16% of them answered this question, referring to additional competences they considered worth mentioning. The majority talked about autonomy and independence (28.6%) in order to manage the activities effectively and to organize the tasks properly. A group of participants focused then on time management (17.4%) to be considered not just from the professional point of view but also in terms of intelligent planning of the private dimension. Communication skills (12.2%) have also been mentioned by some workers, as the distance imposed makes it more complicated to listen and trust the others in an appropriate way, as well as to focus on the other's needs. Smaller groups included additional dimensions related to the emotional and personal spheres, talking about self-control, stress management, and patience (7%); empathy (2.6%); self-learning

TARGET

	All			Z-Y Generations			X Generation – Baby Boomers		
	Gen.	On Site	Dist.	Gen.	On Site	Dist.	Gen.	On Site	Dist.
Deal with humans		2°			1°				
Deal with technology	1°		1°	1°		1°	3°		1°
Agility	2°	3°	2°	2°	3°	3°	1°	2°	2°
Engagement	3°			3°			2°	1°	3°
Collaboration		1°			2°			3°	
Interdisciplinarity									
Innovation			3°			2°			

(0.8%); sharing of information, supporting others and being generous (0.8%).

Finally, a specific section of the questionnaire aimed at investigating the perception of the remote working experience from a more general perspective, asking the involved workers to express an evaluation about it with regard to the professional and private spheres.

The evaluations provided from the *professional* point of view can be classified as follows in **Figure 7**.

The evaluations provided from the *personal* point of view can be instead classified as follows in **Figure 8**.

On the whole, 78% of the sample has appreciated the remote working experience from the professional point of view and 80% from the personal point of view; the same situations have been perceived negatively from about 15% of the participants, and about 6% is neutral. The main advantages of working at a distance include a reduction of the wasted time spent moving and more satisfaction for their condition, elements that can both originate improved productivity and performance; referring to the private dimension, some benefits correspond to self-management of time and opportunity to choose the working place, as well as more free time and the possibility to stay close to family and friends; the

FIGURE 7 | Remote working experience perception – professional point of view.

FIGURE 8 | Remote working experience perception – personal point of view.

general aspect that is more appreciated is the increased flexibility allowed, also affecting the motivational factor positively.

Reconnecting to the future scenario, the survey also proposed a question with the purpose of analyzing the propensity to prefer working at a distance, if being able to choose for the future, selecting one of the following six options:

Yes, every day	10%
Yes, more than 2 days a week	20.2%
Yes, 2 days a week	29.3%
Yes, 1 day a week	15.5%
Yes, just if necessary	17%
No	7%

Just a minority would not continue working at a distance in the future, while 93% of the sample would, the preferred solution would be around 2 or more days a week, therefore quite frequently. Such data provide significant evidence about the average population, which seems ready for this deep transformation in the working routine, entailing a strong impact on the traditional corporate weekly schedule. The COVID-19 emergency has probably let this aspect emerge, bringing to light also in Italy the willingness to adopt a new working mode that is already widespread in other countries.

Some interesting observations emerge when analyzing the responses given by different generations:

Z-Y Generations		X Generation – Baby Boomers	
Yes, 2 days a week	34%	Yes, just if necessary	22%
Yes, more than 2 days a week	19%	Yes, more than 2 days a week	21%
Yes, 1 day a week	18%	Yes, 2 days a week	19%
Yes, just if necessary	15%	Yes, every day	17%
Yes, every day	7%	Yes, 1 day a week	11%
No	7%	No	10%
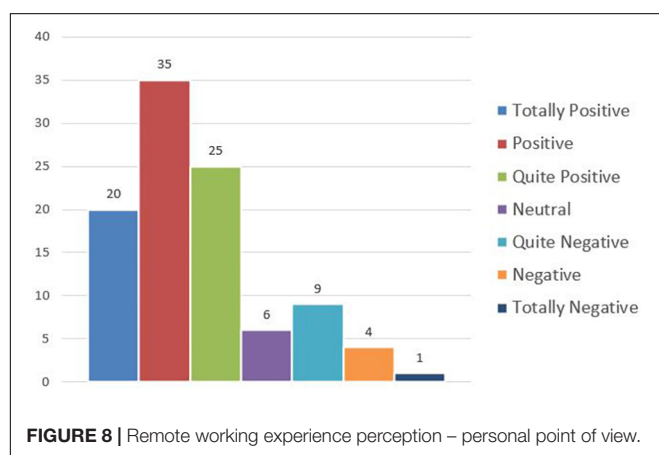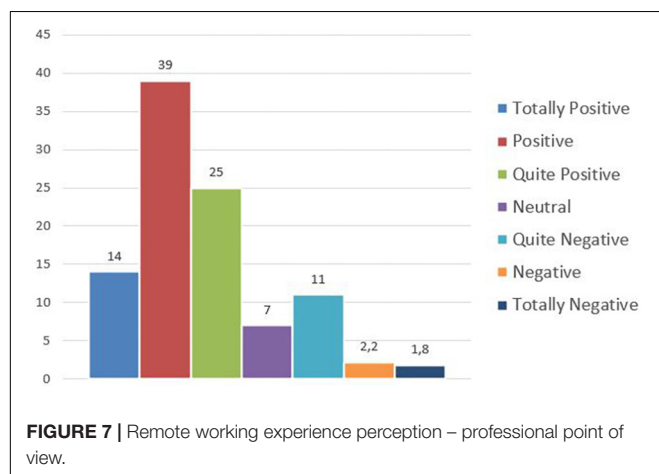
With regard to younger generations X and Z, the majority chose "2 days a week"; conversely, generations X and Baby Boomers "just if necessary." Although, in both cases, working at a distance is generally fully appreciated, we can deduce that the younger generations are more comfortable with this innovative mode of working.

The findings presented allow to conclude that the pandemic has inevitably made the need to develop and implement these Capabilities more evident, accelerating their adoption into everyday work in a much shorter time than we might have expected. The importance of taking advantage of the opportunities generated by new technologies has emerged, besides the acknowledgment of flexibility and open-mindeness as crucial factors to face an ever-changing context. The usefulness of this set of Capabilities thus seems to be confirmed by the results of the survey, which highlights the crucial role they are playing since the outbreak of the pandemic, and which

they seem to suggest will remain even once the pandemic is over. Regardless to the significant role increasingly played by technological innovation, the results of this study have also highlighted one remarkable element: how the human factor remains fundamental and how attention to people's needs must not be put aside, even when work is done remotely, requiring this dimension to be integrated.

CONCLUSION

The study conducted with the purpose of answering the two research questions has provided an interesting insight into the renewed working experience generated by the COVID-19 pandemic outbreak. Both the external desk-based research and the survey allow to draw some conclusions that can be considered consistent with the research hypothesis. Concerning the first research question, investigating the skills emerged as necessary elements of the working experience during the pandemic, a new concept of Capability has emerged, a combination of knowledge, ability, and experience useful to people in every aspect of daily life in order to participate consciously in the surrounding environment that they are living, as well as to create a new future dimension with both intention and full awareness. In particular, a set of seven Capabilities whose development has been accelerated by the pandemic has been identified in the Comau context, as suitable expression of the renewed approach to the working activity, meeting the renewed everyday requirements: people and their needs have to be put at the center (*Deal with Humans*); the confidence with new technologies is unavoidable (*Deal with Technology*); it is crucial to be open-minded and flexible (*Agility*); a real passion enhances every outcome (*Engagement*); it is essential to constantly cooperate with the others (*Collaboration*); different kinds of knowledge have to be combined to achieve relevant results (*Interdisciplinarity*); new possibilities and solutions have to be continuously pursued (*Innovation*). Obviously, the capabilities are not intended to be predictive of the future scenario, which will inevitably be additionally influenced by technological, economic, and social factors; this study merely identifies the key elements of the new work culture that emerged at the time of the research.

Regarding the usefulness of the seven Capabilities as key elements of a new culture of work during the pandemic and, as stated in the second research question, also for a post-pandemic future, it has been undertaken through the analysis of the Comau case. The vast majority of the workers participating in the conducted survey, involving 500 people who started working at a distance during the 2020 lockdown period, have defined the seven Capabilities as useful or very useful during the global crisis they had to face; 90% of them think that such Capabilities will be also useful in the future. The Capabilities will be in any case just one of the ingredients that will characterize the new work culture; a crucial role will be inevitably played by business organization, process aspects, and hard skills.

The seven Capabilities have been all described in a positive way, but some of them have been better taken into account;

the familiarity with the technological dimension (*Deal with Technology*) is necessarily the one recognized as indispensable for each kind of activity, in particular when working at a distance. *Agility* and *Engagement* follow, as, in the current constantly changing scenario, is essential to be flexible and rapid to react proactively and effectively, always moved by passion and interest. *Innovation*, *Collaboration*, and *Interdisciplinarity* confirm the perception of a context where the urgency is to seize the opportunities offered by the digital revolution without losing the human dimension (*Deal with Humans*) in terms of relationships, humanity, and exchange between individuals.

The human beings must, therefore, be put at the center in order to guide the technological progress and manage its innovation, both at organizational and social levels; workers have to be responsible for their choices and to implement new instruments; at the same time, as individuals, they have to be aware of their roles in such a scenario. The main purpose corresponds to the search for balance between technology and centrality of the human factor, allowing the best co-existence of the two spheres, in a context where workers can use digital devices to improve their performances as functional to the needs of people, without perceiving technology as an external and overwhelming element. Aware of the limitations of the research presented in this article, it is planned to carry out a future experimental study that will further investigate the raised issues.

The conclusions illustrated in this final section of the article offer then some concrete indications and coordinates for the subjects involved in the training and education sectors, who face the deep transformation of the surrounding context without full awareness of its impacts. Institutions, stakeholders, and who provide/participate in training initiatives may, therefore, take advantage of this research, considering the evident need of raising consciousness about the new culture of work and the required Capabilities in order to support people performing their working activity effectively and becoming successful protagonists of both the current and future scenarios.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by Internal Control Committee of COMAU SpA. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

All authors listed have made a substantial, direct, and intellectual contribution to the work, and approved it for publication.

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Effects of Health Belief About COVID-19 on Knowledge Sharing: The Mediating Role of Self-Efficacy

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While existing studies have explored factors that affect knowledge sharing among employees from different perspectives, there are still research gaps regarding whether health belief affects knowledge sharing among employees, specifically against the backdrop of the COVID-19 pandemic, and how such effects work. Thus, the purpose of this study is to determine the effect of bank employees' health beliefs about COVID-19 on knowledge sharing mediated by their self-efficacy. From the perspective of social cognitive theory and the health belief model, this study investigates whether employees' perception of susceptibility and severity of COVID-19 affects formal as well as informal knowledge sharing through knowledge sharing self-efficacy. A sample of 407 bank employees (200 women and 207 men) in China was used for the study. The formulated hypotheses were tested using structural equation modeling and bootstrapping. The results showed that employees' perceived susceptibility to COVID-19 significantly undermines formal and informal knowledge sharing self-efficacy. However, there was no significant difference in the extent of its indirect effects on formal and informal knowledge sharing. Further, employees' perceived severity of COVID-19 had no effect on knowledge sharing self-efficacy and on formal and informal knowledge sharing, which could have resulted from the COVID-19 outbreak in China.

Keywords: health belief, knowledge, self-efficacy, COVID-19, China

INTRODUCTION

Coronavirus disease 2019 (COVID-19) was first declared a pandemic on March 11, 2020, and has caused widespread disruption in all areas of people's social life since its emergence (World Health Organization, 2020). As of January 2022, more than 370 million confirmed cases and over 5.6 million COVID-19-related deaths have been reported all over the world (World Health Organization, 2021). Since the emergence of the virus in Wuhan in September 2019 (Huang et al., 2020), more than 130,000 people have been diagnosed with the disease in China, as of January 2022 (World Health Organization, 2021). Although the number of COVID-19 cases in China accounts for only a small proportion of the country's overall population, the virus poses a huge burden on the country (Li et al., 2020; Zhong et al., 2020). As far as business organizations are concerned, the massive impact of the pandemic has also affected Chinese companies. Many companies suffered a huge existential crisis during the pandemic (Wang et al., 2020; Ng et al., 2022). Meanwhile, people have been forced to adopt a series of measures

to avoid infection, such as wearing masks, keeping social distance, or even working from home, which have adversely affected their work and life (Li et al., 2021a; Aldianto et al., 2021).

The organizational crises and individual psychological stress have posed additional challenges for knowledge sharing among employees (Lee et al., 2021) during COVID-19 (Xu et al., 2021). Existing studies have shown that knowledge sharing can bring innovative ability or sustainable benefits to companies (Ruuska and Vartiainen, 2005; Cerne et al., 2014; Škerlavaj et al., 2018). Particularly, the role of knowledge sharing in organizational development is crucial for knowledge-intensive organizations (Henttonen et al., 2016). As a typical knowledge-intensive organization, knowledge sharing is even more important for banks. In the context of COVID-19, a new crisis has arisen in the form of knowledge sharing within companies. Organizational crises can also lead to persistent negative emotions among employees within companies (Konig et al., 2020) and further inhibit knowledge sharing (Nguyen et al., 2022).

Given the crucial role of knowledge sharing in the sustainable development of companies (Kogut and Zander, 1996; Argote and Ingram, 2000; Wang and Noe, 2010), there is a need to analyze how the pandemic affects knowledge sharing among employees. Previous studies have investigated some factors affecting knowledge sharing and how their effects work at the individual level (Bock et al., 2005; Wasko and Faraj, 2005; Chiu et al., 2006; Israilidis et al., 2015). These factors include anticipated reciprocal relationships (Bock et al., 2005; Wasko and Faraj, 2005; Chiu et al., 2006), trust (Nahapiet and Ghoshal, 1998; Wen and Wang, 2021), image (Wasko and Faraj, 2005), identification (Kankanhalli et al., 2005), organizational rewards (Bock et al., 2005), perceived loss of knowledge (Davenport and Prusak, 1998), and knowledge self-efficacy (Jarvenpaa and Staples, 2000; Bock et al., 2005; Wen and Wang, 2021) are deemed to have a significant effect on knowledge sharing among employees. As employees' health belief and knowledge sharing are likely to have been highly affected during COVID-19, we conducted a literature search on the areas. Nevertheless, studies on the relationship between health belief and knowledge sharing among employees during the COVID-19 pandemic are few. Although a significant correlation between health belief about COVID-19 and self-efficacy among individuals has been confirmed in a recent study (Talsma et al., 2021), managers might fail to correctly explain the reasons behind a decline in employees' enthusiasm for knowledge sharing **during the pandemic** due to unavailable research in this area. From the perspective of the health belief model, perceived susceptibility and perceived severity of COVID-19 might cause employees to develop negative emotions regarding knowledge sharing, which might be mediated by self-efficacy. According to previous studies, self-efficacy was also used as a mediating variable in some models (Honicke and Broadbent, 2016; Parhamnia et al., 2021). Furthermore, employees with high levels of perceived susceptibility and perceived severity also demonstrate more negative attitudes when communicating and collaborating with their colleagues, which can result in poor knowledge sharing self-efficacy. Meanwhile, the positive relationship between self-efficacy and employee behavior is an important concern in

social cognitive theory. Consequently, the following research question guides this study—does employees' health beliefs about COVID-19 influence their knowledge sharing self-efficacy?

Based on the above discussion, this study proposes the effects of health beliefs about COVID-19 on knowledge sharing among employees and the mechanism behind such effects from the perspective of bank employees' self-efficacy. Specifically, this study considered perceived susceptibility and perceived severity, two key factors in the health belief model (Janz and Becker, 1984; Yuen et al., 2020), as independent variables and analyzed them using structural equation modeling. The aim was to determine whether these two factors affect formal and informal knowledge sharing among bank employees under the mediating role of self-efficacy. The contributions of this study are threefold. First, this study combines the perspectives of the health belief model and social cognitive theory to analyze the effects of health belief on knowledge sharing in the context of the COVID-19 pandemic, thereby broadening research perspectives on the factors affecting knowledge sharing. Second, this study enriches the differentiated understanding of the factors affecting knowledge sharing by taking into consideration different types of knowledge sharing and analyzing the mechanisms behind the formation of formal knowledge sharing and informal knowledge sharing. Finally, this study is of high academic value in research on employees in the banking sector; a large commercial bank in China, which is a knowledge-intensive firm with a large number of employees, is chosen for this study.

This paper is structured as follows. The next section features a review of existing literature and proposes the corresponding research hypotheses. The third section provides an overview of the research methods used in this study, including the process of data collection and questionnaire development. The fourth section reports the results of model analysis. The fifth section discusses the results of this study, and presents the theoretical and temporal implications of this study as well as its limitations.

LITERATURE REVIEW AND HYPOTHESES

Knowledge Sharing

In knowledge-intensive organizations, knowledge sharing is important (Henttonen et al., 2016), which is reflected in the processes and results of the organization's operations. In processes, knowledge sharing can advance organizational knowledge creation (Nonaka, 1994; Kogut and Zander, 1996) and innovation (Cohen and Levinthal, 1990) by increasing the efficiency of collective knowledge utilization. In results, effective sharing of relevant specialist knowledge can help the organization gain a competitive advantage and sustained performance (Kogut and Zander, 1996; Argote and Ingram, 2000; Wang and Noe, 2010). It also influences employees' job performance and job satisfaction, especially for engineers (Kianto et al., 2016). Even if it introduces organizational challenges (Mabey and Zhao, 2017; Donnelly, 2019), it also

plays a key role in sustaining knowledge-based companies' success and competitiveness (Cegarra-Navarro et al., 2016; Kianto et al., 2017). While the importance of knowledge sharing is self-evident, knowledge sharing strategies are often overlooked in general business strategies, as it is challenging to assess its value effect and action mechanism (Yao et al., 2020). Although knowledge sharing is a common topic in the field of knowledge management research, there are still gaps in the discussion on its influencing factors and formation mechanism.

Knowledge management refers to identifying and leveraging the collective knowledge in an organization to help the organization compete (Von Krogh, 1998). According to Szulanski (1996) and Bhatt (2001), knowledge sharing generally refers to moving knowledge between different organizational actors, both within and between departments and hierarchical levels. In organizations, the key objective of knowledge sharing between employees is the systematic translation of existing knowledge into organizational resources (Dawson, 2001). Within a larger intellectual framework, knowledge sharing is a crucial ingredient of knowledge management at both the organizational and individual levels (Riege, 2005; Oyemomi et al., 2019; Singh et al., 2019). Typically, knowledge management is seen to consist of knowledge processes (such as knowledge creation, sharing, acquisition, transfer, and application) together with infrastructures, capabilities, and management activities that support and enhance the knowledge processes (Gold et al., 2001; Lee and Choi, 2003). Specifically, knowledge sharing is focused on maximizing the utility of collective knowledge. The study of its influencing factors and pathway mechanisms will provide a new theoretical perspective on knowledge management within organizations; it could even help to improve the knowledge management level of cross-organizational cooperation (Wen and Wang, 2021).

With the expansion of knowledge management theory, knowledge sharing, as one of the important micro-concepts, has been enriched in different aspects. From the participant's aspect, there is individual knowledge sharing, group knowledge sharing, and organizational knowledge sharing (Nonaka and Takeuchi, 1995). From the ontological aspect, there is a group (team) knowledge sharing, organizational knowledge sharing, and inter-organizational knowledge sharing; from the epistemological aspect, there is explicit knowledge sharing and tacit knowledge sharing (Liao et al., 2007; Lin, 2007a; Yesil et al., 2013). From the aspect of the knowledge source, there is internal knowledge sharing and external knowledge sharing (Carmeli et al., 2013).

Furthermore, referring to the distinction between formal and informal knowledge management proposed by Hutchinson and Quintas (2008), knowledge sharing could also be divided into formal knowledge sharing and informal knowledge sharing (Witherspoon et al., 2013; Kumari and Takahashi, 2014; Park and Kim, 2018; Lee et al., 2020) from the perspective of the knowledge sharing process. Formal knowledge sharing refers to the storage and exchange of knowledge that takes place publicly within the formal rules and structures of organizations whereas informal knowledge sharing is the exchange of knowledge

about one's daily work among colleagues and in highly private settings (Lee et al., 2020).

Although formal knowledge sharing and informal knowledge sharing are both under the theoretical framework of knowledge sharing, there are significant differences in their mechanisms of influence. According to the research results (Mitchell et al., 2014), it verifies effectiveness by organization size. For example, formal knowledge sharing plays a key role in the performance of small- and medium-sized enterprises. It connects their knowledge with and develops the globally advanced knowledge system by transferring innovative knowledge and technology and sharing specific local experiences. Compared with formal knowledge sharing, informal knowledge sharing is a more flexible knowledge sharing practice (Biancani et al., 2014). Informal knowledge sharing accounts for most KS activities even in a highly institutionalized KS organization (Krogh et al., 2000), and it can occur without specific intentions (Swap et al., 2001). On the other hand, another study shows that both formal knowledge sharing and informal knowledge sharing positively contribute to the task performance of manufacturing companies (Wen and Wang, 2021).

Based on the above discussion, it could be concluded that although some literature makes a distinction between formal knowledge sharing and informal knowledge sharing, the discussion of the differences is not sufficient so far. Besides, available studies have focused on the differences in the effects of formal knowledge sharing and informal knowledge sharing, without noting the differences in the formation mechanisms of formal knowledge sharing and informal knowledge sharing.

Health Beliefs About COVID-19 and Self-Efficacy

Against the backdrop of the COVID-19 pandemic, this study aimed to investigate the effects of health beliefs on knowledge sharing self-efficacy among employees. In the health belief model, perceived susceptibility and perceived severity are the two key factors of greatest concern (Janz and Becker, 1984; Yuen et al., 2020). While perceived susceptibility refers to an individual's vulnerability under a particular health risk, perceived severity refers to an individual's perception of the danger of a particular health risk (Carpenter, 2010; Timpka et al., 2014). Based on the health belief model, the health belief about COVID-19 refers to the individual's vulnerability to COVID-19 and the individual's perception of the risk of COVID-19.

In existing studies, perceived susceptibility and perceived severity have been found to have a significant effect on an individual's attitude and behavior (Wang et al., 2021). Moreover, health belief about COVID-19 was also found to have a strong association with self-efficacy (Talsma et al., 2021).

As a key element in social cognitive theory, self-efficacy is an individual's "can do" belief about a future performance outcome (Bandura et al., 1997). In organizational management-related research, knowledge sharing self-efficacy is defined as an employee's confidence in his/her ability to provide valuable knowledge to other employees in the organization (Spreitzer, 1995; Nguyen and Malik, 2020). As regards the effects of health

belief about COVID-19 on self-efficacy, change in the emotional state serves as a critical path (Bandura et al., 1997). Existing studies argued that individuals use feelings such as stress, fatigue, anxiety, and uncertainty as cues to judge self-efficacy (Usher and Pajares, 2006). For example, employees lose confidence in the value of knowledge sharing and lower their expectations of the effectiveness of knowledge sharing when they feel stressed about knowledge sharing activities. Conversely, employees become more confident in their abilities when they are in a calm emotional state (Tan et al., 2021). Therefore, employees are more likely to develop negative emotions such as stress and anxiety during knowledge sharing when they believe that their environment is threatened by COVID-19 (Petzold et al., 2020; Losada-Baltar et al., 2021), where such emotions are deemed to have a negative association with self-efficacy (Young et al., 2008). Without a doubt, some studies also suggested that self-efficacy can counter the effects of external environments to a certain extent (Bong, 2002; Foster et al., 2016). However, a growing number of studies have shown significantly higher levels of negative emotions among individuals during the COVID-19 pandemic (Han et al., 2021; Rana and Islam, 2021), which will challenge the ability to regulate self-efficacy.

In the wake of multiple shutdowns and continuous social distancing during the COVID-19 pandemic, employees' vulnerability to COVID-19 infection and concerns about the serious consequences of COVID-19 infection can also reduce the frequency and quality of communication among employees (Rfg et al., 2021). Considering that the key goal of knowledge sharing is to transfer knowledge quickly and effectively between individuals (Wen and Wang, 2021), reduced communication efficiency can ultimately diminish employees' confidence in the value of knowledge sharing, which in turn is manifested as a reduction in self-efficacy. To the best of our knowledge, no study has so far measured health belief about COVID-19 among employees in Chinese commercial banks and investigated its effects on knowledge sharing self-efficacy. Therefore, based on social cognitive theory, the following hypotheses are proposed in this study:

H1a: Perceived susceptibility negatively affects knowledge sharing self-efficacy among employees.
H1b: Perceived severity negatively affects knowledge sharing self-efficacy among employees.

Self-Efficacy and Knowledge Sharing

Social cognitive theory suggests that an individual's self-efficacy affects his/her behavior in multiple ways (Bandura et al., 1997). As regards knowledge sharing, which is the focus of this study, existing research also showed that self-efficacy can significantly affect employees' knowledge sharing intention and behavior (Chen et al., 2012; Nguyen and Malik, 2020; Wen and Wang, 2021). A higher level of self-efficacy tends to correspond to a higher level of self-motivation (Hsu et al., 2007) which facilitates increased enthusiasm for knowledge sharing among individuals (Bock and Kim, 2002; Lin, 2007b). On top of that, some scholars argued that employees actively share knowledge because they believe

that their knowledge can help their colleagues solve problems effectively (Bysted, 2013); these kinds of employees usually have high confidence in their ability to complete tasks (Shao et al., 2015).

In empirical research, Teh et al. (2010) who developed a framework based on the theory of planned behavior, found that media self-efficacy has a significant positive effect on knowledge sharing through knowledge sharing intention. Among studies in the Chinese context, Yang and Xu (2021) also discovered that employees' self-efficacy promotes knowledge sharing behavior through feelings of job security and knowledge sharing intention. In a recent survey conducted among manufacturing employees, Wen and Wang (2021) found that self-efficacy does not only positively affects informal knowledge sharing and formal knowledge sharing but also promotes employees' task performance. Despite extensive investigations into the relationship between self-efficacy and knowledge sharing in existing studies, the relationships between self-efficacy and different forms of knowledge sharing have not been fully explored and require analysis in a broader social and industry context. Therefore, based on the theory of planned behavior, the following hypotheses are proposed in this study:

H2a: knowledge sharing self-efficacy negatively affects informal knowledge sharing among employees.
H2b: knowledge sharing self-efficacy negatively affects formal knowledge sharing among employees.

RESEARCH METHOD

Sample and Data

The data used for this study were collected using a questionnaire designed for a survey participated by 32 branches of a large commercial bank in China. The questionnaire was first distributed to 15 bank employees for preliminary testing after it was developed. Then, a few questions were adjusted based on feedback collected from these employees to eliminate ambiguities. According to the feedback collected during preliminary testing, the questionnaire was found to have high overall reliability and acceptability. Next, with the support of the bank's human resources department, an online questionnaire was sent to the corporate e-mail addresses of 700 bank employees between December 28, 2021, to January 2, 2022. During the questionnaire distribution period, a total of 564 employees voluntarily filled out and submitted the questionnaire, indicating an 80.6% response rate in the process. To ensure the quality of the survey data, questionnaires that were filled out over an overly short period (less than 200 s) and those which failed the attention checker process were removed from the sample. In the end, a total of 407 valid questionnaires were obtained, representing a 72.2% valid response rate.

Table 1 summarizes the sample profiles. According to the statistical results, 49.1% of the respondents in the sample are female and 50.9% are male, with the majority of the respondents aged between 26 and 55 years old, accounting for 92.8% of the respondents in the sample. In terms of education degree, all the respondents have received higher education, with 94.3%

of them holding a Bachelor's or a Master's degree, which is higher than the percentage of higher education degree holders among Chinese nationals (15.46%). This is because large commercial banks are more attractive to highly educated job seekers and these banks, which are also knowledge-intensive companies, also prefer to recruit highly educated talents (King et al., 2016). As for job function, the sample comprised employees at all levels in the bank, with general staff constituting the largest proportion at 63.9%.

To test whether the questionnaire results in common method bias, we performed factor analysis on all items using Harman's single-factor test (Podsakoff and Organ's, 1986; Sharma et al., 2009). According to the results of factor analysis performed using SPSS Statistics, version 22, the first factor was able to explain approximately 34.42% of the total variance, which does not exceed 50%; in other words, this finding proves that common method bias, which threatens the validity of the survey, is not present in this study (Harman, 1976; Sharma et al., 2009).

Measurements

The introduction section of the questionnaire generally explained the purpose of this study to the respondents and guaranteed that the questionnaire does not cover any individual evaluation or employee performance appraisal items and will be used for academic research only. Furthermore, it explained that the survey data will be kept confidential. All the questionnaire items were measured using a seven-point Likert scale, where 1 = "completely disagree" and 7 = "completely agree." The original version of the questionnaire was written in English while the Chinese version of the questionnaire was developed by two linguists after translating the questionnaire items into Chinese. Then, the Chinese version of the questionnaire was re-translated into English by native English speakers to ensure consistency in the meaning of the scale across different language versions. The final constructs obtained during the preliminary survey were re-translated into English as well and their sources of reference are listed in **Table 2**.

TABLE 1 | Sample profile.

		Frequency	Proportion (%)
Gender	Female	200	49.1
	Male	207	50.9
Age	<26	23	5.7
	26–35	180	44.2
	36–45	123	30.2
	46–55	75	18.4
	>55	6	1.5
Degree	Junior college	23	5.7
	Bachelor	305	74.9
	Master	79	19.4
	Other	0	0
Job function	Top managers	6	1.5
	Middle managers	69	17.0
	First-line managers	72	17.7
	General staff	260	63.9

In this study, knowledge sharing behaviors among employees were the dependent variables. While knowledge sharing has been discussed extensively in previous studies (Szulanski, 1996; Bhatt, 2001; Wen and Wang, 2021), further research is needed to investigate the varying factors affecting different forms of knowledge sharing (Nguyen and Malik, 2020). Hence, the dependent variables in this study include two types of knowledge sharing, namely informal knowledge sharing and formal knowledge sharing, and the questionnaire items for these variables were developed by Wen and Wang (2021) and Zahra et al. (2007). The sample items include "My colleagues and I have formal knowledge exchange channels (e.g., routine meetings and project reports)" and "My colleagues and I often share information about 'changes in customer needs' through formal channels."

Meanwhile, the independent variables in this study comprise employees' perceived susceptibility and perceived severity of COVID-19, which are the two core dimensions of greatest concern in the health belief model (Janz and Becker, 1984; Yuen et al., 2020). Given that the questionnaire items for these variables were developed by Wang et al. (2021), the sample items for perceived susceptibility include "I think I am more likely to contract COVID-19 than others" and the sample items for perceived severity include "My career will be at risk if I contract COVID-19."

Conversely, the moderating variable in this study is employees' self-efficacy in knowledge sharing; the questionnaire items developed by Bock et al. (2005) are employed to measure employees' confidence in knowledge sharing. The instructions read as follows, "When sharing knowledge, I believe that my abilities can ……," and the sample items include "help my colleagues solve their problems at work" and "help my department improve its workflow."

RESULTS

In recent years, a host of quantitative studies have replaced the traditional regression method of estimation with structural equation modeling (Razzaq et al., 2019) as this method can describe the linear relationship between latent variables (Wen and Wang, 2021). The hypotheses proposed in this study were tested using Amos 23.0 through three main steps. First, a preliminary model analysis was carried out on the reliability, convergent validity, and discriminant validity of the model in this study. Next, the hypotheses proposed in the theoretical model were tested using the maximum likelihood method. Lastly, based on structural equation modeling, the bootstrap method was employed to test the strength and significance of the mediating effect *via* repeated sampling.

Preliminary Model Analysis

Precise results are based on a high level of construct reliability and validity. The Cronbach's α values of all constructs reflected the reliability of the questionnaire. The construct reliabilities

Constructs	Items	Standardized factor loadings	Cronbach α	AVE	CR
Formal knowledge sharing	Formal knowledge sharing 1	0.919	0.867	0.832	0.952
	Formal knowledge sharing 2	0.905			
	Formal knowledge sharing 3	0.939			
	Formal knowledge sharing 4	0.884			
Informal knowledge sharing	Informal knowledge sharing 1	0.868	0.859	0.838	0.954
	Informal knowledge sharing 2	0.943			
	Informal knowledge sharing 3	0.927			
	Informal knowledge sharing 4	0.923			
Self-efficacy	Self-efficacy1	0.907	0.866	0.88	0.967
	Self-efficacy2	0.973			
	Self-efficacy3	0.962			
	Self-efficacy4	0.907			
Perceived susceptibility	Perceived susceptibility1	0.902	0.839	0.761	0.927
	Perceived susceptibility2	0.900			
	Perceived susceptibility3	0.809			
	Perceived susceptibility4	0.874			
Perceived severity	Perceived severity1	0.887	0.761	0.792	0.919
	Perceived severity2	0.877			
	Perceived severity3	0.905			

N = 407; AVE, average variance extracted; CR, composite reliability.

are considered good if the value of α is larger than 0.70 (Hair et al., 2010). **Table 2** shows that the Cronbach's α value ranges from 0.761 to 0.867, which confirms the high construct reliability of our study.

As for the construct validity, it represents the extent to which the items of the questionnaire can measure the theoretical structure and characteristics of key variables. It could be evaluated by convergent validity and discriminant validity, which represent the stability of results and diversity of dimensions (Fornell and Larcker, 1981; Chin et al., 2003).

Convergent validity is commonly reflected by the standardized factor loading, composite reliability (CR), and average variance extracted (AVE; Fornell and Larcker, 1981). Each of these indicators has a corresponding range of values. Specifically, the factor loading should be greater than 0.5 and preferably exceed 0.7, the AVE value should be greater than 0.5, and the CR value should be greater than 0.7 (Hair et al., 2010; Goswami and Agrawal, 2018). **Table 2** provides us with relevant evidence. There are five constructs, including formal knowledge sharing, informal knowledge sharing, self-efficacy, perceived susceptibility, and perceived severity. For all five constructs, the standardized factor loadings are greater than 0.80 (>0.7), the AVE is greater than 0.76 (>0.5), and the CR is greater than 0.91(>0.7). So all indicators are acceptable, and construct validity is verified.

Discriminant validity is acceptable if a construct's square root of the AVE is greater than its correlations with other constructs (Chin et al., 2003). **Table 3** provides relevant evidence. The correlation coefficients between the constructs are all less than 0.5, and all coefficients are significant at the 1% level, also less than the square root of the AVE. Therefore, discriminant validity is verified; hence, all latent variables have significant distinctions.

Structural Model and Hypothesis Testing
Results of Model Fitting
This study attempted to explore the linear relationship between variables and the path of influence by building structural equation modeling based on the previous hypothesis. There were five constructs and 19 indicator variables in this study. For dependent variables, there were two constructs. Both formal knowledge sharing level and informal knowledge sharing level had four indicators each. For this study, we set the self-efficacy intermediate variables with four indicators. We also set the perceived susceptibility and perceived severity as independent variables, having four and three indicators, respectively. The measurement model is depicted in **Figure 1**, which presents the result of structural equation modeling and path analysis through AMOS 23.0 software.

Before hypotheses testing, a goodness-of-fit test is necessary. According to confirmatory factor analysis goodness-of-fit statistics of first-order factor model analysis, the model is capable of identifying convergence. The several fit indices considered in this study are related to absolute fit measures, incremental fit indices, and parsimony fit indices, as shown below (**Table 4**). The results of indices were acceptable. Based on the goodness-of-fit test of the statistical model, the developed hypotheses were tested by the following indicators: hypothesized paths, standardized regression coefficients, and hypothesis testing statistics.

Results of Hypotheses Testing
According to the **Table 5**, all hypothesized paths are supported except for H1b ($t = 0.101$, $p > 0.05$). The first hypothesized path (H1a) assumes a negative relationship between the level of perceived susceptibility and self-efficacy, which was proved by a significant t-value of -2.936 associated with $p < 0.05$. The second hypothesized path (H1b) assumes a positive relationship between the level of perceived severity and self-efficacy. However,

TABLE 3 | Discriminant validity results.

	Formal knowledge sharing	Informal knowledge sharing	Self-efficacy	Perceived susceptibility	Perceived severity
Formal knowledge sharing	0.832				
Informal knowledge sharing	0.368***	0.838			
Self-efficacy	0.493***	0.384***	0.880		
Perceived susceptibility	−0.168**	−0.035	−0.198**	0.761	
Perceived severity	−0.100*	−0.040	−0.099*	0.465***	0.792
Sqr(AVE)	0.912	0.915	0.938	0.872	0.890

*N = 407. The value on the diagonal is AVE. ***p < 0.001; **p < 0.01; and *p < 0.05.*
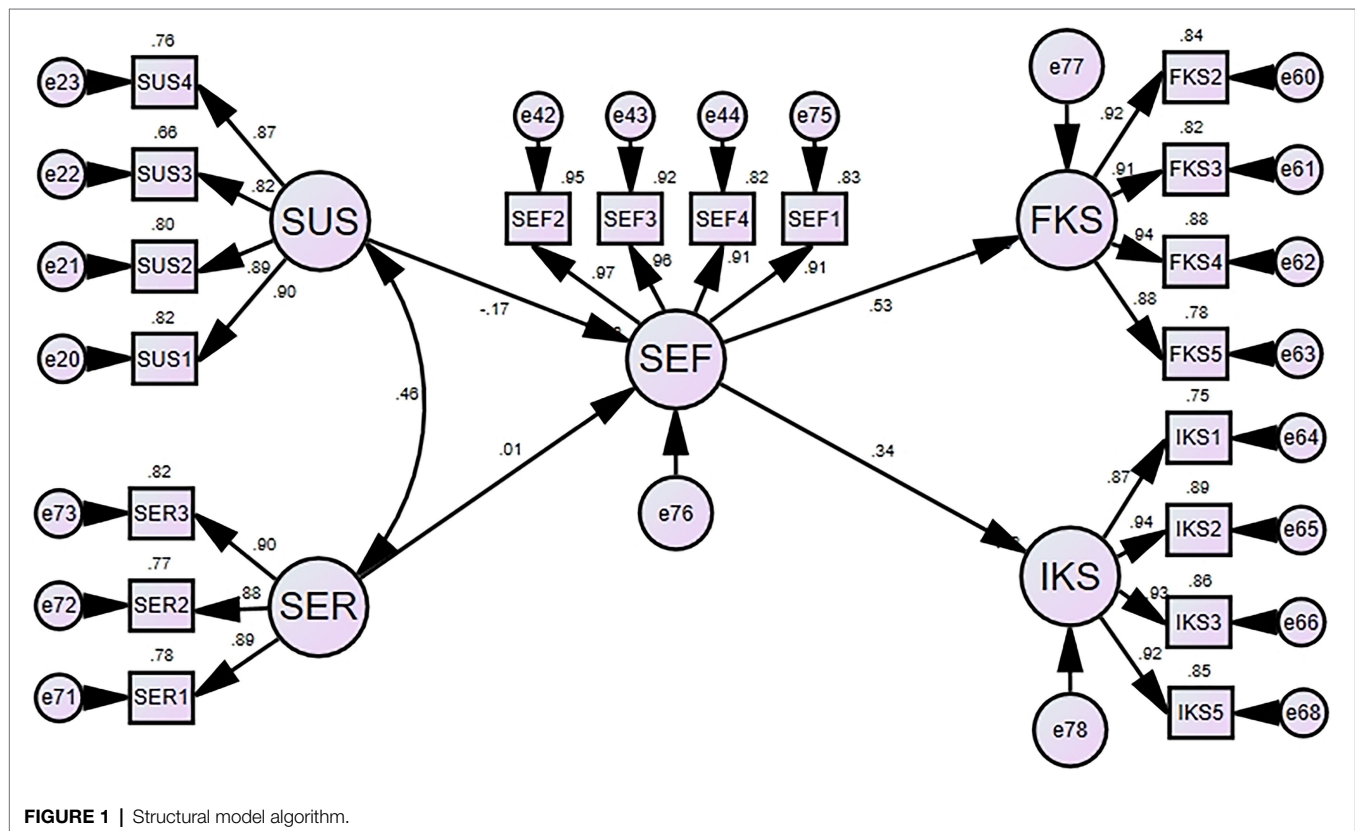
FIGURE 1 | Structural model algorithm.

it could not be proved by the *t*-value of 0.101 associated with $p > 0.05$. Moreover, hypothesized paths (H2a and H2b) assume positive relationships between both self-efficacy and formal knowledge sharing and self-efficacy and informal knowledge sharing. Both the paths were proved by a significant *t*-value of 11.431 and 6.829 associated with $p < 0.01$. The results of indices are acceptable, which proves that most hypotheses in this study are valid. Perceived susceptibility and self-efficacy have direct or indirect impacts on formal knowledge sharing and informal knowledge sharing. Self-efficacy plays an important mediating role in this influence mechanism.

Mediation Analysis

Based on the mediation effect testing, the results in **Table 5** validated the direct effects of perceived susceptibility on

self-efficacy with a coefficient of −0.174, as well as the direct effects of self-efficacy on formal knowledge sharing and informal knowledge sharing with a coefficient of 0.534 and 0.341, respectively. Thus, self-efficacy mediates perceived susceptibility's effects on formal knowledge sharing and informal knowledge sharing. It could be concluded that self-efficacy played a significant positive intermediary role between perceived susceptibility and dependent variables (formal knowledge sharing and informal knowledge sharing). The bootstrapping procedure was employed to examine the indirect effects between and across the variables. Based on a sample of 2000 replicates, we calculated confidence intervals at the 95% level. If the confidence interval does not include 0, then the mediate effect can be considered significant. With this widely accepted principle, we can conclude the following result.

For the dependent variable formal knowledge sharing, the results (**Table 6**) showed that the perceived susceptibility has

TABLE 4 | Goodness-of-fit indices.

Model fit index	Measurement statistics	Recommended range
Absolute fit measures		
GFI	0.923	>0.90
RMSEA	0.054	<0.08
Incremental fit indices		
NFI	0.961	>0.90
CFI	0.975	>0.90
RFI	0.955	>0.90
Parsimony fit indices		
AGFI	0.901	>0.90
PNFI	0.826	>0.50

Sources: Carmines and McIver (1981); Browne and Cudeck (1992); Hu and Bentler (1999).

TABLE 5 | Hypotheses testing results.

No.	Hypothesized path	Standardized path coefficient	t-Value (C.R.)	Decision
H1a	Perceived Susceptibility→Self-efficacy	−0.174	−2.936**	Supported
H1b	Perceived Severity→Self-efficacy	0.006	0.101	Not supported
H2a	Self-efficacy→Formal Knowledge Sharing	0.534	11.431***	Supported
H2b	Self-efficacy→Informal Knowledge Sharing	0.341	6.829***	Supported

*N = 407. ***p < 0.001; **p < 0.01; and *p < 0.05.*

TABLE 6 | Mediate effects testing.

Dependent variable	Construct	Indirect effects	Lower bounds	Upper bounds
Formal knowledge sharing	Perceived susceptibility	−0.09	−0.169	−0.016
	Perceived severity	0.005	−0.039	0.043
Informal knowledge sharing	Perceived susceptibility	−0.058	−0.133	−0.013
	Perceived severity	0.003	−0.029	0.034

N = 407.

significant indirect negative effects on formal knowledge sharing with an impact coefficient of −0.09. Meanwhile, the impact of perceived severity on formal knowledge sharing is not significant because the confidence interval includes 0. It is difficult to say that there is any positive or negative effect. For the dependent variable informal knowledge sharing, the results (**Table 6**) showed that the perceived susceptibility has significant indirect negative effects on informal knowledge sharing with an impact coefficient of −0.058 whereas the effect of perceived severity is too weak to be identified. Hence, the

impact of perceived severity on informal knowledge sharing is not significant.

The following conclusions were drawn. First, perceived susceptibility negatively affects both formal knowledge sharing and informal knowledge sharing mediated by self-efficacy. Second, neither the direct effect of perceived severity on self-efficacy is significant nor is the indirect effect of perceived severity on dependent variables (formal knowledge sharing and informal knowledge sharing). The results of the above tests were almost similar to the results of previous literature and the results of our study and were in line with the theoretical framework set out in this study.

DISCUSSION

The purpose of this study was to analyze the effects of bank employees' health belief about COVID-19 on knowledge sharing. The study also adopted the health belief model (Janz and Becker, 1984) and social cognitive theory (Bandura, 1985) to investigate the mediating role of self-efficacy in the effects of health belief on knowledge sharing. The proposed hypotheses were tested using structural equation modeling which is an empirical research method widely recognized by the academic field (Thungjaroenkul et al., 2016). A total of 407 employees working in a large Chinese commercial bank participated in the study. The results showed that three hypotheses were supported. Bank employees' perceived susceptibility to COVID-19 had a significant negative effect on self-efficacy and indirectly undermined formal knowledge sharing and informal knowledge sharing through self-efficacy. Based on the previous researches review, it can be seen that social cognitive theory and self-efficacy have featured prominently in research on the factors affecting knowledge sharing. It also means that choosing this factor for this research contributes to development of social cognitive theory and also guides bank management practices in a health crisis.

The following findings provide several theoretical and practical contributions to existing literature. For theoretical aspects, this study organically combines the health belief model and social cognitive theory to investigate the vital issue of knowledge sharing among employees against the backdrop of the COVID-19 pandemic. It also expands the understanding of the dangers of the COVID-19 pandemic by exploring how employees' perceptions of the pandemic affect knowledge sharing from the perspectives of perceived susceptibility and perceived severity, even though a vast majority of these employees never actually contracted COVID-19. Although attention has been given to knowledge sharing among employees against the backdrop of the COVID-19 pandemic (Kogut and Zander, 1996; Argote and Ingram, 2000; Wang and Noe, 2010), the effects of health belief factors on knowledge sharing have been largely overlooked. This study discovers that perceived susceptibility, one of the core factors in the health belief model, has a significant negative effect on knowledge sharing self-efficacy

and indirectly undermines formal knowledge sharing and informal knowledge sharing among employees. It is noteworthy that the hypothesis stating that perceived severity affects formal knowledge sharing and informal knowledge sharing through knowledge sharing self-efficacy is not supported by the data.

While it is difficult to determine the reasons the hypothesis is not supported. Combining China's practical experience and strict epidemic prevention measures (Liao and Wang, 2021), one possible explanation is that employees in Chinese companies have a relatively low chance of being exposed to infected individuals' despite being impacted by the COVID-19 pandemic in numerous other ways. In other words, most employees lack a clear understanding of the consequences of contracting COVID-19 and have difficulty connecting perceived severity to knowledge sharing self-efficacy. Relatively speaking, under the intensive and slender publicity (Li, et al., 2021b) and influence of epidemic prevention policies, which is quite different from the situation in other countries (Teslya et al., 2020), the clearer the employees' perception of the risk of COVID-19 infection, the more susceptible their psychological state and behavior are to perceived susceptibility.

Furthermore, this study considers different types of knowledge sharing while investigating the effects of health beliefs on formal knowledge sharing and informal knowledge sharing. In recent years, various studies are focusing on the varying antecedents and consequences between different types of knowledge sharing (Yang, 2010; Aubke et al., 2014; Chugh et al., 2021), but have yet to adequately explore differences in their formation from the health belief perspective. Overall, this study finds no significant difference in the effects of health belief on formal knowledge sharing and informal knowledge sharing. There is no statistical significance in the indirect effects of perceived severity on formal knowledge sharing and informal knowledge sharing, whereas the indirect effects of perceived susceptibility on formal knowledge sharing and informal knowledge sharing are significant within the 95% confidence interval. Although the estimated coefficients for the effect of perceived susceptibility on formal knowledge sharing are greater than those for the effect of perceived susceptibility on informal knowledge sharing, the 95% confidence interval for both types of knowledge sharing highly overlaps each other. Thus, the evidence is not sufficient to suggest that there is a significant difference in the extent of the effects of perceived susceptibility on both types of knowledge sharing. Undoubtedly, differences in coefficients still deserve attention. Since formal knowledge sharing is often present in more formal settings, a decline in knowledge sharing self-efficacy caused by perceived susceptibility may put more pressure on employees to engage in formal knowledge sharing in formal settings (Alajmi, 2012; Connelly et al., 2014), thereby leading to a more significant reduction in knowledge sharing self-efficacy compared to informal knowledge sharing. Hence, such differences warrant further investigation in the future.

LIMITATIONS

Despite the strength of this study, there are some obvious limitations in the study. First, countries around the world have developed different anti-epidemic measures in response to the COVID-19 pandemic depending on the extent of the outbreak across countries. This may lead to different levels of risks and impacts of COVID-19 across countries and among different company employees. Therefore, temporal and regional effects should be considered in future studies. Secondly, this study was conducted in the context of extremely stringent disease prevention measures in China, which influenced respondents' perceptions of health risks, and in turn led to significant differences in the effects of perceived susceptibility and perceived severity on self-efficacy and knowledge sharing. However, the effects of health belief on knowledge sharing may be influenced by other factors, such as cynicism, job insecurity, and role conflict (Nguyen and Malik, 2020). Thus, future studies may extensively consider these factors to enrich the understanding of the relationship between health belief and knowledge sharing.

CONCLUSION

Overall, Chinese bank employees' perceived susceptibility to COVID-19 is found to significantly undermine formal knowledge sharing and informal knowledge sharing through knowledge sharing self-efficacy against the backdrop of the COVID-19 pandemic. Relatively speaking, this study finds no significant effect of perceived severity on knowledge sharing, which may be as a result of the pattern of China's response to the COVID-19 pandemic and the actual infection situation in the country. These findings add to scholars' understanding of the relationships of the pandemic with knowledge sharing self-efficacy and knowledge sharing among employees. Furthermore, this study suggests that managers should take into full consideration health belief-related factors when they observe a decline in knowledge sharing among employees. They should also respond proactively from the perspective of psychological intervention and focus on changes in formal knowledge sharing activities to provide full support for formal knowledge sharing among employees in the event of a pandemic.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

Ethical review and approval were not required for the study on human participants in accordance with the local legislation and institutional requirements. Written informed consent for

participation was not required for this study in accordance with the national legislation and the institutional requirements.

AUTHOR CONTRIBUTIONS

TW and CJ: conceptualization, project administration, and resources. TW: formal analysis and methodology. CJ: supervision. TW and QC: writing—original draft and writing—review and

editing. All authors have read and agreed to the published version of the manuscript.

SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpsyg.2022.882029/full#supplementary-material

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The role of work-family conflict and job role identification in moderated mediating the relationship between perceived supervisor support and employee proactive behaviors

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In recent years, the outbreak and persistence of COVID-19 has greatly changed the way people work, and encouraging employees to work online from home has become a new form of work for organizations responding to the epidemic. Based on the W-HR model, this paper explored supervisor support as a situational resource in the context of online office, aiming to verify the changes in work-family status caused by individuals facing the background of supervisor support, and then relate employees' proactive behavior. Meanwhile, the predicted moderating effect of job role identification on supervisor support and work-family conflict was verified by considering the role identification generated in the positive interaction between employees and supervisors as individual resources. In this study, 555 employees from enterprises in the provinces of Jiangsu and Guangdong were selected as the research participants, and data were recovered at two time nodes. The results show that: (1) Perceived supervisor support significantly relates employee proactive behavior. (2) Work-family conflict mediates the relationship between perceived supervisor support and employee proactive behavior. (3) Job role identification has a significant moderating effect on the relationship between perceived supervisor support and work-family conflict, and high level of job role identification moderated the mediating effect of work-family conflict on perceived supervisor support and employee proactive behavior significantly. This paper expands the research perspective of employee proactive behavior. It can be used as a reference for enterprises to formulate strategies to improve employee proactive behavior in the process of digital reform.

KEYWORDS

perceived supervisor support, work-family conflict, proactive behaviors, job role identification, work-family balance

Introduction

While the outbreak and spread of COVID-19 have brought great challenges to world economic activities, it has also greatly promoted global digital transformation. Working mode is no longer limited to offline office, and online office has become a new choice for organizations in the context of the normalized epidemic (Wang and Wen, 2020). On the one hand, the popularization of digitalization provides a new mode of communication and collaboration within and between organizations, so that cooperation and exchange are not limited by space. On the other hand, with the popularity of online office, the boundary between the work and non-work areas of employees in an organization is becoming increasingly blurred (Derks et al., 2016). The promotion and popularization of digitalization bring great convenience to organizations and individuals. However, it also creates new challenges for organizations and employees. The proliferation of online office tools has blurred the line between employees' work and home roles. If an employee does not receive strong support from the organization, it may lead to an inability to balance work and family. It is difficult for employees in this state to carry out proactive behavior. Work-family researchers encourage the understanding and exploration of ways to solve work-family imbalance among employees at the organizational and individual levels (Yucel and Minnotte, 2017; Rofcanin et al., 2018, 2020; Gu and Wang, 2019; Kalliath et al., 2020; Ben-Uri et al., 2021; Dishon-Berkovits, 2021).

Organizational culture and policies affect employees' recognition of the organization. Organizational culture and policies are often communicated through employees' direct leader, so employees often regard supervisors as the spokesperson of the organization (Li and Ling, 2008). The perceived supervisor support refers to the degree to which employees perceive that they are valued and supported by their superiors. Supervisor support is derived from the importance that organizations and supervisors attach to employees' work contributions and the satisfaction of their emotional needs (Kottke and Sharafinski, 1988). The spread of online work has blurred the line between employees' work and family roles, bringing new challenges for employees to balance work and family. In an organization, if the supervisor can provide sufficient work support to employees, sufficiently respect their opinions and attach importance to their contributions, it will provide them with effective work situation resource support, which will help meet their psychological needs and help them balance work and family properly with sufficient resources. For the purpose of giving back to the organization and the supervisor, employees in this state will spontaneously show the proactive employee behaviors expected by the organization and the leader (Liu, 2011; Hammer et al., 2016; Carlson et al., 2018; Du et al., 2018; Bakker et al., 2019; Arefin et al., 2020; Chan et al., 2021). Work-family conflict is a kind of interrole conflict, which refers to the role pressure of work and family. To

some extent, the participation of one role will become difficult to achieve due to the requirements of the other role (Beutell, 1985). Work-family state has two sides. In the workplace, work-family state is usually manifested as a negative opposite relationship, namely work-family conflict (WFC). With the popularity of online office, employees blur the boundary between working time and family time, and the increase of working time encroaches on family time, leading to conflicts. Take China as an example, with the aggravation of the aging problem and the three-child policy has been promoted, employees have to take on heavier family responsibilities. Although the emergence of COVID-19 has brought convenience to employees' online work, it has intensified the conflict between their work and family roles. On the one hand, employees have to take care of their family roles, such as taking care of the elderly and children, and on the other hand, they have to deal with the increasingly heated workplace competition environment, which makes the work-family conflict of employees increasingly prominent. Under the background of epidemic normalization, how to help employees coordinate work-family issues and obtain the desired employee behavior is a common concern of organizations.

However, work-family conflict has not received enough attention in the field of organizational management. Previous studies mostly chose work-family conflict as the influencing factor of employee behavior, and explored the negative impact of work-family conflict (Bai et al., 2016; Smoktunowicz et al., 2017; Arefin et al., 2020; Kramer et al., 2020; Cui and Li, 2021; Nazim et al., 2021; Park et al., 2021). Few studies have explored how to alleviate and resolve work-family conflict from the perspective of organizational support. Can employees alleviate work-family conflict with the support and attention of their supervisors? Can support and respect from supervisors motivate innovative behavior and organizational citizenship behavior? After the employee feels the support and respect from the supervisor, in the process of positive interaction between the two sides, can the employee obtain and stimulate the job role identification? Can employee's job role identification be a boundary condition between supervisor support and employee work-family conflict? Under the background of building a harmonious work-family relationship, it is a valuable and urgent issue to be discussed.

Work-family relationships are complex and diverse. How can work conflict and help families? Why is family conflict at work, and why can it be beneficial? To answer the above questions, Brummelhuis and Bakker (2012) proposed a theoretical framework to explain positive and negative work-family processes based on resource conservation theory (Hobfoll, 1989). The Work Home Resources Model (W-HR Model) (Brummelhuis and Bakker, 2012). The W-HR model points out two types of resources: "individual resources" and "situational resources." Among them, individual resources come from the inside of individuals, mainly including physical, psychological, intellectual, emotion and capital resources. Situational resources are outside the self and can be obtained from the individual's social situation, including marriage,

employment relationship, social network and other conditional factors, as well as social support such as respect, help and advice. In order to expand the existing research results, based on the W-HR model, from the perspective of situational resources and individual resources, this paper considers the supervisor support in an individual's organizational relationship as a kind of situational resources, and explores the extent to which employees can alleviate work-family conflict by receiving the support and attention from the supervisor. To explore whether the acquisition of job role identification can encourage individuals to adopt more positive and effective coping styles to intervene in the relationship between supervisor support and employees' work-family conflict, we consider the job role identification acquired during the interaction between employees and supervisors as individual resources. Therefore, this paper explains the logical relationship between "resource-state-behavior" based on the W-HR model. With the increase of the care and attention of the superior supervisor in the organization, the interaction between the employee and the supervisor is conducive to the awakening of the employee's job role identification, so that the employee can get two-way energy supplement from the situation and individual resources. The influence of supervisor support on employee proactive behavior was investigated, and the roles of job role identity and work-family conflict were also investigated.

This study provides a more comprehensive perspective for understanding the mechanism of work-family conflict and the relationship between supervisor support and employee proactive behavior. At the same time, it also provides a useful reference for the organization to intervene employee proactive behavior from the perspective of work-family integrated management, in order to further integrate the relevant theories and achievements in the field of labor relations, human resource management system and organizational behavior, and provide a new theoretical perspective and practical guidance for promoting employee proactive behavior.

Literature review

Perceived supervisor support and employee proactive behavior

Supervisors are seen as agents of the organization, and their words and actions affect how the organization is perceived by employees. Perceived supervisor support is a typical work situation resource, which refers to employees' perception of supervisor's support, encouragement and care (Menguc et al., 2013). Effective supervisor support will make employees identify and receive organizational goals and culture, make employees have a positive attitude toward the organization, meet the needs of employees for the sense of belonging, make employees have the willingness to work for the organization, motivate employees to work hard, and make behaviors conducive

to the organization (Strauss et al., 2008; Tement, 2014; Hammer et al., 2016; Han et al., 2020; Gopalan et al., 2021). Based on W-HR model, supervisor support, as a kind of situational resource, can effectively improve employees' job satisfaction and emotional commitment, and then positively affect employees' job involvement, knowledge sharing and other employee behaviors conducive to the organization (Schaufeli and Bakker, 2004; Kuvaas and Dysvik, 2010). Employee proactive behavior refers to employees' efforts to improve the environment or themselves in order to pursue positive results for the organization and individuals (Frese and Fay, 2001). Proactive behavior is a kind of conscious, goal-oriented and motivated behavior. Employee proactive behavior means that employees are able to go beyond the formal tasks assigned to them and work hard to develop their goals and solve problems in order to bring positive results for themselves and the organization. Organizational environmental factors can significantly influence employee behavior choice. Supervisor is the most direct and controllable driving force for employee proactive behavior. As an employee's supervisor, setting a compelling future direction and establishing a supportive background can effectively promote employees' proactive engagement. Supportive leadership, such as helping employees to self-direct and self-manage, can improve proactive behavior (Braun and Nieberle, 2017; Rofcanin et al., 2018; Heras et al., 2020). In addition, the manager can present a clear vision of development to stimulate proactive behavior (Wei and Pan, 2012; Chen and Ellis, 2021). Research shows that supportive leadership such as authentic leadership can be a key factor in promoting employee proactive behavior (Hu et al., 2018). As a situational resource, supervisor support provides support for employees at the organizational level through the supervisor as an agent, so that employees can fully feel the respect and support from the organization and feel that the organization respects their contributions to them. This provides sufficient situational resources for employees to perform positive behaviors. After employees feel the support from their supervisors, they will make more efforts to improve themselves, overcome the difficulties brought by environmental factors, and try to solve problems, so as to repay the support provided by the organization and superior supervisors. Based on this, the following hypotheses are proposed in this study.

> H1: Perceived supervisor support is positively related to employee proactive behavior.

The mediating role of work-family conflict

The W-HR model indicates that work situation resources affect individual resource status. When resources are scarce,

people struggle to acquire or maintain resources to deal effectively with the complexities of the environment (Hobfoll, 1989). When employees are in a state of sufficient resources and can get a good return on their input, employees tend to use redundant resources to get more resources. In contrast, when an employee is in a state of resource depletion, the employee takes action to prevent further loss of surplus resources (Hobfoll, 1989). Work-family conflict is a common work-family state of employees in the study of organizational behavior. When employees face work-family conflict, they will think that the balance between work and family is not balanced. If they cannot get the same resource support from the organization or family, they will feel the lack of resources. Employees in a resource deficit state will take action to prevent further loss of individual resources. Research shows that innovation, knowledge sharing and other behaviors are mostly initiative behaviors that are not explicitly stipulated by organizations (Parker and Collins, 2010). Without the support of organization and family resources, employees facing conflicts will think that they do not have enough resources to carry out their own changes and overcome environmental difficulties. In order to maintain existing individual resources or prevent further loss of their own resources, employees will reduce the occurrence of proactive behavior. Studies have shown that work-family conflict, as a blocking stressor, reduces employees' innovative behavior (Innstrand et al., 2008).

In the context of COVID-19, online working from home has become a new form of organizational work. The promotion and popularity of online office brings convenience to organizations and employees, but also brings new problems. Online office forms blur the line between work and home. The dual role of organization staff and family members makes staff pressure multiply and individual resource loss is serious. Faced with the new problems arising from the popularization of online office, it is necessary to explore effective solutions from the organizational level. Supervisor support is nested in the organizational system as a work situation resource. As the agent of the organization, the supervisor becomes the link and communication medium between the organization and employees. Supervisor support means that supervisors fully respect employees' work contributions and provide necessary work support to employees. Supervisor support is derived from the work situation resources at the organizational level. Employees perceive the care, support and encouragement from their supervisors, which effectively supplement their individual resources, help to alleviate the conflict between work and family, and provide a guarantee for the further occurrence of proactive behaviors. Therefore, this study suggests that work-family conflict may mediate the relationship between perceived supervisor support and employee proactive behavior. When employees perceive support, encouragement and respect from their supervisors, work-family conflict will be reduced

and employee initiative will be increased. Based on this, the following hypotheses are proposed in this study.

> H2: Work-family conflict mediate the relationship between perceived supervisor support and employee proactive behavior.

The moderating role of job role identification

Organizational identification refers to whether an individual's self-identity is consistent with the concept of organizational identification (Ashforth and Mael, 1989; Ashforth et al., 2008). Existing research shows that the strength of personal identity to the organization, the more likely it is advantageous to the company's action, because with the increase of identity, group members will not only focus on the needs of self, but will be trying to keep the consistency of itself and the interests of the enterprise, the enterprise's development goals, as the extension of its own interests. Individuals are less inclined to place their own interests above those of the organization, or even to distinguish between the two (Mael and Ashforth, 1995; Dukerich et al., 2002; Edwards and Peccei, 2010; Avanzi et al., 2015; Cepale et al., 2021). Employee's job role identification is the cognition formed on the basis of their organization identification. Employees' job role identification has an impact on their role behavior. From the perspective of interaction, job role identification comes from a certain social structure, and individuals acquire the meaning of job role identification in the process of interaction with others (Ding et al., 2017). Role is an expectation of the organization to the individual. Based on the specific situation, the individual has the perception and recognition of how to internalize this expectation (Schwartz et al., 2011). When an individual's attitude and behavior in the process of playing a role are consistent with the role expectation, it is called job role identification (Farmer et al., 2003). The research points out that job role identification is gradually formed in role playing, including how to select, confirm and play individual roles, and identify oneself as the way of expression of this role. Therefore, job role identification is a process of continuous shaping and strengthening under the influence of the environment (Renee, 2009). According to social identity theory, job role identification is based on group identity. In an organization, employees' job role identification is the identification of the group identity and the knowledge system, value and emotion it represents. Emphasize the relationship between individual employees and their organizations (Dishon-Berkovits, 2021). Therefore, employees are motivated to seek and maintain a positive organizational identity, and once an employee's organizational identity is established, it will have an impact on their individual behavior (Du et al., 2020). The supervisor,

acting as an agent of the organization, provides employees with situational resources by supporting, encouraging and respecting their contributions. In this process, a positive interaction is formed between employees and their supervisors. In this interaction, employees seek and establish their own organizational identity and positioning, complete their job role identification process, and generate new individual resources. This helps to replenish the personal resources lost by employees in dealing with work-family conflicts and provides emotional and cognitive support for the occurrence of proactive behaviors of employees in the future.

Specifically, job role identification has the possibility to reduce the influence level of supervisor support on work-family conflict. Based on the identification of organizational identity, employees with strong sense of job role identification will make more efforts to change their own situation, overcome the difficulties brought by environmental factors, and gain their individual resources, thus effectively alleviating the work-family conflict level. The resources provided by employees in the state of job role identification can better meet the resource needs of employees, increase the sense of resource acquisition of employees, and enable them to participate in proactive behavior such as innovation with more active use of excess resources. When job role identification plays an effective role, individual resources of employees are at a high level, which to some extent inhibits the negative impact of supervisor support on work-family conflict. When the level of job role identification is low, employees have less personal resources to deal with corporate affairs and family affairs, and the negative impact of supervisor support on work-family conflict is more prominent. Based on this, the following hypotheses are proposed in this study.

> H3: The higher the level of job role identification, the weaker the negative impact of perceived supervisor support on work-family conflict.

Based on the above discussion, job role identification moderates the relationship between supervisor's sense of support and work-family conflict, and improves employees' individual resources in the process of dealing with work-family problems. Job role identification is based on the interaction process to generate organizational identity, and then make positive behavior beneficial to the organization. Specifically, when employees are in work-family conflict, the individual resources provided by job role identification can help employees relieve their negative emotions in the process of work and in the process of dealing with work-family relationship, and avoid employees refusing to engage in positive behaviors by relieving their emotions through other behaviors. In other words, job role identification not only moderates the relationship between perceived supervisor support and work-family conflict, but also further moderates the mediating role of work-family conflict between perceived supervisor support and employee

proactive behavior. Based on this, the following hypotheses are proposed in this study.

> H4: Job role identification moderates the mediating role of work-family conflict between perceived supervisor support and employee proactive behavior, that is, the higher the level of job role identification, the stronger the mediating role of work-family conflict.

The theoretical model constructed in this study is shown in Figure 1.

Research methods

Sample and collection

We collected our data from multiple organizations in the provinces of Jiangsu and Guangdong. We asked employees to report their perceived supervisor support, work-family conflict, job role identification and employee proactive behavior. We measured perceived supervisor support, work-family conflict and job role identification at time 1. Two weeks later, we measured employee proactive behavior. Data collection was performed in two ways: (1) By e-mail, mainly through the enterprise contact person who sent the link to the electronic version of the questionnaire and the answer instructions to the respondents; and (2) By on-the-spot recycling, in which members of the research group visited the enterprises, distributed questionnaires to the subjects, and collected them on the spot. A total of 650 questionnaires were collected in this survey. After eliminating the invalid questionnaires with missing answers and too many similar options, 555 valid questionnaires were obtained, with an effective recovery rate of 85.38%. The composition of the valid samples is shown in Table 1. It can be seen that the samples have a wide distribution and meet the basic requirements of the study. In terms of gender, 54.1% of the participants were male; 58.2% were aged 26–35; 58% were married; 55.7% held a bachelor's degree or above; and 65.9% of participants had a monthly income of more than 4,000 Yuan.

Measures

In this study, we selected appropriate scales available both at home and abroad, which have been widely used in China to ensure the reliability and effectiveness of the measurement variables. We translated these items from English into Chinese in accordance with the "translation and back translation" procedure. Except for the control variables, we used a 7-point Likert scale to measure all variables, ranging from 1 = not compliant to 7 = conforming.

FIGURE 1
Theoretical model. SS, Perceived supervisor support; WFC, work-family conflict; JRI, job role identification.
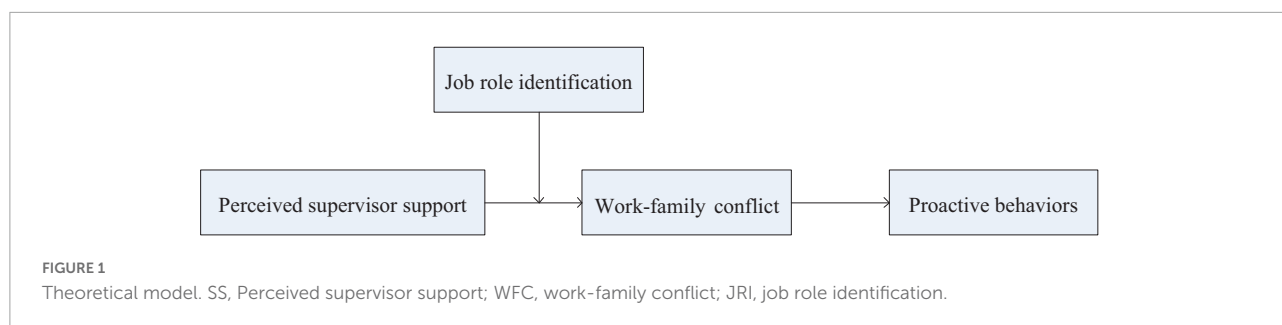
TABLE 1 Composition of valid samples.

Name	Category	Number	Percent	Name	Category	Number	Percentage
Gender	Male	300	54.1	**Education**	High school or below	61	11
	Female	255	45.9		Vocational school/College	185	33.3
Age	25 years old and below	158	28.5		Undergraduate	277	49.9
	26–35 years old	323	58.2		Master degree or above	32	5.8
	36–45 years old	65	11.7	Income	Below 2,000	0	0
	46 years old and above	9	1.6		2,001–4,000	189	34.1
Marriage	Unmarried	227	40.9		4,001–6,000	243	43.7
	Married	322	58		6,001–8,000	82	14.8
	Divorced	6	1.1		Over 8,000	41	7.4

Perceived supervisor support

We selected and revised the perceived supervisor support (SS) scale developed by Greenhaus et al. (1990) and formed a perceived supervisor support load scale with four items. A sample item is as follows: "Supervisors offer help when employees are in trouble." The Cronbach's α coefficient for perceived supervisor support was 0.822.

Work–family conflict

The scale used to measure work-family conflict (WFC) was adapted from Grzywacz and Marks (2000). The scale consists of eight items, four of which measure work-family conflict and four of which measure work-family facilitation. A sample item is as follows: "Stress at home makes you irritable at work." The Cronbach's α coefficient for work-family conflict was 0.933.

Job role identification

We selected and revised the job role identification (JRI) scale developed by Saleh and Hosek (1976) and formed a job role identification load scale with four items. A sample item is as follows: "I'm very committed to my role." The Cronbach's α coefficient for job role identification was 0.952.

Employee proactive behavior

We selected and revised the employee proactive behavior (PB) scale developed by Parker (Parker et al., 2006) and formed employee proactive behavior load scale with four items. A sample item is as follows: "I look for new ways to solve

problems." The Cronbach's α coefficient for employee proactive behavior was 0.87.

Control variables. Considering that demographic variables may affect employees' innovative behavior, we controlled gender, age, marriage, education and income (Tang et al., 2017). In terms of gender, 54.1% of the participants were male; 58.2% were aged 26–35; 58% were married; 55.7% held a bachelor's degree or above; and 65.9% of participants had a monthly income of more than 4,000 Yuan. Refer to Table 1 for specific standards.

Data analysis and results

Common method bias test

Common method variance (CMV) refers to the artificial variation among variables caused by use of the same subjects or data sources, similar measurement situations, common project context, or project characteristics (Podsakoff et al., 2003). Although in this study we used a two time-point data collection method to control the common method variance problem, the fact that the items in each questionnaire were filled in by one person means that there could still be common method variance in the measurement process. In this study, Harman's single factor test was used to test the degree of variation of the sample data. Four factors were extracted through principal component analysis. The results show that the variance explained by the

first factor was 36.07%, less than the critical value of 40%. This indicates that the CMV of the data employed in this paper was not significant, although this issue deserves further investigation. Because the survey data of this study were filled in by the employees themselves, it was necessary to conduct a common method variance test. Using Harman's single factor test method, all measurement items were included in a common factor for model fitting (see the single-factor model in Table 2). It can be seen from Table 2 that the single factor model fitting is poor, which indicates that the CMV of the questionnaire data in this study is relatively small.

Confirmatory factor analysis

In this study, the software Amos 24 was used to conduct confirmatory factor analysis on four variables (i.e., perceived supervisor support, work-family conflict, employee proactive behavior and job role identification) to test the discriminant validity of the measurement variables (see Table 2). It can be seen from Table 2 that the four-factors model is the most suitable ($\chi 2/df = 2.601$; NFI = 0.967; TLI = 0.971; CFI = 0.979; RMSEA = 0.054), as it clearly performs better than the other models, indicating that the measurement variables in this study have good discriminant validity. One can see from Table 2 that the four-factors model has the best fit compared to other models, and each fitting index is at an acceptable level, indicating that

the four main constructs in this study have good discriminative validity.

Descriptive statistics

In this study, gender, age, marriage, education and income were included as control variables. Analysis showed that gender, marriage and education had no significant effect on the dependent variables. Age and income had significant effect on the dependent variables. The mean value, standard deviation, and correlation coefficient of each variable are shown in Table 3, with the square root of the average variance extracted (AVE) on the diagonal. According to Table 3, perceived supervisor support was positively correlated with employee proactive behavior ($r = 0.566$, $p < 0.01$). There was a significant negative correlation between perceived supervisor support and work-family conflict ($r = -0.189$, $p < 0.01$). Work-family conflict was negatively correlated with employee proactive behavior ($r = -0.203$, $p < 0.01$). This suggests that work-family conflict may have an incomplete mediating effect on the relationship between perceived supervisor support and employee proactive behavior. The results show that perceived supervisor support, work-family conflict, employee proactive behavior and job role identification were significantly correlated at a moderate level, which allowed us to further perform a regression model test. It can also be seen from Table 3 that the critical values of the

TABLE 2 Confirmatory factor analysis.

Model	Model factor	χ^2	df	χ^2/df	NFI	RFI	IFI	TLI	CFI	RMSEA
Single factor	A+B+C+D	3,147.08	90	34.968	0.526	0.368	0.533	0.375	0.531	0.248
Two factors	A+B+C, D	2,500.156	89	28.092	0.624	0.492	0.632	0.501	0.63	0.221
Three factors	A+B, C, D	1,990.131	87	22.875	0.7	0.587	0.71	0.597	0.708	0.199
Four factors	A, B, C, D,	218.468	84	2.601	0.967	0.953	0.979	0.971	0.979	0.054

A = SS, Perceived supervisor support; B = WFC, work-family conflict; C = PB, proactive behaviors; D = JRI, job role identification.

TABLE 3 Descriptive statistics and correlation coefficients of the variables.

	1	2	3	4	5	6	7	8	9
Gender	1								
Age	0.025	1							
Married	0.096*	0.605**	1						
Education	0.058	−0.053	−0.058	1					
Income	−0.084*	0.298**	0.208**	0.251**	1				
SS	−0.013	−0.032	0.016	0.026	0.080	1			
WFC	−0.073	−0.009	0.000	−0.055	−0.052	−0.189**	1		
PB	−0.010	0.090*	0.067	0.034	0.096*	0.566**	−0.203**	1	
JRI	0.024	0.049	0.081	0.053	0.129**	0.639**	−0.251**	0.582**	1
M	1.46	3.26	1.60	2.50	4.38	5.90	3.22	5.66	5.87
SD	0.50	1.20	0.51	0.77	1.64	1.07	1.68	0.97	1.15

*Indicates a significant correlation at 0.05 level (double tail); ** indicates a significant correlation at 0.01 level (double tail); $n = 555$.
SS, Perceived supervisor support; WFC, work-family conflict; PB, proactive behaviors; JRI, job role identification.

correlation levels were not higher than 0.75. Therefore, there was no serious multicollinearity problem in the analysis of the data.

Hypothesis tests

In this study, we used the process macro program of SPSS 23 and the bootstrap method to test the hypotheses (Preacher et al., 2007). This method is superior to more traditional methods because it does not require a normal sampling distribution but can instead use the ordinary least squares regression to estimate the direct and indirect effects of the mediations, and can use the 1,000 bias-correction guidance.

Main effect tests

The results of the main effect analysis of perceived supervisor support is shown in Table 4. According to Table 4, perceived supervisor support can significantly promote employee proactive behavior ($\beta = 0.449$, $p < 0.001$). Thus, H1 is supported.

Mediating effect of work-family conflict

First, the process macro program in SPSS 23.0 and the bootstrap method were used to test the mediating role of work-family conflict between perceived supervisor support and employee proactive behavior (see Table 5). It can be seen from Table 5 that the value of the mediating role of work-family conflict between perceived supervisor support and employee proactive behavior was 0.00633; moreover, the 95% confidence interval of bootstrap = 5,000 (0.0005, 0.00173) did not contain 0, thus indicating that the mediating role was significant. Thus, H2 is supported.

Moderating effect of job role identification

In this study, we used the macro program in SPSS 23.0 to test the moderating effect of job role identification on perceived supervisor support and work-family conflict (see Table 6). According to Table 6, job role identification had a significant moderating effect on the path from perceived supervisor support to work-family conflict ($\beta = -0.1104$ $p < 0.05$), indicating that job role identification has a negative regulatory effect between perceived supervisor support and work-family conflict. Thus, H3 is supported.

TABLE 4 Standardized results of the main effects of the Perceived supervisor support.

Variable	Proactive behaviors	
	Coefficient	Standard error
Perceived supervisor support	0.499***	0.032

***$P < 0.001$.

In order to understand the essence of the regulation effect between perceived supervisor support and work-family conflict more clearly, all the samples were divided into two groups depending on job role identification. In more detail, we considered the samples with low job role identification to be those with values of job role identification lower than the mean value minus the standard deviation, and the samples with high job role identification were defined as those having values of job role identification higher than the mean value plus the standard deviation. Then, the simple slope test and the simple effect analysis chart were drawn (see Figure 2).

It can be seen from Figure 2 that perceived supervisor support has a significant negative predictive effect on work-family conflict when job role identification is low, and a weakened predictive effect when job role identification is high. This shows that job role identification has a moderating role in this process, and hypothesis 3 is supported.

We further verified the mediating role of job role identification on work-family conflict between perceived supervisor support and employee proactive behavior (see Table 7). As can be seen from Table 7, when job role identification is one unit standard deviation higher, the 95% confidence interval of the difference of indirect effects did not include 0, indicating that the difference in the indirect effects was significant. Hypothesis 4 is partially supported. In other words, at a high level of job role identification, the mediating role of work-family conflict between supervisor support and employee proactive behavior is moderated.

Discussion

Theoretical implications

The theoretical contributions of this study are as follows. First, we explored the relation of perceived supervisor support on employee proactive behavior and expanded the exploration of antecedent variables of employee proactive behavior. Previous studies mainly explored the antecedents of employee behavior, especially proactive behavior, from negative factors such as workplace ostracism (Zhao et al., 2013; Gürlek, 2021; Zahid et al., 2021; Zhou et al., 2021). In the context of COVID-19, the popularity and promotion of working from home has brought a series of problems to employees, such as conflicts between work and family roles. Based on the W-HR model, this study regarded supervisor support as a kind of work situation resource. As the agent of the organization, the supervisor's support, encouragement and respect for the employees can make the employees feel the care from the organization, which provides enough resources for the employees to get rid of the affairs of the organization and deal with the relationship between work and family. Second, we extend the W-HR model. W-HR model focuses on the work-family domain of employees

TABLE 5 Test results of the mediation effect of work-family conflict (*n* = 555).

Intermediate variable path	Mediating role value		Confidence interval (95%)	
	Coefficient	Standard error	BootLLCI	BootULCI
SS→WFC→PB	0.0063	0.0042	0.0005	0.0173

SS, Perceived supervisor support; WFC, work-family conflict; PB, proactive behaviors.

and provides a complete and focused theoretical framework for understanding the specific causes, linkage mechanisms and consequences of work-family interface (Chan et al., 2020). Based on the W-HR model, resources can be divided into individual resources and situational resources. When the demands of the work field consume personal resources and hinder individuals from contributing to the family field, work-family conflict will result. Individual resources come from within individuals, mainly including physical, mental, governance, emotional and capital resources. Situational resources can be obtained from individual situations such as marital relationships, employment relationships and social networks (Brummelhuis and Bakker, 2012). Previous studies have explored the impact of workplace resources on work-family status from the perspectives of organizational culture, psychological climate, leadership, and post characteristics (Wayne et al., 2004; Braun and Nieberle, 2017; Lee et al., 2017, 2019; Almeida et al., 2018; Brosch and Binnewies, 2018; Rofcanin et al., 2018; Heras et al., 2020; Postema et al., 2021). Previous studies have explored the influence of individual resources on work-family status from the perspectives of body, emotion, job involvement and psychological capital (Almeida et al., 2016, 2018; Carlson et al., 2018; Matei and Vrg, 2020; Postema et al., 2021). In this study, perceived supervisor support was used as work situation resource to enrich the content of work situation resource in W-HR model. As the agent of the organization, the supervisor can communicate and talk with the employees on behalf of the organization. The behaviors of the supervisor, such as encouraging, supporting and respecting the employees, can generate positive interaction between the supervisor and the employees. Such interaction can promote the employees to establish organizational identity and generate job role identification, thus forming new individual resources. As a boundary condition, employee's job identification can continue to influence employee's work and family status. The positive interaction between supervisors and employees makes the working situation resources and individual resources not isolated and forms a linkage effect. Our research enriched and expanded the W-HR model.

Practical implications

Our findings have also some implications for management practice. The popularization and promotion of digitization

urges enterprises to speed up the construction of a new human resource management model. The people-oriented concept is the key to construct a new human resource management model. Giving full play to the initiative of individual employees in order to achieve the sharing and iteration of knowledge, technology and other key information within the organization is the key factor for enterprises to continuously innovate and improve their competitiveness. Based on w-HR model, this study uses supervisor support and job role identification as work situation resources and individual resources, respectively, to verify the influencing factors of increasing employee proactive behavior. Our findings have implications for management practice.

First, from the organizational level. As the agent of the organization, the superior supervisor of the employee is the medium through which the organization communicates with the employee, exchanges and conveys organizational policies. In the context of the current epidemic, it is necessary to give full play to the role of supervisors, provide necessary support to employees, fully respect employees' contributions to the organization, and encourage and motivate employees in the process of work. Supervisor support such as oral praise,

TABLE 6 Test results of the adjustment effect of job role identification (*n* = 555).

Adjustment term	Work-family conflict	
	Coefficient	Standard error
SS × JRI	−0.1104*	0.0432

SS, Perceived supervisor support; WFC, work-family conflict; JRI, job role identification.
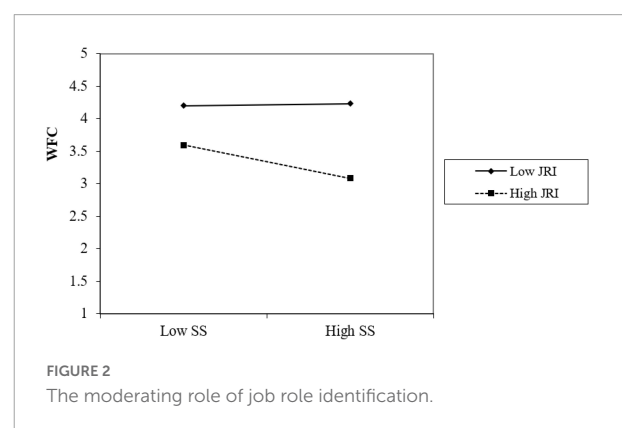*Indicates a significant correlation at 0.05 level (double tail).

FIGURE 2
The moderating role of job role identification.

TABLE 7   Bootstrap analysis of the moderated mediating role (5,000 samples).

Intermediate variable path	JRI	Effect value	BootSE	Confidence interval (95%)	
				BootLLCI	BootULCI
SS→WFC→PB	4.7316 (M-1 SD)	−0.0008	0.0067	−0.0179	0.0098
	5.8779 (M)	0.0064	0.0066	−0.0042	0.0233
	7 (M + 1 SD)	0.0135	0.0093	0.0001	0.0388

eff1/eff2/eff3 refer to a standard deviation below/equal to/higher than the mean value, respectively.

flexible work arrangement, pro-family policy and friendly organizational atmosphere can make employees feel supported by the organization and free them from work affairs, so that they can deal with family problems more easily (Hammer et al., 2016; Lee et al., 2019; Peeters et al., 2020).

Second, from the perspective of employees. Employees can feel the support from the organization through the interaction and communication with their supervisors and the encouragement, support and respect from supervisors. This allows employees to identify with their organization and construct their own identity within the organization. Continued support from supervisor, can make the employee role identity, this aspect for employees to supplement, on its own resources and stop work family conflict, on the other hand, fully the role of identity will inspire employees to implement knowledge sharing, organizational citizenship behavior initiative and innovation of employee behavior, to these is beneficial to the organization's behavior as a feedback of the organization's support (Christ et al., 2011; Dechawatanapaisal, 2018).

Limitations and future research

This study has some limitations. First, the survey data came directly from the employees. In view of this, in terms of employees' behavior, follow-up research can measure the supervisors subjectively perceived employees' proactive behavior and compare it with the employee's perceived proactive behavior, to better understand the degree of employee's innovative behavior more intuitively. In addition, although our research group repeatedly emphasized the confidentiality and the academic value of our questionnaire, there is still the possibility that employees were unwilling to report their actual situation regarding their work-family status. Therefore, follow-up research can reduce the research error as much as possible according to the actual situation and in the form of other reviews. In addition, the independent variables and dependent variable were collected, respectively, only at time 1 and time 2. This strongly limits inferences on the plausible causality relationships. Follow-up research can be conducted in different ways to achieve the purpose of reducing errors.

Second, this study focused only on the moderating role of the job role identification system, i.e., a situational factor, in the influence of the perceived supervisor support on work-family conflict. However, in fact, the job role identification system can also improve employees' proactive behavior. In future research, we can further compare and explore the difference between job role identification and perceived supervisor support in the process of influencing employees' proactive behavior.

Third, based on our general research question, the present study clarified the impact and mechanisms of the perceived supervisor support on employee proactive behavior; as such, the impact and process of the perceived supervisor support on employee proactive behavior remains to be clarified. Further in-depth and targeted research can be performed targeting different types of enterprises.

Conclusion

The implementation of innovation-driven development strategies in China requires enterprises to construct new models of human resource management (HRM) to face increasing challenges and rapid changes in the digital era. Exploring the influencing factors of employee proactive behavior is the prerequisite to trigger employee innovative behavior. We get the following research conclusions. First, based on W-HR model, this study explored the relationship between perceived supervisor support, work-family conflict and employee proactive behavior. The moderating mechanism was tested in the context of job role identification. The main findings of this paper are as follows. First, perceived supervisor support can significantly increase employee proactive behavior. Second, work-family conflict mediates the relationship between supervisor support and employee proactive behavior. Thirdly, job role identification plays a moderating role between supervisor support and work-family conflict. At the same time, we verified that high level of employee's job role identification moderated the mediating effect of work-family conflict on perceived supervisor support and employee proactive behavior, that is, the higher level of employee's job role identification the stronger the mediating effect of work family conflict.

Data availability statement

The original contributions presented in this study are included in the article/supplementary material, further inquiries can be directed to the corresponding author/s.

Ethics statement

Written informed consent was obtained from the individual(s) for the publication of any potentially identifiable images or data included in this article.

Author contributions

ZW contributed to conceptualization, formal analysis, investigation, methodology, supervision, writing—original draft preparation, funding acquisition, and read and agreed to the published version of the manuscript.

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Conflict of interest

The author declares that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Ambidextrous human resource practices and individual creativity—A cross-layer multi-time analysis based on psychological capital and QLMX

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As an important factor in enhancing individual creativity, employees' psychological capital has been widely tested by scholars. However, the effects of ambidextrous human resource practices (AHRP) on individual creativity has not been confirmed. On the basis of the theories of social exchange and resource preservation, we explored the mechanism of AHRP's impact on individual creativity using three-point data collected from March to September 2021 from 23 large enterprises in the service, finance, construction, and education sectors in five Chinese cities: Wuhan, Shanghai, Guangdong, Shenzhen, and Zhengzhou. A cross-layer regression and a Monte Carlo sampling analysis were performed on 135 pairs of leaders and 810 employees. In addition, we tested the cross-layer mediating effect of the psychological capital between AHRP and individual creativity and the boundary effect of the quality of leader–member exchange (QLMX) in the cross-layer effect. Research results indicate that (1) AHRP have positive effects on individual creativity across layers; (2) psychological capital mediates the cross-layer relationship between AHRP and individual creativity; (3) QLMX moderates the direct effect of AHRP on employees' psychological capital; and (4) QLMX moderates the indirect effect of AHRP on individual creativity through psychological capital. The research conclusions lay a theoretical foundation for AHRP at the organizational level and provide a guiding reference for the enhancement of employee creativity at the individual level.

Introduction

In the VUCA (Volatility, Uncertainty, Complexity, and Ambiguity) era, organizational innovation is the main approach used to maintain the survival of an enterprise; it is the core force to promote team development and an important cornerstone to lay the organization forward (Tierney et al., 1999). Organizational innovation comes from the individual

creativity of employees (Van and LePine, 1998; Zhou and George, 2001). Therefore, individual creativity has become an important driving force for organizational development. Existing studies have shown that human resource practices can affect employees' innovation motivation (Kianto et al., 2017), innovative behavior (Gu et al., 2015), and innovation performance (Kianto et al., 2017). Moreover, different types of human resource practice combination have cumulative synergistic effects (Gong et al., 2009). In the process of employees pursuing utilization and exploratory innovation, a single-oriented human resource practice can no longer meet the needs of dual innovation. Therefore, organizations not only need to use internal resources to achieve incremental innovation, but also through the acquisition of external resources to achieve radical innovation, the integration of internal and external resources to meet the needs of individual dual innovation and organizational dual development (Devanna and Tichy, 1990). Ambidextrous human resource practices (AHRP) have been proposed in response to the call to solve the problem of innovation paradox with a dialectical and unified view of balance; incorporate commitment- and cooperation-oriented organizational innovation into the management thinking framework of human resource practices while coordinating and balancing the dual innovation activities of enterprises; maintain the dynamic competitive advantage of enterprises (Bledow et al., 2009); and enhance the dual creation of employees' force.

Existing studies have shown that commitment-oriented human resource practice (CM-HRP) is conducive to the utilization of redundant knowledge within the organization to achieve incremental innovation, while cooperation-oriented human resource practice (CO-HRP) helps the organization to input non-redundant external knowledge to promote radical innovation (Anand et al., 2002). Therefore, AHRP is different from other types of human resource practices, which can significantly improve individual creativity (Chen et al., 2021).

Psychological capital is a manifestation of employees' psychological state or traits, including confidence in success, optimism about attribution, hope for goals, and resilience to adversity (Karatepe and Karadas, 2014). Conservation of resource theory points out that psychological capital, as an individual's positive mental state, positively affects employees' attitudes, behaviors, and performance (Luthans et al., 2005). Innovation requires the courage to break conventions and self-affirmation. Employees who lack self-confidence need the courage to make breakthroughs in innovative thinking. A higher sense of psychological security drives the employees to have stronger willingness to innovate and participate, which can also increase their creativity (Baer and Frese, 2003). Psychological capital has an important internal transmission mechanism in the process of "management practice—mental state—behavior result." Therefore, this study introduces psychological capital to examine its mediating role between AHRP and individual creativity.

On the basis of social exchange theory, although the human resource practices implemented by an organization can affect the attitude, behavior, and performance of employees, their effective

role depends on the quality of the exchange relationship between employees and leader (He et al., 2015). Affected by individual resource constraints and personality preferences, leaders cannot maintain equal relationship exchanges with each team member, and such exchanges can be varied, which leads to differences in the quality of leader–member exchange (Regts et al., 2019). Social exchange theory indicates that QLMX can bring different psychological capital and behavioral manifestations to employees (Cropanzano and Mitchell, 2005). High QLMX can provide employees with different resource tilts, which can bring them higher work performance (Regts et al., 2019) and organizational citizenship behavior (Kacmar et al., 2011; Chughtai, 2014). Therefore, QLMX plays an important role in the formation of individual creativity (Tu and Lu, 2013; Chughtai, 2014; Gu et al., 2015; Tu et al., 2018). In line with this notion, we introduce QLMX into the research framework to test the boundary effect among AHRP, psychological resources, and individual creativity.

This study has three contributions. First, this study enriches the research on AHRP, including the investigation of the effects of AHRP the team level (Prieto and Pilar Pérez Santana, 2012) and its trickle-down effect within the team (Hu et al., 2017). Our study also enriches the research on AHRP from the perspective of individual psychological capital and provides individual-level reference for future research. Second, our work enriches the research on the relationship between leaders and members with high power distance in the Chinese context. QLMX has different effects in various cultural situations (Han and Yang, 2011). Under the high power distance in China, QLMX can affect the leadership style, team atmosphere, and organizational human resource practices (Chen et al., 2007). Given that this study is conducted in the Chinese context, our study enriches the exchange of quality literature by leaders. In addition, it makes a further comparison with the relationship between leaders and members in the existing Western cultural context and lays a contextual basis for future research. Finally, this study further verifies the application of social exchange theory in organizational situations, extends it to the organizational atmosphere of AHRP, and makes a theoretical contribution to the further improvement of social exchange theory.

In summary, this study is based on social exchange and resource conservation theories. It aims to reveal the black box mechanism of AHRP' effects on employees' individual creativity and examine the mediating role of psychological capital in this relationship and the boundary effect of QLMX.

Theoretical background and hypothesis development

Human resource practices are a specific method of business management, and the connotation of different types of such practices may vary; however, the core influence mechanism is essentially the same (Oldham and Cummings, 1996). Specifically, commitment–cooperation-oriented AHRP also influence the output of innovation results by managing employees' work ability,

motivation, and opportunities (AMO; Colakoglu et al., 2006). In view of the ambidextrous system perspective, AHRP deal with the ambidexterity of organizations; use paradox thinking to meet the innovation needs of organizations and individuals; address the contradictions and tensions existing in organizations; and implement a compound human resource management practice, which ensure the coordination and integration of organizational resources to promote dual innovation. With reference to existing research and the AMO paradigm of human resource management, the implementation of commitment–cooperation-oriented AHRP within organizations can provide contextual assistance for the organizations' utilization and exploratory innovations (Xiao, 2018). Commitment-oriented human resource practices are a series of practice collections that promote the improvement of employees' skills, provide employees with growth opportunities, and endow employees with knowledge and skill protection for participating in innovative behaviors. With the goal of improving work efficiency, commitment-oriented human resource practices promote employees' utilization-based innovation level. Conversely, cooperation-oriented human resource practices are a collection of practices that improve employees' cooperation ability, stimulate cooperation motivation, and provide cooperation opportunities. These practices are oriented to work upgrades and reforms and promote employees' exploratory innovation level (Chang et al., 2011). Existing empirical studies have confirmed that the implementation of the organizational context of commitment-oriented human resource practices is helpful for internally refined knowledge management to achieve innovation, whereas the implementation of the organizational context of cooperation-oriented human resource practices can help find the input of external nonredundant knowledge to promote innovation (Anand et al., 2002). Therefore, in view of the ambidextrous perspective of organizations, the AHRP of commitment–cooperation orientation have important research value for exploring the paradox integration mechanism in organizations.

The psychological capital of employees is their perception of the possible consequences of their behaviors in the work environment (Newman et al., 2018). Economists regard psychological capital as a relatively stable psychological tendency or characteristic formed by individuals in their early life. For example, Luthans et al. (2005) claimed that psychological capital refers to people's positive mental abilities; and they listed self-confidence/self-efficacy, hope, optimism, and resilience according to the POB standard (measurable, developable, and can be used to improve job performance). They distinguished psychological capital from self-esteem, self-evaluation, emotional intelligence, and positive psychological traits based on the POB standard. Inside and outside the workplace, individual psychological capital has a positive effect. Using the general public as a sample, psychologists have found that optimism and hope have significantly positive effects on personal health, adaptability and adjustment ability, stress reduction, planning behavior, and employment (Luthans et al., 2007). In the workplace, scholars have found that the overall construction of psychological capital or

individual elements promote individual job satisfaction (Karatepe and Karadas, 2015), organizational commitment (Luthans et al., 2005). The overall construction of psychological capital or individual elements also reduce the absentee rate of subordinates; promote the effectiveness of organizational change; increase the number of established companies; and improve organizational resilience, profitability, and company performance. Numerous research conclusions have laid a literature foundation for us to conduct our study on AHRP in the organizational field to improve psychological capital.

Leading-member exchange is the exchange relationship between leaders and members in an organization. Due to the limited resources, the general leader may establish a differentiated exchange relationship with his members, and thus adopt a differentiated strategy to treat members inside and outside the circle (Wayne et al., 1997). Based on the theory of social exchange, as informal organizational support, leaders' support for employees includes emotional and tool support or creativity, work and social support, and their behavior positively affects employee behavior (Tekleab and Chiaburu, 2011), and leadership support perception promotes employee performance (López-Cabarcos et al., 2022). High QLMX allows members in the circle to obtain higher degrees of freedom, greater decision-making power, and more organizational support (Bauer and Green, 1996). Due to the limited information and resources of leaders, leaders treat different subordinate members in different ways and strategies. They tend to treat "in-the-circle" members through informal rules, emotions, trust, and relationships of social exchange; and through the formal authority of economic exchanges, contract rules and formal policies to treat "outside the circle" members (Han and Yang, 2011). Therefore, QLMX has become an important boundary that affects individual psychology and behavior in the organization.

AHRP and individual creativity

In the era of cross-border integration with increasingly turbulent environment, organizations need to balance current and future development, so it is necessary to implement dual innovation compatibility and achieve the match between organizational strategy and external environment (Sun et al., 2018). Employee creativity refers to the new ideas, ideas, products, services or processes generated in the work, and is also the key to the realization of organizational dual innovation. However, the creativity needs more time consumption, cognitive effort and divergent thinking, so it needs the support of physiological, psychological, social and organizational resources (Shalley and Gilson, 2004).

Social exchange theory poses those employees pay special attention to the resources obtained and contributed by organizations and the interaction among the organizations' members. When the human resource management practices implemented by the organization are perceived by employees as the organization's appreciation, recognition, and investment, the

organization and its employees can form a social exchange relationship rather than a purely economic relationship (Zhong et al., 2016). Human resource practices focus on experience and background when recruiting and selecting employees who are more in line with the corporate values and culture of an organization, thereby providing preconditions for employees to develop their creativity. On the one hand, commitment-oriented human resource practices are conducive to identifying employees with creative potential, high matching of people and positions, and improving the internal consistency of employees' creativity; on the other hand, cooperation-oriented human resource practices have wide flexibility, provide numerous external resources, attract more talents with different social backgrounds and multiple knowledge systems, play the role of external social networks, and promote the creativity of employees (Wang et al., 2015).

Innovative activities not only require employees to have certain skills, motivations and opportunities, but also a fault-tolerant working atmosphere. Research has found that a human resource work system composed of a series of mutually reinforcing and cooperating human resource practices can bring higher innovation to the enterprise performance (Laursen and Foss, 2003). The first dimension of AHRP: CM-HRP not only helps to provide employees with growth opportunities, promotes the improvement of employee skills, and provides knowledge and skills protection for the generation of employees' innovative behaviors. In addition, a safe working atmosphere is formed in the organization to reduce the perceived risk of employees' innovative behaviors, and thus actively participate in knowledge sharing and innovation activities (Collins and Smith, 2006), which is conducive to improving their innovation performance. CM-HRP enhances employees' sense of security and fairness by meeting employees' basic needs for equal rights and job guarantees, thereby increasing employee organizational trust (Chen et al., 2004). Through the internalization of shared values, employees can be promoted to carry out utilization innovation activities in a more reasonable working mode, which can offset or weaken employees' sense of resource exhaustion caused by the fact that a large amount of external heterogeneous knowledge and information cannot be effectively coordinated and integrated with the internal knowledge reserve of the organization (Truss et al., 1997).

The second dimension of AHRP: CO-HRP can enhance employees' external cooperation ability, stimulate external cooperation motivation and provide external cooperation opportunities, thereby promoting the flow and utilization of internal and external resources and information in the organization (Wang et al., 2015). CO-HRP's flexible work design and diversified communication channels help organizational members establish cross-departmental and cross-organizational social networks, provide more opportunities to obtain heterogeneous information and knowledge, and help employees identify and grasp innovation opportunities (Evans and Davis, 2005); its training and development can effectively improve

employees' ability to recognize the value of new knowledge, and bring benefits to the organization by digesting, absorbing and applying external new knowledge (Cohen and Levinthal, 1990). CO-HRP can promote the exchange of knowledge and information between the organization and external personnel or institutions. While improving the organization's knowledge absorption capacity and stimulating knowledge creation to promote organizational exploratory innovation, it can offset the organizational inertia caused by CM-HRP's over-emphasis on job support and creating a safe atmosphere, and make up for the lack of job motivation and initiative triggered by employees' over-commitment (Sinclair et al., 2005).

Therefore, AHRP' complementary and synergistic mechanisms jointly influence employee behaviors to meet the employees' multi-level work and psychological needs at the same time and provide contextual assistance for improving employee innovation performance (Liu et al., 2017). On this basis, we propose the following hypothesis:

> *Hypothesis 1*: AHRP has a positive impact on individual creativity.

The mediating role of psychological capital

The psychological capital of employees is a manifestation of employees' psychological state or traits, including confidence in success, optimism about attribution, hope for goals, and resilience to adversity (Karatepe and Karadas, 2014). Psychological capital is a holistic construct. In comparison with other positive mindsets, the core concept of psychological capital is that it has a similar state and is highly developable. It exhibits the positive psychological state of individuals and can affect the behavior, attitude, and performance of employees. From an individual level, psychological capital comes from the process of growth and development. It is a highly positive psychological state, which mainly includes optimism, self-confidence, resilience, and hope. It can have an important effect on individuals' work attitude, cognitive style, and behavior ability and can bring a positive effect on the communication and cooperation among employees (Zhao et al., 2019).

Existing studies have found that psychological capital can play an important predictive role in individual positive behaviors (Agarwal and Farndale, 2017). On the basis of resource conservation theory, individuals with more resources have less risk of resource loss and can more easily obtain new resources. If employees have a positive mental state and maintain a high level of psychological capital, the organization needs to provide more resources to achieve the spiral of value-added resources. Employees with high levels of psychological capital often have greater performance output than employees with low levels of psychological capital (Luthans et al., 2005). When individuals are limited by their own resources, employees with high levels of

psychological capital tend to respond actively in the process of resource allocation, thereby effectively resolving individuals' problems caused by insufficient resources. As an individual's positive mental state, psychological capital can have a positive effect on employees' attitudes, behaviors, and performance (Luthans et al., 2005). On this basis, this study proposes the following hypothesis.

Hypothesis 2: Psychological capital mediates the relationship between AHRP and individual creativity.

The moderating role of QLMX

Although the practice of human resources affects the attitude, behavior, and performance of employees, the effective play of its role depends on QLMX. Affected by individual resource constraints and personality preferences, leaders cannot maintain equal relationship exchanges with each team member and may be different, which leads to differences in QLMX (Gardner et al., 2019). As the spokesperson of the organization, leaders in the organization influence the interpretation, evaluation, and use of human resource practices by employees. In the investigation of leader–member relations, scholars have often analyzed and summarized interpersonal communication in social life and work environment based on social exchange theory; they believe that if one party obtains certain resources from the other party, then it can willingly give back and give back through attitude, emotion, and behavior (Agarwal and Farndale, 2017). High QLMX provides employees with a trust and respectful working atmosphere, which is a favorable environmental resource. To generate resource increments, employees can be more actively involved in work and study. The leader–member exchange theory believes that the relationship between leaders and employees is a highly typical social exchange relationship (Regts et al., 2019). When QLMX is high, leaders tend to trust and care more about employees, reward them, and give them more promotion space. Moreover, employees can be willing to give back and hope to continue to maintain such an exchange relationship. A large number of research results have shown that if leaders and members can maintain a high-quality exchange relationship, then employees' attitudes and behaviors can change positively (Agarwal and Farndale, 2017).

The effect of high QLMX moderates the effects of AHRP on individual creativity, which develops employees' ability to explore external resources and utilize and allocate internal resources more rationally, encourages employees to share knowledge, and obtains feedback from the organization in time, thereby improving employees' hope and confidence in dealing with work difficulties (Zhao et al., 2019). High QLMX makes it easier to build trust between employees and leaders, allowing employees to understand the development of the organization and obtain development opportunities. Leader–member exchange can make employees have more empowerment. As a

means of motivation (Zhou and George, 2001), empowerment can enhance employees' confidence and resilience, thereby promoting individual creativity. On this basis, we propose the following hypothesis.

Hypothesis 3: QLMX promotes the transformation of AHRP into psychological capital. The higher the level of QLMX, the stronger this promotion relationship.

Conditional process model

In summary, AHRP have positive effects on individual creativity, which can be mediated by individuals' psychological capital. As a boundary condition, QLMX not only moderates the direct influence of AHRP on individual creativity but also moderates the indirect influence of AHRP on individual creativity through psychological capital. On this basis, we propose the following hypothesis.

Hypothesis 4: QLMX moderates the mediating role of psychological capital between AHRP and individual creativity. The higher the level of QLMX, the stronger the mediating relationship.

In summary, the research model is shown in Figure 1.

Materials and methods

Participants and procedures

In order to reduce the common method bias, this study used multi-temporal data, and the sample distribution included Beijing, Shanghai, Guangzhou, Wuhan, and other cities. The data selected middle- and high-level managers and their direct employees as the research objects. The AHRP, QLMX, and psychological capital scale were filled out by employees. Given that employees can intuitively feel the effects of human resource practices and their emotional status changes, individual creativity and questionnaires were evaluated by managers, because managers have a more objective evaluation of the degree of employee innovation. To accurately reflect the causal relationship between AHRP and individual creativity, this study measured at

FIGURE 1
Research model.
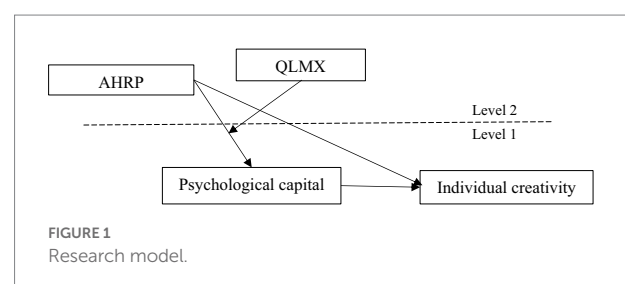
multiple points in time. At T1, demographic variables, QLMX, and AHRP were measured; at T2 (after 3 weeks), employees' psychological capital was measured; and at T3 (after 3 weeks), individual creativity was measured. The questionnaires were distributed by on-site distribution and were recycled subsequently. To ensure the authenticity of the study, the questionnaires were filled out anonymously, and the purpose of the research was fully explained at the beginning of the questionnaire. The respondents were promised that the data would only be used for academic research and would be treated confidentially. In this study, 135 leadership questionnaires and 810 employee questionnaires were effectively collected. For the leadership questionnaire, 26.372% are women, 7.462% are under 30 years old, 34.175% are 30–39 years old, 44.122% are 40–49 years old, and 14.241% are over 50 years old. Undergraduate education accounted for 8.482%, undergraduate 65.886%, and postgraduate 35.632%. 82.173% are married. Service industry accounted for 21.739%, finance industry accounted for 17.391%, construction industry accounted for 34.782%, and education industry accounted for 26.086%. The term of office is 14.831% for 3–5 years, 24.312% for 6–10 years, 35.782% for 11–15 years; 25.075% for more than 15 years. Subordinate questionnaire: 33.756% are women, 38.182% are under 30 years old, 31.261% are 30 to 39, 20.245% are 40 to 49, and 10.312% are over 50. Undergraduate accounted for 10.266%, undergraduate 68.201%, postgraduate 21.533%. 56.312% are married. The term of office is 54.181% for 3–5 years, 34.128% for 6–10 years, 8.773% for 11–15 years, and 2.918% for 15 years or more.

Measures

In order to ensure the reliability and validity of the measurement tool, this study adopted the mature scale widely used in authoritative journals at home and abroad to measure related variables. According to the cross-cultural translation-back translation procedure, through expert discussion and modification and optimization, we strove to achieve accurate semantic expression, standard expression form, and conform to Chinese language standards, and finally finalize the formal questionnaire. Unless otherwise specified, all scale items were measured using the Likert 5-point scale method. 1 represents "strongly disagree" and 5 represents "strongly agree."

Ambidexterity human resource practice

Measured using the Ambidexterity human resource practice (AHRP) scale developed by Xiao (2018), including 13 items, representative items, such as "companies often improve employee capabilities through cross-departmental cooperation or job rotation," "companies often improve through cross-departmental cooperation or job rotation" Employee competence." The reliability coefficient of the scale was 0.878.

Psychological capital

Measured using the psychological capital scale of Luthans et al. (2005), including 24 items, representative items, such as "I am currently confident about completing my work goals" and "I can always recover from bad emotions quickly when I encounter setbacks at work." The reliability coefficient of the scale was 0.828.

Quality of leader-member exchange

Using Liden and Maslyn (1998)'s leadership member exchange single-dimensional scale measurement, it contained 12 items, representative items, such as "For the boss, even if I have to complete a lot of extra work, I do not mind," "I am willing to give up better job opportunities for my boss." According to the method of Harrison and Klein (2007), the average value of LMX of each member in the team was used as the parameter of Quality of leader-member exchange (QLMX). Related research also supported and recognized this method (Homan and Greer, 2013; Huang and Wu, 2019). The reliability coefficient of the scale was 0.899.

Individual creativity

Used Zhou and George (2001)'s employee innovation performance scale measurement, a total of 6 items, representative items, such as "the subordinate often produces creative ideas and innovative ideas to solve problems," "the subordinate will Promote your own creativity or innovative ideas step by step." The reliability coefficient of the scale was 0.891.

Control variables

Consistent with the existing research (Zhao et al., 2019), this research determined the gender (0 = female; 1 = male) and age (1 = below 30; 2 = 30–39; 3 = 49–49; 4 = 50–59; 5 = over 60 years old;), marriage (1 = married; 2 = unmarried); team tenure (1 = 3–5 years; 2 = 6–10 years; 3 = 11–15 years; 4 = 15 years or more), education (1 = below junior college; 2 = undergraduate; 3 = postgraduate and above) as control variables.

Results

Confirmatory factor analysis

Mplus 8.3 was used to perform confirmatory factor analysis on the main variables to evaluate the discriminative validity between the variables. According to Table 1, the four-factor model had a good fit ($\chi2/df$ = 1.903, RMSEA = 0.042, CFI = 0.961, TLI = 0.950, SRMR = 0.045), which was significantly better than the other three alternative models, indicating that the four-factor model variables had good discrimination validity.

Data aggregation test

AHRP and QLMX are a team-level (level 2) variable. The questionnaire-answering process needed to be aggregated to the team level because employees would answer the questionnaires. Before aggregation, the group that examined the aggregated variables must be checked for internal consistency (R_{wg}) and intra-group correlation coefficients, ICC(1) and ICC(2). When $R_{wg} > 0.70$, ICC(1) > 0.10, and ICC(2) > 0.70, which indicate that the data aggregation is ideal (Bliese, 2000). One-way analysis of variance showed that the average R_{wg} of AHRP was 0.712, with ICC(1) and ICC(2) of 0.115 and 0.705, respectively; and that the average R_{wg} of QLMX was 0.753, with ICC(1) and ICC(2) of 0.124 and 0.713, respectively. Hence, AHRP and QLMX variable data were satisfactory, met the aggregation requirements, and could be analyzed across levels.

Common method bias test

Although this study was designed to circumvent the problem of homologous bias in procedures by clarifying the research purpose, emphasizing the confidentiality of information, multi-waves measurement, language specification expression, and differentiated measurement, the same origin bias was still inevitable (Podsakoff et al., 2012). To ensure the rigor of the data, this study used the Harman single factor test method to test the common method bias. The results showed that the unrotated first factor explained 35.817% (<40%) of the variation, and the common factor greater than 1 had 3 eigenvalues. This meant that the problem of homology bias was not serious. Furthermore, this study adopted AMOS 26.0, which used the common method bias as a latent factor to form a five-factor model with the research variables to perform confirmatory factor analysis. The results showed that the four-factor fitting index without the common method bias was: $\chi^2/df = 2.084$, CFI = 0.929, TLI = 0.951, RMSEA = 0.080, and the five-factor model fitting index with the common method bias latent variable was: $\chi^2/df = 2.062$, CFI = 0.931, TLI = 0.965, RMSEA = 0.084, the model fitting index had not been greatly improved ($\triangle\chi^2/df = 0.022$, $\triangle$CFI = 0.002, $\triangle$TLI = 0.014, $\triangle$RMSEA = 0.004). Therefore, there was no serious common method bias problem in this study.

Descriptive statistics

Table 2 shows the mean, standard deviation, correlation coefficient, and internal consistency coefficient of the main research variables. As shown in Table 2, psychological capital was positively correlated with individual creativity ($r = 0.496$, $p < 0.01$), indicating that the accumulation of employees' psychological capital promoted individual creativity. Moreover, AHRP was positively correlated

TABLE 1 Fitness indexes of scales.

	Factor composition	χ^2	df	RMSEA	CFI	TLI	SRMR
Four-factor model	AHRP, PC, QLMX, IC	502.524	243	0.084	0.921	0.905	0.040
Three-factor model	AHRP, PC + QLMX, IC	1070.745	247	0.110	0.876	0.747	0.075
Two-factor model	AHRP, PC + QLMX + IC	1813.500	250	0.254	0.576	0.756	0.154
One-factor model	AHRP + PC + QLMX + IC	2325.204	252	0.354	0.578	0.595	0.135

AHRP, Ambidexterity Human Resource Practice; PC, Psychological Capital; QLMX, Quality of Leader-member exchange; IC, Individual Creativity; "+," Combined two variables into one factor.

TABLE 2 Descriptive statistics and correlation coefficient of variables.

	M	SD	1	2	3	4	5	6
Individual level								
Gender	0.471	0.501						
Marriage	1.154	0.604	−0.141*					
Age	2.257	0.761	0.033	−0.052*				
Team tenure	1.998	1.658	−0.092	0.561**	0.021			
Education	2.668	0.353	−0.183*	0.313**	−0.073	0.371**		
Psychological Capital	4.562	0.613	0.074	−0.061*		−0.044	−0.154	
Individual Creativity	4.651	0.709	0.069	−0.070		−0.054	−0.151	0.273*
Team level								
AHRP	5.034	1.354						
QLMX	4.113	0.431						

AHRP, Ambidexterity Human Resource Practice; QLMX, Quality of Leader-member exchange.
*$p < 0.05$. **$p < 0.01$.

with QLMX ($r = 0.415$, $p < 0.01$); AHRP was positively correlated with psychological capital ($r = 0.428$, $p < 0.01$); and AHRP was positively correlated with individual creativity ($r = 0.419$, $p < 0.01$).

Main effects of AHRP and individual creativity

This study used a cross-level analysis to verify the effect of team-level variables on individual-level variables. We used Mplus8.3 (Hayes and Rockwood, 2020) to conduct a 2–1-1″ multi-layer analysis to test the research hypothesis. As shown in Figure 2, the effects of AHRP on individual creativity were significant ($r = 0.587$, $p < 0.05$), which supported H1.

Mediating effect of psychological capital

To further test the research hypothesis, we drew a path coefficient diagram based on the output of Mplus8.3 (Figure 3). The test results showed that AHRP had significantly positive effects on individual psychological capital ($r = 0.532$, $p < 0.05$); psychological capital had a positive effect on individual creativity ($r = 0.273$, $p < 0.05$); and the mediating effect of psychological capital between AHRP and individual creativity was significant (indirect effect = 0.601, 95% CI [0.388, 0.810], excluding 0). Therefore, H2 was supported.

Moderating effects of QLMX

To test the moderating effect of QLMX, we constructed an interactive item of AHRP and QLMX and analyzed psychological capital. The results showed that the interaction terms between

FIGURE 2
Direct effect coefficient diagram. *$p < 0.05$, **$p < 0.01$.

FIGURE 3
Path coefficient diagram of model. *$p < 0.05$, **$p < 0.01$.
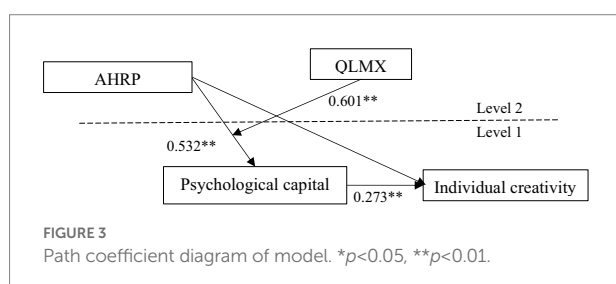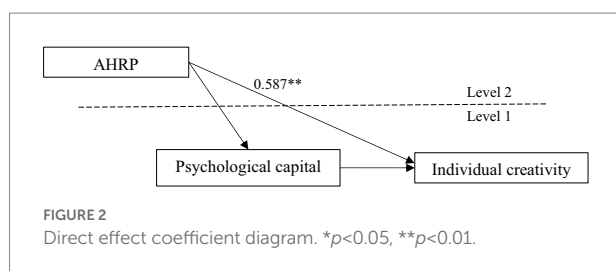
AHRP and QLMX had a positive and significant effect on psychological capital ($r = 0.597$, $p < 0.05$). To more intuitively reflect the moderating effect of QLMX, we had further drawn a diagram of the moderating effect of AHRP on psychological capital when QLMX was one standard deviation above and below the average level. As shown in Figure 4 when QLMX was high, the AHRP had more significantly positive effects on psychological capital. Therefore, H3 was verified.

Moderated mediation effects

To further verify the conditional process model, this study used Monte Carlo repeated sampling test to test the mediating effect of psychological capital (Edwards and Lambert, 2007). The results are shown in Table 3. When QLMX was high, the mediating effect of psychological capital was significant (95% CI [0.559, 0.827], excluding 0). When QLMX was low, the mediating effect of psychological capital was insignificant (95% CI [0.142, 0.485], including 0). However, a difference was observed in the mediating effect between the two levels (Index = 0.571, 95% CI [0.266, 0.879], excluding 0). Therefore, H4 was supported.

Discussion

Theoretical contributions

This study explores the mediating effect of AHRP on the individual creativity of employees, reveals the mediating mechanism of employees' psychological capital and the

FIGURE 4
Moderating effect of QLMX between AHRP and psychological capital.
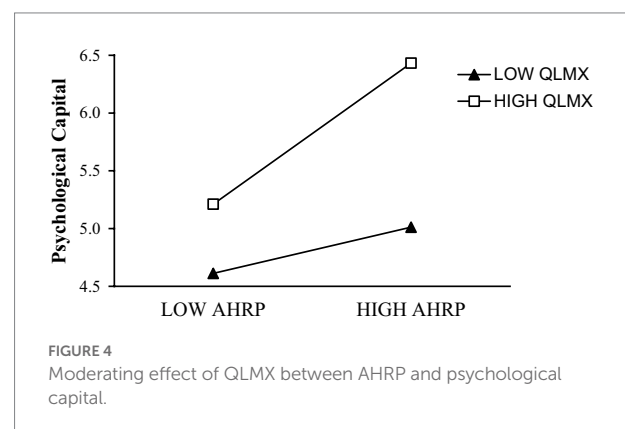
TABLE 3 Moderated mediating effect.

QLMX	Mediator variable	Standard error	95% CI	
			LLCI	ULCI
Low level	Psychological capital	0.893**	0.559	0.827
High level		0.312**	0.142	0.485
Index		0.570**	0.266	0.879

**$p < 0.01$.

boundary conditions of QLMX, and draws the following conclusions.

First, AHRP is significantly positively correlated with individual creativity. Creativity requires more energy and resources. When hesitating whether to participate in innovation, employees' psychological security can inevitably be reduced, in which case they do not propose new ideas and they treat innovative activities negatively. Previous studies mainly discussed the influence of high-performance human resource practice and high-commitment human resource practice on individual creativity (Chang et al., 2014; Chiang et al., 2015). However, in the era of VUCA, only relying on a single human resource practice can no longer meet the dual innovation needs of individuals and organizations. This study also echoes that AHRP can provide resource support for employees' creativity, and make them enter the value-added spiral, thus delaying or eliminating job burnout or stress caused by resource consumption (Kiazad et al., 2015).

Second, psychological capital mediates the indirect influence of AHRP on individual creativity. In view of the fact that previous studies used work prosperity as the explanation mechanism of AHRP and individual creativity (Chen et al., 2021), this study explored the intermediary mechanism between AHRP and individual creativity from the perspective of psychological capital. The establishment of psychological capital needs to be established in the context of human resources implemented by the organization. AHRP promote the accumulation of individual psychological capital through the two dimensions of commitment and cooperation. Psychological capital is the internal guarantee and driving force of individual behavior, which can effectively promote the generation of individual creativity. Therefore, the effects of AHRP on individual creativity are realized through the accumulation of individual psychological capital.

Third, QLMX plays a moderating role between AHRP and psychological capital. Managers should identify and track the psychological safety status of employees to create a corresponding psychological safety environment. Employees' psychological safety comes from their cognition of the organizational climate. High QLMX will help employees gain more decision-making power and resources, and will also increase their psychological security (Howell and Hall-Merenda, 1999). Managers actively tolerate employees' faults and errors while implementing AHRP, provide employees with a relatively safe environment, eliminate their fear of interpersonal risks, and promote innovative behaviors.

Fourth, QLMX moderates the indirect effect of AHRP on individual creativity through psychological capital. Managers should establish diversified interactions with members of the organization, and enhance employees' perceptions of QLMX. In the management process, leaders should devote themselves to establishing connections with employees in terms of openness, effectiveness, affinity, etc., support employees' innovation, actively communicate with employees, understand their work needs, and encourage them to seek innovation, give it appropriate autonomy, allow it to try different solutions, accept the failure of its innovation attempt, so as to provide a tolerant management environment for its innovative behavior, so as to improve its psychological security and ensure individual innovation enthusiasm.

Practical implications

This study provides organization managers the following practical enlightenment.

First, organizations need to implement AHRP. As the external environment becomes more and more complex, organizations usually face different management paradoxes, the most common of which is to pursue the balance between utilization innovation and exploratory innovation. AHRP help the team integrate internal and external resources, strengthen internal coordination and cooperation, and adapt to external needs. Their effective implementation can bring a series of benign effects to the team and the organization. Specifically, in each team, an enterprise can implement a scientific AHRP configuration based on its own actual situation to help organizational members enhance their individual creativity and achieve organizational innovation and development.

Second, the psychological capital of organization members should be increased. Psychological capital is a positive psychological resource. Previous studies have shown that it has a positive relationship with work attitude and behavioral variables such as job satisfaction (Zhang et al., 2021), organizational commitment (Tang et al., 2019) and organizational citizenship behavior (Hu et al., 2018). The results of this study also confirm the positive role of psychological capital. Therefore, in the practice of enterprise management, managers can cultivate and develop employees' psychological capital by measuring the "stock" of employees' psychological capital, or encourage employees to carry out positive self-cultivation to improve their psychological capital.

Third, QLMX in the organization should be improved. Organizations need to pay certain attention to the establishment of a stable and active exchange relationship between leaders and members, improve communication methods, and expand communication channels. Harmonious interpersonal communication is a key factor in promoting organizational cohesion. The high-quality interpersonal relationship among organization members can promote knowledge sharing between team members. In addition, leaders must actively formulate a fair and open competition mechanism, pay attention to employees' investment in innovation and their enthusiasm for work and study to ensure that employees achieve a better state of psychological safety, stimulate their enthusiasm for work, and increase their willingness to participate in innovation.

Limitations and future directions

This study is based on social exchange theory, through multi-agent, multi-temporal, and multi-level follow-up investigations. It has explored the mediating mechanism of AHRP's moderation of

individual creativity and obtained many useful conclusions and enlightenments. Nevertheless, it still has the following shortcomings.

First, data collection. Although multiple time-point data are used to strengthen the causal consistency between variables in terms of time to avoid problems, such as homology variance, non-longitudinal research is difficult to objectively reflect the causal relationship between variables. Therefore, future works can adopt longitudinal, experimental, and objective research. Moreover, evaluation method presents the causal relationship between variables in a true and objective manner. In addition, the practice of psychological capital and AHRP for data collection is performed in a self-evaluation method, which will inevitably have a praise effect on organizational evaluation. Therefore, in-depth interviews can be used for future data collection to improve the objectivity of variable measurement.

Second, sample selection. The sample data of this study are all from China and are influenced by Chinese traditional culture. The concept of "home and everything is prosperous" affects the status of the family in people's minds, and the "circle culture" affects the interpersonal relationship within the organization. Therefore, this study only considers the Chinese context and has certain cultural limitations, which affect the universality of the conclusions. Therefore, future works can be integrated into different cultural contexts to expand the universality of research conclusions.

Conclusion

Organizations implement effective AHRP, which can improve employees' psychological capital, thus helping to enhance employees' creativity. According to the research results, we discuss as follows:

First of all, AHRP has a positive and significant impact on individual creativity. The data results in Figure 2 supported the direct relationship between AHRP and individual creativity. On the one hand, the research results echo the existing research on human resource practice to enhance individual creativity (Han and Yang, 2011). When employees perceive their appreciation, recognition and investment in human resource practices, they can enhance their individual's perception of work safety (Hu et al., 2017), thereby stimulating innovation motivation (Han and Yang, 2011), and enhancing individual creativity (Bledow et al., 2009). On the other hand, the research conclusion points out that AHRP has an impact on individual creativity by helping to improve employees' psychological security, echoing Xiao (2018)'s conclusions on the role of human resources and individual psychological perception, and testing the existing research conclusions.

Second, psychological capital mediates the indirect relationship between AHRP and individual creativity. We tested and confirmed the mediating effect of psychological capital through Monte Carlo repeated sampling method. As a mediating between organizational practice and individual behavior, psychological capital is not only a further test of resource conservation theory, it also echoes the research conclusions of Luthans et al. (2005) that changes in psychological capital affect individual behavioral performance. The implementation of AHRP

can have a positive impact on the accumulation of individual psychological capital, enhance individual self-efficacy, and then affect individual creativity. AHRP echoes Hu et al. (2017)'s research initiative of "organizational diversity promotes individual innovation," and clarifies the internal mechanism of the trickle-down effect of human resource practice.

Finally, QLMX moderates the positive effect of AHRP on psychological capital. The moderating effect diagram in Figure 4 clearly showed the promoting effect of high QLMX on the relationship between AHRP and psychological capital. In the context of "circle culture," the quality of interpersonal relationships within the organization has to be considered. "Circle culture" brings about an imbalance in the distribution of resources (Zhao et al., 2019). This kind of resources includes not only material resources, but also emotional and psychological resources (Luthans et al., 2005). The research conclusions further test the theory of social exchange in the context of China's "circle culture."

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

Ethical review and approval was not required for the study on human participants in accordance with the local legislation and institutional requirements. The authors declare that they strictly adhered to the APA guidelines on ethical research practices. Written informed consent for participation was not required for this study in accordance with the national legislation and the institutional requirements. The patients/participants provided their online informed consent to participate in this study, which stated the voluntary nature of participation, and assurance of confidentiality and anonymity.

Author contributions

All authors listed have made a substantial, direct, and intellectual contribution to the work and approved it for publication.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Frontiers in Psychology

The impact of public responses toward healthcare workers on their work engagement and well-being during the Covid-19 pandemic

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Introduction/context: Healthcare workers (HCWs) play an important role in fighting against the COVID-19 pandemic. However, they have been exposed to mixed public responses more significantly during the COVID-19 pandemic, which have potentially affected their work and life.

Aim: We aim to study what public responses toward HCWs existed, how and why such public responses impacted HCW's work engagement and well-being, and how Human Resource (HR) professionals navigate these impacts. These understandings are important for improving HCWs' work and life quality.

Methods: We adopted a mixed approach including both quantitative and qualitative methods to investigate how the public responses impact HCWs' work engagement and well-being and how human resource management (HRM) shall intervene. Our quantitative study enables us to collect and analyze a large amount of public responses toward HCWs from the social media platform during the COVID-19 pandemic globally, and uncover the sentiments and topics of these pubic responses *via* big data and AI technologies. Our qualitative study allows us to understand how and why these public responses impact HCWs' work engagement and well-being *via* interviews and further identify how HR professionals shall navigate these impacts.

Results: The sentiment analysis showed that 55.9% of the discussions toward HCWs were positive, 27.2% were neutral, and 16.9% were negative. The topic modeling analysis indicated that the commonly identified topics were related to fear (the negative responses) and gratitude (the positive responses). The interviews with 18 HCWs revealed that HCWs' work engagement and well-being were decreased by negative public responses through experiencing tension or disappointment due to social and physical ostracism, rejection, discrimination, and criticism. On the other hand, positive public responses in terms of encouragement, recognition, and tangible donations increased their work engagement and well-being. The analysis also suggested that occupational calling served as a mechanism that explained why public responses had such impacts on HCWs. The interview results also highlighted the significance of HRM in bridging positive public responses toward HCWs and revealed problems

with communication from HRM during the pandemic. This research provides practical implications about how to improve HCWs work engagement and well-being during the pandemic *via* public and HRM efforts.

Introduction

The COVID-19 pandemic has brought about significant disruptions to people's daily lives globally, especially to the lives of employees working in the healthcare industry (WHO, 2021). Healthcare Workers (HCWs) are at the center stage in tackling this public health crisis as a global threat. Many of them are frontline workers working in proximity to patients who may be exposed to close contact with the virus. They are the ones who sacrifice their personal and family time carrying out their roles in hospitals to take care of numerous patients, including COVID-19 patients. Undoubtedly, the COVID-19 pandemic has brought tremendous stress on the healthcare system and healthcare professionals (e.g., Tan et al., 2020a). The stress has been caused by long working hours, night shifts, a large volume of patients, constant exposure to perceived risk, constant change in protocols, and the lack of facilities, equipment, and manpower (e.g., Hwang et al., 2020; Khanal et al., 2020; Pappa et al., 2020).

Besides coping with the physical, mental and emotional stress, HCWs may also be exposed to being stigmatized, discriminated against, and ostracized by the public in the workplace and surroundings (Bagcchi, 2020; Singh and Subedi, 2020). For example, in various countries, HCWs were reportedly denied access to public transport, insulted in the street, and even evicted from rented apartments (Bagcchi, 2020). HCWs also experienced gossip and bullying in communities in various countries (Dye et al., 2020). These negative public responses could make them more vulnerable to negative psychological consequences (Xiong and Peng, 2020). These problems may distract their attention and decision-making abilities, posing a threat to their work engagement and well-being, which might also affect their ability to manage crises or be exposed to occupational hazards.

At the same time, the COVID-19 pandemic has also highlighted the importance of healthcare professionals due to the increase in public awareness and recognition. HCWs were essential workers and have become labeled as heroes during the COVID-19 pandemic (Booth et al., 2020). To recognize their efforts, people have shown their appreciation online by posting pictures of appreciation (Wicker, 2020) and mural paintings on social media and through material provisions like food donations, airline tickets, and vouchers (Allen, 2020; Hessekiel, 2020). Meanwhile, the public responses may also impact HCWs in different ways. For example, a study conducted in Africa found

that the pandemic had strengthened their sense of duty and their role as a nurse due to the reinforced feeling of pride and appreciation from the community for their contribution (Marey-Sarwan et al., 2022). A similar phenomenon took place during the SARS epidemics where HCWs in Singapore experienced social stigmatization (49%), while most (77%) felt appreciated by society and heartened by the social support they received (Koh et al., 2005).

As such, existing studies have suggested both positive and negative impacts of public views toward HCWs during times of public health crisis. However, these studies have not aggregated public responses systematically. In other words, we know little about what was being said in the public response toward HCWs during the health crisis, and we also have limited understanding of how and why the HCWs perceived public responses impact their work life, particularly their engagement and well-being.

As the International Committee of The Red Cross appeals, "the recent displays of public support for COVID-19 responders are heartwarming, but many responders are nevertheless experiencing harassment, stigmatization, and physical violence. Health personnel, medical facilities, and transport such as ambulances must be respected and protected in all circumstances, and the work of medical personnel must be facilitated at all times (IFMSA, 2020, pp.1)." To answer this call, it is imperative for scholars to examine public responses toward HCWs on a large scale during the COVID-19 pandemic, and how they impact HCWs' work engagement and well-being. As long as effective HRM initiatives and practices are implemented, they can improve HCWs' work engagement and well-being (Alfes et al., 2012; Shantz et al., 2016). Therefore, in this paper, our research aims to better understand public responses toward HCWs *via* social media analysis by employing AI and big data technologies, and identify the major types of topics and sentiments under each type of response. More importantly, our research aims to reveal the impacts of such public responses on HCWs' work engagement and well-being during the COVID-19 pandemic and offers valuable insights for HRM professionals to foster engagement and well-being in the healthcare industry. This, in turn, may ensure a more sustainable workforce that can deliver high-quality work during public health crises.

Literature review

Public responses and their impacts on HCWs

During the time of the public health crisis, many people rely on the media to obtain relevant information. Due to the prevalent use of social media, the public is also free to share opinions and views, which formulates the public response. As limited studies have suggested that media exposure could induce stress (e.g., Garfin et al., 2020; Secker and Braithwaite, 2021), there is also a lack of studies that examine public response as a factor to occupational stress, which would also affect work engagement and well-being. However, we can refer to some indirect evidence from existing research. For example, when the public responses are positive, HCWs may interpret them as a form of social support, which has been proved to be inversely related to depression, anxiety, irritability, sleep quality, and loneliness during the COVID-19 pandemic (Grey et al., 2020; Cohen and Nica, 2021). Being recognized and appreciated by the organization at the workplace was also found to improve work engagement and well-being among HCWs (Strömgren et al., 2016; Anwar and Qadir, 2017; Denning et al., 2021). This indirect evidence posits the proposition that positive public responses may enhance HCWs' work engagement and well-being. On the other hand, the negative responses in public are assumed to decrease HCWs' work engagement and well-being during the pandemic.

HCW's work engagement

Employee work engagement is defined as an individual's level of commitment to and involvement in their organization and its goals in general (Markos and Sridevi, 2010). Opposite to burnout (González-Romá et al., 2006), work engagement entails vigor, dedication, and absorption in one's work (Schaufeli et al., 2002). During the COVID-19 pandemic, work engagement among HCWs served as a type of mental resilience and a protective strategy against burnout (Allande-Cussó et al., 2021). Its importance also manifests in its direct prediction of job performance (Christian et al., 2011), employee retention, and safety (Harter et al., 2002).

Research showed mixed impacts of COVID-19 on HCWs' work engagement (Nemțeanu et al., 2022). In some studies, most HCW participants self-reported symptoms of burnout in Singapore (Lum et al., 2021), Italy (Barello et al., 2020), and other countries (Denning et al., 2021). On the contrary, in China and Spain, frontline HCWs were found to have high levels of work engagement, such as dedication (Gómez-Salgado et al., 2021; Zhang et al., 2021). This implies that there are other understudied factors that may impact HCWs' work engagement during the COVID-19 pandemic.

HCW's well-being

Well-being at the workplace includes the physical, psychological, and emotional health of employees in terms of their overall state of being comfortable, healthy, and happy (Pradhan and Hati, 2019). HCWs' well-being is significantly more important compared to other industries due to the grave challenges that they face at their workplace (Tomo and De Simone, 2017). Such challenges included difficult work schedules such as night shift work, being exposed to infectious diseases, and psychological stressors, which negatively affected their well-being (Tomo and De Simone, 2017). These workplace conditions have been aggravated by the COVID-19 pandemic, which has badly affected HCW's well-being (Denning et al., 2021; San Juan et al., 2021). In the last 2 years, HCWs have experienced burnout, work-family imbalance, and high levels of anxiety, depression, fear, and stress (Marton et al., 2020; Tan et al., 2020b). These work conditions may be hard to change due to the variants of viruses, but other factors might be the key to improving HCWs' well-being.

HCW's calling

For many HCWs, their career choice was a calling in terms of making a difference in society and helping others (Gordon and Nelson, 2005). Individuals with career or occupational calling work with a strong sense of meaning and purpose and have a desire to contribute to the community (Dik and Duffy, 2009; Elangovan et al., 2010). It has also been established that perceived calling relates to a higher level of work engagement (Duffy et al., 2011; Hirschi, 2012; Ziedelis, 2019). As such, occupational calling served as a psychological buffer for HCWs in challenging situations, such that stronger occupational calling weakened the association between stressors and burnout among healthcare professionals (Creed et al., 2014). As a result, individuals with a realized occupational calling would have higher work engagement and healthier well-being than those who had no calling at all (Gazica and Spector, 2015). On the other hand, when individuals with clear occupational callings fail to perform these callings (Berg et al., 2010), they often show lower work engagement and well-being than those who are living their perceived calling or who do not have a calling to a particular vocation (Gazica and Spector, 2015).

Self-determination theory

We contend that HCW's occupational calling may serve as a mechanism to explain why public responses impact their work engagement and well-being. As the theoretical foundation, we draw upon the Self-Determination Theory (SDT; Ryan and Deci, 2000). Essentially, the SDT assumes that people are motivated to grow, master, and integrate experiences into a holistic sense of self on three bases of needs—the need for autonomy,

competence, and relatedness. And the development of the sense of self requires individuals' ongoing interactions with the social environments surrounding them. These social environments can either support or inhibit these needs. This dynamic of individuals socializing with the environment shapes the predictions about people's work, life experiences, and psychological states twofold. First, the ongoing satisfaction of these three needs facilitates well-being and work engagement. On the other hand, if some or even all these needs are unmet, there will be detrimental effects on individuals' work engagement and well-being (Ryan and Deci, 2000).

During the COVID-19 pandemic, public responses are one important factor in the social environment that impacts HCW's three needs altogether. Based on self-determination theory, healthcare workers tend to be intrinsically motivated with the utmost desire to help others (Muthuri et al., 2020), which entails relatedness (i.e., the need to feel connected with others), competence (i.e., the need to feel effective in achieving desired outcomes), and autonomy (i.e., the urge to act consistent with an integrated sense of self and take direct actions that would result in real change; Gagné and Deci, 2005; Broeck et al., 2010). As such, being recognized and appreciated by the public can satisfy HCWs' basic psychological needs, which improve their work engagement and positive well-being (Gazica and Spector, 2015). On the other hand, negative public responses in the social environments would bring adverse effects on HCWs' work engagement and well-being. Their need for relatedness is not satisfied because they are ostracized by the people whom they are called to help and thus end up feeling discouraged or disheartened. Their need for autonomy is compromised because they may feel that they are not able to control public responses, including discrimination and stereotypes. Their need for competence is also unfulfilled because they may see that the public does not accept their suggestions or acknowledge their contribution and thus end up feeling helpless or useless in performing their roles. In these ways, both positive and negative public responses can significantly impact HCWs' work engagement and well-being during the COVID-19 pandemic.

Nonetheless, not all HCWs are motivated by calling. There are other HCWs who are motivated by extrinsic factors, such as money and job security (Muthuri et al., 2020). In this case, their relatedness, competence, and autonomy needs might not be associated with their careers. Thus, we propose that public responses have more impact on the calling-motivated HCWs than on the extrinsically-motivated HCWs.

Overview of studies

To uncover public responses toward HCWs during the COVID-19 pandemic, how and why they impact HCWs' work engagement and well-being, and how HRM can navigate such impacts, we conducted two studies with both quantitative and qualitative methods. Study 1, as a quantitative study, focuses on automatically understanding the public responses toward

HCWs by analyzing the large scale of social media data *via* AI and big data analytics. Adopting AI and big data technologies to understand the HCWs' work engagement and well-being has been promising for collecting public information (Campbell and Popescu, 2021; Maxwell and Grupac, 2021; Nemțeanu et al., 2021; Riley and Nica, 2021). In order to obtain the public responses, we developed automatic data scripters to crawl the Tweets toward HCWs from the Twitter platform during the COVID-19 pandemic. Based on the crawled tweets, we performed the sentiment analysis to discover the sentiments or emotions (i.e., positive, negative, or neutral) for each tweet toward HCWs. Furthermore, we conducted the topic modeling to analyze what are the topics or concerns for each category of tweets. This enables us to understand their emotions and concerns toward HCWs.

Study 2, as a qualitative study, further examined how and why such mixed public responses impacted HCWs' work engagement and well-being in different ways. We interviewed 18 HCWs working in Singapore and asked about their calling to be HCWs, the factors that impacted their work engagement and well-being during the COVID-19 pandemic, and what their HRM did effectively or ineffectively. We transcribed their responses for qualitative coding, based on which we identified how positive and negative public responses influenced HCWs' work engagement and well-being and effective HRM practices. We also further compared the impacts of public responses on those who had an intrinsic calling versus those who did not have an intrinsic calling.

Study 1 on public responses *via* big data

Materials and methods

Social media platforms (e.g., Twitter and Facebook) have been widely used for people to share their opinions and thoughts. Twitter, as one of the world's largest social network platforms, hosts a plethora of user-generated posts that closely reflect public reactions (Szomszor et al., 2009). Therefore, we used Twitter as our data source to collect the public responses toward HCWs. This enables us to get responses from a large number of users, which are more representative of the public. Our method consists of several major components, including data collection, data cleaning and pre-processing, sentiment analysis, and topic detection under each sentiment. The details of each component are provided below.

Data collection

The objective of data collection is to collect public responses toward HCWs during the COVID-19 pandemic from Twitter. To do so, we developed one automated data scripter using Python to

crawl the tweets that related to HCWs. The tweets were crawled using a certain set of hashtags related to HCWs, such as #healthcareworkers, #nurses, #frontlineworkers, #doctors, #essential, #firstresponders, #publichealth, #thankyoufrontliners, #nursesrock, #frontliners, #healthcareprofessional, #savinglives, #fightCOVID-19, #worldhealthday, #thankyoufrontlineworkers, and so on. These hashtags are the popular ones related to HCWs. Therefore, when the discussion includes these hashtags, the tweets are most likely talking about something related to HCWs. The crawler scraped 100 tweets at a 15-min interval. In the end, we crawled 400,000 tweets related to HCWs during the COVID-19 pandemic.

Data cleaning and pre-processing

After crawling the data, we first cleaned the dataset such that the irrelevant information in the data would be removed to improve the analysis performance. Irrelevant information mainly includes those irrelevant symbols or characters that exist in the tweets but may not be needed in the analysis. Below are the major data-cleaning tasks performed to clean the tweets.

Removing NaN values

For some tweets, there were NaN values that do not contribute to the meaning of the data. The NaN stands for Not A Number and is normally used to represent the missing value in the data. Thus, all the NaN values were removed.

Removing duplicate tweets

Duplicated tweets were also removed as duplicate data might affect the analysis to cause some form of extreme sampling or bias to the model.

Removing tweets with less than three words

We also removed all the very short tweets (e.g., containing less than three words), as they may not be meaningful and effective enough for the analysis.

Removing @users

Usernames are not relevant and are noises for the analysis. Thus, they were all removed before the analysis.

Removing URLs

URLs in tweets are not useful as they do not contain words of sentimental value or topics, which were thus removed.

Removing special characters

Special characters refer to the irrelevant symbols (e.g., #, !, $, etc.), and numbers that do not contribute to the analysis. These characters were removed.

Removing RT

Tweets that were retweeted from another tweet have the "RT" in them. This does not contribute any meaning to the analysis, and they were removed as well.

Removing stop words

Stop words refer to the most common words in a language that does not add much meaning to a sentence, such as "the," "an," "so," "the," and "what." These words can be safely ignored without sacrificing the meaning of the sentence. As this information does not provide any information to our model, they were also removed. We obtained the stop words list from the Natural Language Toolkit (NLTK).[1]

Tokenization

Tokenization is another most common task in natural language processing to pre-process text data. It is essentially splitting a tweet (e.g., phrase, sentence, or paragraph) into smaller units, such as individual words or terms. Each of these smaller units is called a token. Tokenization helps us to identify the words that constitute a string of characters. This is an important step, as the meaning of the text could be easily interpreted by analyzing the words present in the text.

Lemmatization. For grammatical reasons, the sentences in human language may use different forms of a word (e.g., are, were, going) or families of derivationally related words with similar meanings (e.g., democracy, democratic, and democratization). However, these words may refer to the same meaning. Therefore, we performed the lemmatization to reduce inflectional forms and derivationally related forms of a word to a common base form, which is used to build the dictionary, models, and evaluations.

Sentiment analysis

To understand the emotions of the responses toward HCWs and associated topics, we conducted sentiment analysis on the processed dataset to detect and categorize the tweets based on their sentiment. We categorized all the tweets into three emotion categories, positive, negative, and neutral.

To conduct sentimental analysis, we employed the Natural Language Toolkit (NLTK), which can process the natural human language data to provide statistical natural language insights. VADER (Valence Aware Dictionary for Sentiment Reasoning) was chosen for the analysis as it does not require any prior training data and can easily understand text even if there are punctuations and common speech text (Rahul et al., 2021). Based on VADER, we evaluated the sentiment scores (also referred to as the polarity scores) for each tweet. The polarity score returned from using VADER can be categorized into the categories "negative," "neutral," "positive," and "compound." Each category refers to the sentiment scores of the tweet, with the compound category representing the sentence's emotion. For example, a tweet with the score of {"neg:" 0.539, "neu:" 0.261, "pos:" 0.0, "compound:" −0.8849} could represent that the tweet has mostly negative and neutral sentiments and no positive sentiments at all. The "compound" key, which is calculated by normalizing the other three

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1 https://www.nltk.org/
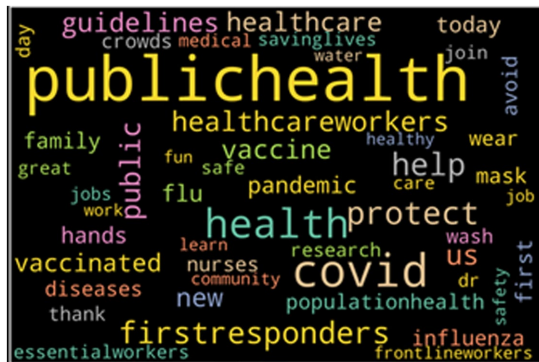
FIGURE 1
The topic 50 keywords from the entire dataset.
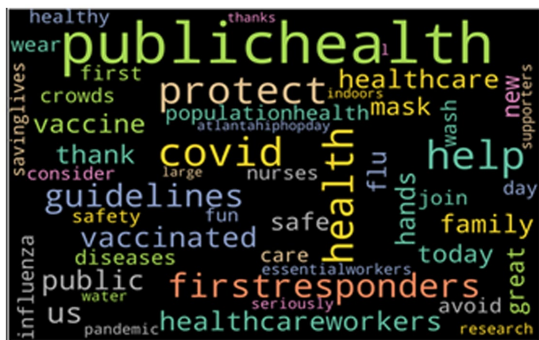
FIGURE 2
The top 50 keywords from positive tweets.

emotions, represents the overall sentiment of the sentence. If the compound value is more than 0.05, the analyzed tweet is positive. If it is less than −0.05, it is negative. Otherwise, it is neutral.

Topic detection

After the sentiment analysis, we also studied, in each category of the emotional tweets, what topics were mentioned. This helps us better understand the reason why they had such emotion while they commented toward HCWs on Twitter.

To do so, we employed topic modeling techniques to automatically identify the topics embedded in the tweets. Topic modeling is the task of using unsupervised learning to extract the main topics (represented as a set of words) that occur in a collection of documents like tweets (Wang et al., 2017). We first divided all the tweets into three categories (i.e., positive, negative, and neutral) according to their sentiments. For each category of tweets, we built an LDA (Latent Dirichlet Allocation) model using Gensim AI libraries to extract the topics under the collection of tweets. Gensim was chosen as it is easy to build topic modeling (Akef et al., 2016). The only concern is that clean data are required

to be in the form of tokenized words. After the data are pre-processed, a dictionary and corpus need to be created to be used as input for LDA models. Gensim Corpora Dictionary was created to store the mapping of words and their integer IDs. To generate the Corpus, Gensim Corpora Dictionary doc2bow was used. The corpus was then mapped to the words found in the lemmatized parsed data and its frequency.

To determine if the topic modeling is good, we evaluate it based on the result of the coherence score and its compute perplexity. A higher value in coherence score or a lower value in compute complexity represents a better topic modeling approach.

Results

Sentiment analysis

To evaluate the overall sentiments of the dataset, we made use of the Matplotlib library to better visualize the output of the sentiment scores. The result indicates that most of the tweets concerning HCWs were of positive sentiments. In the entire dataset, 55.9%, 27.2%, and 16.9% of them were positive, neutral, and negative, respectively. This shows that tweets that mention HCWs were generally positive in nature, with a small portion of them being negative.

Furthermore, using word clouds to visualize, we can dive deeper into what words were used frequently in regard to the various sentiments. Using both the Matplotlib and word cloud library, we visualized the most 50 frequent words grouped by their sentiments. Figure 1 provides an overview of the overall word cloud with the top 50 most frequently mentioned words in the entire dataset. The bigger the font size of the word, the more frequently it is mentioned. From the result, we can see that most of the words used are not negative in nature.

Figure 2 provides the word cloud with the top 50 most frequently mentioned words of tweets that have a positive sentiment. From the word cloud, we can see that when people discuss toward HCWs, many words like "protect," "help," "thank," and "health" are used frequently. These are all words of gratitude toward the HCWs, including appreciation and positive wishes.

Figure 3 indicates the negative word cloud with the top 50 most frequently mentioned words of tweets that have a negative sentiment. As seen, many words (e.g., "death," "stop," "dies," "crowds," and "crisis") are frequently used in such tweets that could be inferred as pessimistic words to use. These are all words of fear and uncertainty toward the HCWs, implying rejection and stereotypes.

Lastly, Figure 4 provides the word cloud that shows the top 50 most frequently mentioned words of tweets with a neutral sentiment. As seen from the word cloud, when people discuss toward HCWs neutrally, they use more neutral words. Many words like "science," "doctors," "medical," and "research" are frequently used in such tweets.

FIGURE 3
The top 50 keywords from negative tweets.

FIGURE 4
The top 50 keywords from the neutral tweets.

Subjectivity analysis

In addition, we also studied the subjectivity and objectivity of the tweets. Subjective sentences generally refer to personal opinion, emotion, or judgment, whereas objective refers to factual information. To conduct the subjectivity analysis, we utilized Textblob,[2] which is a python API commonly used in natural language processing. Using Textblob, we identified the subjectivity and objectivity of each tweet. Our finding shows that 72.5% of tweets are objective, and 27.5% are subjective. Since objective tweets are tweets that are more rational and unbiased, we can conclude that majority of tweets and comments toward HCWs on Twitter are not influenced by the person's emotion or judgment but by factual information.

Subjectivity vs. polarity

To compare subjectivity and polarity, we provide a scatter plot as shown in Figure 5 using Ploty Express. As shown in the scatter plot, there is a cluster around polarity from 0.6 to 0.8 and subjectivity from 0.2 to 0.5. This shows that most of the tweets are

positive in polarity and objective. This indicates that most of the tweets are rational and of positive sentiments toward the HCWs during the COVID-19 pandemic.

Topic detection

Next, we study the topics under each category of sentiment tweets. To be intuitive, we used an interactive chart to display the results using PyLDAvis[3] such that the topics could be easily interpreted. Figure 6 shows the identified results for the negative tweets. The left side of the six bubbles indicates six identified topics. While clicking each topic on the left, the right side shows all the words included in the topics, where the bar size represents the overall frequency of the words that appeared in this topic.

As the image result (as in Figure 6) in Gensim LDA model cannot be fully visualized, for ease of presentation, we also present the six topics with the involved top 10 keywords into the word cloud presentations, as shown in Figure 7. From the keywords in each topic, we can roughly identify the major meaning of each topic for those tweets with negative sentiments, which are provided below:

Topic 0: related to uncertainty.
Topic 1: related to politics.
Topic 2: related to COVID-19.
Topic 3: related to pandemic.
Topic 4: related to precaution measures.
Topic 5: related to economy and working practice.

Figure 7 shows that when people had negative emotions in tweets, the top six topics mentioned were related to uncertainty, politics, COVID-19, pandemic, precaution measures, economy, and working practices. In particular, most of the tweets revolved around the idea of being unsure of how the pandemic is going to be and how the disease will affect the people infected, especially the HCWs. There were also concerns about how it would affect the economy and what kind of response should be taken in current situations.

For all the tweets with positive sentiments, we also performed the topic modeling, and the results are shown in the interactive chart in Figure 6. However, as the interactive chart cannot be fully displayed in figures, we will only show the identified top six topics, each of which is shown in a word cloud with the top 10 keywords in Figure 8.

From Figure 8, we can see that the following are the possible topics that are appearing in each word cloud based on all the positive tweets:

Topic 0: related to good practices.
Topic 1: related to lifestyles.
Topic 2: related to vaccines.
Topic 3: related to health.
Topic 4: related to nutritious food.
Topic 5: related to safety measurements for the company.

FIGURE 5
Subjectivity vs. polarity scatterplot.

FIGURE 6
Negative topic words in Gensim LDA model.

The result indicates that when people were tweeting positively, the tweets likely discussed good practices, healthy lifestyles, vaccines, health, nutritious food, and safe measurements for the company. On the positive word clouds, tweets include ideas on how to prevent infection, maintain good health, and shop for nutritious food like sunflower and pumpkin, and company measures to keep people safe. Such words can be considered caring and might also be tips on how to reduce the chance of infection. Tweets like these are heartwarming as people could be trying to reduce the rate of infection to prevent strain on the HCWs.

Study 2 on impacts of public responses on HCWs

Materials and methods

Participants

The participants were individuals from Singapore's healthcare industry across different positions who have worked in the industry before, during, and after Phase 1 (1 June 2020–18 June 2020) and 2 (19 June 2020–17 July) of

FIGURE 7
The top six topics for the tweets with the negative sentiments.

Singapore's Circuit Breaker. The Singapore Circuit Breaker was designed to combat the spread of the COVID-19 pandemic within Singapore (Lee, 2020). An HCW is defined as an individual who is currently working in the healthcare industry and providing care and services to patients through direct or indirect means. Direct includes doctors and nurses, while indirect includes aides, helpers, laboratory technicians, or even medical waste handlers (Joseph and Joseph, 2016).

Eighteen participants who completed the interviews included those who were directly (e.g., doctors, nurses, clinic assistants, etc.) and indirectly (e.g., patient service associates) delivering care to patients. The age range of the participants ranges from 21 to 60 years old. Participants are both local Singaporeans and non-locals from China and the Philippines who are working in Singapore. There was no specification on the nationality ratio, and the participants were recruited voluntarily. The detailed participant demographics are provided in Table 1.

Procedure

We advertised our research study through social networking platforms such as Facebook, Instagram, and LinkedIn and through personal contacts, and asked for individuals from the healthcare sector to participate in interviews. Interested participants were invited to an online interview *via* the Zoom platform with their identities kept private and confidential. Each interview lasted between 30 and 90 min, depending on participants' experiences and willingness to share their experiences. Of the 18 interviews we conducted, three research assistants first conducted 12 interviews from March to April 2021. The second round of interviews took place in August 2021, where three research assistants subsequently joined and conducted six interviews until the data was saturated. Among all the researchers and research assistants, there was no HCW. According to Khawand and Zargar's qualitative research (2022), we avoided any presumptions and biases for the purpose of reflexivity. In this case, the influence of the researchers' personal presumptions was minimized in the process of

FIGURE 8
The top six topics for the tweets with the positive sentiments.

interviews (Fischer, 2009). When the research assistants conducted interviews, the first and third authors monitored each interview to ensure that dialogs of good quality were established.

After their collection of interviews, the analysis gathered from the first round of interviews in April 2021 was shared with the three research assistants to discuss whether the interpretation and analysis were aligned. All 18 interviews were recorded using the Zoom recording function with participants' consent. All these recordings were deleted after transcription in MAXQDA software. All designed questions for the interview were asked. The semi-structured interview with open-ended questions was displayed on a slide *via* the screen-sharing function on Zoom for participants to refer to and to minimize potential mishearing and misunderstanding of the question.

The questions used during the interviews have been specially created for the participants to share their experiences for our research objectives. We had four subsets of questions. The first subset was about healthcare workers' motivation to join or stay in the healthcare industry, e.g., "What motivated you to take this job?" "What are the most important tangible or intangible rewards that you expect in your career?"

The second subset was about general factors that impact their work engagement, e.g., "what positively and what negatively impacted your work engagement and well-being during the COVID-19 pandemic?"

The third subset was about the public views "Does the public view affect your work engagement and well-being as an HCW? In what way?"

The fourth subset was about their HRM practices. Sample questions include "Were there any HR practices or initiatives implemented that were helpful in increasing (or decreasing) your work engagement and well-being during the COVID-19 pandemic? Why and why not?" "Were there any HR practices or initiatives that you wish could be implemented? If not, what would improve your work engagement and well-being during the COVID-19 pandemic?"

Item	Category	Frequency
Age range	18–24 years old	1
	25–34 years old	8
	35–44 years old	3
	Unknown	6
Gender	Male	4
	Female	14
Nationality	Singaporean	10
	People's Republic of China (PRC)	6
	Philippine	2
Marital status	Married	4
	Single	9
	Unknown	5
Children	Yes	2
	No	10
	Unknown	6
Working years in the healthcare industry	10 years or more	8
	2 to 5 years	6
	6 to 9 years	3
Occupation	Doctor	1
	Doctor trainee	1
	Nurse clinician	1
	Registered nurse	4
	Senior occupational therapist	1
	Senior patient service associate	1
	Senior staff nurse	3
	Staff nurse	4
	Hospital staff	1
	Vaccination center nurse	1

The questions about work engagement and well-being were all asked separately. In addition, a set of Chinese-translated interview questions, introduction, explanation, and definitions were done and used during the interviewing of the Chinese-speaking participants. The purpose of the translation is to help those speaking in Chinese to conduct the interview comfortably in their mother language. This enables us to collect more in-depth and high-quality information for the study.

Analysis

The first and third authors separately and collectively read through the transcripts, and the codes developed. We triangulated the data as we conducted analysis through discussion between the first and third authors. When assigning codes to each response to each question and developing themes based on the codes, the first and third authors and their research assistants discussed and negotiated various aspects of data and reached a unified conclusion regarding coding and interpretation of the data. During this stage, we had high

values of intercoder reliability (0.96), and thus it justified the choice of a single and final coder instead of two or more coders using one set of codes (Burla et al., 2008; Campbell et al., 2013). As a result, with a deep knowledge of the subject matter, the first author coded all the interview transcriptions in MAXQDA Analytics Pro 2020, a software for the analysis of qualitative data (Kuckartz and Rädiker, 2019). During the coding process, the authors kept discussing all the aspects and kept checking the codes and themes to ensure that the results were properly reported.

The transcripts were coded by the question set. We first coded the questions regarding the interviewees' motivators for them to join and stay in their jobs and the motivators to engage in their jobs during the COVID-19 pandemic. Based on this code, we categorized the calling-motivated interviewees and the extrinsic-motivated interviewees. We then coded what public responses the interviewees received and how they impacted their work engagement and well-being. Finally, we coded what HRM practices or initiatives were effective and ineffective in navigating such impacts. We coded the themes under questions regarding work engagement and well-being separately.

Results

This qualitative study addressed the major research question: How and why did public responses impact HCWs' work engagement and well-being? To improve their work engagement and well-being in this area, what did HRM do, and what could HRM do? Findings for these questions were crucial to understanding how to deal with the public responses to better improve the work engagement and well-being levels of HCWs, especially during pandemic crises.

How negative public responses impact HCWs' work engagement and well-being

When asked about the factors that negatively impacted their work engagement and well-being, as well as if and how the public view affected their work engagement, among the 18 interviewees, 9 (50.0%) mentioned that negative public responses negatively impacted their work engagement and 2 (1.8%) mentioned that negative public responses negatively impacted their well-being. Some examples of negative impacts experienced by the HCW's are illustrated below.

> *HCW 14*: "I see a lot of stuff that's coming out, blaming the nurses lately. I think that me and my friends are quite angry. That's discrimination on healthcare professionals in general. You can feel like the discrimination is there, there's a stereotype there. It makes you feel like what's the point of working so hard people do not even appreciate us."

> *HCW 15*: "When I hear colleagues, my colleagues, when they are being discriminated, that really for me, I feel a sense of anger."

The "stuff" that HCW14 was referring to was the public responses portrayed in the media and news. Based on HCW 14 and HCW 15, discrimination, blaming of the nurses, and stereotypes are the reality they face in association with their work. Because of the negative public responses, they felt negative emotions, such as anger and unappreciated, which compromise one's well-being at work. This is consistent with the findings of Study 1.

Specifically, they received negative language responses like criticism, for example:

HCW 1: "We go to work, we are also risking our lives to face patients, and we do not know if the patient has or does not have [the virus]; everyone is questioning each other. Do you have COVID? We risk our life, but in a way, we were like, outcast by the public. Like, 'You work in a hospital. You have COVID.' That kind of thing. So, I do not have the motivation to go to work. I'm not being appreciated. So, what for?"

HCW 2: "By reading some newspapers, I think there's something happening like that, which made me more alert to the surroundings. I have not been wearing uniform to and from work, so I will continue not to wear it. Yeah."

Based on the two responses from HCW 1 and HCW 2, the uncertainty about the virus, its effect, and about who has contracted the virus brought additional stress at work, which reflects the finding in Study 1. The public may also associate whoever working in hospitals (i.e., wearing hospital uniforms) were suspected of carrying the virus, and as a result, people would stay away from HCWs or show negative attitudes toward HCWs.

The following cases show a more severe case of physical ostracism, for example:

HCW 7: "I have one neighbor. When he heard that I work in a hospital, he stepped back. Then he asked if I worked with COVID patients. But I told him that no, I worked in operation theatre. Then he was like okay already."

HCW 3: "I actually recalled one incident. I was working at the dormitory and the chalet. So, I was coming out from the chalet, then my Grab driver, he asked me, if this place was a quarantine facility? So, I said yes, he rolled down the windows, and he drove at 120/Km per hour. Okay, so I got pissed off, so if you do not want me to sit in your car and you think I'm dirty, you can just tell me. I can leave the car. You do not need to do these kinds of things to me."

The negative public response ended up restricting the HCWs' daily living that they used to enjoy before the COVD-19 pandemic. For instance,

HCW 4: "When we order food or beverages, if they see the order is from our hospital, they will not take our orders."

HCW 1: "We cannot go on a cruise; we are not allowed to. We have to ask for permission before going on a cruise."

Furthermore, up to 10 HCWs (55.6%) also faced tough patients and their families who were worried, impatient and did not understand their situations. The following stories revealed that HCWs also needed to face the negative responses from patients' families, who were worried due to the uncertainty and the inconveniences caused by COVID-19 restrictions.

HCW 4: "Since the pandemic, we had a rule that only one caregiver can accompany one patient. Some parents do not understand and then they will abuse us by saying 'this is stupid;' 'why are you so persistent.' They will have conflicts with us and gave us their bad attitudes."

HCW 3: "There was an influx of very tough patients to handle. So, it affected everyone's morale….The patients are getting more and more disturbed because they are affected by the pandemic."

HCW 1: "The challenge for me to approach them was so difficult due to social distancing rules. And then, you know, when you do not have face-to-face interaction, sometimes it's hard for patients to understand you."

In addition, the following response showed that HCWs were rather limited in explaining their medical practices and procedures to the public, which also fueled the uncertainty that the public faced.

HCW 8: "During Phase 1, because I wasn't in the COVID ward. So initially, I wore my uniform to work. But everyone shun from me. So, I decided not to wear my uniform to work. I can understand that everyone is panicking and anxious, and fear that nurses might have bacterial or nurses and result in spreading. I felt that it has affected my work engagement. Because as a doctor or nurses, we are here to help. We worked with precautious and with PPE very well. But for public they do not know how we are working in the hospital, how careful are we at work. But I cannot explain to people that I am not working in COVID wards. But inside my heart, I would feel a little uncomfortable."

The above responses from HCWs showed that not only they faced negative responses from the public because of their professions (i.e., wearing uniforms, showing that they work in hospitals), but they were also restricted in their daily living, in presenting their profession to the public, and even in engaging and explaining their professional practices to the public. The negative emotions experienced at work compromised their work engagement and well-being. Because of their professions, HCWs' receiving negative responses and being restricted in their daily living would bring them to question their calling and purpose at work.

Impacts of positive public responses

When asked about what factors positively impacted their work engagement and how public views affected their work engagement, 9 (50.0%) HCWs mentioned that the positive responses from the public positively affected their work engagement, and 2 HCWs (1.8%) mentioned that the positive responses from the public positively improved their well-being. They received positive public responses in terms of encouragement and recognition, for example:

> HCW 6:"Especially during Phase One, I still remember, almost every week, the words of encouragement, the appreciation letter from the public….Also, encourage letters and encourage words from the public."

> HCW 9:"It is just nice that there is a lot of encouragement from the public and a lot of recognition. It is nice to be appreciated."

The positive public responses also came in terms of tangible donations like food, beverage, gifts, etc.

> HCW 6:"In fact, the public, community, almost every week they give us food, and also there were donations as well."

> HCW 16:"The public also delivers food such as doughnuts, cookies, biscuits for all HCWs [in the hospital]."

> HCW 12:"I think the public that I met, fortunately, were quite nice. They did not ostracize. In fact, during the COVID period, [in] the hospital, we receive a lot of gifts from the public. Some of them were like fruit juice, a lot of other things or cupcakes, somebody even gave us vitamin C, a very expensive brand, and face moisturizer."

Why public responses impacted HCWs' work engagement and well-being

To further analyze why public responses had the above impacts on HCWs' work engagement and well-being, we coded the questions regarding the interviewees' motivators behind their joining and staying in their jobs and the motivators to engage their jobs during the COVID-19 pandemic. We found that those who had the calling to help people and a sense of meaningfulness and significance in their healthcare careers tend to be more influenced by public responses, both positively and negatively.

More specifically, in the interviews, when asked about why they joined or stayed in their healthcare jobs, calling to help people and the sense of meaningfulness and significance were mentioned 22 times by 12 interviewees. For example,

> HCW 10:"I always want to help people in terms of relieving pains and helping families to live better and [have] happier

lives. And with that, I concluded that medicine is the right field and children's health is the right field because children are essentially the center of the family."

> HCW 11:"When I was younger, I had an illness and I was quite determined to help and to give back and take care of other people and wanted to help other people. As a result, [I was] being exposed to the healthcare industry when I was much younger. So that has been my passion since and it has always been. So like I said, my passion was to help people. So, in my day-to-day job, I get to do that and I can see the influence that I'm able to have on other people's life."

> HCW 4:"I am motivated to work in the healthcare industry because I feel good doing something that helps people and makes people's lives easier. I feel that it is important to do something that I think is meaningful to myself and others, which keeps me motivated to work everyday."

Based on their responses, HCW 10, 11, and 4 all expressed that they chose to work in the healthcare industry because they wanted to help people due to their past personal experience or finding a sense of fulfillment from helping others.

In addition to the 12 interviewees who were categorized as calling-motivated HCWs, there were six interviewees who were categorized as motivated by extrinsic motivators such as monetary compensation, job security, or financial bond. When we compared the calling-motivated group with the extrinsically-motivated group, we found a qualitative difference in terms of the extent of being influenced by public views. For instance, among the six interviewees who were motivated by extrinsic motivators, positive impacts were mentioned three times and negative impacts one time. HCW 13 explicitly said her "motivation is money." And when asked about how public responses influenced her well-being, she said:

> *"The public delivers food such as doughnuts, cookies, biscuits for all healthcare workers."*

On the contrary, all 12 interviews who were motivated by their calling to help people mentioned that they were influenced by the public responses, which included 14 mentions of positive impacts and 15 mentions of negative impacts. In other words, the ones that were motivated by their calling were more sensitive to both positive and negative public responses. For example, when talking about why become an HCW, a calling-motivated interviewee, HCW 14, said,

> *"For me, it's mainly having a passion in medical science that helps me to find ways to [have] a career to help the society in the future, so, then of course nursing fits this role."*

Then, when asked about what influenced her work engagement during the COVID-19 pandemic, she said,

"Some of us feel like, this is my passion or calling, like we want to contribute, but when you see the way the public [viewed] us, everyone can feel like the discrimination is there, there's a stereotype; it makes you feel like what's the point of working so hard people do not even appreciate us."

HCW 14's response revealed that the negative public response made her question "the point of working so hard" when what she thought as her passion or calling—helping people—was not appreciated by the public in general.

Similarly, HCW 1 said:

"What motivates me to continue being in the healthcare industry is that, I'd say, being able to help people and understand how they feel. Then from there, even if there are some scenarios where you cannot help, you can always get external organizations to come in to help them, basically being able to help people it's what motivates me and also my colleagues."

HCW 1 further said the following when being asked if public views impacted their work engagement,

"Ever since the Circuit Breaker started, everybody had no idea how to fight this infectious disease. So whoever was working in healthcare, would [be] criticized or shunned away. It was quite hard, in the first place. For everyone, there was no appreciation of what we do. So at work, even when people come to visit, there's a lot of tension with the public. So that's one of the challenges."

Both HCW 14 and HCW 1's responses revealed that they experienced criticism, discrimination, and being shunned away by the people that they were called to help. Their feelings were also translated into tension at work and among colleagues, as they may have felt nervous, stressed, anxious, uptight, or even experiencing low employee morale. Some of them started to question why they should help these people who did not appreciate them.

At the same time, positive public responses could let the calling-motivated HCWs feel warm-hearted. For example, the HCW 12 said:

"I joined the healthcare industry, because I want to help people. What motivates me to continue being in the healthcare industry is the fact that I see my patients improve. [The patients] are achieving their goals, they are getting back to their life, they are not distracted by stroke or any other impairments, or they can manage their life conditions better, like the chronic ones, and they are more confident; they do not have to stay at home, they can still come out and be a normal life. So I think those are personal rewards for me my job."

The same participant, HCW 12, said the following when being asked about what influenced her work engagement:

"Generally, I think the public that I met, fortunately, they were quite nice. They did not ostracize. In fact, during the COVID period, [at] the hospital, we receive a lot of gifts from the public. Then some of them they were like fruit juice and a lot of other things or cupcakes, somebody even gave us vitamin C from a very expensive brand. And also like, face moisturizer, cream.

Therefore, comparing both groups of HCWs, extrinsically-motivated and calling-motivated, we conclude that for those HCWs who were motivated by the calling to help people, the impact of public responses on their work engagement and well-being was more salient.

Effective HRM practices regarding public responses

When asked about the HR practices or initiatives implemented that increased their work engagement and well-being during the COVID-19 pandemic, 3 HCWs mentioned that HRM conveying the recognition or appreciation from the public or patients improved their work engagement, and 1 mentioned the improvement of well-being, for example:

HCW 10:"They sent a lot of messages from the community to us so that we know that our effort is being recognized."

HCW 12:"They also try to get patients to write 'thank you' notes on why they appreciate us."

There were 24 mentions about HR departments delivering tangible benefits sponsored by the public, which could enhance their work engagement, and nine mentions about such HRM practices would improve their well-being. These tangible benefits included free food catering, vouchers or discounts, staycation, or other forms of donations sponsored by the public, for example:

HCW 10:"And they did organize a lot of things for us, for example, all those retreats, and some of them are sponsored by the community and the previous patients. So the hospital passes on all the messages to us so that everybody knows that our work is being appreciated by the community."

HCW 7:"Got one hotel staycation, but I think it was given out by other organizations, not by our hospital. But it's a free staycation for healthcare workers….I think from the public, when they donate things to us, the hospital will pass it on to different wards in rotations. They also gave us things like skin lotion and shower gel."

HCW 2:"Maybe food? We've got a lot of sponsors. And I'm actually quite grateful for the sponsors. I think the HR did a good job in maintaining the pantry with food. There's always food. You can get the food whenever you want to."

HCW 1: They do give us bentos. They were also Grab vouchers for us, both food and transport….They do give us a lot of support when they come up with these vouchers."

HCW 6: "Every week, we receive food from the public and the community as a kind of encouragement."

HCW 17: "Healthcare packs: when we receive, we will feel that the company is thinking for us, and we will feel appreciated. Everyone likes to receive gifts."

HCW 5: "Providing us with food catering for pandemic wards, Grab or taxi voucher, COVID-19 badge, Nurse Day hamper, Corporate pass for tourist attraction places. (They were) stopped for a few years already, for example, free entry to the zoo and bird park for up to 4 headcounts."

The above quotes showed that their respective HR departments or equivalents managed the rewards and benefits for HCWs, including distribution of donations, replenishing the pantry, and providing food catering or vouchers. This type of practice implies an active role of HR practitioners in providing support and care for HCWs, so that HCWs "would feel appreciated."

HRM practices regarding public responses in hope

For the question about "what are the HR practices or initiatives that they wish could be implemented but not that would improve their work engagement and well-being during the COVID-19 pandemic," five mentions were that they would welcome more tangible benefits such as food delivery and discount, for example:

HCW 1: "I think it's really cool. So they can actually offer a monthly food package where we just pay a certain amount and settle for us, and it delivers, or you can either collect it somewhere accessible by staff, or they can send it to our work desk. We have a service internally that allows delivery with robots. So I think there's one good initiative that they can do. We have robots, you know; you do not need a person."

HCW 5: "More benefits, probably. For example, more pertaining to family, like enrichment programs or family discounts for tourist attractions."

The reason why HCWs would appreciate bento's is because at the peak of the COVID-19 pandemic, they had to sleep and eat in hospitals for many days before they changed shifts. They would probably eat food from their respective cafeteria. Therefore, having outside food delivered to them would be a reward so that they could take a break from the usual cafeteria food and enjoy a moment of bliss outside of the hospital.

At the same time, it is noteworthy that 2 of the mentions indicated that they needed such benefits because of the social ostracism in public.

HCW 1: "During Phase 2 to 3, where we were allowed to gather in bigger groups. It's okay to go out in groups to settle our own food. But for us, we are still getting the stares. We would prefer a place, where it's just all healthcare staff. I understand that they are worried that they might contract COVID by just being near us. So, if the bento continues, this can help us."

HCW 1: "The bento stopped after a while. We can continue that. I mean, if we can, you know, instead of going to the public, even though it's common now, but people do still like you know, there is still a case. You do not know where they have been, you know, they are still cautious. With us, even though it's in a hospital, and I mean, you come and visit you are really committed. So I think they got one by which they continue the initiative. I do not mind paying."

Ineffective HRM practices regarding public responses

For the question about what HR practices had decreased their work engagement during the COVID-19 pandemic, 1 HCW mentioned that HRM provided too few tangible benefits to the public. For instance,

HCW 3: "Like sometimes they give us little snacks, vouchers but, do these vouchers make a difference? We are still very drained, right."

To some HCWs, while they may appreciate the tangible benefits, such as snacks and vouchers, their working conditions have not changed; they would also be too physically exhausted or tied up with long hours to enjoy the tangible reward.

Unexpectedly, three HCWs mentioned that they were unsure if it was from HRM.

HCW 8: "There's a hotel staycation, free for HCWs, but I am not sure if it's the hospital or other people give us."

HCW 12: "I'm not sure whether it was the HR department, but we definitely receive a lot of anonymous gifts like sponsorships such as all the different food that comes in. So I guess, there is the food and water. I'm not sure whether it's like the HR or it could be just my manager."

HCW 2: "I'm confused. Who is doing all this? Actually. I do not know if it is the HR or is it the government?"

As shown in these responses from HCWs, they were not clear whether the delivery of the tangible reward was from their

respective HR departments or from other organizations. There could be a few reasons attributed to the doubt about HR's role in supporting their work engagement. First, the HR department in the respective hospitals was not present or active in providing support. Second, communication from HR departments could be lacking, and the HR managers may not be "on the ground" with the HCWs. Third, the organization structure of the hospital could be complex in that HCWs being in the frontline would not normally interact with backend administrative support. This was probably because HRM was far away physically (occurrence frequency = 6) or HRM lacked communication or interaction with them due to working from home (occurrence frequency = 12), for example:

> HCW 7: "I feel that HR are very far away from us. Our hospital is very big, and I do not even know who is in the HR department."

> HCW 11: "When I feel that they are not concerned for me, it builds up this antagonizing relationship….They do not have a strong presence in my working life."

> HCW 2: "HR? More like the managers. Okay. Love and belonging. I do not think HR will go that far."

> HCW 9: "However, the HR left the HOD to manage us overall. This is because I think they have a manpower issue to help us personally."

> HCW 1: "HR does not care about my needs during the COVID-19 pandemic. Not really. It's during the pandemic, so there's minimized interaction with one another. So it's very hard for them to also meet our needs…."

> HCW 5: "I think it is so difficult to interact deeply with HR."

Discussion

Two studies with mixed methods demonstrate that mixed public responses toward HCWs have impacted their work engagement and well-being differently, and HRM could do something effective to intervene. Study 1 uncovers the mixed public responses toward HCWs existed online, with over half (55.9%) of positive emotions, 27.2% neutral, and 16.9% negative emotions. The results of topic modeling on each sentiment indicated that the commonly identified topics were related to their emotional fear, uncertainty, rejection of the negative sentiment data, and appreciation or gratitude for the positive sentiment data.

While Study 1 captured what kind of mixed responses toward HCWs generally existed in the online public environment from the perspective of the public itself. Study 2 was designed to explore the perspective of HCWs to uncover how and why such responses

impacted HCWs. Specifically, Study 2 further uncovered the more specific manifestations of the public's fear and appreciation as identified in Study 1, and revealed how and why these mixed public responses impacted HCWs' work engagement and well-being. In Study 2, we also explored how HRM could intervene or increase the capacities or resources of HCW to better deal with these public responses.

The results show that negative public responses were manifested as criticism, physical ostracism, rejection, and discrimination, and such responses compromised HCWs' work engagement and well-being. On the other hand, positive public responses were manifested as encouragement, recognition and tangible donations, and such responses improved HCWs' work engagement and well-being. Furthermore, these mixed impacts were more salient among those with an occupational calling to help others as compared to those driven by extrinsic motivators like money. To moderate such impacts, HRM, who helped convey the recognition or appreciation from the public or deliver tangible benefits sponsored by the public, improved HCWs' work engagement and well-being. HCWs would also expect the human resource department to cater food for them due to social ostracism in public. On the other hand, HRM who failed to do these or were absent in communication with HCWs decreased their work engagement and well-being.

Our results are consistent with the Self-Determination Theory, which proposes that when the needs for competency, relatedness, and autonomy are satisfied by the social environments, individuals will harvest good work engagement and well-being. An occupational calling provides meaning and enjoyment in an HCW's life and becomes part of an HCW's integrated sense of self. Therefore, when public responses are consistent with their integrated sense of self, they would facilitate satisfaction of the three needs. Consistently, our results suggest that the impacts of public responses on work engagement and well-being were more salient among HCWs who had an occupational calling than those without an occupational calling. On the other hand, the work engagement and well-being of those who do not have a calling to their healthcare vocation might depend on whether those three needs are met in other domains.

Implications for practice

The findings from our studies first serve as an alarm for the public about how they talk about or treat HCWs during health crises in various settings. Because public responses do impose an impact on HCWs in terms of their work engagement and well-being, the public should have the responsibility to respond properly. For example, the public should remind themselves of the observable and hidden consequences when they plan to post negative responses on social media. To navigate such public responses, various institutions such as the government, mass media, and WHO must take effective actions to help reduce the uncertainties and fear about COVID-19. To reduce the negative

responses toward HCWs, active management efforts can be taken, such as proper health education targeting the public (Bagcchi, 2020). On the other hand, the government and mass media should also create an environment and atmosphere of appreciation and recognition for the sacrifice of HCWs, which are suggested to increase their work engagement and well-being.

Our research further provides insight into planning effective HRM initiatives and implementing effective HRM practices in response to the public views or reactions toward HCWs. Our results suggest that, to improve HCWs' work engagement and well-being, HRM professionals could serve as the bridge between positive public responses and HCWs by passing encouragement and recognition from the public and by distributing tangible benefits sponsored by the public. We recommend HRM practitioners in the healthcare industry consider creating a culture that supports nursing staff and providing them with a well-balanced total reward system that is flexible and adjustable, particularly at the time of crisis. For example, they can proactively contact relevant companies and governmental agencies to donate various benefits like discounts, vouchers, foods, and gifts, to the HCWs. HRM professionals can also proactively organize activities among communities and patients to convey verbal encouragement and recognition for HCWs in different terms. Specifically, to recognize the efforts of HCWs, HRM can post appreciation letters from the public or patients at the workplace of HCWs, or organize online events or letter-writing campaigns to gather encouraging words from the public and patients and deliver them to HCWs. We also recommend HRM executives in the healthcare industry must be more active in their communication with HCWs. More specifically, better communication channels that suit frontline workers who do not have access to phones and news as easily are recommended. Although HRM professionals may be working from home due to the pandemic, proactive communication and organized support would show that the organization is compassionate toward HCWs' efforts. HRM practitioners also need to develop its own presence and branding within the organization so that the HR department would be recognized and value add their initiatives. To tackle the issues incurred by the negative responses, the HRM department can initiate counseling, workshops, or hotlines to educate HCWs on how to react in a positive way.

Strengths, limitations, and future directions

In this paper, we have explored a new approach to understanding public responses toward HCWs during the pandemic, revealed how and why they impacted HCWs' work engagement and well-being, and provided practical recommendations for HRM professionals to better navigate these impacts. Our research has opened many interesting areas to extend the research in the future. For Study 1, first, we are currently utilizing only Twitter data. Additional data from social

media platforms such as Facebook and Instagram, which allow for more words and images, would also provide more interesting insights than Twitter which contains word limits. Second, we use the predefined set of hashtags to identify those comments toward HCWs in Twitter data. There are more tweets without these hashtags that could potentially relate to HCWs as well. It will be interesting to explore more advanced event and topic detection algorithms such as sarcasm detection to discover more interesting comments from Twitter or other social media platforms.

For Study 2, our sample size of 18 was relatively small, even though the interviews provided deep insights on the topic. Future studies could use survey techniques to expand the number and occupational categories to a broader range to account for all areas of the healthcare industry, ensuring more representative findings and analysis. In addition, survey can also help identify the quantitative predictions of public responses on HCWs' work engagement and well-being. As our sample for Study 2 is restricted, future investigations may benefit from including samples from various areas of the healthcare industry and human resources, for example, specialists. In this way, scholars could map the potential consequences of COVID-19 in various areas and institutions.

Additionally, due to safe-distancing measures during the COVID-19 pandemic, on-site face-to-face interviews were avoided for our data collection. Instead, the interviews were conducted *via* Zoom, and the camera function was also turned off to protect the identity of the participants. Therefore, this limited the ability to discern the participants' non-verbal cues during the interviews, which could have provided greater insights as such cues would have complemented the actual words that were spoken and added to their meaning. Future research can consider face-to-face physical interviews that allow the analysis of their body language to better interpret their answers.

Lastly, the current sample of interviewees worked in various sizes of hospitals and clinics, which suggest that the capability of HRM would vary across organizations. Future research can also incorporate the use of interviews and surveys from HR professionals in the healthcare sector to gain a deeper understanding of HRM strategy and planning.

Conclusion

Our findings highlight the significant impact of public responses on HCWs' work engagement and well-being and what HRM professionals could do to navigate these impacts. Although many of the online sentiments are positive (i.e., gratitude, caring, including appreciations and positive wishes) and some are negative (i.e., emotional uncertainty) toward HCWs during the pandemic, it is noteworthy that both existing positive and negative public responses could impact HCWs' work engagement and well-being. Specifically, negative public responses affected HCWs' work engagement and well-being negatively, and positive public responses impacted them

positively. Furthermore, such differentiated impacts were more salient among the HCWs who were motivated by calling as compared to those who were motivated by extrinsic factors. As such, our research contributes to the literature by suggesting self-determination theory and vocational calling as a mechanism to explain why public responses could exert such impacts. Based on our results, to promote the positive influence of positive public responses, we call for HRM professionals to serve as a bridge by proactively conveying verbal recognition and passing tangible donations from the public. Moreover, to prevent compromising of HCWs' work engagement and well-being, HRM professionals should make themselves visible or present despite the work-from-home policy through proactive communication with HCWs, highlighting their initiatives, and communicating with HCWs. We believe this is of great importance for handling crises in the healthcare industry in the future.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

The studies involving human participants were reviewed and approved by the Singapore University of Social Sciences IRB

Committee. The patients/participants provided their written informed consent to participate in this study.

Author contributions

WS was responsible for the overall research design and data collection and analysis of Study 2. ZW was responsible for the data collection and analysis of Study 1. MS was responsible for the theory development and data collection of Study 2. WS and ZW wrote the first draft of the manuscript. All authors contributed to the article and approved the submitted version.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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The influence of the COVID-19 pandemic on work connectivity behavior

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Introduction: Based on event system theory, this study analyzed the influence of the event strength of major public health outside the organization on work connectivity behavior.

Methods: The study collected data from 532 employees on their psychological status and working style during the COVID-19 pandemic through an online questionnaire survey.

Results: The results show that driven by financial risk perception, female employees are more willing to pay work connectivity behavior than male employees and unmarried employees are more willing to pay work connectivity behavior than married employees. The risk perception of employees aged 28–33 has the greatest impact on workplace behavior. The impact of financial risk perception on behavior of employees without children is much higher than that of employees with children. The influence of financial risk perception and social risk perception on their behavior of employees with master's degree is much higher than that of health risk perception, but the workplace behavior of employees with doctor's degree is mainly affected by health risk perception.

Discussion: The novelty of the Corona Virus Disease event has a negative influence on work connectivity duration. The criticality, disruption of the Corona Virus Disease event has a positive influence on work connectivity duration. The criticality of the Corona Virus Disease event has a positive influence on work connectivity frequency. Employees' social risk perception, financial risk perception and health risk perception has a positive influence on the work connectivity duration and work connectivity frequency.

1. Introduction

Since the end of 2019, a sudden outbreak of pneumonia caused by the novel coronavirus has disrupted China's hurried pace of economic development. Provinces, municipalities and autonomous regions of China have been affected, and the number of confirmed cases worldwide has reached 250 million. In response to the "black Swan" incident, the Chinese government made timely decisions to suspend or slow down non-essential production and economic activities, and enterprises immediately responded by using mobile communication devices and information interaction technology to achieve remote work from home.

In order to effectively control the rebound of the COVID-19 pandemic, Alibaba, Baidu, Tencent and other leading companies have taken the lead in using digital, intelligent, platform and sharing telecommuting modes in the fight against the epidemic, using communication devices (such as mobile phones and laptops) and application software (such as WeChat and ZOOM) to complete daily work tasks at home. Many companies are also responding to the call to reduce artificial staff turnover (Kaplan, 2014). In the context of the global epidemic and economic recession, the

traditional office mode has been completely changed, and employees can deal with the relationship between work and life more flexibly, and their work autonomy has been improved. But at the same time, the boundary between work domain and non-work domain is gradually blurred, the boundary between working time and non-work time is unclear, and employees perceive that their personal life is "invaded" by work (Lanxia et al., 2020). This kind of behavior in which employees participate in work through communication devices in non-working hours and assume multiple roles in work or life at the same time is called work connectivity behavior (Schlachter et al., 2017). As a product of the post-epidemic era and modern technology, this emerging flexible office behavior pattern is increasingly appearing in the daily work and life of employees, but the academic circle has not formed a research trend of widespread concern on this issue.

At present, the academic research on the antecedent mechanism of work connectivity behavior is only limited to the organizational level (organizational climate, organizational rules, corporate culture, etc.) (Lamar Reinsch Jr. et al., 2008; Fenner and Renn, 2010), the team level (supervisor trust, team member rejection, etc.) (Raghuram and Fang, 2014) and the individual level (personality, autonomous motivation, technology preference, etc.) (Ashforth and Fugate, 2000; Ohly and Latour, 2014; Wanda et al., 2015; Derks et al., 2016; Gadeyne et al., 2018). However, the butterfly effect of major events outside the organization on employees' psychological perception and behavioral response is not considered, that is, the risk perception of employees to external events affects their behavior habits and even has a huge long-term chain reaction to the corporate office mode. In general, previous studies on work connectivity behavior only focus on the internal environment of the organization, and there are few studies on the interaction between the external environment of the organization and employees' psychological perception and workplace behavior.

Therefore, based on event system theory, this study aims to explore how major public health events outside the organization affect employees' psychological perception and workplace connectivity behavior. This paper systematically combs and analyzes the influence mechanism and practical implications of event strength on employees' risk perception and work connectivity behavior in the context of COVID-19. The marginal contribution of this paper is as follows: firstly, based on the risk perception paradox model, the theoretical research framework of public health event strength on work connectivity connected behavior was established, and the research scope of work connectivity connected behavior was expanded. Secondly, in the context of COVID-19, the "black box" of the transmission process of external event strength to work connectivity behavior was opened, and the mechanism of the impact of event strength on employees' perceived social, financial and health risks in different industries, ages, educational backgrounds and genders on work connectivity behavior was explored. Thirdly, this paper provides guidance for deepening theoretical research on work connectivity behavior under public health emergencies. Discussed the workplace, the use and development of technology, has it improved work efficiency? Or does it blur the work family boundary?

2. Research basis and literature review

2.1. Event system theory

Previous literature believes that events are composed of "entities," and different entities interact to form events (Allport, 1954). The

outbreak and spread of COVID-19 worldwide have caused major fluctuations in the global economic situation on the macro level, and has a huge impact on the risk perception and working mode of employees within organizations on the micro level. Event System Theory focuses on the dynamic influence of event space, time and strength on organizations (Morgeson et al., 2015). The global COVID-19 outbreak accords with the research focus of event system theory, in terms of event time attribute, it has a long duration and has a great impact on enterprise management, ordinary employees, citizens and freelancers. In terms of the spatial attributes of the event, there are four dimensions: origin, vertical spread scope, horizontal spread scope, and distance among individuals. The COVID-19 pandemic has covered every city in China, covering a wide range of areas and spreading scope. Therefore, there is little difference between individuals in the temporal and spatial attributes of the event, but there is a difference in the strength attributes of the event. Individuals have different perceptions of the novelty, criticality and disruption of the event, which also greatly affects their behavior patterns to deal with the epidemic. The novelty of the event refers to the degree to which the event is different from the previous event. The newer the event is, the more it can attract the attention of the individual to the event, and then affect their behavior. The criticality of an event refers to its influence on the realization of enterprise and organization goals. The more critical the event is, the more individuals need to pay attention to the development process of the event and actively mobilize resources to deal with it. The disruption of the event refers to the degree to which the occurrence of an event changes and disrupts an individual's past life and habitual coping style. The more disruptive it is, the more it requires individuals to adjust their existing behavior patterns. The existing research scope of applied event system theory mainly focuses on organizational citizenship behavior (Zheng, 2020), dual-worker family management (Crawford et al., 2018), occupational stigma (Jie and Liangmu, 2019), employee creativity (Mo and Shengce, 2018), workplace deviant behavior (Liu et al., 2020) and other issues. However, there are few researches on the effect of external public health events on internal employees' work connectivity behavior by using event system theory. Therefore, based on the event system theory, this study quantifies the influence mechanism of strength stimulus at different latitudes of COVID-19 sweeping the world on employees' work behavior, and the differentiated behavioral responses of employees with different genders, ages, educational backgrounds and industries to health, social and financial risks were investigated.

2.2. The event strength has positive effect on work connectivity behavior

The discussion on the concept of work connectivity behavior originated from the end of the 20th century, when technological innovation and the improvement of communication technology made remote working possible (Nilles, 1998), and employees could complete their work in non-traditional office places through electronic communication and computer technology (Barber and Jenkins, 2014). "Work connectivity" refers to the office behavior of employees using mobile wireless devices to deal with work (Scholsser, 2002), which emphasizes a series of behaviors of organization members using portable wireless communication devices, participating in work or contacting colleagues during non-working hours (Richardson and Benbunan-Fich, 2011). Based on the theoretical perspective of subject initiative, some scholars have proposed that work connectivity connected behavior has

the following characteristics in terms of time, space and role context (Hill et al., 2003): In terms of time, employees can allocate their working time independently. The spatial aspect focuses on the communication between employees and work partners during non-working hours through rich information media, so that work is no longer limited to a fixed place (Cousins and Robey, 2005). In terms of role context, employees switch roles and tasks in different time and space, constantly experiencing role overlap (Richardson and Benbunan-Fich, 2011). Richardson and Thompson (2012) believe that frequency and duration are the two core dimensions of work connectivity behavior in terms of measurement.

In response to the call of epidemic prevention and control, many enterprises have encouraged employees to telecommute with the help of mobile devices in order to reduce staff turnover caused by commuting and reduce the cost of operation supervision. Boundary theory proposes that work and family are two typical domains of an individual, and an individual's time and energy in one domain will constantly infiltrate into another domain, which includes both the participation of multiple roles in the work domain and the joint undertaking of work and life roles (Ashforth and Fugate, 2000). Previous studies have shown that employees with high conscientiousness are more willing to participate in work during non-working hours and in any place through communication devices, such as communicating with work partners or all team members, holding video conferences and receiving replies to emails during holidays (Richardson and Benbunan-Fich, 2011). When employees are tired and stressed, they hope to recover themselves in non-working hours, and their work connectivity behavior will be reduced (Uranová and Ohly, 2016). Therefore, this study attempts to explore the impact of the strength of major public health events on the duration and frequency of work connectivity behaviors:

> *H1a*: Event novelty has a positive effect on the work connectivity duration.
>
> *H1b*: Event criticality has a positive effect on the work connectivity duration.
>
> *H1c*: Event disruption has a positive effect on the work connectivity duration.
>
> *H1d*: Event novelty has a positive effect on the work connectivity frequency.
>
> *H1e*: Event criticality has a positive effect on the work connectivity frequency.
>
> *H1f*: Event disruption has a positive effect on the work connectivity frequency.

2.3. The mediating effect of risk perception between event strength and work connectivity behavior

Risk perception is the public's cognitive and psychological reaction to situations or events (including human beings) that threaten something valuable (Setbon et al., 2005). Internal staff risk perception is used to describe the intuitive judgment of managers and employees on the development trend of internal or external risk events and their concerns about the uncertainty of event results (Slovic, 1987). "Risk

Perception Paradox" also proposes that there is not necessarily a significant positive correlation between the public's natural disaster perception and risk mitigation behavior (Wachinger et al., 2013). This is because employees in different industries and with different characteristics choose different coping methods when facing external risks of the organization, either positively facing or negatively escaping. Previous literature also found that when individuals face environmental health risks, there are two different behavioral paths of "resistance self-protection" and "isolation self-protection," that is, active confrontation to eliminate or overcome risks and self-isolation to reduce or eliminate the impact of risks on themselves (Breckler, 1984; Yanhu, 2018). Taking the SARS epidemic and Wenchuan earthquake as examples, some scholars found that SARS epidemic information and government measures affected people's perception of risk, and the higher the risk perception of individuals, the more likely they are to engage in negative coping behaviors (Kan et al., 2003). In high-risk environments, the public tends to reduce or avoid risks in the face of sudden disasters to relieve their inner pressure, so as to reduce their risk perception (Huaqiang et al., 2009).

People divide different role behaviors and their scope of activities by constructing boundaries. According to the boundary theory, the highly flexible and permeable work boundary allows employees to respond to the needs from the life field. The severity and duration of the COVID-19 epidemic are rare. Although all countries and regions respond to the call for prevention and control and advocate employers with conditions to adopt home-working, flexible working hours or flexible working hours, the increase in working hours and frequency makes employees' sense of work-home boundary blurred (Diaz et al., 2012). Using communication technology continuously can easily lead to job burnout, but the social, financial, health, time and other risks caused by the epidemic also aggravate the anxiety level of employees, putting them in a dilemma (Derks and Ba Kker, 2014). Therefore, the mechanism of risk perception between event strength and work connectivity behavior is worth exploring. Therefore, it is proposed that:

> *H2a*: The mediating effect of social risk perception between event strength and work connectivity duration.
>
> *H2b*: The mediating effect of social risk perception between event strength and work connectivity frequency.
>
> *H2c*: The mediating effect of financial risk perception between event strength and work connectivity duration.
>
> *H2d*: The mediating effect of financial risk perception between event strength and work connectivity frequency.
>
> *H2e*: The mediating effect of health risk perception between event strength and work connectivity duration.
>
> *H2f*: The mediating effect of health risk perception between event strength and work connectivity frequency.

2.4. The risk perception has positive effect on work connectivity behavior

Since the outbreak of COVID-19, the global economy has been blocked, and there are too many negative public opinions. 22.3% of
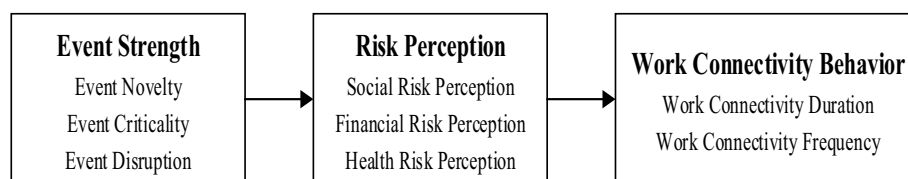
FIGURE 1
Theoretical model.

enterprises have reduced staff and salary, 15.8% of enterprises have closed down, and employees' perception of financial risk has intensified (Depoux et al., 2020), and they have a negative attitude toward personal income level, future development prospect of enterprises and overall macroeconomic situation (Guan et al., 2020). Therefore, employees have to accept the increase in working hours and frequency in order to survive the economic income. However, the long-term work connectivity behavior will aggravate employees' perception of health and social risks, thus causing the accumulation of negative emotions, such as depression, decadence, fatigue, fear and tension, and then leading to the decrease of work enthusiasm (Janssen et al., 2010), and even negative laziness, complaining, shirking responsibility, etc.

The study has found that the relationship between the risk perception of infectious diseases and work connectivity behavior is closely related to demographic variables, and there are significant differences in the connectivity behavior of employees in different industries, gender, education level, age and marital status (Chen et al., 2014). Therefore, it is proposed that:

H3a: Social risk perception has a positive effect on work connectivity duration.

H3b: Financial risk perception has a positive effect on work connectivity duration.

H3c: Health risk perception has a positive effect on work connectivity duration.

H3d: Social risk perception has a positive effect on work connectivity frequency.

H3e: Financial risk perception has a positive effect on work connectivity frequency.

H3f: Health risk perception has a positive effect on work connectivity frequency.

Based on the above hypothesis, this paper constructed a theoretical model of the influence mechanism of event strength on work connectivity behavior, as shown in Figure 1.

3. Research method

3.1. Sample

This study used online questionnaire survey to collect and obtain data. The research objects are employees working in enterprises and

public institutions. The research contents include event strength, risk perception, work connectivity behavior and individual level characteristic information, including gender, age, education background, income, industry, etc.

In order to ensure the validity, authenticity and reliability of the information obtained in the research, this research has adopted a number of control measures to strictly control all links in the research process. First of all, the survey participants were informed about the academic purpose of the survey in the initial guidance of the questionnaire, and promised that all materials will be used only for academic research, and the content of the answers will be strictly anonymous and confidential, thereby eliminating the concerns of the survey participants; Secondly, this survey used the questionnaire star and the plat-form of the Marketing Research Office of Peking University to collect data, and adopted the "snowball" method to collect questionnaires. "Snowball" means that the researchers contacted the staff of institutions, state-owned enterprises, and private enterprises in the Beijing Shanghai Guangzhou and other region, asking them to fill in the questionnaire, and then send it to their friends or other colleagues in their organization to participate in the survey; Finally, setting the answering time, controlling each item to be no less than 3 seconds, and counting the time it takes to answer the entire questionnaire, and eliminate the questionnaires that are not filled in carefully. In the survey, we collected 602 questionnaires，and asked the subjects to fill in their Alipay accounts and pay them 5 yuan through Alipay transfer. After eliminating invalid samples such as short answer time, incomplete filling and regular filling, 532 valid questionnaires were obtained, as shown in Table 1. In order to eliminate the response bias of the survey samples, the independent sample *T*-test was used to test the demographic information, and the results showed that gender, age, education background, income, industry and other covariate tests were not significant.

3.2. Measuring tools

Mature scales were used in this study: The event strength scale designed by Dong and Jun (2017), the risk perception scale designed by Johnson (2005), Vollrath et al. (2010), and Xu and Huang (2020), The work connectivity duration scale designed by Richardson and Thompson (2012), and the work connectivity frequency scale designed by Boswell and Olson-Buchanan (2007), were appropriately modified and augmented based on the situation of this study. Excluding the basic information, Likert's 7-point scoring method was used for all the questions in the study. The interviewed employees were required to score all the questions in the event strength scale and risk perception scale on a scale of 1–7, with 1 = "completely disagree," 4 = "neutral," and 7 = "completely agree." For the work connectivity

TABLE 1 Descriptive statistical analysis results.

Items	Options	Quantity	Percentage	Items	Options	Items	Options
Gender	Male	256	48.1%	Education	College	61	11.5%
	Female	276	51.9%		Bachelor	377	70.9%
Marital	Married	196	36.8%		Master	81	15.2%
	Unmarried	336	63.2%		PhD	13	2.4%
Children	≥1	180	33.8%	Industry	State Organs	139	26.1%
	0	352	66.2%		Institutions	104	19.5%
Age	<22	109	20.5%		State Enterprise	93	17.5%
	22–27	226	42.5%		Private E	114	21.4%
	28–33	137	25.8%		Foreign E	18	3.4%
	34–39	45	8.5%		Joint Venture	16	3.0%
	40–45	13	2.4%		Freelance	25	4.7%
	>45	2	0.4%		Others	23	4.3%

duration, such as "how long I spend on work-related tasks during weekends and holidays," the scale was set as "1–15 min," "16–30 min," "31–60 min," "1–2 h" and "more than 2 h." For the frequency part, such as "how often I deal with work-related affairs through emails in non-working hours" and other items, the scale is set as 1 = "completely inconsistent," 4 = "uncertain" and 7 = "completely consistent." And calculate the average value of all items in each scale. In terms of demography, control gender, age, education background, income and industry to avoid the impact of the above variables on work connectivity behavior (Table 2).

4. Result analysis

4.1. Reliability and validity test

The reliability and validity of the questionnaire were tested, and SPSS 22.0 was used to calculate the Cronbach's α of each scale to measure the reliability of the scale. The results showed that the Cronbach's α of event strength scale, risk perception scale and work connectivity behavior scale were all above 0.7, which met the reliability standard, indicating that the questionnaire had good internal consistency. Through the Bartlett test, KMO > 0.8, and $p < 0.01$, the load factor value of each item is higher than 0.6, indicating that the questionnaire has good structural validity.

4.2. Common method biases test

In order to avoid the common method deviation from affecting the research results, Harman's Single factor test was carried out. Put all variables into an exploratory factor analysis, check the unrotated factor analysis results, and determine the minimum number of factors necessary to explain variable variation. If only one factor is precipitated or the interpretation strength of a factor exceeds 50%, it is determined that there is a serious common method deviation. The results showed that the cumulative variance interpretation rate was 26.467%, less than 50%. Therefore, there was no common method deviation in the samples.

4.3. Confirmatory factor analysis

Further confirmatory factor analysis was performed to compare the degree of fit between competing models. Use AMOS 22.0 each factor to distinguish between the validity of the test model, the eight factors (event novelty, event criticality, event disruption, social risk perception, financial risk perception, health risk perception, work connectivity duration, work connectivity frequency) confirmatory factor analysis found that the fitting index of eight factor model was superior to that of other competition model ($\chi^2 = 713.124$, df = 247, TLI = 0.899, CFI = 0.917, RMSEA = 0.060), it shows that the questionnaire has good structural validity.

4.4. Correlation analysis

In order to avoid the collinearity problem of variables, the correlation coefficient between variables is tested first, and the mean and standard deviation of event novelty, event criticality, event disruption, social risk perception, financial risk perception, health risk perception, work connectivity duration and work connectivity frequency are calculated. To judge the correlation between the variables, the correlation coefficient |r| tends to 1, the more relevant, the closer to 0, the less relevant. See Table 3 for details.

It can be seen from Table 3 that there is no collinearity problem among the variables, so the following structural equation model test can be carried out to further explore the relationship between the variables.

4.5. Analysis on the difference of demographic variables

The difference analysis results of demographic variables show that in the influence of financial risk perception on work connectivity behavior, female employees ($B = 4.719$, SIG. = 0.000) are much higher than male employees ($B = 3.151$, SIG. = 0.000). Unmarried employees ($B = 0.221$, SIG. = 0.001) have more significant work connectivity behavior when facing the same degree of financial risk perception than married employees ($B = 0.109$, SIG. = 0.067). The behavior expression of

TABLE 2 Scale items.

Scales	Dimensions	Items	Factor loading	Cronbach's
Event strength	Event novelty	My enterprise knows the way to respond to this event.	0.813	
		My enterprise has an easy-to-understand procedure for dealing with this emergency.	0.803	
		My enterprise has established procedures and measures to deal with this emergency.	0.780	0.859
		My enterprise has standardized policies and procedures for following this incident.	0.812	
	Event criticality	Managing this emergency is critical to the long-term success of my enterprise.	0.675	0.755
		It is important for my enterprise to deal with this emergency.	0.688	
	Event disruption	This incident destroyed the original work capacity (performance) of my enterprise.	0.730	0.787
		This incident caused my enterprise to pause and think about how to respond.	0.803	
		This incident changed my enterprise's usual way of responding to emergencies.	0.709	
		This emergency requires my enterprise to change its previous way of working.	0.723	
Risk perception	Social risk perception	The epidemic has made it less convenient to buy staple foods.	0.746	
		The epidemic has reduced the convenience of purchasing commonly used medicines.	0.776	0.718
		The epidemic has led to fewer recreational visits to community parks.	0.671	
	Financial risk perception	Delays in resuming work due to the epidemic could lead to lower wages.	0.783	
		The epidemic is likely to reduce personal income this year.	0.779	0.703
		The epidemic may lead to their dismissal from the company.	0.635	
	Health risk perception	There are not many masks at home during the epidemic.	0.831	
		There are not many ways to get new masks during the epidemic.	0.835	0.830
		There are not many other epidemic prevention equipment and materials at home.	0.801	
Work connectivity behavior	Work connectivity duration	The average amount of time I spend using a mobile device (phone, laptop, tablet, etc.) to do work or communicate with colleagues after work each day.	0.770	
		The average amount of time I use a mobile communication device (phone, laptop, tablet, etc.) to do work or communicate with colleagues on weekends.	0.846	0.824
		The average amount of time I use a mobile device (phone, laptop, tablet, etc.) to do work or communicate with colleagues during holidays.	0.850	
		In non-working hours, work stakeholders often use email, WeChat, telephone and other communication methods to contact me to deal with work affairs.	0.753	
	Work connectivity frequency	In non-working hours, leaders often use email, WeChat, telephone and other communication methods to contact me and discuss the frequency of work affairs.	0.806	0.801
		In non-working hours, colleagues often use email, WeChat, telephone and other communication methods to contact me to deal with work affairs.	0.834	

risk perception of employees of different ages showed an inverted U-shaped curve, and the behavior expression level of employees aged 28–33 ($B = 0.210$, SIG. $= 0.005$) was the highest. In addition, we are

surprised that employees without children ($B = 0.263$, SIG. $= 0.000$) have the greatest influence on financial risk than employees with children. Employees with master's degree are significantly more affected by

TABLE 3 Variable correlation analysis.

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Gender	1													
2. Marital	0.146**	1												
3. Children	0.130**	0.912**	1											
4. Age	−0.078	−0.629**	−0.637**	1										
5. Education	0.064	0.117**	0.143**	0.047	1									
6. Industry	0.093*	0.387**	0.330**	−0.419**	−0.113**	1								
7. Novelty	−0.041	−0.197**	−0.207**	0.163**	−0.172**	−0.117**	1							
8. Criticality	0.072	−0.106*	−0.119**	0.060	−0.121**	−0.022	0.600**	1						
9. Disruption	−0.105*	−0.135**	−0.140**	0.095*	−0.130**	−0.055	0.335**	0.187**	1					
10. Social	0.017	−0.069	−0.075	0.068	−0.019	−0.062	0.322**	0.363**	0.363**	1				
11. Financial	0.068	0.052	0.037	−0.080	−0.088*	0.056	0.186**	0.138**	0.396**	0.389**	1			
12. Health	−0.029	−0.030	−0.032	0.037	−0.084	−0.016	0.118**	0.071	0.349**	0.376**	0.484**	1		
13. Duration	0.019	−0.027	−0.022	−0.033	−0.021	0.003	0.194**	0.248**	0.233**	0.213**	0.262**	0.207**	1	
14. Frequency	0.082	−0.009	−0.011	−0.004	−0.037	0.009	0.307**	0.443**	0.117**	0.283**	0.168**	0.145**	0.426**	1

** means $p < 0.01$.

finance ($B = 0.538$, SIG. $= 0.000$) and social risk perception ($B = 0.262$, SIG. $= 0.041$), while employees with doctor's degree are mainly affected by health risk perception ($B = 0.684$, SIG. $= 0.002$).

4.6. Testing the effect of event strength on work connectivity behavior

The analysis results are shown in Table 4. The standardized path coefficient of event novelty on work connectivity duration is −0.167, $p < 0.01$, which has a significant negative effect, and H1a is not valid. The standardized path coefficient of event criticality on work connectivity duration is 0.375, $p < 0.01$, which has a significant positive effect, so H1b is valid; the standardized path coefficient of event disruption on work connectivity duration is 0.229, $p < 0.01$, which has a significant positive effect, so H1c is valid. The standardized path coefficient of event novelty on work connectivity frequency is 0.023, $p = 0.740$, which has no significant effect, and H1d is not valid. The standardized path coefficient of event criticality on work connectivity frequency is 0.591, $p < 0.01$, which has a significant positive effect, so H1e is valid; The standardized path coefficient of event disruption on work connectivity frequency is 0.042, $p = 0.491$, which has no significant effect, so H1f is not valid.

4.7. Testing the mediating effect

In order to further verify the stability of mediating effects of social risk perception, financial risk perception and health risk perception, Bootstrapping command in AMOS 22.0 was used to verify the mediating effects. The results show that social risk perception plays a significant mediating role in the influence of event strength on work connectivity duration (LLCI = 0.017, ULCI = 0.228, excluding 0), and the mediating effect value is 0.102. Social risk perception plays a significant mediating role in the influence of event strength on work connectivity frequency (LLCI = 0.022, ULCI = 0.261, excluding 0), and the mediating effect value

TABLE 4 Path test of event strength to work connectivity behavior.

Dependent variable	Path	Independent variable	Estimate	S.E.
Work connectivity duration	<---	Event novelty	−0.167	***
Work connectivity duration	<---	Event criticality	0.375	***
Work connectivity duration	<---	Event disruption	0.229	***
Work connectivity frequency	<---	Event novelty	0.023	0.740
Work connectivity frequency	<---	Event criticality	0.591	***
Work connectivity frequency	<---	Event disruption	0.042	0.491

*** means $p < 0.001$.

is 0.112. As shown in Figure 2 below, therefore, it is assumed that H2a and H2b valid.

Financial risk perception plays a significant mediating role in the influence of event strength on work connectivity duration (LLCI = 0.037, ULCI = 0.162, excluding 0), and the mediating effect value is 0.085. Financial risk perception plays a significant mediating role in the influence of event strength on work connectivity frequency (LLCI = 0.017, ULCI = 0.112, excluding 0), and the mediating effect value is 0.054. As shown in Figure 3 below, therefore, it is assumed that H2c and H2d valid.

Health risk perception plays a significant mediating role in the influence of event strength on work connectivity duration (LLCI = 0.014, ULCI = 0.076, excluding 0), and the mediating effect value is 0.039. Health risk perception plays a significant mediating role in the influence of event strength on work connectivity frequency (LLCI = 0.003, ULCI = 0.052, excluding 0), and the mediating effect value is 0.021. As shown in Figure 4 below, therefore, it is assumed that H2e and H2f valid.
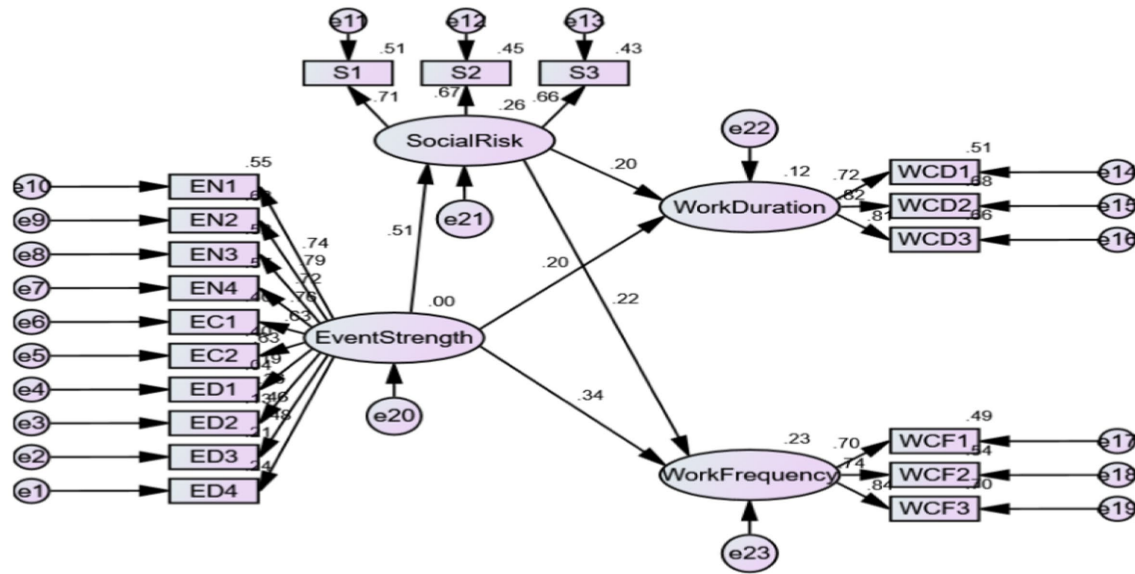
FIGURE 2
Mediating effect test of social risk perception. EN, Event novelty; EC, Event criticality; ED, Event disruption; S, Social risk perception; WCD, Work connectivity duration; WCF, Work connectivity frequency.
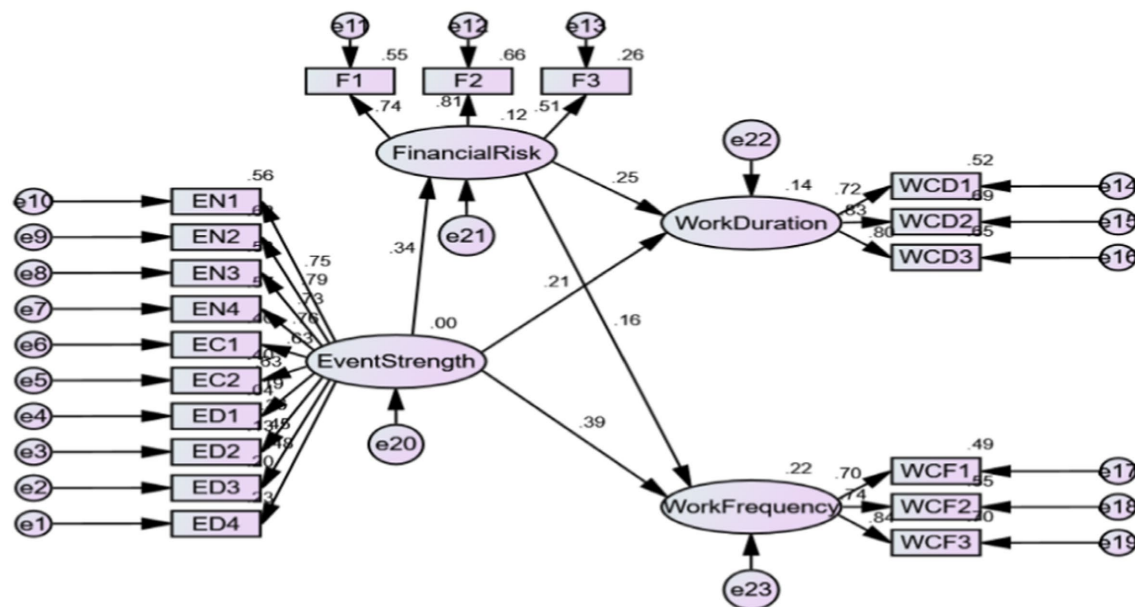

FIGURE 3
Mediating effect test of financial risk perception. EN, Event novelty; EC, Event criticality; ED, Event disruption; F, Financial risk perception; WCD, Work connectivity duration; WCF, Work connectivity frequency.

4.8. Testing the effect of risk perception on work connectivity behavior

The analysis results are shown in Table 5. The standardized path coefficient of social risk perception on work connectivity duration is 0.324, $p < 0.01$, which has a significant positive effect, therefore H3a is valid. The standardized path coefficient of financial risk perception on work connectivity duration is 0.338, $p < 0.01$, which has a significant positive effect, so H3b is valid. The standardized path coefficient of

health risk perception on work connectivity duration is 0.258, $p < 0.01$, which has a significant positive effect, so H3c is valid. The standardized path coefficient of social risk perception on work connectivity frequency is 0.496, $p < 0.01$, which has a significant positive effect, so H3d is valid. The standardized path coefficient of financial risk perception on work connectivity frequency is 0.305, $p < 0.01$, which has a significant positive effect, so H3e is valid. The standardized path coefficient of health risk perception on work connectivity frequency is 0.198, $p < 0.01$, which has a significant positive effect, so H3f is valid.
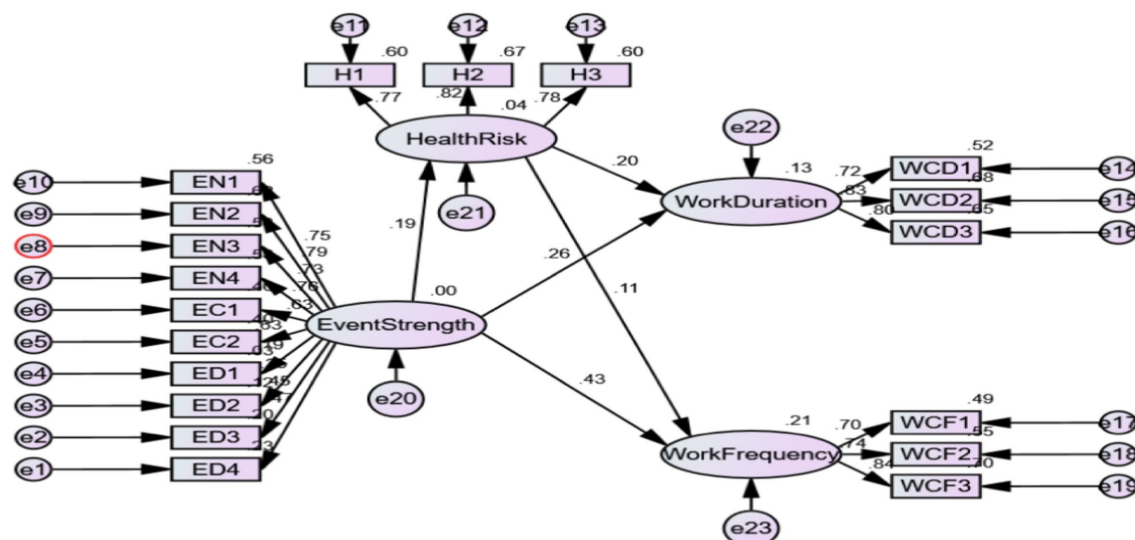
FIGURE 4
Mediating effect test of health risk perception. EN, Event novelty; EC, Event criticality; ED, Event disruption; H, Health risk perception; WCD, Work connectivity duration; WCF, Work connectivity frequency.

TABLE 5 Path test of risk perception to work connectivity behavior.

Dependent variable	Path	Independent variable	Estimate	S.E.
Work connectivity duration	<---	Social risk perception	0.324	***
Work connectivity duration	<---	Financial risk perception	0.338	***
Work connectivity duration	<---	Health risk perception	0.258	***
Work connectivity frequency	<---	Social risk perception	0.496	***
Work connectivity frequency	<---	Financial risk perception	0.305	***
Work connectivity frequency	<---	Health risk perception	0.198	***

*** means $p < 0.001$.

5. Conclusions and discussions

5.1. Research conclusions

Based on the event system theory and risk perception paradox model, this study analyzed and explored the influence of the event strength on work connectivity behavior in the context of COVID-19 from the perspective of major public health emergencies outside the organization based on the 532 questionnaires. The empirical results show that driven by financial risk perception, female employees are more willing to pay work than male employees and unmarried employees are more willing to pay work than married employees. The behavior expression of risk perception of employees of different ages shows an inverted U-shaped curve, and the risk perception of employees aged 28–33 has the greatest influence on workplace behavior. Another surprising outcome is that the influence of financial risk perception on behavior of employees without children is much higher than that of

employees with children. The influence of financial risk perception and social risk perception of employees with master's degree on their behavior is much higher than that of health risk perception, but the workplace behavior of employees with doctor's degree is mainly affected by health risk perception.

The novelty of the Corona Virus Disease event has a negative influence on work connectivity duration. The criticality, disruption of the Corona Virus Disease event has a positive influence on work connectivity duration. This shows that when dealing with major emergencies, the more effective the enterprise has, the more it can reduce the work connectivity duration of employees. At the same time, the enterprise pays more attention to this event, breaks the original working methods and habits, and is easier to increase the cross domain working hours of employees. The criticality of the Corona Virus Disease event has a positive influence on work connectivity frequency, while the novelty and disruption of events had no significant influence on the work connectivity frequency. Through interviews, we found that some enterprises require employees to report their body temperature every day and closely monitor their physical condition. Therefore, the attention of enterprises to events is significantly related to the work connectivity frequency. Social risk perception, financial risk perception and health risk perception plays a significant mediating role in the influence of event strength on work connectivity duration and work connectivity frequency. Employees' social risk perception, financial risk perception and health risk perception has a positive influence on the work connectivity duration and work connectivity frequency. The study found that in life, the epidemic has seriously affected the convenience of employees' daily life, and the purchase of food, medicine, entertainment and other aspects are limited, making employees gradually adapt to the home office mode. In terms of economy, the economic recession and mass layoffs caused by the epidemic have caused employees to worry about the stability of income and work, and employees have to invade their work into the field of life to ensure the basic source of income. In terms of physical health, the lack of epidemic prevention materials makes employees more willing to complete work tasks at home and reduce going out as much as possible.

5.2. Discussions

This study found that under the stimulation of major events outside the organization, driven by financial risk perception, female employees are more willing to pay work than male employees and unmarried employees are more willing to pay work than married employees. The behavior expression of risk perception of employees of different ages shows an inverted U-shaped curve. Financial risk perception and social risk perception of employees with master's degree affected their behavior, but the workplace behavior of employees with doctor's degree is mainly affected by health risk perception. Employees' social risk perception, financial risk perception and health risk perception has a positive influence on the work connectivity duration and work connectivity frequency. The novelty of the Corona Virus Disease event has a negative influence on work connectivity duration, but the criticality, disruption of the Corona Virus Disease event has a positive influence on work connectivity duration. The criticality of the Corona Virus Disease event has a positive influence on work connectivity frequency, while the novelty and disruption of events had no significant influence on the work connectivity frequency. Previous studies have found that, when employees are under pressure, their work connectivity behavior will decrease (Uranová and Ohly, 2016; Cohen and Nica, 2021; Nemțeanu et al., 2021; Mingchao et al., 2022; Yang et al., 2022). This finding is contrary to previous research conclusions.

The theoretical contributions of this paper are as follows: Firstly, this study applies event system theory to interpret the relationship between event strength and work connectivity behavior under epidemic situation from the perspective of major public health emergencies outside the organization, which opens up a new perspective for the study of work connectivity behavior. Work connectivity behavior is an expedient measure for enterprises to cope with the epidemic. Few literatures discuss the psychological and behavioral changes of employees under COVID-19 from the perspective of event strength. This paper expands the research scope of work connectivity behavior. Secondly, based on the risk perception paradox model, this study establishes a theoretical research framework of event strength on work connectivity behavior, opens the "black box" of risk perception in the conduction process between event strength and work connectivity behavior, and explores the internal mechanism of event strength and work connectivity behavior. Thirdly, this study focuses on the differences in social, financial and health risk perception and workplace connectivity behavior among employees of different genders, marital status, age, education background and industry in the face of major sudden public health events. To provide guidance on how to reduce the public's risk perception and achieve flexible work in the post-epidemic era with the help of communication equipment and technology.

5.3. Management implications

In the era of COVID-19, flexible office mode has brought hope for the survival and development of enterprises, but enterprises must attach great importance to the adaptability and psychological changes of employees to public health emergencies, not only pay attention to the production performance of enterprises but also the physical and mental health of employees. The practical management implications of this study are as follows:

We should earnestly study epidemic prevention knowledge and build confidence in fighting the epidemic. A sound emergency plan can significantly reduce employees' cross domain office behavior and prevent the invasion of private life. Enterprise managers and human resources management departments should actively organize all employees to carry out online epidemic prevention knowledge popularization study. We should have correct understanding of the seriousness of the epidemic, calling on all staff to be vaccinated, purchase disinfectant, masks and temperature guns, adopt flexible working hours, and provide a copy of epidemic prevention materials to all staff on duty. To establish the consciousness of "community of destiny" of the country, nation and enterprise, shoulder the social responsibility of the enterprise, reduce the risk perception and anxiety of employees, ensure the smooth operation of the enterprise, and rebuild the self-confidence of employees.

We should reasonably allocate working hours and implement flexible office work. The flexible office mode in the post-epidemic era is favored by the post-1990s and post-2000s generations. With the help of telecommuting equipment and office software, employees' commuting time can be greatly reduced, work performance can be improved, and operating costs of enterprises can be reduced. However, there is also the dilemma of work-family balance. When employees to complete the labor/additional work had to be devoted himself to work in the field of family, enterprise should according to the employee's gender, family status, education background, industry, providing suitable for family friendly policies for employees, such as mobile hardware support, monetary subsidies, accumulative total overtime hours for paid vacation, etc. Leaders should affirm employees' initiative, when assigning work, they should consider the individual situation of employees as far as possible, and reasonably distribute the task load.

5.4. Research limitations

Firstly, our study used the method of questionnaire to verify the relationship between event strength, risk perception and work connectivity behavior. In the future, multiple time point data can be used to ensure the reliability of analysis results. Secondly, although this article reveals the influence mechanism of employees' external public health event strength on risk perception and work connectivity behavior, but the model proposed in this study is not comprehensive. From the related literature, we find that risk perception is not the only factor that affects the event strength on work connectivity behavior. There are other factors that can be explored, such as corporate culture, leadership style, team climate, employee competence, etc. Finally, some of the findings of this study may have certain differences due to different regions and different strength of the epidemic, which may limit the universality of our research results. Therefore, future research should further explore the differences in work connectivity behavior in different regions.

Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

Author contributions

YL and ZZ: conceptualization, methodology, validation, resources, data curation, writing—original draft preparation, writing—review and editing, and supervision. YL: software. HZ: formal analysis. HZ and LL: investigation. LL: visualization. ZZ: project administration and funding

acquisition. All authors have read and agreed to the published version of the manuscript.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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