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# Enhancing organizational communication *via* intelligent voice assistant for knowledge workers: The role of perceived supervisor support, psychological capital, and employee wellbeing

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In the world of globalization, knowledge workers have grown in importance to organizational development. Currently, the intelligence voice assistant (IVA) has a high degree of participation in people's lives, displaying a trend of becoming an emotional partner for humans. Therefore, whether the application of IVA can help enhance organizational communication for knowledge workers is worthy to be explored. This study adopted an interactive situation-simulation survey experiment to explore the impact of the application of IVA on knowledge workers' perceived supervisor support, psychological capital, and employee wellbeing, using a 2 (voice gender: male/female) by 2 (voice characteristics: machine-like/anthropomorphic) between-subject experimental design with two additional control groups (text-only/no-interaction). Besides, voice interviews were designed to understand what knowledge workers need from the IVA. Results show that: (1) There were pair-wise correlations among perceived supervisor support, psychological capital, and employee wellbeing of knowledge workers, and psychological capital played a complete mediating role between perceived supervisor support and employee wellbeing; (2) There were significant differences among the scores of different groups (the experimental groups, the text-only control group and the no-interaction control group) on perceived supervisory support and employee wellbeing, with the experimental groups overall better than the control groups. (3) Knowledge workers hope that the services provided by the IVA mainly include three categories: work support, emotional support and life support. In conclusion, this study shows that the use of IVA can significantly improve perceived supervisor support, psychological capital, and employee wellbeing of knowledge workers, and provide some useful directions for the product design.

## KEYWORDS

intelligent voice assistant, knowledge workers, perceived supervisor support, employee wellbeing, psychological capital

## 1. Introduction

The concept of “knowledge workers” was first proposed by Peter Drucker, the renowned American scholar in the field of management science. It refers to “those who master and use symbols and concepts and work with knowledge or information” (Drucker, 2006). Today, knowledge workers work in IT communications, transportation, engineering manufacturing, information consulting and new retail industries. With the globalization of economy and technology, the importance of knowledge workers in the development of organizations has become increasingly strong (Drucker, 2013). Organizations and enterprises must rely on excellent talents to achieve sustainable development. In order to retain excellent employees and stimulate their creativity and enthusiasm, enterprises must pay attention to the improvement of employee wellbeing (Harter et al., 2003; Wright and Walton, 2003; Huhtala and Parzefall, 2007; Babamiri et al., 2021) *via* effective organizational communication.

However, effective organizational communication is not easy. Gaps in educational background, life and work experiences, values and goals, cares and preferences, habits and modes, cognitive schemas, emotional needs as well as defensive mechanisms often hurdle effective communication between employees and supervisors (Berkovich and Eyal, 2018; Steiner et al., 2020; Tucker et al., 2020; Jia and Cheng, 2021), resulting in low perceived supervisor and organizational support, exhausted psychological capital and high turnover intention (Jing and Yan, 2022; Zhang et al., 2022)—to some extent they have put their wellbeing at risk. For example, supervisors may often neglect the needs to give timely feedback on knowledge workers and show appreciation for their progress or knowledge workers may not be apt at finding the most appropriate way to communicate with supervisors when problem arises. A lack of trust between supervisors and subordinates can lead to communication issues (Salas-Vallina et al., 2020). Building good relationships *via* effective communication between supervisors and subordinates can make employees feel that the organization they work for is not only a place to make a living, but also a place they belong, and thus forming a high attachment to the job and the organization (Wardani et al., 2020). In the era of fast-developing informational technology, what tool may solve the communication problem? A well-designed intelligent voice assistant (IVA) could be the answer.

The IVA is a software agent that can interpret human voice and respond through synthetic voice. People use synthetic voice to perform basic tasks or change settings through smartphones or computers, such as searching for information or arranging reminders (Hoy, 2018). Nowadays the intelligent voice assistant has been widely used in various fields, including military management (De Melo et al., 2020), medical treatment (Dhakal et al., 2020), schooling (Chiu et al., 2020), etc. It is no longer that human learns to communicate with a machine, but instead

machine learns to communicate with a human, exploring his actions, habits, behavior and trying to become his personalized assistant (Polyakov et al., 2018). Sharevski et al. (2021) found that when the content broadcasted by the intelligent voice assistant was changed to introduce a misinterpretation of reported events, the subjects would have cognitive and emotional changes as a result. It is thus clear that with the development of IVA products, the interaction between people and these products has extended from the initial hard interaction experience to emotional needs. In the process of interaction, how to make artificial intelligence (AI) understand people more accurately and form more natural interaction has become the core of interactive experience. To make AI communicate with people like people, the key lies in emotional computing, that is, AI emotionalization (Martinez-Miranda and Aldea, 2005). The research found that the personification of intelligent voice will make users more willing to use relevant tool, and when the tone of intelligent voice is very similar to human, it can improve the positive experience of users (Schroeder and Epley, 2016). With AI popularized in modern workplaces, teams of people and machines becomes commonplace, if and only if AI can successfully work with humans. A study found that participants produced higher quality solutions when working with a voice assistant than working without one (De Melo et al., 2020). In the workplace, emotional support can generally be derived from three sources: organization, supervisors, and colleagues (Nasurdin et al., 2020), while employee-organization relationship has significant positive effects on work engagement and work wellbeing (Che et al., 2022). Given the growing evidence highlighting the important role of expression of feelings in social interaction, developers and designers cannot ignore the embodied value of assistive technologies. More complex emotional communication should be considered more in future work, which may increase the influence of voice assistants (Shamekhi et al., 2018). Therefore, this study intends to explore the emotional application of IVA for knowledge workers to enhance organizational communication and get the emotional support they need. The emotional support in organizations mainly includes the support of supervisors, colleagues and organizations. Studies found that strengthening supervisor support can help employees experience happiness at work (Cahill and Sias, 1997). Therefore, this study aims to explore whether conveying leaders’ support and encouragement through IVA can improve knowledge workers’ perceived supervisor support.

On the other hand, from the perspective of resource conservation theory and job requirements resource model, the organization provides supervisor support as an external resource (Hobfoll et al., 2018). As an important component of organizational support, supervisor support can improve employee wellbeing (Cahill and Sias, 1997). Psychological capital has a direct effect on wellbeing at work, both in terms of employees’ job satisfaction and positive emotions

(Babamiri et al., 2021). Avolio et al. (2004) found that hope, resilience, self-efficacy and optimism are closely related to leadership behavior. With the support of the organization, colleagues, especially managers, and with confidence and hope for success, employees will take more positive actions and actively use their potential to complete the organization's tasks (Terry et al., 1993). Positive emotions such as hopefulness and optimism can also assist people to develop psychological resources, thereby contributing to their wellbeing at work (Kawalya et al., 2019). Besides, psychological capital can have an indirect yet positive effect on wellbeing at work through the mediating role of employees' trust in their supervisor (Babamiri et al., 2021). Psychological capital can trigger cognitive, emotional and social mechanisms to bring wellbeing, and can also predict satisfaction with important life fields such as work, interpersonal relationship and health (Youssef-Morgan and Luthans, 2013).

To sum up, based on the theory of resource conservation and the job requirement resource model, combined with the emotional development of artificial intelligence, this study aims to design a proof-of-concept experiment to explore whether the application of an IVA can enhance organizational communication for knowledge workers through an interactive scenario-simulation survey experiment method, and further clarify the relationship among perceived supervisor support, psychological capital and employee wellbeing as a result. Against the background of the widespread use of IVA, this paper also intends to remind organizational managers to pay attention to knowledge workers' emotional needs and the possible use of IVA in organizational communication. The goal is to provide some new reference for the organization to retain outstanding talents, provide emotional support for employees, and realize the dual development of individuals and organizations.

## 2. Methods

### 2.1. Participants

In this study, the online smart research platform *Credamo*<sup>1</sup> and its data collection services was used to design and conduct the experiment. The employees of enterprises and institutions across China were grouped by random sampling. Each group presented only one condition. For a pilot test, a total of 39 questionnaires were collected, and 11 non-knowledge-workers and those who failed to pass the attention-check questions were excluded. As a result, 28 data were obtained. After modifying the screening questions for knowledge workers based on the pilot results, a formal experiment was conducted. A total of

378 responses were collected. After excluding 83 non-voice responses, 295 valid interview data were obtained. By screening out 135 non-knowledge workers and those who failed to pass the attention-check questions, 243 valid responses for the experiment data were obtained.

Among them, 146 women accounted for 60% of the total sample, and 97 men accounted for 40% of the total sample. There were 34 subjects aged from 18 to 24, 101 subjects aged 25–30, 89 subjects aged from 31 to 40, 13 subjects aged 41–50, and 6 subjects aged 51–60, accounting for 14, 42, 37, 5, and 2% of the total sample, respectively. There were 2 subjects with junior high school education or below, 2 subjects in high school or technical secondary school, 16 associate-degree students, 178 college undergraduates, 45 subjects who were postgraduates or above, accounting for 1, 1, 6, 73, and 19% of the total sample, respectively.

There were 48 participants from state-owned enterprises, 21 participants from public institutions, 6 participants from state organizations, 130 participants from private enterprises, 13 participants from foreign-funded enterprises, 24 participants working as professionals, and one participant identified as self-employed, accounting for 20, 9, 2, 53, 5, 10, and 1% of the total sample, respectively. There were 72 participants whose positions are ordinary employees/non-managers, 87 participants at the basic-level management/junior technician/section level, 66 participants at the middle management/intermediate technician/department level, and 18 participants at the senior management/senior technicians/office/bureau level, accounting for 30, 36, 27, and 7% of the total sample, respectively.

### 2.2. Instruments

The instruments used in this study are as follows:

The measurement of perceived supervisor support was based on the scale developed by Hayton et al. (2012). We selected the first four items according to the size of factor load value, and then modified them to better suit the participant ethics and culture. For psychological capital we adopted the Psychological Capital Scale (PCQ-24) compiled by Luthans et al. (2008), which includes four dimensions of self-efficacy, optimism, hope and resilience, with six items for each dimension. For employee wellbeing we adopted Zheng et al. (2015)'s integrated perspective that employee wellbeing is not only the cognition and perception of employees' satisfaction at the work and life levels, but also the psychological experience and satisfaction state of emotions displayed at the work and non-work levels, and thus the employee wellbeing questionnaire mainly includes the three dimensions of employee life wellbeing, employee work wellbeing, and employee psychological wellbeing.

In terms of experimental materials, the research took emotional management as the theoretical basis, through consulting hot events and relevant reports, and using

<sup>1</sup> A powerful, large-scale smart research platform that provides both online research design and data collection services in both the Chinese and English languages (<https://www.credamo.com>).

action learning facilitation and brainstorming methods to guide the thinking process of three psychology graduate students and instructors, and finally summarized the following situations.

1. **Background.** Suppose your enterprise has created an intelligent voice assistant for employees named Xiaoyi. In addition to basic functions such as note taking and search, it can also help you communicate quickly with your superiors online. Please imagine that you are working very hard today, but some difficulties have affected the completion of today's work. Now it is time to leave work, and you feel physically and mentally exhausted. At this time, you need to feedback your work with your superiors, so you pick up your mobile phone and say, "Little by little, help me to feedback today's work results to my superiors."
2. **Feedback content.** Xiaoyi responded: Hi, this is Xiaoyi. I see that you've been working hard all day. I've sent your summary of today's work to the superior. The superior sent feedback that the work summary you submitted has presented a relatively complete work result. It can be seen that you are one step closer to achieving the goal! I have been looking for experts to consult about those difficult work problems. Now enjoy your leisure time.

## 2.3. Procedure

This study employed a proof-of-concept experiment by controlling and manipulating a single independent variable (the application of IVA) and observing the corresponding changes of the dependent variables. The method of interactive survey experiment with different priming materials and IVA content were used for two purposes: (1) to measure the relationship between supervisor support, psychological capital and employee wellbeing; (2) to explore the impact of the application of IVA on the above variables through situational simulation experiments.

The study adopted a 2 (IVA voice gender: male/female)  $\times$  2 (IVA voice trait: machine voice/anthropomorphic voice) two-factor between-subject design—corresponding to Group 1–4 in the script, and two control groups were designed: the plain text group and no interaction group (plain text means that the feedback of the IVA was presented in the form of text—corresponding to Group 5 in the script; no interaction means that the subjects filled in the scale directly after reading the background materials, and did not participate in the interaction of the IVA—corresponding to Group 6 in the script). The process of the experiment was that the subjects first read the situational materials after the end of the day's work, then completed the scale after voice interaction with IVA under prompts, and understood the needs of knowledge workers for voice assistant services through voice message interviews. See

Figure 1 for a diagram display of the procedure and see Supplementary material for the fully downloaded scripts for the experiment.

The protocols of the current study were approved by the Ethics Review Committee of School of Psychology, Fujian Normal University. The participants provided their written informed consent to participate in this study.

## 3. Results

### 3.1. Qualitative results

Qualitative results were acquired by asking the subjects the following two questions: (1) "Please recall the problems you have encountered with the supervisors at work recently and what events need intelligent voice help?" (2) "What services do you think the intelligent voice assistant can provide to enable you to obtain emotional support?". Through coding and analysis, it is found that the services that knowledge workers want voice assistants to provide mainly include: information transmission and communication with leaders, work tips, answering questions and solving doubts, information search, providing encouragement and comfort, relieving stress, providing emotional support for leaders, feeling emotions, life tips, helping to make calls, sending messages and holiday condolences, which can be summarized into three categories: work support, emotional support and life support (see Table 1 for the coding schema).

### 3.2. Quantitative results

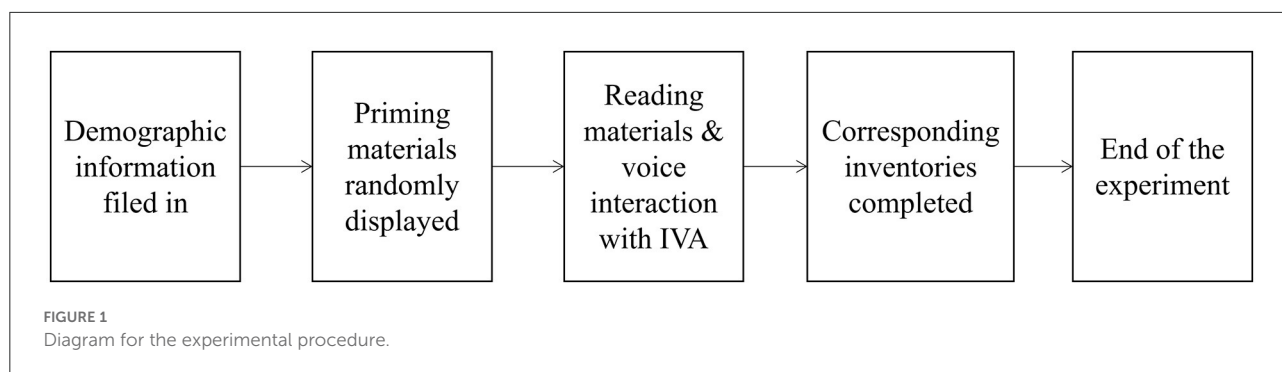
#### 3.2.1. Correlational analysis

The correlation analysis results of perceived supervisor support, employee wellbeing and psychological capital of knowledge workers are shown in Table 2A. Pearson correlation analysis shows that there was a significant positive correlation between perceived supervisor support and psychological capital of knowledge workers,  $r_{(241)} = 0.68$ ,  $p < 0.01$ ; there was a significant positive correlation between perceived supervisor support and employee wellbeing,  $r_{(241)} = 0.58$ ,  $p < 0.01$ ; there was also a significant positive correlation between psychological capital and employee wellbeing,  $r_{(241)} = 0.79$ ,  $p < 0.01$ .

#### 3.2.2. Regression analysis

The results of regression analysis in this study are detailed in Table 2B. According to the analysis results, when the employee wellbeing was taken as the dependent variable, the perceived supervisor support and psychological capital had a significant positive predictive effect on the employee wellbeing. Moreover, when the psychological capital of knowledge workers was taken as the dependent variable, the perceived supervisor





support also had a significant positive predictive effect on psychological capital.

### 3.2.3. Mediation analysis

This study used the Bootstrap method to conduct mediation analysis, and the results were shown in Table 2C. Psychological capital played a complete mediated role between perceived supervisor support and the employee wellbeing. The mediation effect value was 0.43, and the Bootstrap 95% confidence interval was [0.32, 0.56], excluding 0. Specifically, the higher the perceived supervisor support and psychological capital, the higher the employee wellbeing.

### 3.2.4. ANOVA of experiment results

The results of ANOVA of the experiment are shown in Table 3. There was a difference among the scores of the subjects in the experimental group, the plain text control group and the non-interactive control group in the sense of perceived supervisor support [ $M_1 = 5.69$ ;  $M_2 = 5.40$ ,  $M_3 = 4.74$ ,  $F_{(2,240)} = 25.43$ ,  $p < 0.001$ ], psychological capital [ $M_1 = 5.72$ ;  $M_2 = 5.66$ ;  $M_3 = 5.24$ ,  $F_{(2,240)} = 13.14$ ,  $p < 0.001$ ], and employee wellbeing [ $M_1 = 5.70$ ;  $M_2 = 5.65$ ;  $M_3 = 5.22$ ,  $F_{(2,240)} = 7.90$ ,  $p < 0.001$ ].

After LSD multiple comparisons, it was found that the scores of the above variables of the subjects in the experimental group and the plain text control group (that is, using IVA) were significantly higher than those of the non-interactive control group (that is, not using IVA), and the perceived supervisor support of the subjects in the experimental group was also significantly higher than that of the plain text control group. However, the main effect of IVA voice gender was not significant,  $F_{(1,163)} = 0.76$ ,  $p = 0.39$ ,  $\eta_p^2 = 0.005$ , the main effect of IVA voice trait was not significant,  $F_{(1,163)} = 0.67$ ,  $p = 0.42$ ,  $\eta_p^2 = 0.004$ , and the interaction effect between the two was not significant either,  $F_{(1,163)} = 1.084$ ,  $p = 0.30$ ,  $\eta_p^2 = 0.007$ , suggesting that the IVA voice gender and voice trait were not that important for the supposed effects on knowledge workers.

## 4. Discussion

### 4.1. The relationship among perceived supervisor support, psychological capital, and employee wellbeing

In this study, we found that there were positive correlations between perceived supervisor support, employee wellbeing and psychological capital, and psychological capital played a completely intermediary role between supervisor support and employee wellbeing. When employees have a higher perceived supervisor support from their supervisors, their psychological capital is stronger and their wellbeing is higher.

As a part of organizational support, supervisor support has two main effects: the first direct effect, including the satisfaction of personal needs and the proportion of health and wellbeing, will directly reduce the impact of work stress. Second, as the agent of the organization, immediate supervisors' positive attitudes toward their subordinates are regarded by them as conferring support of the organization, and employees may not bring out their best work output until their internal psychology are warmly impacted (such as attaining emotional commitment). At the same time, supervisor support also positively affects subjective wellbeing, which reduces turnover intention (Gordon et al., 2018). If the level of supervisor support were low, employees could not feel the care from the organization. This is because the employees' own emotional input may not receive corresponding feedback and response, which would weaken the direct emotional connection between employees and the organization (Eisenberger et al., 2002; Dawley et al., 2008; Khan et al., 2015).

The subjective wellbeing of employees is influenced by leadership style as well as by perceived supervisor support (Celik et al., 2020). Having open and frank communication and reliable supervisors can enhance employees' sense of emotional support, enhance employees' wellbeing (Aycan and Eskin, 2005), promoting employees' self-esteem and sense of identity with the organization, and can lead to more pleasant feelings (Herrbach and Mignonac, 2004). Therefore, strengthening supervisor

TABLE 1 Qualitative coding of knowledge workers' interview responses on IVA needs.

Core coding	Relevance coding	Open coding	Example of original utterance
Work support	Information transmission and communication	Report work progress and achievement (66)	I hope it can help me report work summary to my supervisor and convey the progress of the project.
		Resolve conflicts with supervisors (25)	There is a contradiction with my supervisor at work, which is inconvenient to express directly. I hope the voice assistant can help me communicate with the supervisor.
		Acquire feedbacks from the supervisor (20)	I hope the assistant can help to feed back the supervisor's words in a timely manner.
		Clarify job requirement (11)	I hope the voice assistant can tell me what exactly the supervisor's requirements are.
		Project approval communication (8)	When I need to find the leader for project approval but couldn't find him, I hope the intelligent voice assistant can help the leader to approve it.
		Ask the supervisor for leave (4)	I hope the intelligent voice assistant can help me to ask the supervisor for leave, and let the supervisor understand me.
		Report work difficulty to the supervisor (4)	I hope that the assistant can help feed back the difficulties I encountered at work to the leader, and acquire the leader's guide or help.
		Communicate with colleagues (2)	Help me communicate with my colleagues or with the leader if it is inconvenient to talk face to face.
	Work tips	Remind the work schedule (41)	Remind me of my work schedule, what should I do now, and when the next meeting will start.
			Which task is the most urgent that needs to be communicated with supervisors in time.
	Reminders	Remind to rest (9) Remind the supervisor of my messages (4)	Remind me to get up and have a rest during office hours
			Sometimes the supervisor doesn't reply to me for a long time. I hope the voice assistant can remind the supervisor to reply to my message in time.
	Answering questions	Provide work suggestions and evaluation (19) Provide solutions to problems (17)	I hope the voice assistant can help me when I encounter difficulties, take the initiative to ask me about my situation, and give me suggestions.
			When it is the first time I do a project, and I don't know how to handle it. I hope the voice assistant can help me, teach me how to do it, or provide some templates to help me solve problems.
	Job assistance	Information search (34) Develop work plan (8) Organize and send files (6) Translation (2)	The supervisor assigned a new project, but I am not familiar with it. I hope the assistant can help me inquire about the relevant background.
			I hope the voice assistant can help me make work plans and prioritize different tasks.
			Help me sort out and classify the documents in the system, and then send them to the colleagues or supervisors.
			Help me translate some English content.
Emotional support	Encouragement and comfort (72)	When I am working overtime or tired, I hope the supervisor can talk with me and encourage me through the intelligent voice assistant.	
	Stress reliever	Play soothing music (27)	When I feel very stressed and in a bad mood, I can play some soothing music to make me feel happier.
		Chat with me (20)	When I'm bored, the intelligent voice assistant can chat with me.
		Tell me some jokes (15)	When I am unhappy, the intelligent voice assistant can tell me some jokes to ease my bad mood.
		Tell me some stories (5)	The intelligent voice assistant can tell some stories and talk with me like a friend.
	Supervisor support	Deliver supervisors' care and encouragement (35)	Convey the concern of supervisors and let me know that my efforts are meaningful

(Continued)

TABLE 1 (Continued)

Core coding	Relevance coding	Open coding	Example of original utterance
		Convey the affirmation of supervisors (5)	I hope that the intelligent voice assistant can convey the affirmation and encouragement of the supervisor to my work results, which makes me feel that my work is meaningful and valuable.
	Pleasant voice	Warm and gentle (5)	I hope the voice assistant's voice is very gentle and warm, which will make me feel very happy.
		Simulate the voice of supervisors (4)	The voice assistant can be the voice of the supervisor to communicate with me, which will be more real.
		Like human voice (4)	The assistant's voice shall be like a human voice, which can be like communicating with friends.
		Lively (1)	Pay attention to the voice intonation—add some lively elements.
	Recognizing and understanding emotions	Recognizing and understanding emotions (8)	I hope the intelligent voice assistant can recognize my emotions and talk to me or comfort me according to my emotions.
Life support	Life tips	Weather (4)	I hope the assistant can remind me of the weather today and whether I need to bring an umbrella.
		Eat and drink (2)	The voice assistant reminds me to eat and drink at the appropriate time.
		Do exercises (1)	Remind me to exercise every day.
		Traffic condition (1)	It can remind me of the current traffic situation on the way.
		Important dates and holidays (5)	I hope that the intelligent voice assistant can remind me on important holidays, anniversaries and birthdays.
	Life assistance	Help make calls (5)	I hope the intelligent voice assistant can help me make phone calls or reply to messages when I am driving.
		Record information (4)	I hope the intelligent voice assistant can help me record important information.
		Holiday condolences (3)	Send me a blessing at the festival.
		Plan my life (2)	Help me make a life plan, when and what to do, and arrange the time.
		Open household appliances or applications (2)	It can help me turn on electrical appliances such as air conditioners, televisions, etc., as well as the application software to be used.

TABLE 2A Correlational analysis.

Variable	M	SD	1	2	3
1. Perceived supervisor support	5.49	0.83	1		
2. Psychological capital	5.64	0.56	0.68**	1	
3. Employee wellbeing	5.62	0.70	0.58**	0.79**	1

\*\* $p < 0.01$ .

TABLE 2B Regression analysis.

Outcome variable	Predictive variable	$R^2$	$\Delta R^2$	$F$	$B$	$SE$	$\beta$	$t$
Employee wellbeing		0.339	0.336	123.67***				
	Perceived supervisor support				0.492	0.044	0.582	11.121***
Psychological capital		0.467	0.465	211.331***				
	Perceived supervisor support				0.462	0.032	0.684	14.537***
Employee wellbeing	Psychological capital	0.63	0.628	409.735***	0.991	0.049	0.794	20.242***

\*\*\* $p < 0.001$ .

TABLE 2C Mediation analysis.

	Effect value	Boot standard error	Boot CI lower limit	Boot CI upper limit	Relative effect value
Total effect	0.43	0.06	0.37	0.60	–
Direct effect	0.06	0.05	–0.03	0.15	–
Mediation effect of psychological capital	0.43	0.06	0.32	0.56	100%

Boot standard error, the lower limit of Boot CI and the upper limit of Boot CI refer to the standard error, the lower limit and the upper limit of the 95% confidence interval of the indirect effect estimated by the percentile Bootstrap method of error correction, respectively. All values are rounded to two decimal places.

TABLE 3 ANOVA analysis of experimental results.

Variable	Grouping	Number	Mean	Standard error	F-value	Post-hoc comparison (LSD)
Perceived supervisor support	① Experimental groups	167	5.69	0.67	25.43***	① > ② > ③
	② Plain-text control group	37	5.40	0.70		
	③ Non-interaction control group	39	4.74	0.70		
Psychological capital	① Experimental groups	167	5.72	0.46	13.14***	①② > ③
	② Plain-text control group	37	5.66	0.43		
	③ Non-interaction control group	39	5.24	0.54		
Employee's wellbeing	① Experimental groups	167	5.70	0.54	7.90***	①② > ③
	② Plain-text control group	37	5.65	0.68		
	③ Non-interaction control group	39	5.22	0.57		

\*\*\* $p < 0.001$ .

support can help employees experience positive emotions in their work and alleviate the pressure and occupational fatigue caused by negative emotions (Gilbreath and Benson, 2004; Nabawanuka and Ekmekcioglu, 2022). The conclusions of this study are consistent with these findings.

Previous studies showed that psychological capital was positively associated with job satisfaction and positive affect, and negatively associated with negative affect and psychological and physical distress (Wardani et al., 2020; Ho and Chan, 2022). In order to enhance employees' psychological capital, recently emotion management has been paid more and more attention in human resource management. Specifically, it is a management method that managers use sincere words to strengthen the emotional connection between managers and employees, to meet the psychological needs of employees, and to form a harmonious working atmosphere (Bolton, 2005; Sloan, 2008; Kaplan et al., 2014). When employees feel their supervisors are more supportive, they are more satisfied with their job and may have enhanced performance. In future organizational communication, we should pay more attention to the role of

emotion management. Managers should show love and care for employees, establish harmonious interpersonal relationships, and ultimately achieve the emotional sublimation of loyalty to the organization. The enrichment of psychological capital in a nurturing and supportive environment contributes to employees' psychosocial functioning in the long run (Ho and Chan, 2022).

## 4.2. The effects of IVA application

This study used an interactive survey experiment to study the impact of the application of IVA on the psychology of knowledge workers. The study found that the interaction of IVA can improve the supervisor support, psychological capital and employee wellbeing of knowledge workers, but there was no significant difference in the use effect of different voice attributes in this study. During the interaction between the subjects and the IVA, when the IVA conveys the concern and encouragement of the supervisor, the employees can feel the concern and



encouragement of the supervisor, thus improving the degree of confidence and hope and enhancing the sense of wellbeing. As IVA becomes more popular, users turn to IVA not only for routine tasks, but also for expressing emotions. Sharevski et al. (2021) found that the broadcast content of the intelligent voice assistant affects subjects' perceptions of and emotions. Verleysen et al. (2015) found that as the appreciative inquiry increased among employees, so as their resilience, self-efficacy, hope and optimism, which is consistent with the results of this study *via* the application of IVA.

In remote work, the use of IVA is particularly important. Low quality virtual remote communication between supervisors and colleagues may render their personal goals and priorities unclear (Raghuram et al., 2001). Remote workers may need more self-regulation in this scenario. For example, it could be difficult for remote workers to coordinate some of their work tasks with colleagues, synchronize and coordinate work actions, work schedules and resting time. It may also be difficult to motivate each other and help each other through timely information exchange (Raghuram et al., 2003), which results in difficulties to obtain and share information.

In the coding of interview results, 12% of total participants also reported that they hoped that leaders could encourage and care about themselves and affirm their work value through IVAs. More than 33% of total participants hope to be able to transmit all kinds of information and communicate with leaders and colleagues through IVAs. Seventeen percent of total participants reported that they hoped that the IVA could remind their work progress and arrange work plans for themselves. Twenty-three percent of total participants reported that they hoped that the IVA could relieve their pressure by playing music and telling jokes. It can be seen that the service demand of employees for IVA is no longer a simple reminder. In view of the fact that remote work may continue in the future, we need to study and explore how to promote the management in remote work, explore the needs of employees and the conditions to meet their needs, and use the research theory results to guide the design of intervention methods to develop a model that can assist knowledge workers in their daily work Information transmission and psychological counseling, and provide emotional support for personalized IVA to improve employee wellbeing and work performance.

### 4.3. Conclusion, limitation, and future directions

Based on the extensive use of IVA, this study finds that the application of IVA can improve perceived supervisor support, psychological capital and employee wellbeing of knowledge workers, and also finds that there are positive

correlations among the perceived supervisor support, employee wellbeing and psychological capital of knowledge workers. On one hand, a theoretical contribution of this study is to provide another piece of evidence that enhancing organizational communication can improve employee wellbeing. Employees who feel the affirmation and respect of their supervisors can have improved self-efficacy and enriched sense of hope. On the other hand, this study may prompt organizational managers to pay more attention to knowledge workers' emotional needs and provides sufficient social support to them, either directly if they were able to (*via* effective leadership skill training) or indirectly through the application of tools such as intelligent voice assistants. For knowledge workers, perceived supervisor support through either means can help them to have a good mood, maintain physical and mental health, and promote work performance and creativity. Aside from knowledge workers, supervisors can also have their personalized IVA, realizing efficient organizational communication and conveying timely support and affirmation to their subordinates when the subordinates feedback their work summary or encounter difficulties, so that the subordinates can feel the care and support of their supervisors. In this process, the elegantly-designed IVA can provide companionship and encouragement to improve the psychological capital and wellbeing of employees and also feedbacks important information to the supervisors for organizational decision making, which can realize the dual-development of both employees and organizations.

Nevertheless, this study is not without limitations. One limitation is that it adopted the method of cross-sectional study, and lacked more specific and dynamic structure data. Subsequent research can study the dynamic interaction of IVA in the real work situation of employees, compared with direct interactions with supervisors, and conduct longitudinal research to track the dynamic changes of employees' psychology. In addition, this study employed a unified scenario to test the effect of using IVA. Subsequent research can detect more nuanced impacts by providing personalized IVA services for the subjects.

Last but not least, many IVA products have developed different types of voice, such as child voice, adult female voice, adult male voice, all kinds of star voice and voice with different emotions. Subsequent research shall consider whether the different voice types of different IVAs have different effects on users.

### 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.

## Ethics statement

The studies involving human participants were reviewed and approved by the Ethics Review Committee of School of Psychology, Fujian Normal University. The patients/participants provided their written informed consent to participate in this study.

## Author contributions

BY and S-QW conceived of the present project, designed the study, and collected the data. S-QW analyzed the data and wrote the first draft of the manuscript. BY critically revised the manuscript. All authors approved the final version of the manuscript.

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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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## Supplementary material

The Supplementary Material for this article can be found online at: <https://www.frontiersin.org/articles/10.3389/fcomm.2022.1084703/full#supplementary-material>

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