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Development of a two-way mentorship scale focusing on next-generation core competencies

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With society and technology developing rapidly and the new generation of young adults entering the workforce, the core competencies that must be possessed by employees are changing along with factors such as changes in the external environment and enterprises' internal demands; consequently, the characteristics of mentorship are also subject to change. This study investigated two-way mentorship and the core competencies necessary for workers in an organization. After rigorous testing and compilation processes, this study developed a two-way mentorship scale for assessing the three dimensions of career development, psychosocial support, and role modeling. The data analysis revealed that the internal consistency values for career development, psychosocial support, and role modeling were 0.911, 0.879, and 0.791, respectively. The factor loading of all items exceeded 0.50 and thereby conformed to the theoretical model. Confirmatory factor analysis revealed that the goodness-of-fit indices of the scale met the corresponding standards. The average variance extracted was 0.342–0.497, the composite reliability was 0.591–0.911, and the square root of the average variance extracted was 0.584–0.704. Finally, managerial, practical, and academic suggestions are proposed on the basis of the study results, and the research limitations are identified.

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Introduction

Mentoring is a popular workplace practice and can yield positive outcomes for mentors, mentees, and organizations (Ivey and Dupré, 2022). Farkas et al. (2019) have demonstrated that the widespread implementation of mentorship programs can effectively facilitate professional development and increase career satisfaction. Imparting the knowledge and skills related to the organization and the position improves employee competency, fulfills their psychological contract, and promotes the future of their career, thereby enhancing their work performance and the performance and competitiveness of the enterprise (Bower et al., 2019; Chen, 2014; Huang et al., 2016). Traditional mentorship refers to the mainstream mentorship model used by various enterprises and organizations in Taiwan and involves experienced employees imparting knowledge unidirectionally to inexperienced employees. Numerous domestic and foreign studies have quoted Kram (1983) and Scandura (1992) in terms of how mentorship functions are used to address organizational issues.

Following the evolution in time and the popularization of the internet, new employees' core competencies should emphasize not only knowledge and skills but also personal traits, attitudes, and technology acceptance and use (Business Next Publishing, 2019; Global Views Monthly, 2018; Li, 2017; TaiwanJobs, 2017). With the pace of digitalization, automatization, and robotization increasing rapidly, organizations are continually changing the required employee core competencies; changes are thus continually needed in competence-based models (Škrinjarić, 2022). Studies and magazine reports have indicated that personal traits, sensitivity to technology, and willingness to learn about different types of knowledge and skills are criteria that every large enterprise should use to recruit talent (Business Next Publishing, 2019; Global Views Monthly, 2018). Overall, inexperienced and experienced employees' work value, background, and job condition requirements vary because of differences in time. In addition, in response to major societal changes, enterprises place more emphasis on basic skills such as technology sensitivity, continual personal learning and development, and cooperation between employees. The shift in emphasis has prompted several enterprises to introduce unconventional training methods. As protégés learn from mentors, protégés also encourage mentors to acquire new knowledge and skills, helping them to develop talents consistent with current trends in technological development.

The implementation of effective mentorship programs is influenced by the following factors: mentor capability, opportunities in the mentorship program, program length, and motivation of participating individuals (Liao et al., 2020; Venkatesa Perumal and Singh, 2022). The matching process and individual characteristics of the participants are key factors in mentor-mentee matching (Deng et al., 2022). Nguyen et al. (2020) contended that a strong connection and clear communication between mentors and mentees are essential to the success of a mentoring program.

Reverse mentorship emerged from the existing limitations of traditional mentorship. In reverse mentorship, grassroots employees assume responsibility for teaching executive management about new concepts and ideas (Chen, 2014, 2018; Murphy, 2012; Tsai, 2018). Two-way mentorship was developed on the integrated theoretical basis of traditional and reverse mentorship (Chen, 2014, 2018). The integration of traditional and reverse mentorship is based on developments in information technology and the related work of the digital generation. The integration of traditional and reverse mentorship also emphasizes that the interaction between the instructor and instructee is not one-way. Both parties can learn from and interact with each other to acquire new knowledge (Chen, 2014). Although two-way

mentorship features a theoretical framework and focuses on conforming to mainstream trends, few relevant studies have been conducted domestically or abroad. Few scholars have explored and developed concepts and hypotheses related to two-way mentorship; however, few relevant empirical studies have been conducted. In addition, as the new generation enters the workforce and as society and technology develop rapidly, the core competencies that enterprises emphasize may gradually transition from employee knowledge and skills to basic skills such as technology use, continual personal development, and teamwork to ensure that employees form new-generation core competencies. However, the need for new-generation core competencies indirectly results in relevant traditional mentorship evaluation tools are not effective in accurately measuring the functionality of mentorship relationships, predicting individual work performance, or responding to an enterprise's requirements that employees gain new-generation core competencies.

This study examines the theoretical framework of integrated two-way mentorship developed by other scholars. On the basis of a literature review, this study developed a model for new-generation core competencies and integrated these competencies into the two-way mentorship model to define and established a two-way mentorship scale according to existing structures. Additionally, the reliability and validity of the scale were assessed using a rigorous test development program to enable employees and enterprises to understand the existing trends and functional development of current mentorship relationships. The scale can serve as an assessment tool for enterprises or future studies in assessing mentorship relationships and their functions.

Literature review

New-generation core competencies. The concept of occupational competency originates from a study on diplomat performance conducted by consulting firms led by McClelland (1973), who suggested that occupational competency refers to an individual's ability expressed through external behavioral representation in work scenarios and that competency can predict individual performance with extremely high accuracy. Since the mid-1980s, many scholars have applied occupational competency in cognitive management fields such as recruiting and employee development as crucial indicators for headhunting (McLagan, 1989). Core competencies are the work abilities that all members of an organization should possess in accordance with the organization's culture, values, and goals (Chao, 2008; Srivastava, 2005; Wu and Lee, 2006; Yang, 2012). Scholars have claimed that core competency is a dynamic learning resource that varies with internal and external environmental changes in an organization. Additionally, the critical abilities guiding the success of enterprises can be obtained, and enterprise performance and competitiveness can be improved (Srivastava, 2005). Tsai (2011) suggested that core competency is the ability integrated by organizations during learning processes. Core competency can be repeated, applied, and shared in any situation. According to Taiwanstat (2017), the unemployment rate of people with a bachelor's degree was 5.79% in 2011, which decreased to 5.38% in 2016. The unemployment rate of people with a bachelor's degree was higher than that of people with other education levels. Another statistical survey reported that following the development of diverse university entrance channels, the supply of bachelor's degrees exceeds the demand, thereby causing a depreciation of bachelor's degrees. To solve this problem, higher education institutions have proactively promoted academia-industry cooperation or collaborative projects with enterprises and organizations in various fields to increase students' opportunities to gain practical experience and

indirectly understand enterprises' needs in terms of talent. Additionally, schools can adjust their courses to satisfy the professional talent recruitment needs of various major enterprises.

When determining the basic core competencies of employees recognized by various enterprises, most mass media entities or scholars use self-developed scales or scales developed in accordance with relevant testing units to investigate enterprises and collect and analyze relevant data. However, with rapid societal development, an increasing number of enterprises have emphasized capabilities and conditions rather than professional knowledge and techniques. For example, with the advent of the internet and the digital era, major enterprises have made creativity, competent internet usage ability, and international horizons as crucial recruitment criteria (TaiwanJobs). Global Views Monthly (2018) conducted an opinion poll and found that organizations considered the most crucial quality of new employees to be "proactive attitude and ambition," followed by "learning capacity and adaptability," "stress resistance and emotional management abilities," "responsibility and self-management abilities," "communication and expression abilities," and "professional knowledge and skills." The findings revealed that most enterprises have recently considered the internal characteristics of recruited employees to be more valuable than their external characteristics. Wilson and Daugherty (2019) proposed in *Harvard Business Review* that the ability to work with artificial intelligence and other advanced technologies is a required contemporary skill. These abilities require three main skills: (1) training, which involves using the design of certain algorithms, programs, programming languages, or other techniques to teach machines to execute tasks; (2) explanation, which involves analyzing the results obtained from collecting and integrating considerable amounts of data and explaining the results to nonexperts; and (3) maintenance, which involves ensuring the normal function and safety of artificial intelligence systems. Business Next Publishing (2019) maintained that the ability to use technology for communication is a necessary skill for enterprise employees. In addition, the professional segmentation between various fields will become increasingly blurred in the future. Future talent must gain interdisciplinary integration abilities through learning and practical experience in relevant fields and convert the acquired knowledge into relevant abilities (Global Views Monthly, 2018). Scholars have proposed a new concept based on interdisciplinary abilities—"slash youth"—which indicates that people's careers are no longer based on a single occupation or identity (Kuang, 2017).

Traditional mentorship. According to Kram (1983), mentorship is the interaction between experienced and inexperienced members of a group or organization, in which experienced members provide instruction, career planning, support, and development to new members. Mentorship reduces the cost of education and training, promotes the sharing and flow of information or knowledge, and achieves the goal of organizational socialization. Scandura (1992) extended Kram's definition of mentorship and suggested that in addition to providing career and psychological support, mentors serve as role models by promoting a protégé's work and helping the protégé to assimilate into their team, thereby increasing the pace of progress in the organization. Li (2012) argued that during the interaction process of the mentor and protégé, the mentor shares knowledge that the protégé uses to improve their abilities and work performance, thereby helping the organization to grow and innovate.

In a one-way mentorship, different resources are provided to the protégé to help them develop in their work; this is known as the "mentoring function" (Hung, 2010; Kram, 1983, 1985;

Scandura, 1992). Kram (1983) was the first to promote the mentoring function model and divided mentoring functions into two categories: (1) career development function, which involves enhancing the protégé's work abilities and assisting in their career development, and (2) psychosocial function, which involves providing resources to enhance the protégé's emotional expression, management, and role model imitation. On the basis of the mentoring functions defined by Kram, Scandura (1992) added the function of role modeling, which refers to the protégé imitating the mentor through instruction and through observation of the mentor's behavior in terms of work performance and social abilities. Love et al. (2022) described that women play a significant role in team mentoring networks and exhibit turn-taking in team meetings. Deutsch et al. (2023) revealed that an empowerment and leadership initiative program for women could assist mentees and mentors in improving their mentorship skills, and the program offered them insights into the challenges and other aspects of one's early career.

Regarding the application of mentoring in the medical field, one-on-one mentorship and group-based mentorship are crucial for empowering nursing and medical students in their pursuit of professional development and career placement and are crucial for promoting overall student well-being during clinical placement (Farkas et al., 2019; Lee and Chiang, 2021; Skjevnik et al., 2020). In addition, social media plays a key role in networking and mentorship, especially for women pursuing careers in specialties with relatively low female representation (Corsini et al., 2021).

Reverse mentoring. Reverse mentoring is facilitated by young, grassroots, or new employees to guide the executive management of an organization to learn about new ideas, concepts, and values (Chen, 2012; Murphy, 2012). Murphy (2012) extended Kram's (1985) concept of traditional mentorship and suggested that reverse mentoring could promote leadership skills in inexperienced employees, increase their understanding of organizational management, and enable experienced employees to acquire new knowledge and skills from inexperienced employees, thereby facilitating valuable cultural connections. Cross-generation learning and exchange prompts enterprises and organizations to improve their potential for developing and elevating their creative abilities. A portion of enterprises in Taiwan have introduced reverse mentorship. For example, in 2018, Bayer Taiwan, Co., Ltd. implemented a reverse mentoring program and selected two interns for the mentor roles and executive management personnel as protégés to facilitate mutual learning in terms of mentors' providing novel thoughts and ideas about their career plans and values (Taiwan Business TOPICS, 2018). Reverse mentoring differs from traditional mentoring in terms of the exchange of roles between the mentor and the protégé. When inexperienced employees take the role of mentor, they can provide experienced employees or executive management personnel with novel knowledge and techniques. This system enables protégés to innovate their thought processes and improve the mentors' performance in knowledge communication and management.

Two-way mentorship. Cosmetic Executive Women launched a second wave of their innovative two-way mentorship program, which was supported by PUIG. The purpose of this program was to construct a learning platform and to obtain constructive feedback from both mentors and mentees. This program involved active engagement between mentors and mentees, encouraging the exploration of both short-term and long-term objectives and any problems arising during the process.

Two-way mentorship is a model for improving the personal abilities of mentors and protégés to satisfy the improvement needs of core competencies (Chen, 2014, 2018). This model integrates the theoretical frameworks and characteristics of both traditional and reverse mentoring systems. The two-way mentorship system emphasizes the importance of information technology development and the work characteristics of younger generations (Chen, 2014). The roles in two-way mentorship are identical to those in traditional mentorship; however, the interactive model is not a unidirectional provision of instruction and suggestions. In the two-way mentorship model, both parties learn from and interact with each other to acquire new knowledge, techniques, and ideas to improve their work behavior and performance, thereby indirectly elevating enterprise performance, competitiveness, and creativity.

The functional structure of reverse mentoring is based on that of traditional mentoring. The involved functions are divided into career, psychosocial, and role modeling functions. The main difference between traditional mentoring and reverse mentoring is that the career function in traditional mentorship implies protection, which is inapplicable to reverse mentoring; thus, it is replaced with management (Chen, 2012; Murphy, 2012; Steimle, 2015). Most scholars have conducted studies on the three constructs of traditional mentorship to explore the effects of mentoring functions at the individual and organizational levels. Researchers have collected and summarized the relevant studies and categorized functions according to the mentoring function theory proposed by Chen (2014, 2018). The function categories are (1) career development, (2) psychosocial support, (3), and role modeling. The effects of mentoring functions on employee performance, business performance, and enterprise and organization development were explored.

Career development. According to social support theory, individuals employ resources and support provided by others to develop and achieve goals (Vaux, 1988). Career development refers to improving the protégé's work ability during the mentorship and facilitating the protégé's career development (Kram, 1985; Scandura, 1992). In terms of career development, reverse mentoring emphasizes the sharing of knowledge of new technology between different generations (Murphy, 2012). Research has indicated that knowledge sharing improves performance and helps promote responsibility toward work and understanding the decisions made by relevant units, thereby benefiting team cohesiveness and strengthening organization and enterprise competitive development (West & Farr, 1989). In addition, because of the role exchange between mentor and protégé, the tasks involving protection and challenge in career development in traditional mentoring are inapplicable to reverse mentoring. Instead, the protégé is encouraged to generate creative and challenging thoughts (Murphy, 2012). Scholars have proposed that management is applicable to the career development aspect of reverse mentoring (Chen, 2013).

In summary, career development is beneficial for work performance. However, numerous enterprises have transitioned from traditional mentoring to reverse mentoring or two-way mentorships, in which both the mentor and the protégé learn and grow together. Therefore, this study used the mentoring function definitions of two-way mentorship as the basis for integrating the current mainstream business models of enterprises to develop a two-way mentorship scale and explore mentor and protégé behaviors in terms of career development.

Psychosocial support. As the public has increased their understanding and knowledge of psychology, enterprises have increasingly emphasized employees' psychological status.

Numerous studies have identified that social support functions exist in mentorships. During the mentoring process, the protégé explores, experiences, and understands the value and meaning of the work content and the role, thereby enhancing the protégé's work performance and indirectly promoting the enterprise's brand image and competitiveness (Hoffmann and Loughhead, 2016). Lin and Chang (2010) observed that organization socialization and social support functions had mediating effects on employees' physical and mental health. Hoffmann and Loughhead (2016) reported that the inspirational motivation proposed in transformational leadership theory is positively related to psychosocial support, and that psychosocial support is positively related to the satisfaction levels of inexperienced employees.

Murphy (2012) defined psychosocial support in reverse mentoring as a derivative of social exchange theory. Through mutual sharing and open-ended discussion of life experiences, the relationship between mentor and protégé can be improved. Additionally, psychosocial support development is promoted. Studies have confirmed that mutual sharing strengthens teamwork and promotes a sense of belonging and value among employees. Furthermore, mutual sharing leads to the positive development of organizations (Crowther et al., 2002). Psychosocial support in reverse mentoring retains the definition and implications of the relevant functions of traditional mentoring and further emphasizes the importance of psychological support (Chen, 2013; Murphy, 2012). A study on structured in-service training courses for teachers receiving two-way instruction revealed that psychosocial support improves training course design, in which teaching and teamwork were the most crucial factors for career development (Chen, 2018).

Overall, psychosocial support helps protégés improve their work abilities, attitudes, and identification with their roles, enabling them to fully dedicate themselves to their work by enhancing their self-efficacies, which further helps them demonstrate their ideas and value, increasing their opportunities to explore new skills. However, psychosocial support and its implications are not fully interpretable across generations and cultures. Emphasis is primarily placed on protégés. Few studies have explored the psychological feelings of mentors. Thus, the present study employed a two-way mentorship scale to explore and interpret how both mentors and protégés are represented in their relationship (Tables 1–4).

Role modeling. Most scholars have employed social learning theory by Bandura as the basis to describe the function of role modeling in mentorships. During mentorships, protégés observe, learn, and imitate their mentors' behavior. Nkomo et al. (2018) suggested that career and role modeling positively affect new employees' work satisfaction and their commitment to an organization. The results suggested that inexperienced employees receive instrumental resources and support from mentorships by observing the work and attitude of experienced employees. This process influences inexperienced employees' work performance and identification with their roles.

Murphy (2012) claimed that role modeling in reverse mentoring is affected by role identity and the cross-generational differences in value between mentors and protégés. In the early stages, experienced employees tend to question whether inexperienced employees should be mentors. However, studies have verified that experienced members value long-term career development and believe that learning is not limited by age (Gibson and Barron, 2003). Therefore, the role modeling function of reverse mentoring is gradually emphasized and acknowledged. In role modeling, inexperienced employees, as mentors, help their protégés (experienced employees) comprehend problems and learn about and generate new concepts, and the experienced

Table 1 Theoretical content of two-way mentorship.

Scholar(s)	Theoretical content	Definition
Kram (1983)	Traditional mentorship	Traditional mentorship is the interaction between experienced and inexperienced members of a group or organization, where experienced members provide instruction and career planning and development support to new members.
Chen (2012) Murphy (2012)	Reverse mentorship	Reverse mentoring refers to young or new employees helping the executive management of an organization to identify new ideas, concepts, and values.
<i>Global Views Monthly</i> (2018) China Institute of Occupational Skills Development (2011) 1111 Job Bank Assessment Center (2011)	New-generation core competencies	Core competencies are required in basic skills, namely the abilities shared by employees of an enterprise or organization. Both individuals and teams can possess competencies.
Chen (2014) Chen (2018)	Two-way mentorship	Two-way mentorship is a model for improving the personal abilities of mentors and mentees to enable them to satisfy core competency requirements.

Table 2 Profiles of experts.

Expert code	Sex	Job tenure	Tenure as mentor	Tenure as mentee	Current occupational type	Title
1	Female	24 years	13 years	11 years	Integrated circuit design	Head of human resources
2	Female	7 years	0 years	7 years	Technology manufacturing	Senior coordinator
3	Female	13 years	1 year	0 years	Education	Associate professor
4	Female	27.6 years	9.25 years	18.35 years	Semiconductor	Senior manager
5	Female	30 years	20 years	10 years	Information services	Special assistant to the chief executive officer

Table 3 Proposed scale development: Sociodemographic variables of sample and descriptive statistics.

		N = 504	Career development		Psychosocial support		Role modeling	
			Mean	Standard deviation	Mean	Standard deviation	Mean	Standard deviation
Sex	Female	316	4.824	0.691	4.629	0.796	4.764	0.842
	Male	188	4.781	0.675	4.617	0.842	4.723	0.806
Educational attainment	High school or below	20	4.7	0.794	4.593	0.958	4.683	0.888
	Junior college	17	4.893	0.714	4.773	0.694	4.705	0.865
	University	259	4.797	0.703	4.582	0.833	4.719	0.82
Mentor status	Graduate school or above	208	4.826	0.651	4.669	0.782	4.796	0.833
	Former mentor	91	4.731	0.77	4.515	0.862	4.571	0.954
	Current mentor	87	4.926	0.761	4.793	0.809	4.651	0.844
Mentee status	Never a mentor	326	4.799	0.635	4.61	0.795	4.825	0.777
	Former mentee	237	4.748	0.724	4.569	0.807	4.638	0.877
	Current mentee	267	4.862	0.644	4.674	0.815	4.847	0.771

employees learn new things, which contributes to career development (Chen, 2013; Murphy, 2012). In a study on two-way structured in-service training courses, role modeling was most crucial to in-service teacher training, followed by psychosocial support and career development. Role modeling, teaching, teamwork, and communication skills are the primary factors of career development that are conducive to improving work performance, and they indirectly contribute to the virtuous development of enterprises and organizations (Chen, 2018).

According to the literature, role modeling in mentorships enables protégés to learn and imitate mentors' work attitude and performance, which further helps the protégés to enhance their abilities and complete tasks independently. In addition, protégés inherit the mentors' will to become a professional talent. However, the content and interpretation of role modeling in traditional mentoring have included insufficient profound implications in recent mentoring processes. Therefore, the

present study integrated new-generation core competencies to develop a two-way mentoring scale to explore how mentors and protégés demonstrate role modeling in terms of mutual learning.

Overall, enterprises' current talent recruitment criteria differ from those of the past by placing increased emphasis on personal traits, work motives, attitudes, and other internal qualities, which indirectly affect the development of enterprises and organizations. By reviewing the literature and collecting relevant data, this study found that certain core competencies were discussed more frequently among studies, indicating that such competencies were more highly valued by enterprises and organizations. Thus, the present study collated relevant articles and magazines and divided the new-generation core competencies into three categories, namely (1) basic skills: abilities shared by employees of an enterprise or organization; (2) individuals: characteristic representation of individual employees in terms of their work identity and content; and (3) teams: representation of

Table 4 Item analysis results of the overall scale.

Item number	Item code	Mean	SD	CR	Correlation with total score	Cronbach's α after item deletion
1	Instruction a	4.925	0.893	12.779**	0.560	0.936
2	Instruction b	4.768	0.914	16.006**	0.664	0.934
3	Instruction c	4.829	0.960	16.759**	0.651	0.934
4	Protection a	4.829	0.968	14.373**	0.602	0.935
5	Protection b	4.800	0.921	18.901**	0.668	0.934
6	Challenge arrangement a	4.685	0.988	17.031**	0.588	0.935
7	Challenge arrangement b	4.865	0.847	16.764**	0.664	0.934
8	Exposure a	4.833	0.946	17.954**	0.666	0.934
9	Exposure b	4.851	0.889	20.296**	0.703	0.933
10	Visibility a	4.692	1.045	14.716**	0.576	0.935
11	Visibility b	4.815	0.973	17.783**	0.702	0.933
12	Acceptance	4.583	1.056	20.839**	0.715	0.933
13	Teaching	4.808	1.001	16.311**	0.590	0.935
14	Consultation	4.641	1.046	22.868**	0.707	0.933
15	Friendship a	4.506	1.164	13.681**	0.532	0.937
16	Friendship b	4.171	1.304	15.331**	0.572	0.936
17	Team a	4.925	0.908	18.334**	0.672	0.934
18	Team b	4.740	0.941	21.135**	0.733	0.933
19	Trust	4.304	1.168	10.160**	0.490	0.935
20	Respect a	4.984	0.883	14.945**	0.575	0.934
21	Respect b	4.960	0.891	16.118**	0.635	0.936

** $p < 0.005$.

interpersonal interaction and exchange in workplaces. In addition, detailed explanations of the core competencies and their contents are provided.

Methods

Research procedures. This study conducted rigorous tests to develop a reliable and valid two-way mentorship scale. The process is illustrated in Fig. 1.

Scale development. On the basis of the theory proposed by Kram (1983), Scandura (1992) developed a mentoring function theory consisting of three constructs. After exploratory and confirmatory factor analyses, the mentoring function theory model structure yielded favorable reliability, validity, and robustness. The present study collated relevant literature to explore the evolution and effects of various mentoring systems. Two-way mentorship is a novel mentoring system. However, studies have only discussed the concept, hypothesis, and development of this novel system and have not developed a robust and comprehensive measurement scale for evaluating it. Therefore, the present study adopted the theoretical frameworks for two-way mentorship proposed by Chen (2014, 2018) according to the conceptual discourses by Murphy (2012) and Scandura (1992) and divided the functions of two-way mentorship into the following three constructs: career development, psychosocial support, and role modeling. The contents of the three constructs were supplemented on the basis of the core competencies of employees at current enterprises and organizations collated by the present researcher. After discussion with an adviser, the present researcher developed the items of the scale by referencing the frameworks and contents of two-way mentorship proposed by Chen (2014, 2018), Murphy (2012), and Scandura (1992).

A 6-point Likert scale was employed for questionnaire responses rated as 1–6, which indicated “strongly disagree,” “disagree,” “slightly disagree,” “slightly agree,” “agree,” and “strongly agree,” respectively. The participants reviewed the items and selected the anchor according to their perceptions.

Research participants. The study participants were individuals who were currently enrolled in mentorship programs. The samples differed depending on the stage of scale development.

Expert review. To determine the suitability of the scale, four experts (supervisor, trainer, experienced employee, and inexperienced employee) were invited to assess the item descriptions. If any item description was vague or if any item was unreasonable, they would be noted and adjusted accordingly. This process was repeated until all problematic item descriptions were eliminated.

Pilot scale. Theoretically, the sample size of a pilot questionnaire should be 3–5 times or 5–10 times the number of items on the subscale with the most items (Gorsuch, 1983; Tinsley and Tinsley, 1987; Wu and Tu, 2012). Generally, a sample size of 100–300 (or more) is suitable for factor analysis (Comrey, 1973; Wu and Tu, 2012). In the present study, the pilot scale comprised 37 items, of which 16, 12, and 9 were related to the career development, psychosocial support, and role modeling subscales, respectively. Therefore, on the basis of the number of items on the career development subscale, the number of distributed pilot scales should be between 200 and 370. This study used purposive sampling to identify employees in enterprises or organizations in northern, central, southern, and eastern Taiwan who were a part of mentorship programs. A total of 303 participants responded.

Proposed scale. Employees from enterprises or organizations in northern, central, southern, and eastern Taiwan who were a part of mentorship programs were selected through purposive sampling. In total, 504 scales were distributed and collected. The responses were analyzed through item, reliability, and factor analysis to verify the reliability and validity of the proposed scale.

Results

Pilot scale analysis

Item analysis. Before item analysis was conducted, the items were coded to facilitate understanding of the implications of the items in the subsequent analyses. The results of the item analysis revealed that the number of items ranged between 4 and 5,

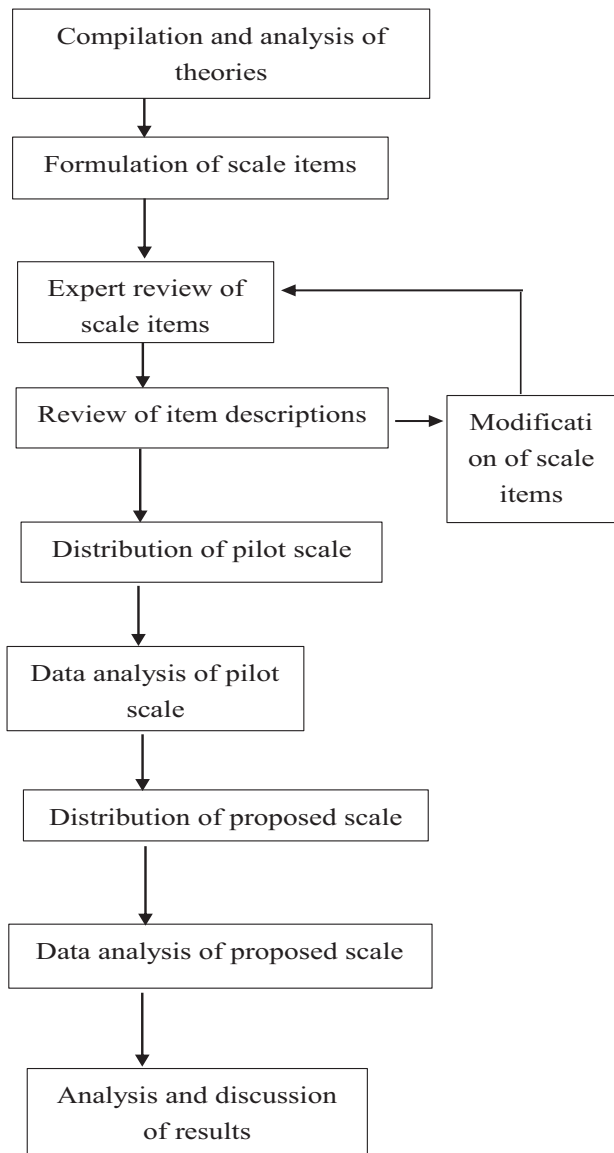


Fig. 1 Compilation process for the developed two-way mentorship scale.

indicating that the average number of all items was higher than the median (3.5) of the scale. The overall standard value was higher, indicating that the scale possessed acceptable power of discrimination. Moreover, the upper and lower 27% of the total score of the scale was used as the standard for grouping to facilitate the independent samples *t*-test and to obtain the composite reliability (CR) of the items. Items that did not reach significance were removed (Chung and Sheu, 2015). The results revealed that the CR of the items on the overall scale reached significance, suggesting that the items on the overall scale possessed favorable power of discrimination.

The product-moment correlation between each item score and the total score was considered when eliminating items (Chung and Sheu, 2015). Items with a correlation coefficient lower than 0.30 were removed. The results revealed that overall, the correlation coefficients of the items on the overall scale were higher than 0.30, indicating a moderate-to-high positive correlation between the scale items and the total score. Next, changes in the internal consistency of the scale (Cronbach’s α) after item deletion were calculated and considered when deleting items. The internal consistency of the scale was 0.956; however, after the

item *High standard a* was deleted, the internal consistency of the scale was 0.957. Thus, the present researcher decided to delete the item *High standard a*.

Factor analysis. The Kaiser–Meyer–Olkin (KMO) test was used to measure sampling adequacy, and Bartlett’s test of sphericity was used to examine whether the scale data could undergo factor analysis. The KMO value of the scale was 0.95, indicating that numerous common factors existed between variables and that the scale was suitable for factor analysis. According to Bartlett’s test of sphericity, the chi-squared value of the scale was 269.22, with a degree of freedom of 35 ($p < 0.001$), indicating that common factors exist between the variables and that the scale was suitable for factor analysis. The researcher used the setting of the three-factor components for factor analysis and adopted the principal component extraction method ($fm = “pa”$) and direct oblimin ($rotate = “promax”$) for factor extraction and analysis, respectively. The values for the three-factor components were 7.01, 6.12, and 3.78. According to a previous study (Chung and Sheu, 2015), an item criterion that directly reflects a factor has the ability to be fully loaded on the factor and to possess a factor complexity (com) of 1 or approaching 1 while also possessing a higher ratio of factors explaining the items (h2) and a lower ratio of measurement error variance (u2). According to the criteria, the items *Management a*, *Management b*, *Information a*, *Information b*, *Learning resource a*, *Identification*, *Supersession a*, *Supersession b*, *High standard b*, *Communication a*, and *Communication b* satisfied the criteria and were deleted.

In the second factor analysis, the KMO value was 0.92, and Bartlett’s test of sphericity chi-squared value was 157.03, with a degree of freedom of 20 ($p < 0.001$), indicating the suitability of the scale for factor analysis. The factor characteristic values were 8.747, 1.685, and 1.327, and the variances explained were 0.487, 0.337, and 0.176, respectively. Then, the researchers named the three constructs “career development,” “psychosocial support,” and “role modeling,” in accordance with the theoretical frameworks proposed by Chen (2014, 2018), which were themselves based on studies by Murphy (2012) and Scandura (1992).

Reliability analysis. The results of the one-item analysis and two-factor analyses revealed that the internal consistency reliability of Cronbach’s α for the overall scale was 0.91. The Cronbach’s α coefficients of the subscales were 0.892, 0.878, and 0.763, suggesting that the internal consistency reliability of the adjusted scale was higher than that of the original scale (Chung and Sheu, 2015).

Overall scale analysis

Descriptive analysis. The 504 responses were used for item and exploratory factor analysis. Among the participants, 316 were female and 188 were male. Most of the participants had an undergraduate education ($n = 259$), followed by a graduate or higher education ($n = 208$). The number of participants with an education level of senior high school or vocational school or lower and of junior college were 20 and 17, respectively. Among the participants, most were only protégés without experience as mentors ($n = 326$), and among them, 267 continued to be protégés. In total, 178 of the participants had mentor experience, and among them, 91 discontinued and 87 continued being mentors, respectively.

Most of the participants worked in academia, education, and counseling ($n = 114$); 64 worked in the restaurant, tourism, cosmetics, and hairstyling industries; 43 worked in customer service or at sales counters; 40 worked in the information technology and software sector; 39 worked in marketing,

Table 5 First factor analysis results of the overall scale.

Item number	Item code	Factor 1	Factor 2	Factor 3	Ratio of explainable factors	Ratio of measurement error variance	Factor complexity
1	Instruction a	0.638			0.387	0.613	1.05
2	Instruction b	0.664			0.513	0.487	1.10
3	Instruction c	0.737			0.515	0.515	1.00
4	Protection a	0.665			0.438	0.562	1.02
5	Protection b	0.682			0.516	0.484	1.02
6	Challenge arrangement a	0.747			0.449	0.551	1.03
7	Challenge arrangement b	0.786			0.562	0.438	1.09
8	Exposure a	0.693			0.524	0.476	1.01
9	Exposure b	0.656			0.561	0.439	1.08
10	Visibility a	0.636			0.404	0.596	1.16
11	Visibility b	0.635			0.542	0.458	1.06
12	Acceptance		0.532		0.581	0.419	1.49
13	Teaching		0.560		0.433	0.567	1.07
14	Consultation		0.541		0.573	0.427	1.36
15	Friendship a		0.918		0.565	0.435	1.10
16	Friendship b		0.831		0.542	0.458	1.03
17	Team a		0.476		0.506	0.494	1.49
18	Team b		0.514		0.609	0.391	1.49
19	Trust			0.571	0.390	0.610	1.13
20	Respect a			0.912	0.711	0.289	1.05
21	Respect b			0.823	0.703	0.297	1.00
	Eigenvalue	9.615	1.515	1.229			

planning, and project management; 28 were administrative personnel; 24 were human resources personnel; 23 were health care services personnel; 17 were in communications and design; 16 worked in finance; 15 worked in manufacturing and technical maintenance; and 62 worked in other industries.

In terms of the industries the participants worked in, 84 were in culture and education; 81 were in electronics and information; 66 were in general service; 46 were in restaurant-related positions; 37 worked at social welfare institutions; 26 worked in health and medicine; 20 were in general manufacturing; 20 were in wholesale; 17 were in mass media and communication; 21 worked in finance; 14 were soldiers, public servants, or police officers; 13 were in research and development; 13 were in construction and real estate; and 45 worked in other industries.

The results of descriptive statistics revealed the overall scale had a mean of 4.739 with a standard deviation (SD) of 0.661. The means and SDs for career development, psychosocial support, and role modeling subscales were 4.808, 4.624, and 4.749, and 0.684, 0.828, and 0.838, respectively.

Item analysis. Overall, the mean item scores were between 4 and 5, indicating that the overall mean scores of the items were higher than the median score of the scale (3.5). The higher value of the overall scale indicates acceptable discrimination power. The product-moment correlation between each item score and the total score was considered when eliminating items. Items with a correlation coefficient lower than 0.30 were deleted. The results revealed that the correlation coefficients of the items on the overall scale were higher than 0.30, indicating a moderate-to-high positive correlation between the scale items and the total score. Next, changes in total scale internal consistency (Cronbach's α coefficient) after item deletion were calculated and considered when deleting items. The internal consistency of the total scale was 0.940, and the internal consistency after the deletion of each item was lower than 0.940, suggesting that the scale possessed favorable power of discrimination (Chung and Sheu, 2015).

Factor analysis. The researcher used the setting of the three-factor components for factor analysis and adopted the principal component extraction method (fm = "pa") and direct oblimin (rotate = "promax") for factor extraction and analysis, respectively. The results are presented in Table 5. The three-factor characteristics were 9.615, 1.515, and 1.229. According to Chung and Sheu (2015), an item criterion that directly reflects a factor has the ability to be fully loaded on the factor to possess a factor complexity (com) of 1 or approaching 1 while also possessing a higher ratio of factors explaining the items (h2) and a lower ratio of measurement error variance (u2). The factor loading of item *Team a* was lower than 0.50 and was deleted.

In the second factor analysis, the KMO value was 0.94, and Bartlett's test of sphericity chi-square value was 245.9 with a degree of freedom of 19 ($p < 0.001$), indicating that the scale was suitable for factor analysis. The principal component extraction method (fm = "pa") and direct oblimin (rotate = "promax") were used for factor extraction and analysis, respectively. The results are presented in Table 6. Item 17 coded as *Team a* with the statement "The mentor and the protégé cooperate and jointly execute tasks" was deleted because its factor loading was lower than 0.50.

The factor eigenvalues were 9.147, 1.476, 1.229. The researcher then named the three constructs "career development," "psychosocial support," and "role modeling," in accordance with the theoretical frameworks proposed by Chen (2014, 2018), which were themselves based on studies by Murphy (2012) and Scandura (1992).

Confirmatory factor analysis

Goodness-of-fit test: Confirmatory factor analysis was conducted on the two-way mentorship scale to verify its construct validity and authenticate the factor structure obtained from the data collected for the pilot scale. The total sample ($n = 504$) was analyzed using the lavaan command in the R language. The goodness-of-fit chi-square value, degree of freedom, and relevant fit coefficients for the overall scale were obtained. The results revealed that the overall model goodness-of-fit chi-square (χ^2) value was 583.093, with a degree of freedom (df) of 167

Table 6 Second factor analysis results of the overall scale.

Item number	Item code	Factor 1	Factor 2	Factor 3	Ratio of explainable factors	Ratio of measurement error variance	Factor complexity
1	Instruction a	0.656			0.389	0.611	1.04
2	Instruction b	0.635			0.515	0.485	1.15
3	Instruction c	0.731			0.514	0.486	1.00
4	Protection a	0.650			0.439	0.561	1.01
5	Protection b	0.660			0.519	0.481	1.03
6	Challenge arrangement a	0.745			0.451	0.549	1.02
7	Challenge arrangement b	0.788			0.566	0.434	1.09
8	Exposure a	0.691			0.523	0.477	1.01
9	Exposure b	0.648			0.559	0.441	1.08
10	Visibility a	0.640			0.401	0.599	1.14
11	Visibility b	0.639			0.538	0.462	1.05
12	Acceptance		0.574		0.604	0.396	1.34
13	Teaching		0.580		0.444	0.556	1.05
14	Consultation		0.584		0.599	0.401	1.23
15	Friendship a		0.856		0.544	0.476	1.08
16	Friendship b		0.777		0.524	0.490	1.02
18	Team b		0.513		0.604	0.396	1.49
19	Trust			0.573	0.399	0.601	1.15
20	Respect a			0.860	0.675	0.325	1.06
21	Respect b			0.837	0.729	0.271	1.00
	Eigenvalue	8.75	1.69	1.33			

Table 7 Convergent validity of the two-way mentorship scale.

Item number	Item code	Factor loading	Error variance	Reliability	Subscale	AVE	CR
1	Instruction a	0.656	0.495	0.378	Career development	0.486	0.911
2	Instruction b	0.635	0.410	0.506			
3	Instruction c	0.731	0.449	0.512			
4	Protection a	0.650	0.523	0.439			
5	Protection b	0.660	0.405	0.519			
6	Challenge arrangement a	0.745	0.558	0.427			
7	Challenge arrangement b	0.788	0.331	0.537			
8	Exposure a	0.691	0.420	0.531			
9	Exposure b	0.648	0.342	0.568			
10	Visibility a	0.640	0.666	0.391			
11	Visibility b	0.639	0.438	0.539			
12	Acceptance	0.574	0.392	0.617	Psychosocial support	0.497	0.850
13	Teaching	0.580	0.533	0.457			
14	Consultation	0.584	0.391	0.609			
15	Friendship a	0.856	0.847	0.393			
16	Friendship b	0.777	1.017	0.422			
18	Team b	0.513	0.336	0.486	Role modeling		
19	Trust	0.573	0.817	0.658		0.342	0.591
20	Respect a	0.860	0.296	0.401			
21	Respect b	0.837	0.189	0.625			

($p < 0.001$), rejecting the null hypothesis and thus suggesting the scale had room for adjustment. However, because chi-square values are easily affected by sample size, other fit coefficients could be applied to analyze the value. The results revealed that the absolute fit indices of the root mean square error of approximation and the standardized root mean squared residual were 0.07 and 0.044, respectively, reaching the standard (< 0.08). The relative fit indices of the comparative fit index and non-normal fit index were 0.921 and 0.911, respectively, reaching the standard (> 0.90). The results suggest that the scale model had robust factor structures and favorable construct validity. All the fit indices reached the corresponding standards, indicating that the theoretical model explained the collected data.

Convergent validity: Convergent validity refers to the degree to which two measures of a construct that theoretically should be related are actually related (Babbie, 2016; Wu and Tu, 2012). According to the convergent validity standard proposed by Fornell and Larcker (1981), both the standardized factor loading and average variance extracted (AVE) must be more than 0.5, and the CR must be more than 0.6.

The results are presented in Table 7. The factor loadings of all items on the scale were higher than 0.50. The AVEs and CRs for the career development, psychosocial support, and role modeling subscales were 0.486, 0.497, and 0.342, and 0.911, 0.850, and 0.591, respectively. After two items were deleted from the role modeling subscale, the number of items on the subscale was lower

than that on the other two subscales, thereby indirectly affecting the AVE and CR results of the subscales.

Discriminant validity: Discriminant validity tests the degree to which the relationship between potential constructs is weaker than the relationship within potential constructs. The researcher referenced Hair et al. (2006) and selected correlation coefficients with a construct AVE root square higher than that of other constructs. The AVE root squares for career development, psychosocial support, and role modeling were 0.697, 0.704, and 0.584, respectively. Except for the role modeling AVE being lower than the correlation coefficients of other constructs, the AVEs of the other constructs were higher than the correlation coefficients of other constructs. Thus, discrimination validity was present in the career development and psychosocial support constructs.

Reliability analysis. The results of the one-item analysis and two-factor analyses revealed that the internal consistency reliability of Cronbach's α for the overall scale was 0.94. The Cronbach's α coefficients of the subscales were 0.911, 0.879, and 0.791, suggesting that the internal consistency reliability of the adjusted scale was higher than that of the original scale (Chung and Sheu, 2015). The complete questionnaire can be found in Appendix II.

Discussion and suggestions

Discussion. Professional development can be promoted by mentorship, sponsorship, teamwork, diversity initiatives, and succession planning (Bonifacino et al., 2021; Creta and Gross, 2020; Ureña et al., 2021; Williams et al., 2021). Given the trend of technological development, Shamambo et al. (2020) indicated that e-mentoring programs combine mentoring, business transition, technology, and social engagement (Saxena et al., 2020). In response to the COVID-19 pandemic, distance mentorship models were deployed to overcome geographic limitations, increase mentorship access, and strengthen mentorship relationships (Raborn and Janis, 2021).

This study integrated the theoretical two-way mentorship framework and new-generation core competencies to develop a two-way mentorship scale, which was then used to evaluate a training and development model for both mentors and protégés in terms of mutually strengthening core competencies and improving personal abilities in the workplace. Studies have frequently cited the mentoring functions questionnaire by Scandura and Ragins (1993) and the shortened mentoring functions questionnaire (MFQ-9) developed by Castro and Scandura (2004). The present study compared the proposed scale and the two instruments in terms of the number of items, reliability, validity, and content implications. The results revealed that the overall internal consistency of the two-way mentorship scale was higher than 0.90, and the internal consistency coefficients of the subscales among the constructs were more than 0.70. After exploratory and confirmatory factor analyses, the construct validity, convergent validity, and discriminant validity of the scale satisfied the standards. The scale was verified as reliable in interpreting current mentorships. The results of the comparison of the proposed scale and the two instruments revealed that incorporating elements of the two-way learning model and of mentoring and new-generation core competencies into item descriptions enriched the abundance and diversity of the scale in terms of abilities and qualities other than professional knowledge and skills. The scale was closer to the factual considerations of organizations regarding talent recruitment and selection. Thus, the proposed scale had an interpretation that more effectively satisfied current mentor relationships when compared with the mentoring functions questionnaire by

Scandura and Ragins (1993) and the MFQ-9 by Castro and Scandura (2004).

The results indicated that the component implications of career development for the two-way mentorship were affected by the theoretical framework. Exploratory factor analyses of implications such as instruction, protection, challenge arrangement, exposure, and visibility had a factor loading higher than 0.50 for career development. This result suggests that the proposed scale retained a portion of the implications of traditional mentoring functions in terms of career development. The result is also consistent with the results of studies suggesting that the training modes of traditional mentoring benefit workplace development, thereby promoting organizations' brand images and competitiveness (Kram, 1985; Nkomo et al., 2018; Scandura, 1992). When both the mentor and the protégé learn from one another through a traditional mentoring structure, the work performance of both parties can be positively affected (Chen, 2018).

In the psychosocial support construct, items acceptance, teaching, consultation, friendship, and teamwork reached 0.50-factor loading, indicating that the implications of psychosocial support mainly formed through equivalent and virtuous interaction between the mentors and the protégés. The results indicated that psychosocial support was consistent with the results of Chen (2018) and Chen (2014). This function is not simply provided by one party to the other. Virtuous bidirectional interaction is conducive to individual adaptation in various situations and to the development of work ability (Murphy, 2012). The support, encouragement, and sharing of individual work or life experience between mentor and protégé helped develop psychosocial support, thereby promoting the favorable development of work environments and interaction as well as work efficiency (Cheng et al., 2013).

The results revealed that role modeling reached the factor loading standard, but only for trust and respect. The composition and development of role modeling in a two-way mentorship were mainly affected by the trust between the mentor and the protégé and the protégé's respect toward the mentor's work attitude, behavior, and professionalism during the mentorship process. The results also indicated that the interpretation of the implications of role modeling in a two-way mentorship was influenced by the theory proposed by Scandura (1992). The results were consistent with those of Ku and Hsieh (2006). When individuals develop trust in an organization to acknowledge their work performance and attitude, intraorganizational interaction and communication can be promoted with enhanced openness to improve employees' altruistic behavior at work, forming a virtuous cycle.

Overall, the two-way mentorship scale partially reflected the mutual learning of the mentor and the protégé during work, promoting their work abilities. On the basis of the theoretical traditional mentoring framework, the two-way mentorship scale integrated new-generation core competencies, developed comprehensive implications and extended the items to demonstrate the interpretation of real mentor relationships through two-way mentoring functions.

Suggestions. According to data analysis, the two-way mentorship scale exhibited extremely high reliability and validity. Subsequent empirical studies may focus on the two-way learning training mode of two-way mentorships by using the scale to assess the current status and experience of two-way learning modes in mentorships. The results of the analysis of the responses from the mentors and the protégés were compared with their work behavior and performance to determine their abilities, emotions, and attitudes in work scenarios and how two-way mentorship changed these characteristics. The

development of two-way mentorship helped the human resources departments of design enterprises with the recruitment, selection, employment, education, and retention of talent. Through the mutual learning model of two-way mentoring, new employees can enhance their work performance while adapting to their work environments. In addition, experienced employees may become more motivated to acquire new knowledge and skills and to be committed. Two-way mentorship affects mentors' and the protégés' positive development in core competencies and other relevant abilities. Two-way mentorship contributes considerably to the selection, cultivation, and retention of talent among organizations, thereby benefiting the organizations' development in the industry.

The present study collated relevant studies and journals, finding that new-generation core competencies have gradually become the focus of talent selection and cultivation among organizations and enterprises. Therefore, extending new-generation core competencies and using them to design courses for training new employees is recommended. When employees enter a new workplace, they can become familiar with the basic skills required to perform their duties and rapidly adapt to their work environment and various scenarios to improve their work efficiency. New-generation core competencies can be used as the criteria for talent selection to help management personnel select talent suitable for the organization or a position. Rapid and simple selection of suitable personnel can promote the rapid development of organizations, thereby reducing the risk of lack of assessment of new-generation core competencies.

The promotion of two-way mentorship facilitates the development of mentors' and protégés' new-generation core competencies. Through mutual learning and exchange, employees' basic work abilities can be improved, demonstrating their personal value. Both mentors and the protégés actively propose higher standards according to their individual capacities, seek different channels and resources to improve their personal competitiveness, embrace various challenges, and try new things. This system not only improves work performance but also indirectly affects mentors' and protégés' daily life needs. The two-way exchange and learning model facilitated the exchange mode between mentors and protégés. The interaction pattern that omits one-way channels improves communication and coordination between mentors and protégés, develops their empathy, and facilitates virtuous interaction with others. Employees can express themselves freely without the constraints of situational frameworks or the limits of others' perceptions of their role. Additionally, knowledge sharing between teams can be smoothed and enriched. During the sharing process, new ideas or strategies that benefit organizational development can be easily generated to promote the positive development of organizational teams in relevant fields.

Future studies. To further explore this topic, future studies can increase the number of questionnaires distributed and conduct sampling across various industries, job positions, and mentor and mentee roles to increase the robustness of the research results. In addition, future studies can incorporate research methods such as qualitative interviews and field surveys to further understand the actual interactions between mentors and mentees during guidance and work as well as the implications of these interactions; adoption of such methods can compensate for the superficiality of the two-way mentorship scale.

The role modeling subscale of this study contains few items, which caused its CR and discriminant and convergent validity to

be lower than those of other subscales—this is a study limitation. Future studies should modify or improve the role modeling subscale by including more items or investigating why role modeling items were eliminated in the pilot study.

Future studies can incorporate other variables or test criterion-related validity to determine the function of the two-way mentorship scale in actual situations. In addition, future research should investigate the relationship between two-way mentorship and other variables to understand the effect of the training model of two-way mentorship on the thinking, emotions, and behavior of mentors and mentees in the workplace.

Data availability

The datasets generated during the current study are not publicly available but are available from the corresponding author on reasonable request. However, some of the data are provided in supplementary materials.

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Author contributions

Y-CC develops the main conception and design of the work, drafts the work, and integrates the work that has been appropriately investigated and resolved. C-CC conducted the data analysis of the work, drafted the work, and ensured the accuracy of the work.

Competing interests

The authors declare no competing interests.

Ethics approval

This noninterventional study did not require ethical approval due to its design, nor did it take place within any private or protected space. Therefore, no specific permissions were required to conduct the study in the geographical regions specific to this study. Additionally, participants' data were deidentified and only analyzed for the purposes of this study.

Informed consent

Before participants were enrolled in this survey, the researchers informed them of their rights regarding confidentiality. The details given were as follows. 1. Participation in this research is confidential. In the survey, participants are asked any questions that would reveal any personal information. In the event of any publication or presentation of the following research, no personally identifiable information will be shared because participant names are in no way linked to their responses. 2. Participants' decision to participate in this research is completely voluntary. Participants may withdraw at any time. Participants do not have to answer any questions they are not willing to answer.

Additional information

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