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Development of Virtual Transformational Leadership Scale for Leaders in E-Commerce Businesses

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Abstract

Leaders in e-commerce businesses face significant complexity and uncertainty in virtual work environments. However, research on the measurement of leadership development in a virtual work environment for leaders in e-commerce businesses in Thailand is limited. Thus, the main purposes of this study were to examine the dimensions and to develop the scale of virtual transformational leadership for leaders in e-commerce businesses and test its psychometric properties. A multi-methods design was implemented to examine the dimensions and develop the virtual transformational leadership scale for leaders in e-commerce businesses. Firstly, the integration of virtual leadership and transformational leadership behaviors and interviewed with five e-commerce experts were conducted to synthesize the virtual transformational leadership dimensions for leaders in e-commerce businesses. The final 33-item scale of virtual transformational leadership for leaders in e-commerce businesses was generated and distributed as a second result. Data was collected using an online questionnaire, and the instruments used were Likert-type scales. The participants were 600 leaders in e-commerce businesses in Bangkok. The goodness-of-fit indices showed that the virtual transformational leadership model was consistent with the empirical data (Chi-square = 2314.71, $df = 585$, p -value = .00, RMSEA = .07, SRMR = .04, NFI = .97) with a Cronbach's alpha score of .96. This study contributes to behavioral science research by developing a virtual transformational leadership scale that measures virtual transformational leadership behaviors for leaders in e-commerce businesses in the Thai context.

Digitalization has influenced business activities and introduced some unpredictable factors that cause many changes and impact business and organizational management. During the COVID-19 pandemic, many organizations were forced to rapidly change their business operations and working processes that required social distancing, contactless trading, and more online working (O'Leary, 2020). However, these changes influence e-commerce businesses to be recognized as having a significant impact during times of crisis; as a result, e-commerce online sales value in Thailand reached 49 billion US dollars during the COVID-19 pandemic, up from 33 billion US dollars in 2017. It demonstrates that e-commerce businesses are expanding and driving Thailand's economy (Electronic Transactions Development Agency, 2021). Furthermore, e-commerce platforms are rapidly growing across the world as a result of the impact of digital technology transformation and changing customer behaviors and needs (Bugshan & Attar, 2020; Ningfei & Hu, 2018), which are concerned with business changes in the context of digital transformation and emphasize organizational innovation, flexibility, and adaptive change as being key to the success of e-commerce businesses (Gunasekaran et al., 2002; Kickul & Gundry, 2001). In other ways, leaders in e-commerce businesses are faced with many challenges, such as unpredictable situations, fast-moving

business strategies, and changing customer behaviors. So, they are required to quickly adapt and improve business strategies and team performance in the fast-paced and virtual work environment.

Substantial studies on virtual leadership have demonstrated the influence of transformational leadership on the performance of virtual teams in virtual work environments (Ruggieri, 2009). Purvanova and Bono (2009) discovered that transformational leadership behaviors had a greater impact on virtual teams than on face-to-face teams. However, there is a gap of knowledge of leadership behaviors that should be emerged of the digital transformation and the organization in a virtual work environment, which focuses on an individual leader's characteristics in the contexts and factors that influence how leadership develops. According to digital transformation, traditional leadership styles are no longer sufficient due to the complexity of today's digitalized world; new leadership styles must adapt to challenging situations and be aware of recent technological developments to determine which are threats or opportunities that impact businesses and organizations. (Dirani et al., 2020; Henderikx & Stoffers, 2022) Thus, the researcher was interested in studying the integration of transformational leadership (Bass & Avolio, 1994) and virtual team leadership concepts (Batırlık et al., 2022) to develop a new leadership concept that is appropriate for today's situational requirements for leaders in e-commerce businesses.

Thus, the researcher was interested in studying the integration of transformational leadership (Bass & Avolio, 1994) and virtual team leadership concepts (Batırlık et al., 2022). The objectives of this study were to examine the dimensions and to develop scale of a virtual transformational leadership for leaders in e-commerce businesses. The scale could assist Thai organizations in measuring the outcome of factors that affect the virtual transformational leadership behaviors. Moreover, leaders in e-commerce businesses will be able to develop leadership behaviors specifically in the Thai context to perform well and lead a virtual team in a fast-paced and virtual work environment which is critical leadership development now and in the future.

Literature Review

This section provides an overview of the main concepts of this research, which include transformational leadership and virtual leadership, reviewed behavioral leadership theory to explain the integration of transformational leadership and virtual leadership as a new concept of virtual transformational leadership, and to identify a measurement model in scale development process.

Behavioral Leadership Theory

Behavioral leadership theory is a leadership concept that evaluates leader behavior and contributes to developing an effective leader or implementing a new leadership style by acquiring a specific set of behaviors with a focus on trait theories, behavior theories, and contingency theories. First, trait theories emphasize the characteristics of a leader at an individual level as being different and in possession of special or unique personality attributes, abilities, and skills. Fleenor (2017) defined the characteristics that make an effective leader include decision-making ability, adaptability, awareness of employee motivation, trustworthiness, etc. Second, behavior theories are concerned with a leader's action style, which is classified as either task-oriented emphasizing the achievement of work goals and organizational structures, as people-oriented, focusing on the interpersonal relationships and consideration for followers. Trait and behavior theories begin with the assumption that a successful leader in any achievement situation demonstrates the behaviors that are most beneficial to team productivity and psychosocial development (Kovach, 2018). And contingency theories are contextualized in leadership and modeled as more adaptive and situationally flexible than a trait or behavioral theories. Kovach (2018) affirms that the most effective type of leadership depends on situational factors and that no one style of leadership applies or should be followed in all workplace situations.

As a result, trait theories analyze situations and the characteristics of the leader who will lead in each situation, behavioral theories focus on examining leadership behavior and what leaders should do, and

contingency theories emphasize that situational factors and environments are important factors in determining effective leaders at various levels in the organization. Thus, this research discusses behavioral leadership associated with transformational and virtual leadership to investigate a new leadership concept based on the dynamics of the workforce and situation.

Transformational Leadership

This research focused on transformational leadership as many studies emphasized the importance of transformational leadership in a virtual work context. Purvanova and Bono (2009) compared the impact of transformational leadership on virtual and face-to-face team performance and found that transformational leadership behaviors had a greater impact on virtual teams. Successful transformational leadership in a virtual environment provides advantages for overcoming distance and a lack of physical contact with the team (Chrisentary & Barrett, 2015), as well as having an impact on virtual team decision-making processes (Davidaviciene & Al Majzoub, 2022). Transformational leadership consists of four dimensions, which are idealized influence, inspiring motivation, intellectual stimulation, and individualized consideration behaviors (Bass & Avolio, 1994). Leaders are inspirational when they appeal to their followers' feelings, communicate a clear vision of the future, and express confidence in their ability to achieve their goals. Leaders are intellectually stimulating because they encourage their followers to think critically and generate new ideas. They are also considerate of their followers' abilities and enthusiastic to assist them in improving their potential and achieving their goals. The transformational leadership measurement instrument was the *multifactor leadership questionnaire*: MLQ contains 20 items measured on a 5-point Likert scale, from 'strongly disagree' (1 point) to 'strongly agree' (5 points) and consists of five components, which are idealized attributes, idealized behavior, individualized consideration, intellectual stimulation, and inspirational motivation (Bass & Avolio, 1994; Batista-Foguet et al., 2021).

Substantial evidence demonstrates that transformational leadership seems to be influenced by charisma and communication factors (Balthazard et al., 2009) and has the potential to enhance performance, satisfaction, and motivation (Purvanova & Bono, 2009). Furthermore, transformational leadership behaviors are the greatest influence on virtual leaders and positive impact on team achievement in virtual work environments (Ruggieri, 2009). According to Kahai et al. (2013), mentioned that transformational leadership had a significant impact on encouraging learning efforts and frequency of communicate to solve team problems, and Lee et al. (2015) found that organizations led by transformational leadership had an impact on increasing a team's creativity also increases respect and trust among followers in a virtual work environment.

Virtual Leadership

New technologies have accelerated the transition of business practices to a virtual work environment. Leaders are faced with the challenge of managing and working with virtual teams, which have team members in different locations, time zones, and cultures, through online technology to establish a social relationship, ensuring everyone's participation and connection (Kahai et al., 2013). For virtual performance development, virtual leaders should be conscious of their team members' specific competencies, as well as ensure clear communication of goals and collaboration between the leader and the team members (Gilson et al., 2015; Maduka et al., 2018). Virtual teams succeed by fostering trust in the team's performance, as virtual teams cannot function independently (Contreras et al., 2020; Weimann et al., 2013). As a result, virtual leaders must understand the team and business goals, and recognize diversity by fostering trust in the virtual team and allowing different points of view to be expressed, as well as clear communication with virtual team members, in order to understand the goals of working together for the success of the business and organization.

Batırlık et al. (2022) research on the *global virtual team leadership scale* (GVTLS) was to create a valid and reliable scale with 29 items on the virtual team leadership phenomenon. It found that virtual team

leadership behaviors are divided into six major dimensions: 1) managerial qualities 2) interactivity 3) human relations 4) characteristics personal traits 5) rewards and 6) flexibility (in this research, the fifth dimension "rewards" was removed because the researcher observed that it related to transactional leadership definitions more than transformational leadership definitions). On this scale, it will be possible to measure the leadership characteristics of individuals working in multinational companies in a virtual environment. Substantial research on virtual leadership has an impact on how leaders use digital technologies to interact with virtual team members, as well as manage and support virtual teams to ensure that they perform as productively as possible. So, it shows that virtual leadership must eventually prepare the future leader.

A systematic review of the contributions of a leadership behavior theory perspective to the study of transformational and virtual leadership generated the concept of virtual transformational leadership. There was significant evidence that transformational leadership and virtual leadership positively affected the performance of both leaders and followers in today's work environment of digitalization and virtualization, so leaders must adapt their leadership style to the situation's requirements. However, no research has been done on the integration of transformational leadership and virtual leadership concepts. As a result, this research could be related to the development of a virtual transformational leadership concept that adjusts the individual factors, such as decision-making ability, adaptability, awareness of employee motivation, and trustworthiness, as well as the situation factors, such as digital and virtual work environments, which influence the virtual transformational leadership behaviors of leaders in e-commerce businesses.

However, the studies on virtual or transformational leadership in the e-commerce context in Thailand are limited; most of the studies focused on the factors affecting the behaviors of leaders in other fields. For example, Unhalekka and Boonyarit (2020) investigated the link between intrapreneurship and Medical Representatives (MR) job performance in Thailand. This link is mediated by MRs' work engagement and tempered by their first line manager's transformational leadership. There is also no specific scale for virtual transformational leadership behaviors, both individual and situational factors. This knowledge gap can be filled through the integration of virtual leadership and transformational leadership concepts. Therefore, the objectives of this study were (1) to examine the dimensions and (2) to develop the scale of virtual transformational leadership for leaders in e-commerce businesses. In summary, the conceptual framework for the development of a virtual transformational leadership scale is the synthesis of virtual leadership and transformational leadership dimensions. The interview method was also used to collect data from e-commerce experts because it implies researchers meet with executive leaders in e-commerce businesses to interview them to verify and confirm the dimensions that are related to and essential to leaders in e-commerce businesses, as well as provide more insightful information relevant to e-commerce business work challenges and how to overcome the challenges from an expert's perspective.

Method

This study implemented a two-phase, multi-methods design. The first phase was to integrate and synthesize of virtual leadership and transformational leadership dimensions and to interview with five e-commerce experts were conducted to verify and confirm the virtual transformational leadership dimensions for leaders in e-commerce businesses. which was then used in phase two, to test the psychometric properties.

Phase 1

The purpose of this phase is to examine the definition and dimensions of virtual transformational leadership of leaders in e-commerce businesses. The scale draft was also created based on this phase finding.

Participants

The participants of this phase were five e-commerce experts, who selected based on the following four criteria: 1) presently working in the e-commerce company at managerial level or higher, 2) had more

5-year experiences working in e-commerce businesses, 3) managing team members and involved in the performance evaluation process, and 4) experienced in the virtual work environment.

Procedures

This phase was to integrate and synthesize of virtual leadership and transformational leadership dimensions and to interview five e-commerce experts to verify and confirm the dimensions of virtual transformational leadership for leaders in e-commerce businesses that were created by integrating transformational leadership and virtual team leadership components and synthesizing each dimension to draft the operational definitions of each dimension. The interview proceeded with establishing a rapport to engage the interviewee before inquiring into the behavior and thought process of virtual transformational leadership for leaders in e-commerce businesses by probing. The initial interview questions were: (1) What are the challenges of leaders in e-commerce businesses? (2) What are the challenges of leading teams in virtual work environments? (3) What are the important skills of leaders in e-commerce in virtual work environments? (4) What do you think about virtual transformational leadership? and (5) How have leaders in e-commerce businesses demonstrated virtual transformational leadership behaviors?. The interview was recorded and translated properly. The researcher integrated records and related studies for data analysis with deductive methodologies and developed the operational definition of virtual transformational leadership. The researcher used the operational definitions to develop a virtual transformational leadership scale for leaders in e-commerce businesses and invited experts in behavioral sciences and industrial and organizational psychology to evaluate the content validity by indexing the item objective consistency.

Phase 2

The purpose of this phase is to test the psychometric properties of the virtual transformational leadership scale for leaders in e-commerce businesses.

Participants

This phase the participants were 600 leaders in e-commerce businesses in Bangkok and Thailand e-commerce association members, the sample size recommendations for a good sample size is 300, and an excellent sample size is 500 (Tabachnick, 2013). By cluster random sampling, the participants in this study were leaders from 428 companies in the e-commerce business in up to 5 districts in Bangkok.

Procedure

This phase was to test the psychometric properties of the virtual transformational leadership scale. The online questionnaires with consent forms were distributed to the sample via email to the human resources departments of e-commerce companies in Bangkok and to Thailand e-commerce association members emails from December 19, 2022, to January 31, 2023.

Data Analysis

Descriptive statistical analysis was employed to describe a general characteristic of participants. The psychometric properties of the scale were analyzed in term of item discrimination, construct validity, and reliability. The item-total correlation was performed to estimate the item discriminations. All items must perform more than 0.2 item-total correlation. The data was tested for reliability by Cronbach's alpha coefficient to determine the internal consistency of the scale. Last, the researcher ran a second-order confirmatory factor analysis to measure construct validity with LISREL version 8.72.

Ethical Considerations

This research protected the informants' rights by providing official letters requesting permission for data collection and consent forms to participants and the research areas before gathering research data. These were considered and approved by the Human Research Ethics Committee of Srinakharinwirot University, the ethics certificate number SWUEC/E/G-364/2565, with an approval date of September 8, 2022.

Results

The results were provided in two phases. The purpose of the phase one was to examine the dimensions of virtual transformational leadership for leaders in e-commerce businesses and to develop the scale of virtual transformational leadership for leaders in e-commerce businesses. The phase two was used to test the psychometric properties of a virtual transformational leadership scale for leaders in e-commerce businesses.

Phase 1

The first phase examined the dimensions of virtual transformational leadership by integrating and synthesizing the concepts of transformational leadership and virtual leadership, which are described in the literature review. Content validity was confirmed through interviews with five e-commerce experts, which were implemented to verify and confirm the dimensions of virtual transformational leadership that particularly relate to the e-commerce context. The meaning of each dimension is discussed, along with relevant quotations that support the explanation. The synthesis of virtual transformational leadership dimensions as shown in Table 1.

Table 1

Table of Virtual Transformational Leadership Dimensions Synthesis

Theory/Dimensions	Virtual transformational leadership dimensions		
	Guiding change	Building synergy	Empowering individuals
Transformational leadership dimensions (Bass & Avolio, 1994)			
Idealized influence	✓		
Inspiring motivation		✓	
Intellectual stimulation		✓	
Individualized consideration			✓
Virtual team leadership dimensions (Batırlık et al., 2022)			
Managerial qualities	✓		
Interactivity		✓	
Human relations		✓	
Personal traits			✓
Flexibility			✓

Guiding Change

Guiding change, which is synthesized from the "idealized influence" component of transformational leadership and the "managerial qualities" component of virtual team leadership, refers to a leader's behavior as being a role model and foreseeing future challenges and opportunities, to deal with changes and turn challenges into opportunities and adaptive change in a virtual work environment.

E-commerce is changing at a rapid pace; what was intended may not be implemented at all, and what is always changing must be recognized ahead of time. Leaders must constantly be prepared when it comes to change. (E-commerce expert 1)

Customers' needs for online businesses change on a daily basis, so we must understand how to respond to our customers in a timely manner. As a result, leaders must be aware of new business challenges and opportunities, keep updated on technology, and be prepared to deal with challenges promptly as they arise. (E-commerce expert 2)

Leaders must be able to propose solutions to future challenges as the business or organization changes, as well as interact with employees to encourage them to comprehend the situation and adapt to all aspects of it. (E-commerce expert 3)

Building Synergy

Building synergy is synthesized from the “inspiring motivation” and “intellectual stimulation” components of transformational leadership and the “interactivity” and “human relations” components of virtual team leadership, which refer to a leader’s behavior of building a team’s consensus, transparency, and mutual trust as well as stimulating a team member’s creativity and knowledge sharing in the virtual work environment.

Building trust among virtual teams is challenging, as collaborative work requires transparency and goal-setting. As a result, leaders must engage team members in collaborative work with easily accessible knowledge sharing to assist everyone understand, trust, and support one another. (E-commerce expert 1)

Leaders in virtual work environments must foster relationships among team members and encourage them to collaborate more successfully, even if they have never met in person, especially with new team members who are required to connect with other team members. (E-commerce expert 2)

For virtual working, communication and mutual agreement are crucial to building team consensus. Thus, team leaders must encourage all team members to contribute and share their thoughts in order to avoid possible misinterpretations or misconceptions that could lead to work problems. (E-commerce expert 3)

Empowering Individuals

Empowering individuals is synthesized from the “individualized consideration” component of transformational leadership and the “personal traits” and “flexibility” components of virtual team leadership, which refers to a leader’s behavior of recognizing individualization and encouraging followers to develop their potential by turning work challenges into an opportunity for personal growth and proving advice through appropriate online communication skills in the virtual work environment.

Everyone has individual strengths and weaknesses. A good leader, like a good coach, must understand how to encourage each team member’s abilities while developing their weaknesses through effective virtual communication. Leaders must allocate time for their followers to discuss and guide them on how to perform a better job, as well as allow them to think of ways to work that they are talented at, in order to achieve their goal. (E-commerce expert 1)

Empowering followers means not letting them work alone. However, the leader must keep an eye on them and track their work progress on a regular basis, as well as be available to assist when problems arise, in order to give them the freedom to think and learn by trial and error in working with their own style, which they have developed and created independently. (E-commerce expert 2)

We today function in different time zones or locations, interacting over the internet and meeting in person only on rare occasions. As a result, leaders must allocate time to connect and effectively communicate with all their followers individually. It is critical to understand all points of view; both sides must be open-minded and listen to and accept each other’s perspectives in order to find a solution that is equitable and without bias. (E-commerce expert 3)

Item Generation

This research used a virtual transformational leadership scale for leaders in e-commerce businesses by adapting the Multifactor Leadership Questionnaire: MLQ (Bass & Avolio, 1994) and Global Virtual Team Leadership Scale (GVTLS) (Batırlık et al., 2022). Firstly, the virtual transformational leadership 40-item scale was generated from the meaning of each dimension and the interview results. The researcher conducted a check for content validity by using the index of item objective congruence (IOC) and invited

three experts in behavioral sciences, industrial and organizational psychology, and e-commerce business to evaluate the content validity. The IOC was analyzed and passed the selection criteria of .67 – 1.00 and six items were removed because the IOC score was lower than .60. As a result, the number of items was reduced to 34 items and then the scale items have revised some wordings aligned with the comments of the experts and try out to test the validity scale with 35 leaders in e-commerce businesses. It found that t-ratio values between 1.33 – 6.30 and one item were deleted due to an insignificant value at 1.33 so reduced to the final 33 items in the scale. This research used questionnaires on a 5-point Likert scale from (5) frequently to (1) never for positive items and the reverse point from (1) frequently to (5) never for negative items (the questionnaires were in the Thai language). All instruments had a Cronbach's alpha coefficient greater than .70 (Nunnally, 2016) and a correlated item-total correlation value of .20 or higher, as shown in Table 2.

Table 2

Cronbach's Alpha Coefficient and Correlated Item-Total Correlation

Dimension	Sample (n=600)	
	CITC	α
Guiding change	.56 - .83	.87
Building synergy	.50 - .84	.91
Empowering individuals	.35 - .69	.92

Table 3

Basic Values and Statistics used to Examine Normal Distribution of Dimensions

Dimension	<i>M</i>	<i>SD</i>	λ	AVE	CR	R^2
Guiding change	3.17	.44	.93	.38	.87	.86
Building synergy	2.94	.51	.96	.49	.91	.94
Empowering individuals	3.01	.53	.96	.51	.91	.95

Note. *M* = Mean, *SD* = Standard deviation, λ = Factor loadings, AVE= Average variance extracted, CR= Construct reliability, R^2 = Correlation coefficient

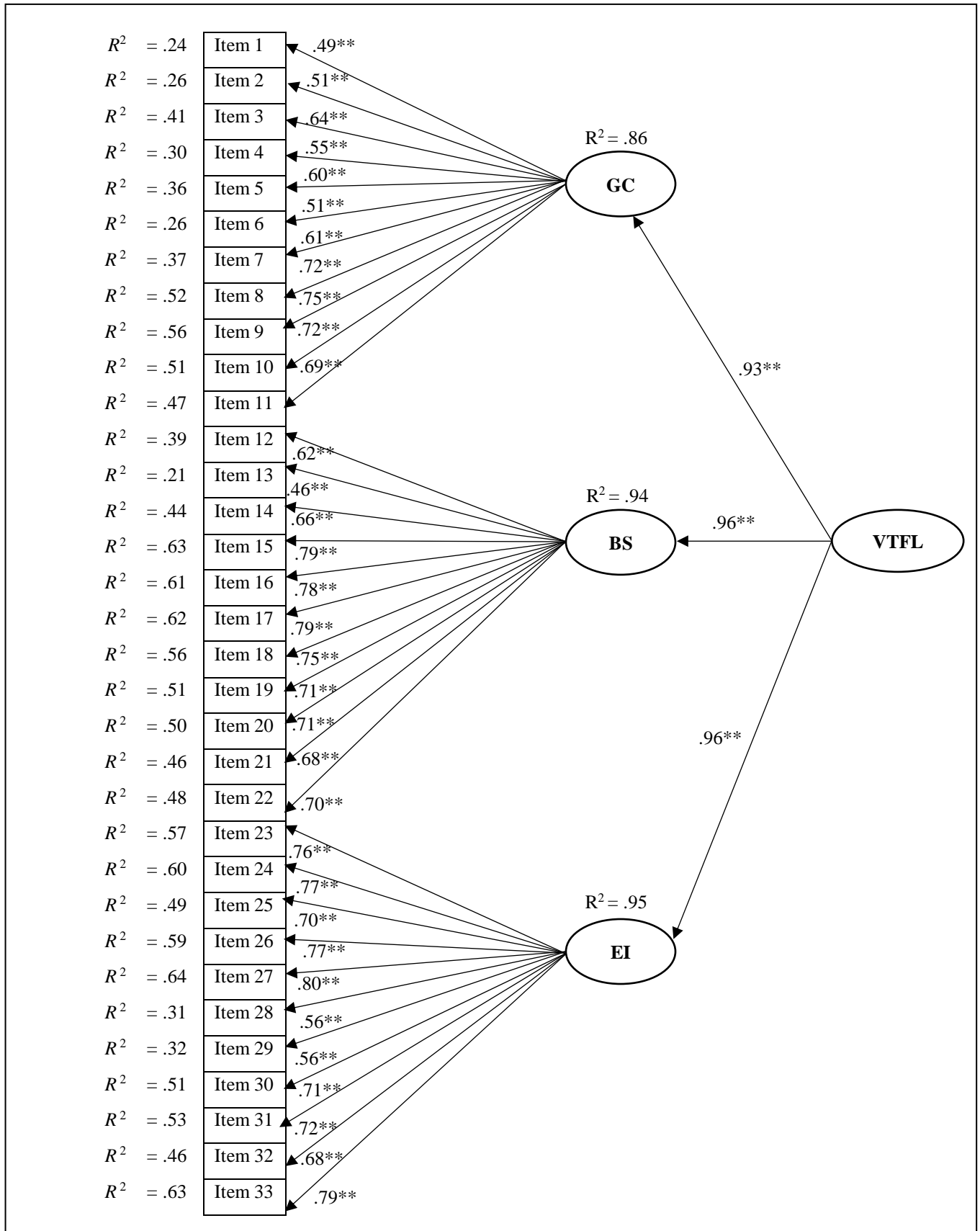
Phase 2

This phase was executed to complete the phase one's results by examining the scale's psychometric properties. The total 600 respondents who completed the scale, there were female, 56.50%, with a majority 38.20% of age 42 - 57 years old. Around 29.50% were working in the e-commerce business for 1-3 years, as well as 41.83% were leaders in middle level. It shows descriptive statistics and confirmatory factor analysis. The results of item discrimination were tested by item-total correlation and 33 items had a coefficient correlation of more than 0.2. For the reliability test of 33 items, Cronbach's alpha was .96, which greater than .70 is considered satisfactory (Nunnally, 2016), so the scale had reliability. The individual dimension Cronbach's Alpha and factor loadings values were also calculated. Guiding change had a Cronbach's Alpha value of .87 and a factor loadings value of .93. Building synergy had a Cronbach's Alpha value of .91 and a factor loadings value of .96. Empowering individuals had a Cronbach's Alpha value of .92 and a factor loadings value of .96. Convergent validity can be considered by magnitude of factor loadings whether factor loadings are stronger than .60 this indicates good convergent validity (Garson, 2010 as cited in Cabrera-Nguyen, 2010). Table 3 showed that all dimensions followed the normal distribution assumption.

Finally, the second-order confirmatory factor analysis (Figure 1) demonstrated that the virtual transformational leadership for leaders in the e-commerce businesses model was consistent with the empirical data indicated by the goodness-of-fit indices (Chi-square = 2314.71, df = 585, p -value = .00, RMSEA = .07, SRMR = .04, NFI = .97). The thresholds of mentioned indices for satisfactory fit suggested by Schumacker & Lomax, 2010: NFI > .90, RMSEA < .08, SRMR < .08. Second, convergent and discriminant validity was conducted. The results of the factor loadings from the second-order confirmatory factor analysis of the virtual transformational leadership scale items as shown in Table 4.

Figure 1

The Second-Order CFA of Virtual Transformational Leadership Scale for Leaders in e-commerce Businesses



Note. VTFL = Virtual Transformational Leadership, GC = Guiding Change, BS = Building Synergy, EI = Empowering Individuals

Table 4*Factor Loadings of Virtual Transformational Leadership Scale Items*

Item	Factor loadings
Dimension 1: Guiding change	
9. During online meetings, you encourage team members to consider issues from various perspectives.	.75
8. You adapt online technology to provide real-time responses at work	.72
10. You do not involve your team members in problem-solving because it is a waste of time. (R)	.72
1. You encourage team members to use digital technology to find new solutions.	.69
3. You are driven to achieve your goals.	.64
7. You implement digital technology to simplify the work process.	.61
5. You have a plan in place to deal with unexpected changes.	.60
4. You foresee a future businesses opportunity.	.55
2. You think that advanced work planning is a waste of time. (R)	.51
6. You consider that change is an obstacle at work (R)	.51
1. You work hard to be a good role model for your followers.	.49
Dimension 2: Building synergy	
15. During online meetings, you stimulate team members to share new ideas.	.79
17. You motivate team members to focus on individual achievements rather than team achievements. (R)	.79
16. You end the call when team members disagree on different ideas during online meetings. (R)	.78
18. You encourage team members to accept different opinions during online meetings.	.75
19. You influence team members to trust each other when working remotely.	.71
20. You encourage team members to share work data on the Cloud system to be accessible to everyone.	.71
22. You motivate team members proud when they succeed together.	.70
21. You think that complimenting team members during online meetings is unnecessary. (R)	.68
14. You create a fun and friendly online meeting atmosphere.	.66
12. You use work-related online applications to communicate with team members.	.62
13. You use games to stimulate team members' participation in online meetings.	.46
Dimension 3: Empowering individuals	
33. You encourage your followers to see work challenges as opportunities for personal growth.	.79
24. You provide individual work feedback to followers via video conference.	.77
26. You email detailed and clear feedback on your followers' work.	.77
23. You actively listen to your followers' feedback during the online meeting.	.76
31. You expect your followers to reply to your emails immediately, even after office hours. (R).	.72
30. You show appropriate facial expressions and tone of voice during online meetings with followers.	.71
25. You encourage your followers to focus on developing their strengths.	.70
32. You allow your followers to discover ways of working that suit them.	.68
28. You keep track of each followers' work progress through appropriate online communication.	.56
29. You schedule online meetings with your followers based on your availability. (R)	.56

Note. $N = 600$, (R) = Reverse-scored items

Discussion and Conclusion

The purposes of this study were 1) to examine the dimensions of virtual transformational leadership for leaders in e-commerce businesses, and 2) to develop a valid and reliable scale of virtual transformational leadership for leaders in e-commerce businesses by integrating the transformational leadership and virtual leadership concepts to approach the phenomenon of leadership and determine the characteristics of the leader in virtual work environments.

Discussion of Main Results

The results from this research demonstrated that virtual transformational leadership for leaders in e-commerce businesses consist of three dimensions, which are guiding change, building synergy, and empowering individuals. Guiding change behavior was affirmed by Leavy (2020) that leaders should be role models by encouraging a positive attitude toward change and ensuring that followers are proficient in digital technologies. For building synergy behavior defines a leader's behavior of building virtual team relations through transparency in working and stimulating the team's creativity for innovation (Lee et al., 2015) in the virtual work environment to foster trust among team members. Supported by Contreras et al. (2020), it is stated that managing and leading virtual and hybrid teams requires a new style of leadership that includes trust between employees and less hierarchical organizations. The significance of the leader-follower relationship is reinforced because it facilitates reaching virtual team members (Cortellazzo et al., 2019). Empowering individuals behavior is a leader's behavior that encourages individual team members to develop their personal growth as virtual leaders should be aware of specific competencies of their followers (Maduka et al., 2018) and motivating them by providing advice through appropriate online communication skills in the virtual work environment because virtual team performance improvement requires clear communication of goal and collaboration between the leader and followers (Gilson et al., 2015) as well as understanding the followers' needs can enhance team performance and increase their work motivation (Petriglieri et al., 2019).

The psychometric properties of the virtual transformational leadership scale for a leader in e-commerce businesses developed in this study were accepted of content validity, item discrimination, reliability, and construct validity. As a result of the data analysis and expert consultation, a valid and reliable 33-item scale of virtual transformational leadership for leaders in e-commerce businesses was created and could be applied to assess and develop virtual transformational leadership behaviors for leaders in e-commerce businesses.

As a result of the dimensions of virtual transformational leadership for leaders in e-commerce businesses dimensions and the scale developed in this study, which could be used to develop leaders behaviors for dealing with change to turn a challenge into an opportunity, building virtual team members synergy, and enhancing followers' growth and development through appropriate online communication technologies in a virtual work context, as supported by Dirani et al. (2020) stated that leaders should change their leadership styles to adapt to challenging situations by having the foresight that facilitates them to achieve the organization's goals and prioritize the requirements of team members that can increase employee commitment to the advantage of the organization. And leaders must be conscious of recent technological developments to determine which are threats or opportunities that impact businesses, internal organizational structures, and lead employees in an uncertain environment (Kane et al., 2019). Thus, a new approach to managing and leading a virtual workforce is required at all levels of the organization. Henderikx and Stoffers (2022) also affirmed that traditional leadership approaches are no longer sufficient due to the complexity of the modern digitalized world; leading, guiding, and managing employees in this time of growing digitalization requires new leadership understandings. As a result, it can be assumed that virtual transformational leadership is a foreseeable leadership trend.

Limitations

This research was conducted primarily for leaders in e-commerce businesses in Bangkok. This limitation should be considered before collaborating with other industry or e-commerce business leaders outside of Bangkok. The scale created in this study may be adapted for validation and application with other business populations in future research. Furthermore, the virtual transformational leadership scale is based on self-report, which may represent respondent bias. Thus, this scale also required further research into followers' perspectives to explore stakeholder outcomes and use the information to prevent negative factors that could affect the results.

Implications for Behavioral Science

The implications of this research will assist leaders in e-commerce businesses. This virtual transformational leadership scale is a reliable and valid tool for further research in the field of e-commerce business to develop their leadership behaviors to deal with changes not only during the COVID-19 pandemic but also in future business challenges and opportunities. Leaders in e-commerce businesses who demonstrate virtual transformational leadership behaviors can provide significant support to virtual team members during critical times. They may encourage the team's learning efforts to solve the problem and stimulate innovative work behaviors to meet new challenges. Furthermore, the developed scale in this study can be used in the training need analysis process to assist leaders in the organization in developing virtual transformational leadership behaviors. For future research, the qualitative findings can be used to develop a training program for leaders in e-commerce businesses to improve their virtual transformational leadership behaviors, as well as to design training activities in the development program that relate to virtual transformational leadership behaviors. Furthermore, researchers can also examine the outcomes of virtual transformational leadership and then create a conceptual framework to explain the relationship between the antecedents and outcomes of virtual transformational leadership.

Conclusion

The dimension and scale of virtual transformational leadership for leaders in the e-commerce businesses was developed to expand behavioral science research on the integrations of transformational leadership and virtual leadership concepts. This research is required to identify the ideal concept of a particular behavior for a situation that leaders in e-commerce businesses confront by investigating how individual behaviors are influenced by significant aspects of the situation. And scale development is a reliable tool for further research into the development of leaders in virtual work environments. This scale can also be used in future behavioral science research to identify virtual transformational leadership behaviors by assisting the organization to evaluate the behaviors of leaders to create leadership and design training programs. Furthermore, virtual transformational leadership is beneficial to guide leaders faced with today's dynamic and high-velocity environment as the roles and responsibilities of leaders in e-commerce businesses are rapidly changing as technology advances, it is expected that this research concept and scale development of virtual transformational leadership will be a pioneer in leadership in virtual teams in different and diverse sectors, and its findings will be shared with academic perspectives.

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