

ACHIEVING SUSTAINABLE COMPETITIVE ADVANTAGE IN THE METAVERSE: ROLES OF INTELLECTUAL CAPITAL AND SERVICE INNOVATION PERFORMANCE IN HOTELS

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Abstract: The concept of the "metaverse" has the potential to fundamentally alter interactions between hotels and individuals within fully connected virtual worlds. This study investigates how Virtual Human Resource Development (VHRD) practices contribute to enhancing Sustainable Competitive Advantage (SCA) in hotels, with consideration of the mediating roles of Intellectual Capital (IC) and Service Innovation Performance (SIP). Data were collected from employees in green hotels in Egypt. Using SmartPLS-SEM, our findings reveal a significant indirect relationship between VHRD and hotel SCA. Furthermore, the study confirms a positive correlation among VHRD, IC, and SIP. Crucially, our results demonstrate that both IC and SIP play positive mediating roles in linking VHRD practices to a hotel's SCA. Hotels should encourage innovative thinking and actions among their employees by integrating virtualized real-life scenarios into HRD practices through IC and SIP to achieve short and long-term SCA objectives.

Keywords: VHRD, sustainable competitive advantage, intellectual capital, service innovation performance, green hotels, Metaverse

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INTRODUCTION

The new wave of the digital era is characterized by the emergence and rapid development of spatial and immersive technologies, specifically virtual reality (VR) and augmented reality (AR) (Kamenov, 2017; Zhang and Chen, 2023). It is widely anticipated that this wave will shape the future of computing and become the dominant paradigm known as the metaverse. Over the past three decades, the fictional idea of the metaverse has gradually emerged as a pivotal and empowering catalyst driving a revolution in various aspects of our lives, including education, business, remote work, and entertainment. With its immersive and expansive nature, the metaverse promises to redefine the way we learn, conduct business, collaborate remotely, and engage in leisure activities online (Mystakidis, 2022).

Although the metaverse is still mostly conceptual and lacks clear implementation, except for the gaming industry (Katz, 2024), its true potential lies in its ability to provide individuals with the opportunity to partake in hyper-realistic virtual interactions, experiences, and transactions. The advantages of digitization became apparent during the global COVID-19 pandemic, as people were compelled to rely on online meeting platforms for various activities such as

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meetings, learning, training, consulting, and engaging with others (Buhalis et al., 2023). Lundmark (2022) predicted that by 2030, all connectable physical devices will be digitally linked, creating a growing interdependence between the digital and physical worlds, where actions in one realm will impact the other. Further, Dwivedi et al. (2022, 2023) suggested that the metaverse can expand the physical world by utilizing augmented and virtual reality technologies, enabling users to seamlessly engage with both real and simulated environments using avatars and holograms. Prior virtual environments and immersive games, such as Second Life, Fortnite, Roblox, and VRChat, have been identified as precursors to the metaverse, offering some insights into the potential socio-economic impact of a fully functional, persistent, cross-platform metaverse. The metaverse provides users with the ability to communicate more expressively, employing hand gestures and displaying body movements, thus positioning it as an embodied Internet that enhances the sense of presence and makes online interactions more akin to those experienced in the real world (Zalan and Barbesino, 2023). Consequently, the metaverse is expected to introduce a plethora of innovations and disruptions across all aspects of life. This not only brings about societal and cultural implications but also presents transformative opportunities and challenges for marketplaces and communities worldwide (Dwivedi et al., 2023; Shin et al., 2024).

Numerous academic and industry reports extensively explore the potential business opportunities of the metaverse. Ashton et al. (2024) highlighted that food and lodging providers are adopting "Metaverse strategies" to enhance customer experiences, with Chipotle, McDonald's, Ritz Carlton, and Wendy's initiating immersive technology pilot programs (Ashton et al., 2024; Cai et al., 2024; Shin et al., 2024; Zaman et al., 2024). Dwivedi et al. (2023) and others have also discussed the metaverse's potential impact. Lundmark (2022) and Rozak et al. (2023) underscored its significance in the business realm. Jung et al. (2024) emphasized the need for future research in metaverse tourism and hospitality to define its features and explore its potential benefits for human and community well-being. Additionally, experts suggest that immersive technologies could revolutionize hospitality services by providing immersive experiences for both workers and customers, enabling interactions in virtual environments (Ashton et al., 2024; Buhalis and Karatay, 2022; Go and Kang, 2023; Shin et al., 2024).

Consequently, in the realm of human resource management (HRM) functions, the metaverse shows great potential for overcoming the limitations of traditional web-based training tools by providing a more dynamic and interactive educational experience through virtual human resource development (VHRD) practices which has been shown to have a significant impact on training and skill development (Mozumder et al., 2022), by offering a more realistic and engaging environment for employees (Mystakidis, 2022). Conformingly, Bennett (Bennett, 2009; Bennett and Bierema, 2010) argued that VHRD has emerged from a paradigm shift in HRD that requires new skills, policies, and theories for workplace learning and development. Additionally, the integration of augmented reality and virtual reality in the form of the metaverse has demonstrated promising results in improving cognitive and social skills across various fields (Rozak et al., 2023). Moreover, VHRD fosters creativity and innovation by connecting people, objects, ideas, activities, and practices and by encouraging creative problem-solving (Bresciani et al., 2021).

Since the learning process is about change, VHRD is also regarded as a change process (Chung et al., 2016). Thus, VHRD applications target both employees and organizations to build learning capacities (Bennett, 2014). Role-plays and simulations-based technology are two examples of virtual training and real multimodal ways to learn that came from learning management systems and intranets (Georgakopoulos, 2010). Simulations are widely used in the manufacturing and service industries in terms of building capacities. For instance, in the hotel industry, simulation is used in training and in the learning process to assist learners in developing skills, identifying problems, detecting potential problems, and finding solutions (Alsetoohy et al., 2019; Alsetoohy and Ayoun, 2018; Azizi et al., 2021; Poulouva et al., 2021). Besides, VHRD is fundamentally linked to the strategic future of organizations through functions such as knowledge management, human resource optimization, organizational culture, and networking (McWhorter, 2023). Thus, VHRD is considered the next generation of knowledge management that could optimize knowledge and creativity flows in organizations (Chung et al., 2016). This is because VHRD could be utilized as a vital tool to obtain and share knowledge to develop employees' competencies and create innovative behaviors (Bennett and McWhorter, 2017; Park et al., 2018). Knowledge is not just preserved by individuals (Allameh, 2018); it can be found in databases, internal and external interactions, business processes, and systems in organizations (Nisar et al., 2021), which constitutes the organization's Intellectual Capital (IC). This is not only relevant, but it also has the potential to be a strategic tool for hotels to enhance their human capital by providing extensive training activities (Fenech et al., 2019) and using virtual reality to design and create new learning programs that regularly contribute to the creation of new human resource development practices (Khandelwal and Upadhyay, 2021), which makes training a major investment for these organizations (Tseng et al., 2014). This indicates the importance of understanding virtual reality interventions in the development and management of human resources, not only to thrive in an ambiguous and unpredictable business environment but also to prepare hotels for the future (Gerards et al., 2021; Minbaeva, 2021).

Consequently, IC is based on both employees' and organizational learning and knowledge (Holton and Yamkovenko, 2008). Similarly, VHRD applications target both employees and organizations to build learning capacities. Precisely, HRD practices were found to have a significant role in optimizing hotels' IC (Youndt and Snell, 2004) through increasing employees' skills and abilities (Holton and Yamkovenko, 2008).

Moreover, the organization's investment in technology is crucial for its IC (Youndt and Snell, 2004). IC represents hotels' creativity, foresight, and predictive capacity, which promotes hotels' growth and competitive advantages (Davey et al., 2017; Liu and Jiang, 2020). IC has been found to improve financial performance resulting in creating a Sustainable Competitive Advantage (SCA) for hotels (Davey et al., 2017). Thus, hotels that intend to invest in both HRD and VR through VHRD will have more opportunities than their rivals to increase their IC and achieve SCA.

Notably, the ability of the hotel's employees to innovate is the basis of the hotel establishment's existence and performance (Tsai and Wang, 2017). Moreover, establishing service innovation occurs as a result of an interactive learning process (Dana et al., 2021). Accordingly, VHRD can help drive service innovation by connecting people, objects, ideas, tasks, and practices, through inspiring creative problem solutions (Bennett, 2014; Wu et al., 2023). Likewise, Park et al. (2018) argued that VHRD could create a new atmosphere for HRD practices in organizations; resulting in creativity, synergy integration, and balance in the organization's goals. Conversely, organizations that cannot continually innovate will lose their market share and SCA, because service innovation is a driving pillar for hotel SCA (Hossain et al., 2021). Thus, Service Innovation performance (SIP) could optimize the hotel's environmental, social, and economic performance, resulting in a positive relationship with the hotel's SCA.

Although the current literature on metaverse-driven virtual reality interventions and practices in the development and management of human resources indicates that it is a relatively new phenomenon, we noted three major gaps in the literature. Firstly, researchers address this phenomenon with different terms, such as electronic HRD (Minbaeva, 2021), technology-based HRD (Strohmeier, 2020), smart HRD, and transformative HRD (Sankar et al., 2021). Therefore, the formulation of a comprehensive conceptual framework for the VHRD is crucial to gaining a deeper understanding of the role of the VHRD in hotel HRD activities. Thus, the current study responds to this research gap by answering the question, "What is VHRD, and what is its relevance to hotel HRD, especially in the aftermath of the COVID-19 pandemic?"

Second, to date, empirical studies investigating the role of VHRD in building hotels' SCA are scarce. For example, Bengtsson (2017) asserted that while technological developments affect human resources development, there is very limited research on the role of VHRD in enhancing the competitive position of organizations. The literature fails to illustrate the potential impacts of IC and SIP on business performance (Bontis et al., 2015). In this endeavor, our conceptualized model merged VR technology with hotel HRD practices to build a win-win relationship between employees and hotels. And to respond to this, many recent studies have highlighted the need to develop a culture of creativity in human resources departments and focus on adopting modern technologies (Abdullah and Shoaib, 2021; Bengtsson, 2017).

Third, we note that the literature lacks information on the mediating factors that contribute to enhancing sustainable competitiveness in the context of digital transformations. In this pursuit, we have considered the mediating roles of IC and SIP. Therefore, the current study tries to fill the abovementioned gaps in the literature and answer the subsequent questions by investigating the relationship between VHRD practices and SCA, with an emphasis on the role of IC and SIP as mediator variables in green hotels (Figure 1). Addressing these gaps allows scholars and practitioners to reevaluate traditional human resource management practices and adopt innovative tools and technologies to make hotel HRM more future-oriented. Beyond human capital, innovation in hotels requires significant investments in intangible assets and fostering innovative behaviors among employees to achieve Sustainable Competitive Advantage (SCA) (Rajapathirana and Hui, 2018). This study examines how factors like Intellectual Capital (IC) and Service Innovation Performance (SIP) influence SCA in green hotels in Egypt, offering a new perspective on how Virtual Human Resource Development (VHRD) practices can indirectly enhance SCA. Theoretical contributions include a refined understanding of VHRD in the hotel context, clarifying terms like "digital human resource," "smart human resource," and others to build a robust theoretical framework. By integrating VR technology with hotel HRD practices, the study aims to foster mutually beneficial relationships between employees and hotels, exploring both direct and indirect pathways linking VHRD practices to SCA in green hotels.

THEORETICAL BACKGROUND AND HYPOTHESES DEVELOPMENT

1. The metaverse

The concept of the 'metaverse' was initially introduced in 1992 in Neal Stephenson's sci-fi book, *Snow Crash* (Steuer, 1992), and was depicted as a black spherical planet that users could access through terminals equipped with virtual reality features (The Economist, 2023). Despite being coined in 1992, there is a lack of consensus surrounding the precise definition of the term "metaverse." According to Davis et al. (2009), the metaverse can be described as a captivating virtual environment that encompasses a three-dimensional virtual environment, where individuals engage with one another and software agents in the form of avatars. It aims to replicate the real world, albeit without the constraints of physical limitations. Buhalis and Karatay (2009) provided a comprehensive definition of the metaverse, describing it as a harmonious integration of the digital and physical realms where ambient intelligence is employed to enhance physical environments, products, and services. Expanding on this concept, Sparkes (2021), illustrated that the metaverse can be predominantly understood as a shared online realm that encompasses three-dimensional graphics, accessible either through a traditional screen or the immersive experience of virtual reality.

The concept of the metaverse is often described as a digital realm that replicates the real world, allowing individuals to engage with one another in an all-encompassing and interactive environment (Dwivedi et al., 2022). While there are varying interpretations, many definitions of the metaverse emphasize its amalgamation of virtual and physical realities, distinguishing it from previous technological advancements. As a result, the metaverse represents a significant departure from prior innovations in three distinct aspects. The metaverse is an immersive virtual world where people can work and socialize using avatars and virtual reality devices. Unlike other virtual worlds or gaming platforms, Metaverse allows users to freely communicate and interact with others in a more realistic setting. It offers various functions like attending meetings, replying to emails, and shopping, making it like real life (Dwivedi et al., 2022, 2023). The metaverse is not a standalone technology but rather a combination of different information and communication technologies that work together seamlessly (Ashton et al., 2024; Buhalis et al., 2023; Zaman et al., 2024). Additionally, the metaverse offers an inclusive environment

where users can connect and interact with one another. By allowing users to navigate and socialize within various virtual worlds, such as Horizon World, Sandbox, and Roblox, it opens up unique possibilities for marketing (Dwivedi et al., 2023; Shin et al., 2024). Finally, the metaverse enhances immersion by providing users with full-spectrum MR/VR headsets, haptic gloves, and sensory clothing, allowing them to see, hear, and feel the virtual environment. It also enables users to interact with others and provides haptic cues and multi-sensory reference points for a more immersive experience. This enhanced sense of presence and embodiment in the virtual world is expected to enhance imagination and creativity.

2. VHRD practices and SCA in the hotel context

In the hotel context, there are two types of competitive advantages. One is the fleeting competitive advantage, which usually generates financial gains but has a limited lifespan. The other is the SCA, which develops when rivals are unable to replicate the source of the advantage (Alsetoohy et al., 2022; Alsheref et al., 2024; Barney and Hesterly, 2005). In today's fast-paced and highly competitive business environment, where ideas are easily shared, a SCA is not based on the physical resources of an organization but rather on its nonphysical human resources that are capable of maximizing the use of these resources (Emeagwal and Ogbonmwan, 2018). Based on the Resource-Based View (RBV) theory, hotel resources are the primary means to attain such a SCA (Abou Kamar et al., 2023). Hotels have superior organizational resources for rapidly achieving SCA due to the availability of their intangible, rare, non-traceable resources that can't be easily imitated or purchased by their competitors (Hossain et al., 2021). Hence, SCA is the ultimate embodiment of a hotel's capabilities, resources, and operations as well as a critical criterion for knowing whether hotels allocate their resources appropriately to achieve a specific goal. Technological innovation could extract, develop, and harness the potential value of internal resources of the organization, which would lead to gaining a competitive advantage. Accordingly, VHRD was defined by Bennett (2009) as "a culturally appropriate and media-rich web-based environment that strategically improves expertise, performance, innovation, and community building through formal and informal learning" (p. 365). The rich media environment includes sound, video, images, virtual simulations, tutorials, and related multimedia content, enabling trainees to interact with the objects from which they learn (Bennett, 2009). Thus, VHRD practices may be a keyway to understanding how some organizations can get and keep a competitive edge. Moreover, VHRD practices were found to have a significant positive relationship with SCA (Elidemir et al., 2020; Hamadamin and Atan, 2019). Hence, linking the hotel's practices with VR has become an inevitable choice for hotels to achieve SCAs. VHRD can help obtain and share knowledge to develop employees' skills, experiences, and competencies to improve the hotel's operations sustainably and efficiently (Park et al., 2018). Hotels need to plan their training activities so that their employees can be more creative and accept new technology (Banmairuroy et al., 2022). Hence, the following hypothesis is proposed:

H1: VHRD practices positively impact SCA in green hotels.

3. Intellectual capital (IC) in hotels

In 1969, the economist John Kenneth Galbraith proposed the first concept of IC, which consists of intangible assets and an ideological process (Holton and Yamkovenko, 2008). Recently, scholars defined IC as "the accumulation of all knowledge, information, intellectual property, experiences, social networks, capabilities, and competencies that enhance organizational performance" (Subramaniam and Youndt, 2012). Therefore, IC is considered a tangible, non-financial resource based on organizational skills, experience, and knowledge to improve performance and create value-added assets and competitive advantage (Chen et al., 2021; Nisar et al., 2021; Subramaniam and Youndt, 2005, 2012). In the hotel context, IC is a way of producing core value and improving competitive advantage, representing hotels' creativity, foresight, and predictive capacity, which promotes organizational and industrial growth and development (Davey et al., 2017; Liu and Jiang, 2020).

IC consists of three main components: human capital; organizational or structural capital; and relational capital (Nisar et al., 2021). Human capital is considered the most significant intangible asset within an organization. Examples of human capital are the ability to innovate; know-how; experience; team performance; employee flexibility; tolerance; motivation; satisfaction; the ability to learn; loyalty; formal training; and education (Bontis et al., 2015). Hence, human capital refers to the processes related to education, training, and other career plans designed to enhance the knowledge, skills, abilities, values, and social assets of employees that will lead to employee satisfaction and productivity increases and will ultimately affect the company's performance (Allameh, 2018). Accordingly, human capital indirectly affects performance by generating various advantages for the organization. Second, organizational capital refers to the reserve of non-human knowledge within an organization (e.g., databases, organizational charts, copyrights, trademarks, process instructions, strategies, or anything else that gives the organization more value than tangible assets) (Bontis et al., 2015; Fernández-Pérez de la Lastra et al., 2020). Third, relational capital is the total assets that are used to manage, organize, and maintain stakeholders' relationships (e.g., shareholders, customers, rivals, government, society, and public associations) (Han and Li, 2015).

Previous studies have stressed that HRM practices are a vital tool for extending and transforming the IC of the hotel business, which facilitates the achievement of their sustainable goals (Haldorai et al., 2022). For example, Kong and Thompson (Kong and Thomson, 2009) stated that the concepts of HRD and IC are closely related. They further concluded that HRD practices should be the driving force in these relationships. Furthermore, they underlined the interconnected nature of IC and the centrality of IC in HRD for optimizing human resource effectiveness. They stressed the need for evaluating both tangible and intangible assets to enable management to make better HR decisions. They advocated for further empirical investigation into the relationships between HRD practices and intellectual capital. Similarly, Chen et al. (2021) confirmed that HRD practices are related to knowledge-resources development, for instance, human capital (i.e.,

individual skills and abilities), organizational capital (i.e., knowledge management systems), and relational capital (i.e., social networks and individual relationships). Consequently, IC is based on both employees' and organizational learning and knowledge. As a result, HRD has two tasks: one is to increase human capital, and the other is to increase the organization's IC (Holton and Yamkovenko, 2008). This formed HRD to be the developmental, constructive, and collaborative activity to support the hotel's IC. These developmental practices are training and development opportunities that optimize employees' knowledge and skills (Chen et al., 2021). Organizations can enhance their human capital by providing extensive training activities to their employees, which makes training a major investment in these organizations (Tseng et al., 2014). For example, Hubal and Day (Hubal and Day, 2006) revealed that newly recruited employees who were trained and instructed using virtual characters performed better in a real-world interview than those who were simply trained with written instructions. Additionally, Suen and Chang (Suen and Chang, 2017) stated that simulation and virtualization in HRD have improved training sessions and course content. In their study of manufacturing firms, Yong et al. (2019) revealed that virtual training, directed at skills and knowledge development, was found to increase employees' human capital as well as relational capital through sharing knowledge and establishing relationships with their colleagues. Additionally, Ma et al. (2021) found that employees' green training increased their knowledge, skills, abilities, attitudes, and commitments toward environmental management, and green training affected positively green IC. Hence, the following hypothesis is proposed:

H2: VHRD practices positively impact the IC in green hotels.

IC is the driving force behind firm performance and the creation of competitive advantage (Davey et al., 2017). Several studies have used the resource-based view (RBV) theory to demonstrate how IC contributes to a business's competitive advantage (Haldorai et al., 2022). Organizational resources and capacities, not industry structure, are what the theory argues to be the dominant drivers of value creation and high firm performance (Bontis, 1998). The RBV emphasizes the need to make good use of internal resources, both material and intangible, to gain a competitive advantage in the marketplace. RBV theory shows that organizations can grow and do better in the long run if they keep working to improve their intellectual capital. IC has been found to improve financial performance resulting in creating a SCA for hotels (Davey et al., 2017). Tonial et al. (2018), for example, reported that Brazilian businesses that used IC management practices improved their performance and competitive advantage and increased their sustainability. Economic, environmental, and social performance were all improved by the characteristics of IC (Yusliza et al., 2019). Similarly, Mansoor et al. (2021) showed that IC is crucial to an organization's growth. Thus, we argue that the employee's acquired knowledge-based virtualization and visualization improve the employee's knowledge, skills, experience, and career, which, in turn, enhances the hotel's IC and SCA.

H3: IC positively impacts the SCA in green hotels.

Based on the RBV, IC can be considered a strategic hotel resource because it involves distinct intangible knowledge and assets (Yong et al., 2019). Using the rationale of RBV theory, this study demonstrates the role of IC in inducing the VHRD effect on SCA. To properly adopt VHRD, hotels must first acquire and develop the necessary technological resources and competencies (Alsetoohy et al., 2022; Alsetoohy and Ayoun, 2018; Jung et al., 2024). Here, VHRD is what inspires and propels the hotels to pursue a range of business initiatives that help build and retain talented employees with high levels of IC. To be specific, VHRD supports hotel businesses in increasing their human IC and, hence, their competitive advantage because VHRD forces hotels to train and prepare their employees to have sustainable knowledge and skills (i.e., human capital) (Pham et al., 2019). Human capital reflects the distinctive knowledge and experiences of employees that are used to increase innovation and creativity in a way that helps improve the quality of services and products provided (Tuan, 2021). This helps build a SCA because innovation often stems from human capital (Yusliza et al., 2020). Eco-friendly products, for instance, frequently emerge from the innovative input of employees who possess extensive environmental knowledge and skills (Alsetoohy et al., 2021). Human capital is probably one of the most valuable intangible assets that hotels can use to give them an edge over their competitors. Hence, we developed the following hypothesis:

H4: IC mediates the relationship between VHRD practices and SCA in green hotels.

4. Service innovation performance (SIP)

Many hotels have relied on creativity and service innovation to gain a competitive edge in the increasingly volatile marketplace (Hoang et al., 2022; Liang et al., 2022). Yang et al. (2022) defined the contribution of employees to service innovation through the generation and development of unique service practices and ideas, has become an important source of development and competitive advantage in the hotel industry (Sharma et al., 2021; Yang et al., 2022). In the hotel context, VHRD practices are widely considered precursors of gradual and radical innovations (Ziyae et al., 2021). To meet the quality-of-service expectations of hotel guests, VHRD practices must create an atmosphere in which employees experience enough confidence to practice innovative and creative behaviors (Tajeddini and Martin, 2020). Accordingly, Ziyae et al. (2021) argued that the more effective human resources are developed and used, the greater the hotel's competitive edge will be. Hotels can develop products and/or services that are distinct from rivals to add value to guests through innovation. SIP is grounded in value creation and restructuring processes that necessitate the development of new attitudes, skills, abilities, and competencies for co-creation and transferring values to customers (Horng et al., 2018). VHRD practices directly influence SIP by encouraging resources and capabilities development by strengthening employees' knowledge, skills, and behaviors within the organization (Nieves and Quintana, 2018). Thus, going beyond traditional HRD practices is a requirement to encourage employees' engagement in service innovation (Li et al., 2019). This was confirmed by Park et al. (2018) who argued that VHRD could create a new atmosphere for HRD practices in organizations; resulting in creativity, synergy integration, and balance in the organization's goal. Similarly, Wu et al. (2023) and Bennett (2014) argued that VHRD can help hotel employees who are open to new ideas and approaches by connecting

people, objects, ideas, tasks, and practices to inspire creative problem-solving to improve job performance. These employees are more likely to demonstrate effective SIP. Thus, we suppose that:

H5: VHRD practices positively impact SIP in green hotels.

SIP enables the organization to shift from providing unprejudiced products to integrating products and services to provide customized solutions that meet customer's specific needs (Lightfoot and Gebauer, 2011), which helps create more effective methods to seize future market opportunities (Tajeddini and Martin, 2020). Notably, the ability of the hotel's employees to innovate is the basis of the hotel's existence and performance (Tsai and Wang, 2017). Due to the volatile, uncertain, and intensely competitive hotel business environment, SIP (i.e., rearranging or repurposing existing data, ideas, resources, processes, business models, and technologies) is a key driver of growth and a source of competitive advantage (Tajeddini and Martin, 2020). SIP could optimize the hotel's environmental, social, and economic performance, resulting in a positive relationship with the hotel's SCA (Hossain et al., 2021). Hotels may create distinctive core values and retain long-term competitive advantages when they can accurately identify their customer's current needs and preferences and execute SIP approaches. By carefully innovating, hotels can provide products/services that boost their performance. Essentially, when hotel employees are more proactive and adopt extra-role behaviors that help them confront obstacles, their creative behaviors become more noticeable. Guests' feedback and suggestions have been used by several hotels as inspiration for smart applications (Wu et al., 2023). Thus, we suggest the following hypothesis:

H6: SIP has a positive relationship with SCA in green hotels.

Human resource practices positively affect product and service innovation, which has empirical evidence in theoretical and managerial practices (Lu et al., 2020; Mothe and Nguyen-Thi, 2021). According to Roscoe et al. (2019), HR departments are responsible for training, staffing, and evaluating to improve and enable an innovative organizational culture. Creative mindsets and thinking are inculcated in organizations through HR managers. The creative intent of organizations is facilitated by the organizational commitment, support, and motivation of employees. Such practices lead employees towards renewed goals and thus achieve competitive advantages for the organization. Likewise, innovation brings a competitive advantage to companies that intensify the training of their employees to face the continuous fluctuations in the business environment (Ahmed et al., 2023). Hence, we developed the following hypothesis:

H7: SIP mediates the relationship between VHRD practices and SCA in green hotels.

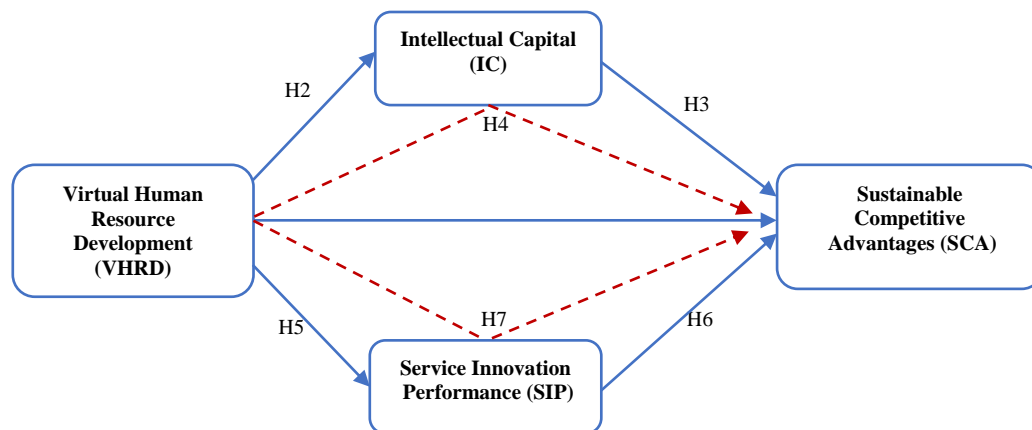


Figure 1. The proposed model

MATERIALS AND METHODS

3.1. Sampling

A suitable sample of the target population for this study, namely, frontline employees of green hotels in Egypt, was appointed to collect data. Thus, the research paper mainly targets green hotels that have already adopted at least one of the VHRD practices in their human resource management systems (i.e., green hotels). These green hotel trends not only tackle environmental problems by conserving energy, water, and resources but are also intended to improve employees' behavior and enhance guest satisfaction and comfort. Normally, green establishments in the hospitality industry are assessed regularly by local and international authorities along with guests' reviews to overcome greenwashing activities (Alsetoohy et al., 2021). Additionally, the task roles of their employees are usually updated to cope with the most recent green practices in their daily operations. Thus, green hotels pay more attention to developing their employees' skills and capabilities through advanced technologies to save time and cost as well as environmental circumstances to support their sustainability. Additionally, the pilot study's results (15 hotels in the Greater Cairo Metropolitan) indicated that the majority of green hotels adopt such technology 11 green hotels adopt online training programs for their employees through virtual reality. Due to the abovementioned reasons, this study focused on green hotels in Egypt as a field study. Information related to these green hotels was retrieved from the website of (www.greenstarhotel.org).

3.2. Measurements and data collection

The questionnaire was established based on a thorough revision of related studies. Additionally, the items of the questionnaire were assessed by five-point Likert scales ranging from ("strongly disagree = 1" to "strongly agree = 5). The

questionnaire consists of five sections: namely, VHRD practices, hotel IC, SIP, and hotel SCA, in addition to respondents' demographics. In the first section, we adapted fourteen items from Otoo (2018) to measure the hotel's VHRD practices, which consist of three constructs: virtual training and development (5 items), employee involvement (5 items), and career development (4 items). The second section includes nineteen items that measure the hotel IC based on Liu and Jiang (2020). The hotel IC contains three constructs: HC (7 items), organizational capital (8 items), and relationship capital (4 items). Likewise, SIP was measured by eight items retrieved from Li et al. (2019). The fourth section measures the hotel's SCA with four items adapted from Hossain et al. (2021). Finally, the fifth section includes the profiles of respondents. Additionally, all items of the questionnaire have been modified to fit the research purposes. Besides, the first version of the questionnaire was checked by five professors and two managers in the hotel industry. After considering their pivotal comments, the questionnaire was distributed to hotels' employees (30 employees from 15 hotels) through the pilot study. Slight modifications have been received from the hotel's employees. Thus, due to receiving slight modifications from the pilot study participants, the final version of the questionnaire was ready to be disseminated.

We deployed mixed methods in data collection; in-person and online surveys were used. Accordingly, 76 certified green hotels in Egypt were contacted through an invitation email with a statement of the title and purpose of the study. Only 57 hotels responded to our email and directed us to disseminate the questionnaire among their employees. We contacted the employees directly in person and we also asked a key person in each hotel to share the link to the online survey with the WhatsApp groups of the hotel employees. After eight months of collecting data, we received 629 questionnaires from all participants, however, the number of invalid questionnaires was large (79 surveys). Most of the invalid questionnaires (72) have been received from the online questionnaire. The invalidity of these questionnaires was due to employees filling them out during work and missing answers to many questions in the questionnaire. Finally, 550 questionnaires were valid to run the statistical analyses, achieving a response rate of 87%. Table 1 illustrates the participants' demographics in the study.

Table 1. Participants' demographics

Characteristics	Frequency	%
Gender		
Male	244	54
Female	206	46
Marital status		
Single	127	23.1
Married	404	73.4
Separated	7	1.3
Widow	12	2.2
Age		
20 - < 30 years	220	40
30 - < 40 years	278	50.5
40 to < 50 years	41	7.5
50 - 60 years	10	1.8
Over 60 Years	1	0.2
Education		
< College	64	11.6
Bachelor	467	84.9
Master's degree and MBA	10	1.8
Doctorate	9	1.6
Working area		
Food and beverages	335	60.9
Front Office	113	20.5
Housekeeping	34	6.2
Human resources	54	9.8
Others	14	2.5
Experience		
< 5 years	108	19.6
5 < 10 years	250	45.5
10 < 15 years	166	30.2
>15 years	26	4.7

3.3. Data Analysis and Techniques

Two-step processes (i.e., the measurement model and the structural model) were deployed to examine the study hypotheses by using Smart PLS_SEM software (Version 3.2.3) (Hair et al., 2012). Table 2 illustrates that the values of the Composite Reliability (CR) and Cronbach's alpha for all latent variables were above the threshold of .7 (Hair et al., 2012), which constitutes establishing the internal consistency of the research study. Likewise, the item loadings were above .6 (Hair et al., 2010); the CR values were greater than 0.6 (Hair et al., 2012) and the AVE values were above the value of .5 (Abou Kamar and Alsetoohy, 2021; Fornell and Larcker, 1981), which establishes the convergent validity. In stage two, the higher-order model was assessed and checked, confirming the validity and reliability of all constructs, see Table 2. Additionally, analyzing the discriminant validity of the measurements was performed by using the Fornell-Lacker criterion and the Hetero-Trait/Mono-Trait ratio (HTMT ratio). Table 3 demonstrates that discriminant validity was established as the

square root of each construct was higher than the construct's highest correlation with any other construct. The data confirm that the measurement scales accurately reflect the constructs that they were intended to measure.

Table 2. Construct Reliability and Validity

Construct/ Item	Item Loadings	Mean	SD	Cronbach's Alpha	CR	AVE	VIF
Virtual Human Resource Development (VHRD)				0.735	0.850	0.654	
Virtual Training and Development (VTD)... <i>In virtual training...</i>				0.804	0.865	0.564	
VTD1: adequate and relevant knowledge and skills are acquired through training programs	0.715	4.298	0.585				3.222
VTD2: the skills and knowledge-related resources that were used in the training program are available for use on the job	0.768	4.316	0.662				4.773
VTD3: training programs for employees in all aspects of quality	0.637	4.356	0.691				4.008
VTD4: the activities of the training program provided meet the needs of the employees	0.800	4.169	0.717				3.324
VTD5: employees are sponsored to the training programs based on relevant training needs	0.820	4.338	0.627				3.842
Employee Involvement (EI)				0.815	0.874	0.587	
EI1: Information is widely shared in this organization	0.881	4.209	0.622				3.764
EI2: Collaboration and teamwork across working functions are vigorously emboldened	0.631	4.4	0.712				1.340
EI3: Everyone believes that he/she can make an impact	0.623	3.996	0.739				1.322
EI4: The capacity of employees is regarded as an essential determinant of competitive edge	0.776	4.009	0.66				2.147
EI5: The organization relies on horizontal control and coordination	0.878	4.173	0.619				2.331
Career Development (CD)				0.791	0.865	0.616	
CD1: The hotel provides virtual training to help develop my career	0.774	3.92	0.911				1.748
CD2: The hotel provides a personal development plan	0.822	4.062	0.964				1.921
CD3: The organization provides me with impartial career advice whenever required	0.820	4.071	.930				1.944
CD4: Management gives work that has developed my skills for the future	0.720	3.68	0.923				1.600
Intellectual Capital (IC)				0.737	0.851	0.658	
Human Capital (HC)... <i>Employees...</i>				0.879	0.906	0.582	
HC1: have a suitable education to fulfill their jobs.	0.802	3.733	0.777				3.099
HC2: are well trained	0.637	3.711	0.90				1.763
HC3: hold suitable work experience for accomplishing their job successfully	0.745	3.924	0.956				1.736
HC4: are well-skilled professionally to accomplish their job.	0.811	3.782	0.839				3.127
HC5: understand that doing this job well is a reward.	0.769	3.813	0.919				1.844
HC6: Considering the time spent on the job, employees feel thoroughly familiar with their tasks.	0.712	4.16	0.875				1.880
HC7: Mastering their jobs means a lot to our employees.	0.847	3.773	0.908				3.717
Organizational Capital (OC1) ... <i>Employees...</i>				0.923	0.937	0.651	
OC1: realize the relationships among authority, responsibility, and benefit	0.722	4.258	0.757				2.293
OC2: effectively construct an information system.	0.822	4.316	0.750				3.872
OC3: effectively utilize their information system.	0.803	4.316	0.726				3.419
OC4: know well about the contents of a company's culture.	0.743	4.436	0.908				2.348
OC5: Recognize the company's perspective.	0.866	4.449	0.826				3.767
OC6: can operate an efficient business process.	0.787	4.08	0.834				2.231
OC7: can effectively share their knowledge.	0.840	4.351	0.716				3.519
OC8: can conveniently access enterprise information	0.858	4.329	0.788				4.346
Relational Capital (RC) ... <i>Employees have...</i>				0.892	0.925	0.755	
RC1: a close interaction with their partners.	0.869	4.231	0.816				2.308
RC2: mutual respect with the partners.	0.878	4.142	0.913				2.742
RC3: mutual trust with the partners	0.881	4.182	0.883				2.737
RC4: personal friendships with the partners.	0.847	4.209	0.862				2.104
Service Innovation Performance (SIP)				0.916	0.932	0.633	
SIP1: The new service is profitable	0.839	4.124	0.738				3.102
SIP2: The market share of new services is big.	0.860	4.044	0.753				3.840
SIP3: The profitability exceeds expectations.	0.682	3.987	0.819				3.222
SIP4: The service improves the hotel's perceived image.	0.865	4.076	0.777				4.773
SIP5: The service improves customer loyalty.	0.840	3.96	0.791				4.008
SIP6: The service improves the profitability of other products/services.	0.692	3.92	0.750				3.324
SIP7: The service attracts a large group of new customers	0.807	4.013	0.78				3.842
SIP8: The service brings an important competitive advantage to the company	0.758	3.956	0.782				4.315
Sustainable Competitive Advantage (SCA) ... <i>This hotel...</i>				0.852	0.901	0.694	
SCA1: offers comparatively lower prices than competitors	0.853	4.111	0.812				2.683
SCA2: offers high-quality product/service to the customer	0.771	4.018	0.805				1.595
SCA3: response well customer demand for new features	0.824	4.164	0.803				1.797
SCA4: has time-to-market lower than the industry average	0.881	4.191	0.785				2.928

Additionally, the HTMT values were less than the threshold of 0.85 (Hair et al., 2012), and all constructs' correlations were lower than the square root of the AVE of their respective constructs (Fornell and Larcker, 1981), see Table 3. Therefore, discriminant validity was achieved. Eventually, the values of the Variance Inflation Factor (VIF) are lower than 5, confirming that there are no multicollinearity issues between the model constructs.

Table 3. Fornell-Larcker Criterion

Construct	CD	EI	HC	OC	RC	SCA	SIP	VDT	VHRD	IC
CD	0.785									
EI	0.428	0.766								
HC	0.386	0.342	0.763							
OC	0.342	0.436	0.368	0.807						
RC	0.348	0.409	0.453	0.628	0.869					
SCA	0.354	0.411	0.370	0.592	0.643	0.833				
SIP	0.257	0.367	0.253	0.300	0.307	0.463	0.796			
VDT	0.415	0.600	0.445	0.445	0.463	0.507	0.485	0.751		
VHRD									0.809	
IC										0.811

RESULTS

After assessing and establishing the high-order measurement model. The next step was to assess the research structural model. In assessing the structural model, we account for the relationships between the theoretical constructs (Chin, 2010). Thus, the R^2 , p values, and significance level of the path coefficients were assessed. The results indicate that all latent variables have explained 51.3% of the variance in achieving a SCA in green hotels. Likewise, VHRD has explained a 34.9% variance in hotel IC and a 21.1% variance in SIP. Accordingly, the study model has substantial explanatory power (Chin, 2010). Figure 2 shows that the path coefficients and the p values refer to statistical significance between the research variables except for the relationship between VHRD practices and hotel SCA. The strongest positive relationship is between VHRD and IC followed by the relationship between IC and SCA. Paradoxically, the findings of the current study do not show a significant relationship between VHRD and SCA ($\beta = 0.089$, $p = 0.198$) in green hotels. Hence, this finding doesn't support H1. Conversely, the findings of the study reveal that VHRD practices have positive influences on IC ($\beta = 0.591$, $p = 0.000$) and SIP ($\beta = 0.459$, $p = 0.000$) in green hotels, which supports H2 and H3 respectively. Similarly, our findings asserted the positive impacts of IC ($\beta = 0.541$, $p = 0.000$) and SIP on SCA ($\beta = 0.233$, $p = 0.000$), respectively.

To check the significance/insignificance of the indirect effects of the research model, bootstrapping tests with 5,000 samples in SmartPLS-SEM were conducted to calculate the Bias- Corrected-Confidence Interval (BCCI), T-statistics, component weights, and observed significance values in path coefficients to check and assess the mediating effects of both IC and SIP across the theoretical model. To establish a mediating effect, two requirements should be fulfilled. First, the indirect effect between the Independent Variable (IV) and Dependent Variable (DV) must be significant. Second, BCCI mustn't straddle a zero between the Lower Level (LL) and Upper Level (LL). Accordingly, both requirements were fulfilled in the current study. The findings indicate positive indirect significant relationships between VHRD (IV) and SCA (DV) through IC and SIP. Moreover, BCCI does not straddle zero between [LL 0.177, UL 0.470] and [LL 0.054, UL 0.178] which identified the significant mediations. Thus, Table 4 illustrates that IC ($T = 4.334$, $p = 0.000$) and SIP ($T = 3.477$, $p = 0.001$) mediate positively the relationship between VHRD practices and SCA, indicating validation of H6 and H7, respectively.

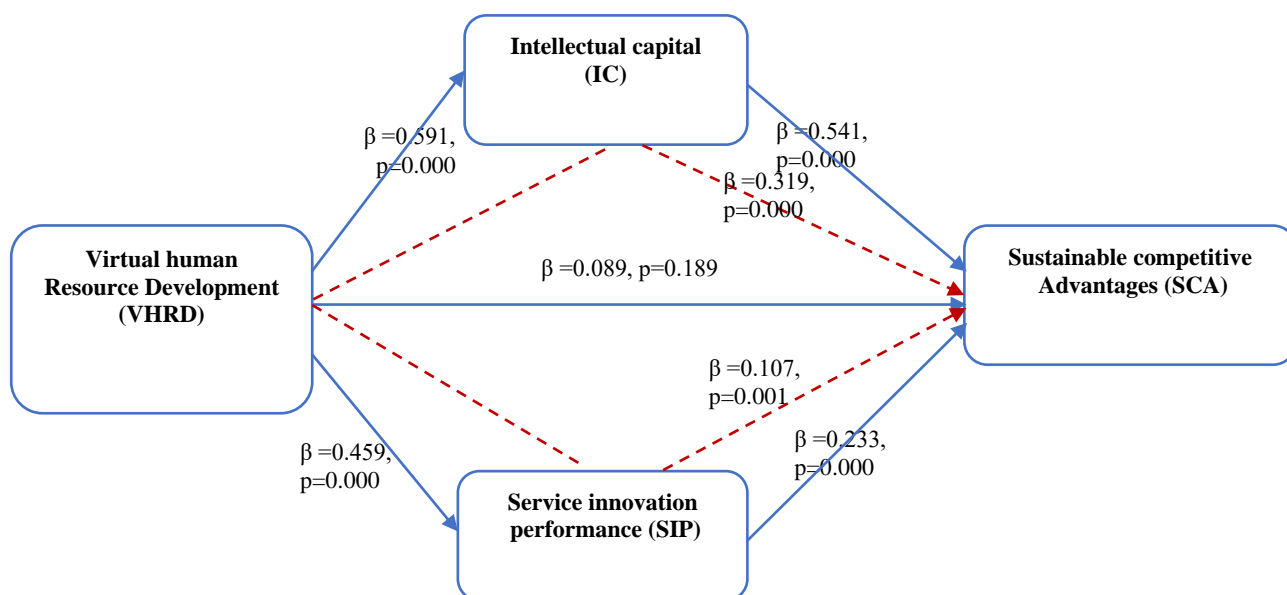


Figure 2. Results of path coefficients and P values for the research variables

Table 4. Results of the hypotheses test

No	Hypothesis	β	t-Value	P-Values	Results
H1	VHRD --> SCA	0.089	1.275	0.198	<i>Rejected</i>
H2	VHRD --> IC	0.591	5.970	0.000***	Supported
H3	IC -----> SCA	0.541	6.765	0.000***	Supported
H4	VHRD --> SIP	0.459	5.260	0.000***	Supported
H5	SIP -----> SCA	0.233	4.351	0.000***	Supported
H6	VHRD --> IC ---> SCA	0.319	4.334	0.000***	Supported
H7	VHRD --> SIP---> SCA	0.107	3.477	0.001**	Supported

DISCUSSION AND CONCLUSION

Previous research studies in VHRD emphasized the need for the development of explanatory and conceptual theories and called for further studies to fill in this gap (Bennett, 2014; Bennett and McWhorter, 2017, 2021; Chung et al., 2016; Go and Kang, 2023; McWhorter, 2023). For example, existing studies have primarily focused on individuals' attitudes or behavioral intentions within the metaverse (Cai et al., 2024; Go and Kang, 2023; Zaman et al., 2024). Additionally, Ashton et al. (2024) suggest that future research could delve into specific aspects of virtual worlds, such as HRM, to provide a more detailed and nuanced perspective. Furthermore, Chung et al. (2016) argued that VHRD research is still in its infancy, highlighting the need for further investigation in this area. Thus, the current study investigated the influence of VHRD practices on SCA and the mediating roles of both IC and SIP in green hotels. Precisely, it is somewhat surprising to find that VHRD practices do not have a significant direct influence on the hotel SCA because green hotels already have some merits over their competitors which contributes to forming the hotel SCA. Additionally, the nature of SCA itself in the context of green hotels often involves multiple contributing factors, including environmental sustainability practices, customer loyalty, operational efficiency, and community engagement. VHRD practices contribute to these dimensions indirectly by strengthening the organizational capabilities and fostering a supportive environment for sustainable practices. Confomingly, research indicates that while VHRD practices can enhance hotel capabilities and employee satisfaction, their direct impact on SCA may be mediated by other factors such as (IC) and (SIP). For instance, Bontis et al. (2015) argue that IC, which includes human capital nurtured through VHRD, contributes to organizational performance indirectly rather than directly influencing SCA. This finding is in line with Banmairuoy et al. (2022) who found that traditional HRD practices didn't have a significant direct on the SCA of S-Curve industries.

However, the results indicated that VHRD practices indirectly and significantly influence SCA as it is embedded in the IC and SIP in green hotels confirming the findings of (Banmairuoy et al., 2022). Our findings suggest that VHRD practices in hotels alone are not sufficient to gain a SCA. In the hotel industry, VHRD practices are more geared toward employee behaviors and attitudes. Thus, employees' knowledge, skills, and experiences rooted in the hotel VHRD practices should be first transformed into innovative behaviors or intangible assets that represent the hotel's SIP and IC, respectively. These new resources (i.e., SIP & IC) will add value to hotels to establish a SCA.

The results of the study indicated that VHRD practices have a positive influence on the hotel IC. The finding is in line with Holton and Yamkovenko (2008) who confirmed the role of HRD practices in increasing an organization's IC. The research findings strengthen the pivotal role of VHRD practices in the era of advent technology to enhance both the tangible and non-tangible assets of hotels. Thus, the acquired knowledge of the hotel employees based on virtual training will result in improving human capital (i.e., individual skills and abilities) organizational capital (i.e., knowledge management systems), and relational capital (i.e., social networks and individual relationships).

It is noteworthy that the findings of the study showed a strong positive relationship between IC and achieving SCA in hotels. This result is associated with previous studies (Farooq et al., 2021; Kanaan et al., 2020; Xiao and Yu, 2020). In these emerging yet highly dynamic hotel environments, the study argued that IC, as intangible assets, is an important source to achieve SCA in hotels, confirming the argument of Hall (1992) who stated that tangible assets of an organization could be counterfeited and replaced, which does not make it as a source of SCA. The hospitality industry is an intensive-labor industry, our findings favor the importance of the human, relational, and organizational capital of the hotels as scarce, unique, non-tradable, and durable resources that constitute the hotel SCA.

Similarly, as predicted the influence of VHRD on SCA is mediated by IC. The finding reveals that VHRD practices have significant indirect effects on hotel SCA. This finding fits the conclusion of (Patky and Pandey, 2020) who confirmed the positive indirect effect of IC on human resource practices flexibility and innovation performance. Besides, the finding is consistent with (Nisar et al., 2021) who stated that green human resource management practices indirectly influence environmental performance through green IC. The interpretation of the finding is that hotel VHRD practices enhance employees' skills, knowledge, expertise, and communication with hotel guests (i.e., IC) which, in turn, helps the hotel to achieve a SCA. Accordingly, the finding suggests that when a hotel adopts VHRD practices to achieve a SCA over its competitors, the hotel needs to consider and balance all dimensions of IC, because IC paves the way for VHRD to establish SCA. Hence, IC is considered a continuous and vital pillar in this relationship (Patky and Pandey, 2020).

Interestingly, the findings show that VHRD practices are significantly correlated to SIP in green hotels, supporting the findings of Capelleras et al. (2021) who revealed that training practices are positively related to employees' innovativeness in hotels, due to the intangible and irreplaceable nature of hotel services which mainly depend on the skills, abilities, attitudes, and behaviors of employees. The finding supports the argument of Bennett (2014) that VHRD can help drive SIP by connecting people, objects, ideas, tasks, and practices, through inspiring creative problem solutions.

As predicted, the results of the path coefficient reported a positive relationship between SIP and the hotel SCA. Moreover, SIP mediates positively the relationship between VHRD practices and SCA in green hotels. Precisely, our findings support the previous arguments of (Kallmuenzer and Peters, 2018; Tajeddini and Martin, 2020), who stated that employees' innovativeness is significantly related to hotel performance, resulting in achieving a SCA. The finding supports our arguments that SCA in the hotel sector occurs mostly through the transition of knowledge and skills of employees into innovative behaviors. Hotel guests often seek alternatives instead of accepting less service attention.

As a result of the above mentioned, VHRD in hotels is considered an integrating technology with HRD practices to improve employees' learning capacity along with performance to establish a SCA. Finally, the research findings provide invaluable input to guide hotel operators HR managers, and policymakers in the hotel industry when establishing strategies for their hotels. The findings can be used as a pivotal assessment tool to promote their personnel's and hotel capabilities as well as the hotel's competitive edge through innovative technology.

6. Theoretical implications

This study fills the lack of a solid theoretical foundation of VHRD in the hospitality and tourism industry which prevents VHRD from realizing its full potential. The conceptualized model merged the VR technology with the hotel HRD practices to build a win-win relationship between employees and hotels, which contributes to academia by bridging this gap. However, VHRD has been investigated in different disciplines, and this study is a pioneer in exploring VHRD practices in the hotel sector. Additionally, prior studies have focused on only one single dimension of HRD (i.e., training). The current study extended to study all VHRD dimensions in green hotels. Thus, the current study tries to fill this gap in the hospitality literature. Besides, we conceptualized two relationships (i.e., direct and indirect) between VHRD practices and SCA in green hotels, which provide both scholars and practitioners with more insights into the nature of these relationships. However, despite the insignificant direct relationship between VHRD and SCA, our findings infer that hotels can't achieve SCA through only the advent of technologies or HRD practices. Our research findings favor the importance of intangible assets and innovative behavior of hotel employees to gain SCA. These findings provide academia with a different research view through a tested model of how VHRD practices could help gain SCA in green hotels through indirect relationships. Thus, employees should be encouraged to be more assertive in their opinions and more comfortable sharing new ideas to establish a SCA in the hotel industry that is driven by intense technology and innovation. As a result, the conceptualized framework of the study can be used as a guide for hotel operators who seek to adopt VR in their HRD practices to attain SCA.

This finding opens a new research area and paves the way for scholars to conduct more research studies on intangible assets' role in the hospitality industry. Similarly, we claimed that prior empirical research investigations focused on the link between HRD and hotel performance rather than hotel SCA (Chen et al., 2021). This research offers a more complete theoretical perspective on using VHRD to attain SCA in the hotel sector. As a result, this study starts to fill this gap in the literature in this challenging area of research. To conclude, the study sheds light on the latent assets, capabilities, or resources in green hotels, which represent great potential for achieving SCA through providing academia and industry with empirical figures of the mediating roles of IC and SIP in the relationship of VHRD and SCA in green hotels.

7. Practical implications

Hotels are more likely than competitors to discover and capitalize on opportunities, and they are more prepared to incur business risks by making competitive movements. Thus, hotels should seek to establish a virtual platform for training their employees. For instance, practices of VHRD in hotels, such as online training modules and virtual workshops, can help hotels save costs associated with traditional training methods like hiring trainers or arranging physical training venues. Further, virtual training programs allow hotel staff to access learning materials anytime, anywhere, making it easier for employees to balance work and learning commitments. This flexibility can lead to higher employee satisfaction and retention. Additionally, virtual training programs can be easily scaled to accommodate the training needs of a growing workforce or multiple hotel locations without significant additional resources. One important implication is the consistency in training. VHRD ensures that all employees receive consistent training experiences, regardless of their location or shift schedule. This consistency can improve service quality and guest satisfaction across the hotel chain. Our findings encourage hotels to establish virtual platforms which in turn enable hotels to offer a wide range of learning opportunities, including language courses, simulation of job duties, cultural sensitivity training, and sustainability practices, fostering a more inclusive and knowledgeable workforce. Besides, this virtual platform prepares hotel staff to adapt to new technologies and innovations, ensuring the hotel remains competitive in a rapidly evolving industry. Also, VHRD practices on the virtual platform can provide remote access to emergency procedures and protocols, which in turn will enhance crisis preparedness among hotel employees by responding effectively to crises (Bennett and McWhorter, 2021).

On the other hand, this platform will provide analytics and reporting features that allow human resource managers to track employee progress, identify areas for improvement, and tailor training programs to meet specific needs, thereby optimizing resource allocation and improving overall efficiency. A significant practical implication to hotels and particularly to green hotels that adopt VHRD practices is "Reducing hotel Carbon Footprint". This could be achieved by minimizing the need for travel and physical resources, virtual training practices contribute to the hotel industry's sustainability efforts by reducing carbon emissions and resource consumption. Hence, hotels that seek to adopt VHRD practices to gain a SCA should direct VHRD outcomes into immaterial resources that competitors cannot easily duplicate or purchase. Furthermore, hotel managers should emphasize development approaches, notably VHRD practices, to encourage staff to learn by experience and to be knowledge seekers. VHRD is still necessary since it is the process of preparing employees to be valued organizational resources.

Moreover, the finding suggests that the more the hotel invests in VHRD practices, the higher the value of the return on investment will increase. Consequently, hotels should enhance their infrastructures, such as an intranet, virtual platforms, and a 3D virtual environment, to help optimize their share market through latent assets. For example, a 3D virtual environment in hotels makes it easier for a lot of employees in different places and at different levels to get virtual training at the same time. This can save money on training, give employees more freedom with their time, and help chain hotels standardize their policies. As a result, chain hotels, green chain hotels, and hotel management companies are more likely than other independent hotels to benefit quickly from VHRD. The study approved that improving employees' abilities, skills, and knowledge through involving them in the HR virtual practices will have a great effect on their career development, involvement, and loyalty to the hotel. The benefits of employees' involvement and career development through VHRD are reflected in decreasing employee turnover, cost savings, identifying and detecting potential problems, finding innovative solutions, enhancing social skills in building teamwork; branding hotel image; and presence; and achieving a competitive edge. For instance, if an employee in a hotel acquires new knowledge or skills through VHRD practices that are not widely used by the hotel's rivals, the hotel will make use of its human capital better than competitors could.

Additionally, VHRD practices can facilitate knowledge sharing among hotel employees regardless of their geographic locations. This fosters a culture of continuous learning and knowledge exchange, leading to the accumulation of intellectual capital and promoting teamwork and collaboration among employees, which are essential components of intellectual capital in a hotel setting. Investing in VHRD practices in hotels demonstrates a commitment to employee growth and development, which can improve talent retention rates. Moreover, by identifying and nurturing talent through virtual platforms, hotels can effectively plan for succession and ensure the continuity of intellectual capital within the hotel. Thus, a hotel that is seeking SCA over its rivals should not only pay attention to tangible assets more than intangible assets. This is because IC doesn't only assist hotels in gaining a SCA by creating resources and capabilities but also facilitates the hotel growth rate in the long run (Bontis et al., 2015). VHRD practices offer flexibility in terms of when and where employees can access training and development resources. This flexibility enables employees to acquire new skills and knowledge at their own pace, contributing to the adaptability of the workforce and the overall intellectual capital of the hotel. In addition, it promotes a culture of innovation by encouraging employees to explore new ideas and approaches. As employees contribute their intellectual capital to innovation efforts, hotels can gain a competitive advantage in the market by offering unique services and experiences to guests. Thus, by recognizing and leveraging the relationship between VHRD practices and intellectual capital, hotels can enhance their organizational performance, employee satisfaction, and sustainable competitiveness in the hospitality industry. By addressing guests' and employees' intangible or unmet requirements, IC helps create new market share, improve guest and employee loyalty, and enhance innovative marketing tools. Thus, hotel owners and managers should think about IC when they make and carry out their hotel marketing plans.

VHRD practices are considered a long-term investment in hotel-specific human capital, resulting in creativity and innovation in employee service performance. In the hotel and restaurant sectors, attracting and acquiring specific knowledge, skills, and abilities of an employee to do specific technical work is highly costly. Therefore, hotels should adopt and activate their VHRD practices to accumulate specific skills of employees to do such technical work, which is reflected in both innovation in service performance and hotel SCA, as well as cost savings.

For hotels, integrating virtual reality technology into human resource development programs allows hotel staff to undergo immersive training simulations. For example, employees can practice handling various customer scenarios in a virtual hotel environment, leading to better service innovation and customer satisfaction. Additionally, implementing virtual employee engagement activities such as virtual team-building exercises, online recognition programs, and virtual social events can enhance employee morale and motivation. Engaged employees are more likely to contribute innovative ideas and strive for service excellence. Typically, utilizing virtual platforms for collaboration and communication among hotel staff facilitates idea-sharing and brainstorming sessions for service innovation. Virtual tools such as video conferencing, project management software, and online forums enable employees to collaborate effectively regardless of their physical location, which in turn will lead to achieving a SCA for the hotel.

Hotel operators should encourage their employees to behave and think innovatively by virtualizing real situations within VHRD practices to add value to guests over competitors, this makes hotels more likely to achieve a SCA. So, the mediating role of SIP is a driving source for the hotel SCA. Our findings suggest hotel operators invest in VHRD practices to develop the knowledge and skill levels of the current employees to innovate in-service performance to achieve a SCA instead of recruiting high-cost talented employees. In a dynamic market environment, service innovation enables hotels to respond effectively and quickly to changing customer preferences and market trends by introducing new services or modifying existing ones to better meet customer needs, thereby maintaining their competitive position. Additionally, innovative services help hotels differentiate themselves from competitors by offering unique experiences or features. This differentiation can create a competitive edge that is difficult for competitors to replicate quickly, leading to SCA. Moreover, service innovation often involves the implementation of new technologies (e.g. VR) or processes that can improve operational efficiency. Streamlining operations and reducing costs while maintaining or enhancing service quality can contribute to SCA by allowing hotels to offer competitive prices or invest in further innovation. Thus, by continually investing in service innovation and leveraging it to build SCA, hotels can position themselves for long-term growth and resilience in the face of industry disruptions and economic downturns.

8. Limitations and directions for future research

Despite our best efforts to ensure accuracy in the study's procedures, several limitations must be considered when

interpreting the findings. First, the fact that we used data from only 57 green hotels in only one country (Egypt) is the main limitation of the study. A replicated study with a large sample of hotels from diverse categories is essential. Therefore, caution should be exercised when extrapolating the study's findings to other categories of hotels and other hospitality facilities. Second, although the current research hasn't found a significant direct relationship between VHRD practices and SCA in green hotels, future research might adopt the current research framework on restaurants.

Hence, future research may confirm or provide different results which can help both hotel and restaurant operators and owners to decide on VHRD investments. Third, the current study investigated the relationship between VHRD practices and SCA, further research studies might investigate the relationship between VHRD practices and employee performance and/or organizational performance. Finally, future research studies could explore the effects of employees' and hotels' demographics to achieve SCA through VHRD practices in hotels.

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