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Gamification and gigification: A multidimensional theoretical approach

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ABSTRACT

The main purpose of this paper is to explore the performance of white-collared gig workers using three theoretical perspectives: knowledge-based view theory, employee engagement theory, self-determination theory. The study investigates the relationship between intellectual capital, collective cognitive engagement, intrinsic motivation, and knowledge management as antecedents to the performance of gig workers. Furthermore, it investigates whether a moderation effect of intrinsic motivation using game elements can improve the performance of gig workers. This study uses primary data collected over 8 weeks from January 2020 to Feb 2020. This study collects self-administered cross-sectional primary data from an online platform that currently engages white-collar gig workers or has engaged them in two previous years (2018 and 2019) in either one or more platforms. This study also develops a conceptual model to measure the performance of white-collared gig workers using an extension of the three theoretical perspectives.

1. Introduction

Over time, the Gig Economy has grown in popularity. The gig economy is divided into two types of employment: unskilled and skilled. The unskilled worker class is further divided into three categories: those who drive (Uber, Lyft, Ola), those who distribute food (Zomato, Postmates, etc.), and those who perform basic tasks with a limited ability set (TaskRabbit). Any worker who engages in hard manual labour, such as construction, mining, or repair, is referred to as a blue-collar worker (Chiarini, Belvedere, & Grando, 2020). This working class has been overly explored by firms and even by academic research. However, the second category is classified as white collar workers. This includes suit-and-tie employees who work in service industries and avoid manual labour as well as professional workers. This latter group comprise the white-collared gig workers, such as engineers, consultants, management executives, etc., who have been largely unexplored in the literature. This knowledge-driven, white-collared gig workforce is different from other industries as working on projects for multiple companies simultaneously can help to grow skills and create opportunities (Fischer, 2017; Prasad & Mangipudi, 2021; Prasad, Rao, & Vaidya, 2019). These workers have to work with and for the firms based on a mutual agreement captured by work and time, which then translates into understanding such workers' performance management (Prasad et al., 2019). Performance assessment may also be problematic, especially if a firm hires the gig worker to do a job that most organisations' traditional metrics cannot adequately capture. Recent literature reveals that the level of motivation is low for gig workers, which causes slow progress in their engagement and performance levels (Wardhana, Herlina, Bangsawan, & Tuori, 2020). When extending these lower performing factors, the theoretical assumptions on factors of intellectual capital, collective cognitive engagement, intrinsic motivation and knowledge management that affects the performance of gig workers is represented through knowledge-based view theory (Friedrich, Becker, Kramer, Wirth, & Schneider, 2020; Swacha, 2015), theory of employee engagement (Looyestyn et al., 2017; Lukas, Eskofier, & Berking, 2021) and self-determination theory (Gajanova & Radišić, 2021).

The newer and more unique context of this paper is that we are focusing on the antecedents to the performance of gig workers. The gig economy literature focuses on measurement of the performance of gig workers (Veen, Kaine, Goods, & Barratt, 2020; Wardhana et al., 2020).e Our study is different from other studies because we are trying to develop our conceptual model by considering the effect of antecedent factors on the performance of gig workers. We aim to understand the performance of white-collared gig workers using three theoretical

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perspectives—knowledge-based view theory, theory of employee engagement, self-determination theory—using a sample size of nearly 450 gig workers. The study explores the relationship between intellectual capital, collective cognitive engagement, intrinsic motivation, and knowledge management as antecedents to gig workers' performance. We also test if the moderating effect of intrinsic motivation using game elements can improve the performance of gig workers. The study collects primary data from white-collared gig workers and tests the hypotheses after controlling the effect of "nature of work" and "relevant experience" on their performance (Newlands, 2021). The study contributes to an extension of knowledge-based view theory to assess the performance of gig employers. The study will also benefit employers who are gradually increasing their dependence on white-collar gig workers. The study also helps design better and improved performance metrics, which may help in sustainably engaging gig workers.

More jobs have been produced due to the increased use and expansion of companies entering the gig economy (Gleim, Johnson, & Lawson, 2019). However, not all gig work prospects are created equal. Gig jobs typically fall into one of two categories: sharing the full-time hours within the jobs. The expectations of those who want to participate in these two forms of gig work are somewhat different (Gleim et al., 2019). Individuals seeking freedom and flexibility in the face of wage stagnation and increased income instability now have more job opportunities due to the rise of companies joining the gig economy. Horowitz and Rosati (2014) stated that according to Fabio Rosati, CEO of Upwork, gig work contributes more than $700 billion to the United States (US)'s national economy. Gig work allows younger people to earn money while attending school, or to engage in other activities that are not conducive to conventional jobs. The gig economy provides an opportunity for underemployed employees or those experiencing wage stagnation to supplement their income (Gleim et al., 2019). Gig work is a choice for those reaching retirement age who want to avoid receiving social security payments. For example, the AARP ride services and Uber have a partnership that allows senior citizens to work as Uber drivers (Gleim et al., 2019).

The emergence of the gig economy has brought some new opportunities and challenges to the workplace (Hayzlett, 2018; Healy, Nicholson, & Pekarek, 2017). However, many academics, trade unionists, and current or former gig workers have expressed concerns about platform companies' business and labour practices. Some claim that platforms promote "sham contracting" by allowing companies to mask jobs as independent contracting and escape employee benefits like superannuation (Healy et al., 2017) insurances and paid leave. Critics of the platform model are concerned about the uncertain working status of gig-economy jobs (Hayzlett, 2018; Healy et al., 2017). While the difficulty of correctly classifying various types of jobs is not recent, the addition of new technology-driven business models, which are related to increasingly complex working structures, has exacerbated existing definitional tensions (Pereira and Mohiya, 2021; Fletcher-Brown et al., 2021). The emergence of platforms as new work market intermediaries has sparked a critical debate about the suitability of existing legal classifications and the need for new ones (Healy et al., 2017). The division of jobs encouraged by gig economy business models that minimise labour costs by deeming employees as "independent contractors" has drawn widespread criticism (Josserand & Kaine, 2019). Regardless of its exact scope, the rise of the gig economy has sparked a heated debate about its effect on work experience and labour standards, both for those who do gig work and for those who have more traditional jobs that could be jeopardised by new, unregulated labour market participants.

While questions have been raised about the impact of its growth on the nature of employment, minimum labour standards, and worker voice (Johnston & Land-Kazlauskas, 2018a), the potential appeal of 'portfolio' or freelance work has also been recognised (Manyika et al., 2016). Despite media and public interest, academic research in the field is still scarce, likely due to the digital form's recent growth.

Table 1
Comparison of the contextual factors in developed and developing economies regarding gamification and gigification.

Contextual factors of developed economies	Contextual factors of developing economies	Existing research gaps
Gig workers (for example in USA) must pay a separate self-employment tax, which contractors in many other countries do not have to pay (Lobo, 2019; Rolph, 2010; Skrzek-Lubasińska & Szaban, 2019)	Gig workers (for example in India, Bangladesh, and Pakistan) which are the top ten developing countries with gig economy does not implemented a separate self-employment tax (Lobo, 2019; Rolph, 2010; Skrzek-Lubasińska & Szaban, 2019)	Intellectual capital Cognitive collective engagement
Mobile applications and gamification approaches are highly used in developed countries in education sector (Halloluwa, Vyas, Usoof, & Hewagamage, 2018; Purwandari, Sutoyo, Mishbah, & Dzulfikar, 2019)	The application of mobile technology for gamification approaches are in education sector is less in emerging economies due to low number of technical infrastructure facilities (Halloluwa et al., 2018; Purwandari et al., 2019) and due several socio-cultural aspects (Bai, Hew, & Huang, 2020; Gao, Li, & Sun, 2020)	Knowledge management Intellectual capital
The continued advancements of (smart) technology and artificial intelligence, globalization and deregulation facilitated the gig economy in developed countries such as USA, UK and Germany (Braganza et al., 2021; Lobo, 2019)	The less supportive technology and infrastructure facilities can be considered as a barrier for the development of gig economy (De Ruyter & Rachmawati, 2020; Holland & Brewster, 2020; Lobo, 2019)	Knowledge management Intellectual capital
The concept of gig economy is growing vastly due to the flexible working hours and working from home conditions (Holland & Brewster, 2020; Lobo, 2019)	The cultural factors are affecting the concept of gig workers as gig employment is not a full time and permanent job position (Lobo, 2019; MacDonald & Giazitzoglu, 2019)	Cognitive collective engagement
Following legal challenges to worker classification and the emergence of worker guilds, US-based trade unions introduced a new legislation at the municipal level that strengthens rights and collective organizing opportunities for gig and platform workers (Holland & Brewster, 2020; Johnston & Land-Kazlauskas, 2018b).	Gi workers are facing several risks including precarious working conditions and algorithmic workplace monitoring, thus constraining workers' autonomy and bargaining power (Anwar & Graham, 2020, 2021; Ioannides, Gyimóthy, & James, 2021)	Cognitive collective engagement

Source: Developed by authors.

1.1. Inter-connection between the concepts of gamification and gigification

Gamification refers to the application of game-design elements and game principles in non-game contexts (Bassiouni & Hackley, 2016; Prabowo, Sucahyo, Gandhi, & Ruldeviyani, 2019). It can also be defined as a set of activities and processes used to solve problems by utilising or applying game element characteristics (Spanellis, Dörfler, & MacBryde, 2020). Gigification is one of the many new ways of working (Braganza, Chen, Canhoto, & Sap, 2021). Several scholars have recently noted the growing potential of gig work (Braganza, Chen, Canhoto, & Sap, 2021). For hundreds of years, if not millennia, the phenomenon of gig work has been evident (Harvey, Rhodes, Vachhani, & Williams, 2017). However, in recent years, this type of job has rapidly expanded into a larger portion of global operations and the supply chain labour market. There is an link between both the concepts of gamification and gigification on technology as technology plays a vital role in facilitating the gamification features and gigification context (Agogué, Levillain, & Hooge,

Table 2
Summary of the literature on most frequently used theoretical applications.

Current Literature	Key Focus	Focused Theory	Areas of Contribution
Burbano (2019); Teece (2000); Galunic and Rodan (1998); Gleim et al. (2019); Bontis et al. (2000); Berzkalne and Zelgalve (2014); Petty and Guthrie (2000); Cheng et al. (2010); Maditinos et al. (2011); Burbano (2019); Stewart and Stanford (2017)	- Intellectual capital-Work engagement-Knowledge management	Knowledge-based view theory	-Long term competitive advantage of the firms-Intellectual capital evaluation-Work engagement and utilization of the firm resources-Knowledge management in organizational levels
Saks and Gruman (2014); Mayfield and Mayfield (2017); Blomme et al. (2015); Shuck et al. (2017)	-Cognitive collective engagement	Theory of employee engagement	- Work engagement and leadership techniques-Physical, mental, and cognitive factors affecting the work-related resources and engagement-Psychological connection with employees' work performance-Measuring the employee engagement and the validity of current metrics
Krishen et al. (2016); Lin et al. (2009); Gilal et al. (2019); Rigby and Ryan (2018);Prabowo et al. (2019); Hassan and Hamari (2020)	-Intrinsic motivation-Work engagement	Self-determination theory	- Effects of customer satisfaction on customer loyalty-Motivational regulations on the marketing environment and consumers' behavioral intentions

Source: Developed by authors.

2015; Braganza, Chen, Canhoto, & Sap, 2021).

Therefore, this study explores the relationship between intellectual capital, collective cognitive engagement, intrinsic motivation and knowledge management as antecedents to the performance of gig workers by considering the gamification, gigification and emerging country context. This further distinguishes this study from developed economies, as in developing countries with more informal labour markets, the gig economy has long been the de facto standard. For example, researchers have recently found that since developing countries are far more comfortable with informal economies, the transition to a "gig economy" is not a considerable shift for these emerging economies (Loo, 2017; Rolph, 2010; Zanello, Fu, Mohnen, & Ventresca, 2016). Table 1 further illustrates the contextual factors that differentiate developed and developing economies regarding gamification and gigification.

The two main contributions from this study are as follows. First, this study contributes theoretically to the current research by applying the knowledge-based view theory to assess the performance of gig employers. It is evident in the literature that proliferation of new information sources and technology placed pressure on companies to rapidly update their skills by exploiting external expertise (Holland & Brewster, 2020; Low & Ho, 2016). Companies have begun to rely more heavily on external networks for new information, and multinational corporations have begun to use their global reach to gain access to a broader range of knowledge sources (Alcácer, Cantwell, & Piscitello, 2016). This focus on external knowledge presented researchers with a significant theoretical challenge of how public knowledge could help a company to develop firm-specific competitive advantages and the knowledge-based view theory answered this question by combining strategic capability, knowledge acquisition and application capabilities (Alcácer et al., 2016; Galunic & Rodan, 1998; Low & Ho, 2016). Second, this study contributes practically by detailing how employers are gradually increasing their dependence on white-collar gig workers by designing and improving performance metrics, which facilitate the engagement of gig employees.

The authors test if a moderation effect of intrinsic motivation using game elements can improve the performance of gig workers or not. This study collects primary data from about 450 white-collar gig workers and tests the hypotheses after controlling the effect of "nature of work" and "relevant experience" on their performance using structured equation modelling (Warp PLS 6.0). This leads to the formation of two main research questions:

RQ1: By how much do the factors of intellectual capital, collective cognitive engagement, intrinsic motivation, and knowledge management affect the performance of gig workers?
RQ2: By how much does the moderation effect of intrinsic motivation using game elements improve the performance of gig workers?

Further, the selection of a proper theoretical framework is necessary to identify the relationship between intellectual capital, collective cognitive engagement, intrinsic motivation, and knowledge management as antecedents to the performance of gig workers and the moderation effect of intrinsic motivation using game elements to improve the performance of the gig workers (Duggan, Sherman, Carbery, & McDonnell, 2020). Therefore, the authors categorised the current literature based on the most frequently used theorical application as follows (see Table 2).

Therefore, considering the main contribution of these three theories, the authors selected knowledge-based view theory considering its contributory factors on long term competitive advantage of firms and intellectual capital evaluation. Further, they considered the core areas of work engagement and utilisation of firm resources and knowledge management at organisational levels. This further addresses the first research question (*RQ1: By how much do the factors of intellectual capital, collective cognitive engagement, intrinsic motivation, and knowledge management affect the performance of gig workers?)* of this study. Then the theory of employee engagement and self-determination theory is used to explore collective cognitive engagement, intrinsic motivation and knowledge management considering the contributory factors on the effects of customer satisfaction on customer loyalty and motivational regulations on the marketing environment and consumers' behavioural intentions. This further addresses the second research question (*RQ2: By how much does the moderation effect of intrinsic motivation using game elements improve the performance of gig workers?)* of this study.

1.2. Gig economy and gig workers with automation and digitalisation

Automation and digitalisation are having a transformative impact on production and work organisation around the globe (Chiarini et al., 2020). These changes, which are frequently associated with the "gig economy," have been argued to constitute a "Fourth Industrial Revolution" (de Ruyter, 2019). This digital industrial revolution appears to herald the start of a new era in European manufacturing. As a result, it is being bolstered by the European Union (EU) with a variety of actions, including research and infrastructure funding, as part of a larger digital single market strategy (Chiarini et al., 2020; Loo, 2017). The degree of automation and digitalisation of the gig economy and gig workers varies based on the division of labour, technical capacity and socio-cultural

features.

There were very few locations in the early days of business process outsourcing (BPO) that could provide enough connectivity to support transnational workflows (Chiarini et al., 2020; Graham, Hjorth, & Lehdonvirta, 2017) but as more people in low-income countries gained access to the internet, a fundamentally different type of outsourcing has emerged: digital labour platforms. Clients post jobs on automated labour websites, and staff bid on them. Digital labour platforms, in comparison to BPO work, reflect a radically new model in that they enable business processes to be outsourced without the use of formal BPO organisations (and their associated overheads) (Braganza, Chen, Canhoto, & Sap, 2021; Graham et al., 2017). Further, digital labour networks aid unemployment issues by bringing together more workers in areas where they are needed but do not currently exist (Chiarini et al., 2020). Because of the global spread of digital communication, millions of people have turned to outsourced digitally mediated work to help them solve some of these challenges (Braganza, Chen, Canhoto, & Sap, 2021; Graham et al., 2017).

With the development of technology, workers can circumvent some of the limitations imposed by their local labour markets, and tasks such as translations, transcriptions, lead generation, marketing, and personal assistance can now, in principle, be performed by workers from anywhere for clients based anywhere. Much has been written on how globalisation developments have expanded capital's global scope at the detriment of labour's geographic position (Braganza, Chen, Canhoto, & Sap, 2021; Braganza, Chen, Canhoto, Sap, & Control, 2021; Burbano, 2019; Graham et al., 2017). The rise of digital jobs could suggest that not only capital but also labour will compete in a global market with more facilitated technical infrastructure (Chiarini et al., 2020).

When considering the socio-cultural aspects, the gig economy and gig workers also face different trade union strategies and labour laws which vary from country to country. Further, gig workers also face several risks as no large-scale or successful digital labour movements have emerged. This is due not only to the fact that many of them do not know each other, but also to the belief that if they stop working, staff from other parts of the world will easily replace them. Digital job environments are built to constantly remind employees that they are part of a competition – one in which workers from all over the world compete to provide clients with the best possible terms.

1.3. Theoretical underpinnings and literature review

Although the term "gig economy" is new, the phenomenon is not (Gleim et al., 2019). People have found ways to supplement their income and have flexible work schedules even before the rise of technological platforms that have enabled today's gigs (Gleim et al., 2019). For example, Avon, a direct sale business, was founded in 1886 while Tupperware was established in 1946. Mary Kay and Amway followed in the early 1960s, allowing (primarily) women to earn money by selling goods to friends and associates from the comfort of their own homes and in their own time (Gleim et al., 2019).

1.3.1. Knowledge-based view theory

According to Hata and Adamson (1996), the theoretical models and conceptualisations of business enterprises that describe and predict their structure and behaviours are known as firm theories, which have evolved over time. In the 1980s, a firm's resource-based strategy demonstrated the vital role of organisation-specific strategic assets in achieving a competitive advantage (Wernerfelt, 1995; Winter, 1998). In the 1990s, however, the proliferation of new information sources and technology placed pressure on companies to update their skills rapidly by exploiting external expertise (Low & Ho, 2016). Companies began to rely more heavily on external networks for new information, and multinational corporations began to take advantage of their global reach to access a wider variety of knowledge sources (Buckley & Casson, 1985). This focus on external knowledge presented researchers with a significant theoretical challenge of how public knowledge could help a company develop firm-specific competitive advantages. Knowledge-based view theory answered this question by focusing on a particular form of strategic capability: knowledge acquisition and application capabilities (Galunic & Rodan, 1998; Low & Ho, 2016).

According to knowledge-based view theory, a firm's success depends on its own capabilities for knowledge production and the management of relationships for external knowledge transfer (Galunic & Rodan, 1998; Low & Ho, 2016). A recent literature field experiment revealed that exchanging charitable donation information raised workers' feelings of closeness to their gig employer. The effect was more substantial if workers previously felt distant from (rather than felt close to) their employer (Burbano, 2019). Knowledge is a precious resource for the corporate sector and the economy itself. Teece (2000) argued that a company's ability to develop, disseminate, use, and retain difficult-to-copy information assets is inextricably related to its competitive advantage. Such assets are developed internally by businesses where employees' "know-how" and "learning-by-doing" are developed. Vvr MON He argues that an organisation must incorporate information to create a long-term competitive advantage. According to Teece (2000), businesses that achieve information integration have three essential characteristics, (a) an ability to integrate knowledge among its workers, (b) a well-defined scope of integration for creating useful types of knowledge that rivals find difficult to imitate, and (c) integration versatility.

Several authors have identified that corporate domination is characterised by intellectual capital (Bontis, Keow, & Richardson, 2000; Cheng, Lin, Hsiao, & Lin, 2010). There seems to be agreement about intellectual capital's content, which typically includes three elements: human capital such as personnel skills and qualifications; institutional capital such as copyrights, patents, software; and relational capital such as customer and supplier relationships. The need to measure these forms of capital stems primarily from emerging principles of knowledge-based economies, which necessitate new accounting techniques to solve the shortcomings of traditional accounting techniques (Berzkalne & Zelgalve, 2014; Petty & Guthrie, 2000). Evaluation methods for estimating organisational intellectual capital and strategic management strategies for controlling and improving intellectual capital have received much coverage in the literature (Pandey et al., 2021). For example, Human Resource Accounting, Economic Value Added (EVA), Balanced Score Card, and Skandia Navigator are standard accounting techniques for measuring intellectual capital (Bontis et al., 2000; Cheng et al., 2010). The discrepancy between book and market prices, or the quantification of intangible assets, has been used to measure intellectual capital's worth. The empirical results show that intellectual capital, financial performance, and shareholder value are all positively linked (Bontis, Wu, Chen, Cheng, & Hwang, 2005).

In practice, this means that as intellectual capital rises, the gap between demand and book value grows wider (Maditinos, Chatzoudes, Tsairidis, & Theriou, 2011). Further, strategic management tools are crucial in developing well-fitting organisational strategies that enable workers to engage in knowledge development procedures for tacit and explicit knowledge creation and to improve corporate capacity to achieve a competitive advantage (Berzkalne & Zelgalve, 2014; Petty & Guthrie, 2000). Tacit awareness refers to personal characteristics where workers can quickly transfer from one job to another through databases, guides, and guidelines; explicit information is limited within a firm's boundaries. The link between knowledge management and innovation can be justified based on various scholarly evidence. The literature indicates that knowledge management activities have a direct and indirect effect on innovation and organisational success, as well as an improvement in innovation capacity (López-Nicolás & Meroño-Cerdán, 2011; Noruzy, Dalfard, Azhdari, Nazari-Shirkouhi, & Rezazadeh, 2013; Santoro, Vrontis, Thrassou, & Dezi, 2018). Furthermore, it has also been identified that information development, knowledge incorporation, and knowledge implementation have all been found to help with creativity

and success among education-related sectors (Caza, 2020; Martínez Guillem & Briziarelli, 2020) and in marketing related (Isa, Jaganathan, Sern, Ahmdon, & Nafi, 2020; Sutherland, Jarrahi, Dunn, & Nelson, 2020) gig jobs.

Further, knowledge-based view theory is identified as the most appropriate theoretical framework to measure work engagement, intellectual ability, and knowledge management of gig workers in an emerging context for two main reasons. First, knowledge is regarded as a company's most strategic advantage, according to the knowledge-based philosophy of the firm (Low & Ho, 2016; Stewart, 2007; Teece, 2000; Winter, 1998). The knowledge-based view (KBV) of the firm is an organisational learning management philosophy that provides businesses with strategies for gaining a competitive advantage (Stewart, 2007; Teece, 2000). This is accomplished by increasing employee participation in the development and implementation of the firm's organisational priorities and long-term transformational objectives (Petty & Guthrie, 2000; Rich, Lepine, & Crawford, 2010; Stewart, 2007; Teece, 2000). Therefore, based on the literature, the applicability of knowledge-based view theory to measure the components of work engagement, intellectual ability, and knowledge management of the gig workers in emerging context can be justified. Secondly, one of the major challenges in Gig economies is that the concept of knowledge is under developed due to the lack of infrastructure and technical capabilities within these firms (Ernst, 2000). Further, the main assumption of the knowledge within a firm is a major component in this study as the authors are developing this conceptual model using this fundamental theoretical assumption for workers in the gig economy (Hata & Adamson, 1996).

Firms consider this information to be a valuable commodity that is difficult to ignore. Within businesses, the development of information is a dialectic process involving implicit and explicit knowledge. Therefore, we hypothesise the following based on the above discussion:

H1a: Work engagement has a positive impact on intellectual ability concerning scientific knowledge stock.
H1b: Intellectual ability concerning scientific knowledge stock of the firm is positively related to innovation performance of gig workers.
H2a. Work engagement has a positive impact on knowledge management concerning scientific knowledge resources.
H2b: Knowledge management concerning scientific knowledge resources of the firm is positively related to innovation performance of gig workers.

1.3.2. *Theory of employee engagement*

Employee engagement has been one of the most discussed business subjects worldwide (Saks & Gruman, 2014; Truss, Alfes, Delbridge, Shantz, & Soane, 2013). Two main trends have emerged since the advent of employee engagement in the management literature. First, several scholars have highlighted employee engagement as the gateway to an organisation's success and competitiveness (Cheema, Akram, & Javed, 2015; Levene, 2015; Nazir & Islam, 2017; Sheng, Wang, & Amankwah-Amoah, 2021). In reality, it has been claimed that companies with engaged workers have higher shareholder returns, productivity, and customer satisfaction (Barik & Kochar, 2017; LePine, Zhang, Crawford, & Rich, 2016; Rao, 2017; Turner, 2019). However, it has been repeatedly documented that employee engagement is on the decline and that today's workers are increasingly disengaged (Richman, Civian, Shannon, Jeffrey, & Brennan, 2008; Sheng, Amankwah-Amoah, Wang, & Khan, 2019; Sheng et al., 2021; Wei, Wagner, Hudson, Yu, & Shattuck, 2015). According to some studies, half of all US workers are either not completely engaged or disengaged. This obvious concern has been called an "engagement deficit," and it costs US companies billions of dollars in lost productivity each year (Bates, 2004; Saks & Gruman, 2014).

According to Saks and Gruman (2014), two problems have plagued employee engagement research and continue to do so. First, there are various definitions of employee engagement, and there is still a lack of agreement and consensus about what engagement means (Saks & Gruman, 2014; Shuck, Adelson, & Reio, 2017). Researchers have difficulty agreeing with the name for the phenomenon (Breevaart et al., 2014; Saks & Gruman, 2014). Some argue that it should be referred to as employee engagement, while others argue that it should be referred to as job engagement or work engagement (Kalokerinos, Kjelsaas, Bennetts, & Hippel, 2017; Saks & Gruman, 2014). Further, several instruments have been established to assess employee engagement, and concerns about measuring the engagement and the validity of current metrics continue to be raised. Aside from these two persistent issues, scholars have not identified any widely accepted theory of employee engagement (Glavas, 2016; Saks & Gruman, 2014; Shuck et al., 2017). Therefore, considering the relational theory of employee engagement based on the relationship management paradigm and the job demands-resources model that Jiang and Shen (2020) identified, the primary mediators between perceived authentic leadership and individual employee behavioural results were perceived open communication and employee engagement. Apart from employee engagement, corporate communication researchers have recognised the importance of identifying leadership styles that promote organisational communication and result in positive workplace outcomes (Mayfield & Mayfield, 2017) such as charismatic leadership (Jamal & Abu Bakar, 2017; McGuire, Cunningham, Reynolds, & Matthews-Smith, 2020), democratic leadership (Kelly & MacDonald, 2019), and task and relations leadership (Mayfield & Mayfield, 2017; Mikkelson, Sloan, & Hesse, 2019).

Several studies have investigated employee engagement as operational concepts in organisational behaviour research are not always clear (Anitha, 2014; Christian, Garza, & Slaughter, 2011). Further, it has been found that employee engagement is linked to a psychological connection with employees' work performance rather than employees' attitudes or characteristics of a job or an organisation (Anitha, 2014; Christian et al., 2011; Maslach, Schaufeli, & Leiter, 2001). Employee engagement is a motivational construct that explains how workers devote their energy to accomplishing their job goals (Ariani, 2013; Rich et al., 2010). Kahn (1990) mentioned that engagement includes three distinct dimensions: physical, mental, and cognitive. Most scholars have built theories considering these main three aspects: for example, psychological contract theory shows the relationship between work-related resources and engagement, which may differ among different employee categories and mechanisms through which engaged people will remain engaged (Blomme, Kodden, & Beasley-Suffolk, 2015); implicit leadership theory (Blomme et al., 2015); social identity theory (Giessner, Knippenberg, Ginkel, & Sleebos, 2013); and engagement theory (Kearsley & Shneiderman, 1998), etc.

Blomme et al. (2015) examined the possible connections between work engagement and leadership techniques. In previous research, Blomme et al. (2015) found that engaged employees were more willing to put in extra effort at work than their less-engaged colleagues and that engaged employees were less likely to change jobs or transfer to another business. Furthermore, the authors discovered that job engagement levels were positively associated with work efficiency and employees' ability to convey their companies' unique selling points to clients (Blomme et al., 2015). It was evident in the literature that the concept of employee engagement with operational concepts in organizational behaviour research is not always clear (Anitha, 2014; Christian et al., 2011), and most of the scholars built theories based on Kahn's (1990) dimensions of physical, mental, and cognitive factors which show the relationship between work-related resources and engagement. Consequently, we hypothesise the following based on the above discussion:

H3a: Work engagement is positively related to collective cognitive engagement.
H3b. Collective cognitive engagement within the firm is positively related to the innovation performance of gig workers.

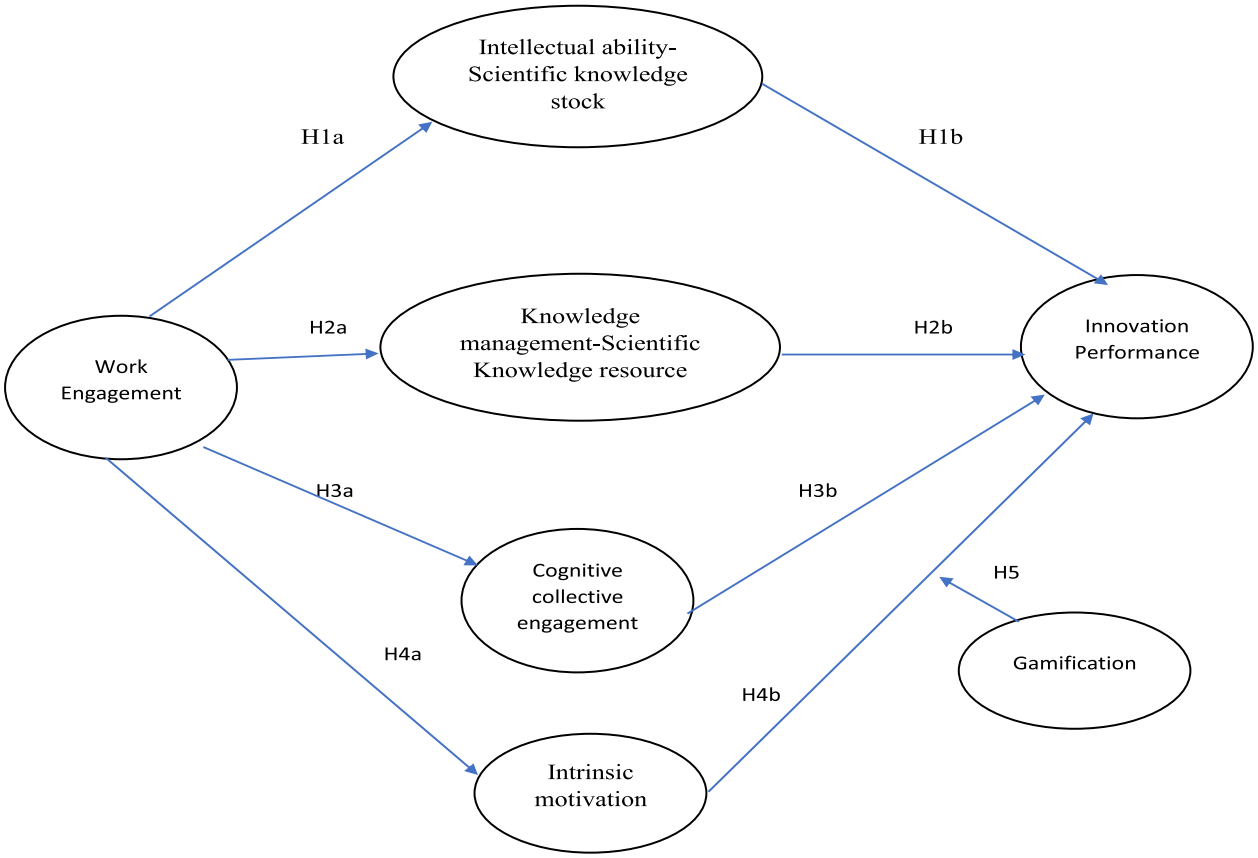

Fig. 1. Theoretical Mode.

1.3.3. Self-determination theory

Self-determination theory is part of a family of holistic psychological theories that include those of Jean Piaget and Carl Rogers. It suggests that humans are an active species with innate and profoundly developed tendencies towards psychological growth and development (Deci, Koestner, & Ryan, 1999). Individual differences and motivation are combined in self-determination theory (Krishen, Berezan, Agarwal, & Kachroo, 2016). According to this theory, the fulfilment of core psychological needs shapes behaviour, growth, and development (Krishen et al., 2016). Self-determination theory is a *meta*-theory that claims that an individual's core needs are divided into three categories of competence (desire for mastery), relatedness (desire to be cared for, care for others, and have a significant relationship with others), and autonomy (sense of freedom and volition) (Ryan & Deci, 2000). According to the theory, these three needs are at the heart of the proclivity for growth, integration, social development, and well-being. Self-determination theory is an empirically-based theory of human motivation and personality in social contexts that distinguishes between autonomous and directed motivation. Experiments on the impact of extrinsic incentives on intrinsic motivation led to the theory's growth (Ryan & Deci, 2000). Since the initial studies of self-determination theory, various authors have developed four mini-theories to address different, but related, issues over the past thirty years: the effects of social environments on intrinsic motivation; the development of autonomous extrinsic motivation and self-regulation through internalisation and integration; individual differences in general motivational orientations; and the functioning of fundamental universal psychological needs that are essential for growth, integrity, and wellness (Ryan & Deci, 2000). Although self-determination theory has been refined over time (ex: Deci & Ryan, 1980, 1985, 1991, 2000, 2008), the primary focus on the role of the person-environment dialectic in the fulfilment of the significant psychological needs has remained. It is important to note that in self-determination theory, it is proposed that what matters is not the environment per se, but what it means functionally in terms of supporting people's psychological needs (Deci et al., 1999).

The number of social factors that have been discovered to influence people's needs and, as a result, motivation has increased over time, and they range from incentives and deadlines to positive and negative feedback (Ryan & Deci, 2000; Vallerand, Pelletier, & Koestner, 2008). The phenomenon of intrinsic motivation – the innate propensity to seek out challenges, novelty, and learning opportunities that begins at birth – exemplifies this dynamic human nature. Another example is internalisation, or an individual's lifetime proclivity to take in and try to incorporate the social practices and values surrounding him/her (Deci et al., 1999). While the growth tendencies that underpin intrinsic motivation and internalisation are evolved and therefore "normal," this does not mean that they are always efficient (Deci et al., 1999). On the other hand, these innate impulses necessitate unique supports and nutrients from one's social environment (Ryan & Deci, 2000). Fig. 1 shows an overview of self-determination theory.

Within self-determination theory, these components are referred to as psychological states, described as the supports necessary for psychological development, integrity, and wellness (Deci et al., 1999). Three basic psychological needs are defined in self-determination theory: autonomy, relatedness, and competence. People have more vitality, self-motivation, and well-being when these three needs are supported and met in a social sense (Ryan & Deci, 2000). The thwarting or irritation of these essential needs, on the other hand, results in decreased self-motivation and increased ill health; in reality, thwarting these needs is implicated in the aetiology of many types of psychopathology (Ryan & Deci, 2000). Self-determination theory was developed and researched using a collection of five mini theories that make up the theory's formal structure. Each mini theory was first proposed to explain phenomena from laboratory and field research on factors influencing human

motivation and optimal performance. In the non-marketing area, much of the current literature on theory continuously addresses 'motivation.' In the marketing domain, however, few studies have evaluated the self-determination mini-theories (Gilal, Zhang, Paul, & Gilal, 2019). Further, Gilal et al. (2019) showed that only one study used motivational regulations as mediating variables to investigate the effect of customer satisfaction on customer loyalty; that study demonstrated that loyalty is positively affected by both intrinsic and defined regulation, whereas introjected regulation and external regulation are unrelated to loyalty (Lin, Tsai, & Chiu, 2009). A study conducted by Lin et al. (2009) is the only one in the marketing domain that used organismic integration theory constructs to bridge the gap between the marketing environment and marketing outcomes.

Gamification has sparked interest in all corners of society over the last decade, from academics to professionals in different industries and even popular media (Khan, Boroomand, Webster, & Minocher, 2020). Organisational gamification most of the time has used self-determination theory (Khan et al., 2020; Shi & Cristea, 2016; van Roy & Zaman, 2017). Self-determination theory as a motivational theory distinguishes between intrinsic and extrinsic motivation, both of which can be influenced by various rewards (Ackerman, 2021). The studies that have applied self-determination theory show that the game properties such as preference, repeatability, and feedback lead to needs fulfilment and improve intrinsic motivation in the video game context (Lin et al., 2009; Rigby & Ryan, 2018; Shi & Cristea, 2016). Considering that intrinsic motivation is positively related to innovation performance and perseverance, and those game elements can enhance intrinsic motivation by supporting the psychological needs outlined by self-determination theory, this theory presents a favourable framework for gamification in the organisational behaviour context (Jabagi, Croteau, Audebrand, & Marsan, 2019; Shi & Cristea, 2016; van Roy & Zaman, 2017).

Given the lack of information about the mediating effects of motivation styles, future research could benefit from examining whether autonomous (e.g., intrinsic and identified) or controlled (e.g., introjected and external) motivational regulations promote the connection between the marketing environment and consumers' behavioural intentions (Gilal et al., 2019). Consumer behaviour outcomes such as emotional attachment, word-of-mouth advertising, brand enthusiasm, and consumer e-waste behaviour are likely to be more affected by autonomous motivational regulations (Gilal, Zhang, & Gilal, 2018; Hudson, Roth, Madden, & Hudson, 2015; Levy & Hino, 2016). This expectation is in line with self-determination theory that states controlled motivational regulations only have a short-term effect on behaviour and cannot maintain behaviour over time, while autonomous motivation contributes to long-term customer engagement (Gilal et al., 2019). Due to a lack of data on the mediating effects of motivation types, future research may benefit from examining whether autonomous (e.g., intrinsic and identified) or controlled (e.g., introjected and external) motivational regulations can promote the link between the marketing environment and consumers' behavioural intentions (Gilal et al., 2019) which leads to the following hypotheses:

H4a: Work engagement has a positive impact on intrinsic motivation.
H4b. Intrinsic motivation with autonomous (e.g., intrinsic and identified) or controlled (e.g., introjected and external) motivational regulations can positively promote the innovation performance of gig workers.

1.4. Gig economy: overview and scope

The gig economy is becoming an essential topic in academia, generating debates about the future of jobs, labour reform, and the effect of technology on job quality (Kaine & Josserand, 2019). As already mentioned The fragmentation of work encouraged by gig economy business models has come under criticism (Burbano, 2019; Josserand & Kaine, 2019; Kaine & Josserand, 2019; Manyika et al., 2016). As a result, despite minimal and contradictory knowledge about the digitally powered economy—also known as the network economy, on-demand economy, or gig economy—international public and policy interest has grown (Minifie & Wiltshire, 2016). Employment in that economy has come to be known as 'gig work', which refers to 'task-based and 'electronically mediated jobs' (Statistics, 2018)) that allow for the online platform or smartphone app-based connection between those proposing to perform services or tasks and those demanding services. Two types of 'gig work' have been defined under this wider definition as 'crowd work' and 'work on demand' (Kaine & Josserand, 2019; Valerio, 2017).

Further, when considering the first category of cloud-based crowd work that is generally undertaken in a worker's own home, it has another two subcategories. First, according to Scholz (2017), crowd-sourced platforms primarily trade-in "microtasks", which coordinate the use of human intelligence to perform tasks that computers cannot, such as Amazon Mechanical Turk. The second subcategory makes use of relevant technical skills to deliver work online. On-demand gig work differs from crowd work in that it includes 'real-world' rather than virtual activities (Stewart & Stanford, 2017). Regardless of its exact scope, the rise of the gig economy has sparked a heated debate about its effect on work experience and labour standards both for those who do gig work and for those who have more traditional jobs that the gig workers could jeopardise (Healy et al., 2017; Johnston & Land-Kazlauskas, 2018a; Kaine & Josserand, 2019). Although questions have been raised about the effect of its growth on the nature of employment, minimum labour standards, and worker voice (Johnston & Land-Kazlauskas, 2018a), the potential appeal of 'portfolio' or freelance work has also been recognised (Manyika et al., 2016). Despite the public's and media's interest, academic research in the field is still forthcoming (Kaine & Josserand, 2019).

The white-collared gig workers involved in jobs, such as engineering, consultants, management executives, are technologically smart and driven by knowledge and intellect (Kaine & Josserand, 2019). These employees must cooperate with their employers based on a shared understanding captured by work and time, which translates into an understanding of how to manage their efficiency. Performance evaluation can be complex because most organisations' conventional metrics still cannot adequately capture the gig worker's job. Recent literature reveals that the level of motivation is low in global gig workforce which causes a dip in their engagement level and hence their performance levels (Kaine & Josserand, 2019; Tassinari & Maccarrone, 2020; Werner, 2021).

The gig economy is the most recent stage in the evolution of non-traditional forms of employment. Its rapid expansion has ignited an intense debate about regulatory and protective institutions (Tassinari & Maccarrone, 2020). Gig work jeopardises existing legislation modes based on collective bargaining, resulting in legal ambiguity (Tassinari & Maccarrone, 2020). The potentials, conditions, and limits for the emergence of solidarity and collective action among gig workers are only now being investigated (Lehdonvirta, 2016; Waters & Woodcock, 2017; Wood, Lehdonvirta, & Graham, 2018). Therefore, this study aims to further this understanding and add to the growing body of knowledge on the performance of white-collared gig workers using three theoretical perspectives: knowledge-based view theory, theory of employee engagement and self-determination theory.

The study will contribute to an extension of knowledge-based view theory to assess the performance of gig employers. The study will also benefit employers who are gradually increasing their dependence on white-collar gig workers. The study also helps design better and improved performance metrics, which will help sustain the engagement of gig workers. Consequently, this research investigates the relationship between intellectual capital, collective cognitive involvement, intrinsic motivation, and knowledge management as antecedents to gig worker success. The authors also investigated whether a game-based moderation effect of intrinsic motivation will boost gig workers' efficiency. This

study gathers primary data from white-collar gig workers and tests the hypotheses after adjusting for the impact of "nature of work" and "related experience" on the results.

1.5. Gamification: overview and scope

Gamification implies game design to non-game contexts and it involves business simulation games for leadership training within a new economy of "fun at work" management ideologies (Morschheuser & Hamari, 2019). When considering a marketing perspective, gamification is applying game elements to a product to improve user interaction by making it more fun and challenging (Prabowo et al., 2019). Gamification has been used in several areas, such as education (Huang & Soman, 2013; Majuri, Koivisto, & Hamari, 2018), health care (Johnson et al., 2016; Schmidt-Kraepelin, Thiebes, Stepanovic, Mettler, & Sunyaev, 2019), and transportation (Marcucci, Gatta, & Le Pira, 2018; Murawski, 2020; Prabowo et al., 2019). In general, gamification has been shown to increase product use and individual motivation to complete a task in some fields (Murawski, 2020). The gamification methods used in game-informed programming to minimise (or offload) labour coordination costs in potential crowdsourcing networks, computer-supported interactive work environments, and "gig economy" markets are considered an effective marketing strategy (Morschheuser & Hamari, 2019).

New forms of economic collaboration and management, such as crowdsourcing, have become possible due to the growing pervasive interconnectedness caused by recent technological advances, such as the internet and smartphones (Afuah & Tucci, 2012; Morschheuser & Hamari, 2019; Behl and Dutta, 2020). In parallel, crowdsourcing business analysts also estimate that at least 50% of all organisations that manage such innovation processes gamify their processes (Afuah & Tucci, 2012; Morschheuser & Hamari, 2019). Further, current literature shows that crowdsourcing systems are among the most significant domains employing gamification (Koivisto & Hamari, 2019; Morschheuser & Hamari, 2019). This further illustrates that organisations seek to make the crowdsourced work activity more like playing a game to provide other motives for working rather than just for monetary gain (Colbert, Yee, & George, 2016; Vesa, Hamari, Harviainen, & Warmelink, 2017). Although the emerging phenomenon seems intuitively appealing, little is known about the gamification of work, including its future opportunities and challenges (Koivisto & Hamari, 2019; Morschheuser & Hamari, 2019). Furthermore, to fully understand the benefits of gamification, a combination of expertise in game design, motivational psychology, and management is needed (Koivisto & Hamari, 2019; Morschheuser & Hamari, 2019).

When considering the gamification and intrinsic motivation of employees, the potential impact of gamification on knowledge work and knowledge workers (white-collar gig workers) has not been explored so far in the literature at a generic level (Dörfler & Stierand, 2020; Spanellis et al., 2020). The few studies that discuss this problem take a narrow view of information work as knowledge exploitation (Agogué et al., 2015) or as a mix of knowledge with information (Spanellis et al., 2020). Gamification has been studied extensively in user motivation and worker engagement (Spanellis et al., 2020; Vassileva, 2012). However, if gamification is used as more than just a tool for motivation via play, it can positively affect organisational structures and group dynamics, among other things (Spanellis et al., 2020; Vassileva, 2012). Thus, it is essential to investigate the gamification of white-collar gig workers. Therefore, this study contributes to an extension of knowledge-based view theory to assess gig employers' performance. The study will also benefit employers who are gradually increasing their dependence on white-collar gig workers. The study also helps in designing better and improved performance metrics which would be useful for engaging gig workers in a sustainable manner. Gig work is highly mechanical and repetitive and demands less creativity and innovative thinking (Braganza, Chen, Canhoto, & Sap, 2021). Hence, adding some gamification elements will make their repetitive work interesting and innovative. Gig workers' intrinsic motivation may motivate them to perform well in an organisation but adding gamification enhances their innovation performance. Hence, we propose that;

H5: Gamification has a positive moderating effect on the relationship between gig workers' intrinsic motivation and innovation performance.

The hypotheses are summarised in Fig. 1

2. Research design

We used primary data collected from white collar gig workers using an online survey. The contact details of potential respondents were collected using web scraping in Python. We only collected responses from platform owners who had offered work to white-collar gig workers in the past two years. We then approached them by sending an online questionnaire to collect their responses. This method is suitable for studies whose objectives are testing the hypotheses, describing population, and building theory. We discussed the design of the research instrument (questionnaire) and how it was used to collect the data. The research instrument was developed using existing scales published in top journals that was widely accepted for multiple studies. We modified the scale in our study's context slightly without changing the underlying meaning of the items. The responses were collected using a 7-point Likert scale wherein seven denotes strongly agree, and one denotes strongly disagree. We pre-tested the scale with 24 experts who worked in both academia and industry. We also performed a group discussion online with all the experts to understand any critical issues related to ambiguity, vagueness, understanding of questions and responses, and the questionnaire flow (Dillman, 2011). The constructs, their respective sources, and the corresponding items are listed in the Appendix.

2.1. Data and method

Data were collected over a period of 8 weeks from January 2020 to February 2020. The study collected self-administered cross-sectional data from an online platform that currently engages white-collar gig workers or has engaged them in the two previous years (2018 and 2019) in either one or more platforms. The analysis unit is gig workers, and the survey intended to collect responses from an online platform. In case we received multiple responses from one or more stakeholders from the same online platform, we reported an average response to each question in our data. The sample consisted of 214 firms that engaged gig workers who worked in consultancies, craft, art, music, stand-up comedy, talent hunt, computer programming, course curriculum design, fashion design, and many more. The average time of gig worker engagement on these websites was roughly 14 days, with a minimum of 1 day and a maximum of 90 days. In the preliminary questions, we verified whether the respondent had a fair understanding of managing online gig platforms to ensure data collection from the right respondents. We also used a period of 4 weeks to collect responses. The first wave of data was collected by the third week after the questionnaire was issued, while the second wave was initiated after the fourth week. We thereby collected all of the data in roughly 8 weeks.

We then scanned the data and omitted cases where the data were incomplete. We found a mismatch in the respondent's reported data and information when tallying it with secondary data published on the web page of the online platform. Thus, by following the critical informant approach, we reached a final number of 214 respondents. The respondents were divided into three categories: platform owner, head of technical operations, or chief technology officer. The respondents had techno-functional roles with an average of 4.8 years experience. The firms were also categorised based on the type and nature of the gig work. Many of the respondents were from the US, followed by the UK, Australia, China, and India. We also tried to map the diversity in the firms' geographic presence and operations with the kind of gig work that their platform allowed. The overall response rate was close to 37%, moderately high, and way above the acceptable threshold value. We

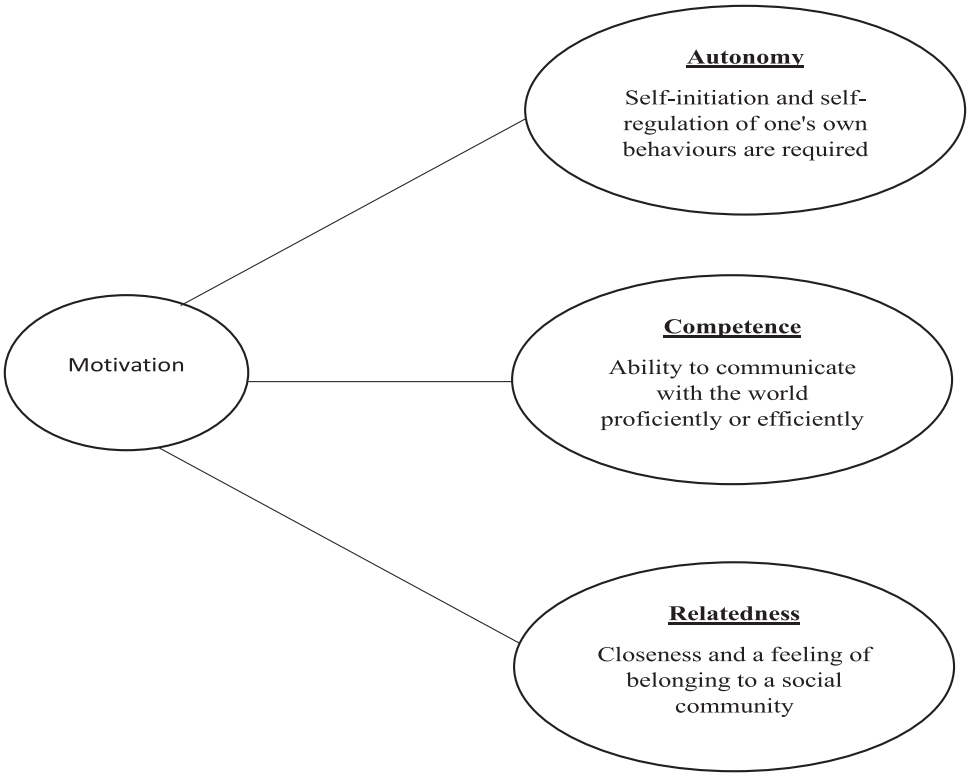

Fig. 2. SDT: Antecedents of motivation.

accompanied the survey with a strong rationale and a cover letter explaining the need and importance of the responses. We also studied and compared the response rate of similar past studies and found that our response rate was similar to others, which confirms that our study is in line with others from a methodological aspect.

2.2. Non-response bias

We gathered primary data using a survey-based instrument, and thus the data might suffer from non-response bias. To address this concern, we followed Chen et al.'s (2015) guidelines of a two-step approach. As a first step, we compared the sample websites' popularity and innovation with other gig firms using a *t*-test to understand if there any difference between the two groups. The *t*-test ($p > 0.37$) revealed no significant difference between the sample firms and other firms from the sampling frame. The second step tested the difference between every measured item of the respondent's data from wave 1 (first 30% respondents) and wave 2 (last 30% respondents). We tested the proposed hypothesis using Armstrong and Overton's (1977) method and both respondent sets were equivalent to each other. The test results ($p = 0.23$) confirm no significant difference between the dependent variable, independent variable, and the control variable. The combined results from the first and second steps confirmed that our data did not suffer from non-response bias.

3. Data analysis and results

To test our hypothesised model, we used Warp PLS 6.0, which is a partial least square-based structured equation modelling (PLS-SEM) technique (Kock, 2019). The hypothesised model is reflective and is developed on multiple theoretical perspectives rather than any existing model, which makes PLS-based SEM the best choice in this case. Moreover, Henseler et al. (2014) also argued that latent variables are estimated as weighted aggregations of indicators without the inclusion of measurement error in a traditional PLS approach. It is further debated by Dubey et al. (2019a, 2019b), Kock (2019), and Henseler (2014) that measurement errors start to dominate the actual indicators, and the overall effect can be seen on the composite factors. In addition to this, Kock (2019) also debates that measurement errors cannot be omitted as their absence in the composite indicators could lead to some unknown source of bias.

In recent years, PLS-SEM has become a popular choice for survey based-research. PLS-SEM is most suitable for examining complex models without imposing distributional assumptions on the data. Hence, PLS-SEM is the best suited method to examine the proposed complex framework work presented in the study. Further, PLS-SEM is a causal-predictive approach to SEM that emphasises prediction in estimating statistical models, whose structures are designed to provide causal explanations (Sarstedt et al., 2017). The technique thereby overcomes the apparent dichotomy between explanation and prediction, which is the basis for developing managerial implications (Hair et al., 2019). Thus, the PLS-SEM software needs to be carefully selected to ensure it follows a PLS-SEM technique that bridges the gap between covariance-based SEM and PLS-SEM (Kock, 2019; Sarstedt et al., 2014).

3.1. Measurement model

We followed a three-stage approach and checked for critical factors like reliability, validity, and unidimensionality proposed by Chen and Paulraj (2004). First, we calculated Cronbach's alpha to test the constructs' reliability and found it was greater than 0.7 (Cronbach, 1951; Nunnally, 1978). We then calculated the construct validity using exploratory factor analysis (EFA) (Chen & Paulraj, 2004). EFA was performed using principal component analysis (PCA) with varimax rotation. Lastly, to check for unidimensionality and construct validity, we performed confirmatory factor analysis (CFA). According to Gerbing and Anderson (1988), CFA offers a stringent and robust method to test for unidimensionality. We further ensured that each of the constructs was composed of at least three items. Individual factor loadings were calculated and found to be greater than 0.5 (refer Table A1- Appendix), which confirms the convergent validity parameter. Fornell and Larcker

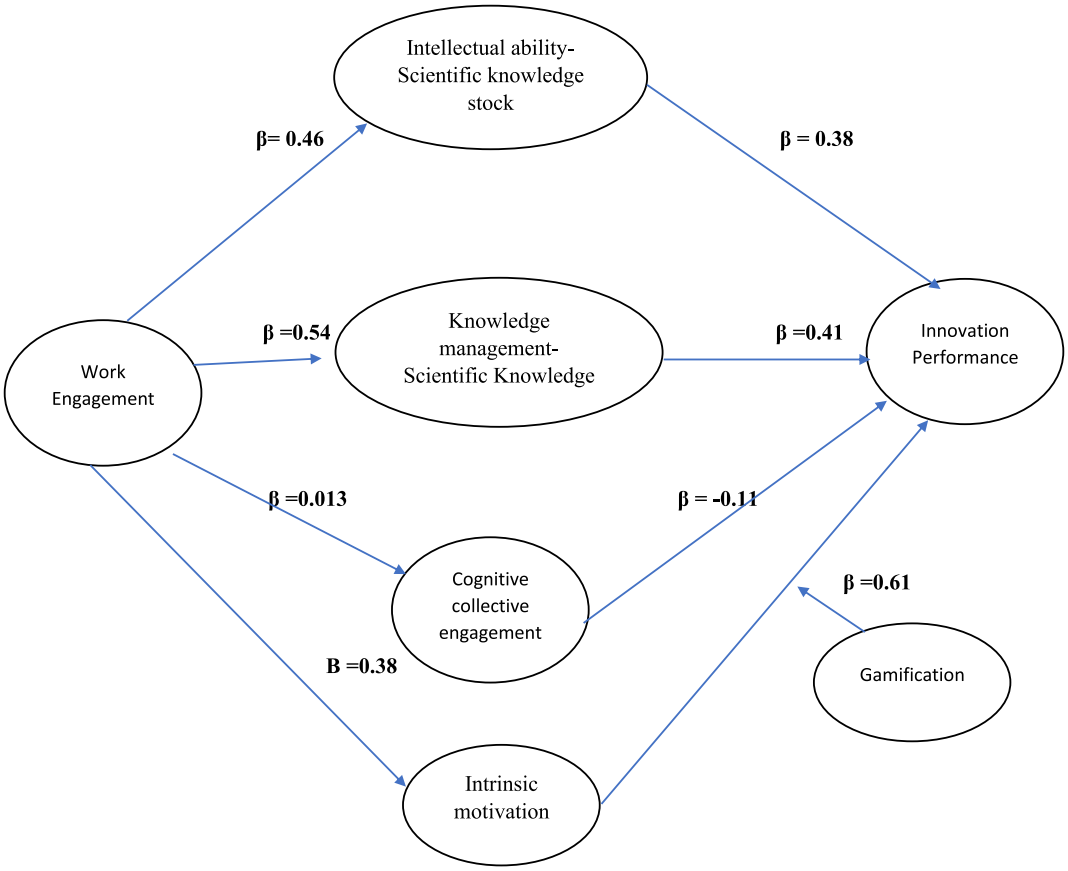

Fig. 3. Structural Estimates.

(2011) suggested that average variance explained (AVE) square root should be greater than the construct's correlation with other constructs, and the results confirmed similar results confirming discriminant validity (Refer Table A2- Appendix). To check the reliability of the constructs, we calculated Cronbach's alpha of the construct. We found that the composite reliability (0.814) and reliability of individual constructs were greater than the threshold value (0.7). We then calculated the Variance Inflation Factor (VIF) to test if the data suffered from the issue of multicollinearity (Peng and Lai, 2012), which was negative and confirmed by the results with values (4.112) less than 5 (threshold value).

Additionally, while earlier studies claimed that an ideal scenario should have a VIF less than 3, any value less than 5 is still considered acceptable. Next, we calculated the average path coefficient (APC) and average R square, which are key indices for model fitting the data, and the results confirmed that it was not a concern. Overall, we concluded that the model fitted our data. Table A3 (Appendix) presents the model fit and quality indices parameters.

The next step included checking for endogeneity in our data, as suggested by. We calculated the non-linear bivariate causality direction ratio (NLBCDR), Simpson's paradox ratio (RSCR), R2 contribution ratio, and the statistical suppression ratio (SSR). We found that all four indices had values greater than the threshold value of 0.7. Referring to the arguments of Podsakoff and Organ (1986), we ran a battery of tests for common method bias (CMB) as our study is based on primary data. Moreover, Podsakoff et al. (2003) suggested that self-reported data also suffer from issues like social desirability, and thus it is essential to report CMB results. We designed our research instrument using multiple scales to minimise the effects across each type of construct. To double verify CMB, we performed a conservative version of Harman's one-factor test proposed by Podsakoff et al. (2003) to confirm that the data had fewer chances of suffering from CMB. Table A4 (Appendix) represents the causality assessment indices.

Studies often report that causality is an issue that most empirical studies miss out on while testing hypotheses. Guide and Ketokivi's (2015) method in their seminal paper was used to test for causality in our study. The proposed theoretical framework has unidirectional relationships proposed in the study. To test for causality, we interchanged the independent and dependent constructs and performed a Durban-Wu-Hausmann test following the guidelines of Davidson and Mackinnon (1993). We found that the residuals were insignificant, confirming that the proposed nature and relationships of constructs are the same as proposed in the theoretical model. The favourable results of CMB, causality, and endogeneity confirm that the data is ready to perform the required statistical analysis using PLS-SEM.

3.2. Results of hypotheses testing

Fig. 2 presents the results of the hypotheses testing from Warp PLS. The results concluded that the overall value of r is 56% for explaining innovation management. We also show the corresponding values of PLS path coefficients and their corresponding values of sig values in Fig. 2 and Table A5. The results confirm that H1a, H1b, H2a, H2b, and H4 are supported, while H3a and H3b are found to have non-significant values. Also, gamification is found to have a positive moderating effect on the relationship between intrinsic motivation and innovation performance of white-collared gig workers. The supporting hypotheses (H1a, H1b, H2a, H2b, and H4) partially explain how and why knowledge-based view theory can be applied to understand the relationship between work engagement, knowledge, and intellectual performance of gig employees that translates into their degree of innovation in their work (Saks & Gruman, 2014). The mediating effect of knowledge and intellectual attributes possessed by gig workers are explained in the study. It is also found that gamification offers positive support to innovative

behaviour, which is also a function of gig workers' intrinsic motivation. The study also supports that innovation can be explained better if explained with knowledge management theories and motivation theories (Nazir & Islam, 2017). The work engagement of gig workers is mainly on an individual basis on digital platforms. It also has a negative impact on their innovative performance. This is showcased in our results as H3a and H3b are found to have a non-significant relationship. Table A5 sets out the results and their corresponding coefficients (see Fig. 3).

4. Discussion

The results offer interesting results to understand the nature of white-collar gig workers' innovation performance when engaged on digital platforms. The results confirm that work engagement has a positive and significant impact on intellectual ability and knowledge management in scientific knowledge stock; however, the results reflect counterintuitive arguments for the relationship between work and collective cognitive engagement. While earlier studies have tested similar relationships, it is often seen that these are studied in the context of knowledge creators or grass root innovators. Additionally, Kaine and Josserand (2019) confirmed that while work engagement often leads to an increase in workers' knowledge and cognitive skills, our study only showed this to be partially true. The study uniquely positions the case of white-collared gig workers in the nature of their job, degree of engagement with the job, and degree of engagement with the digital platform as distinctly different from previously studied subjects. The nature of gig workers' job makes them work independently on projects that promotes them to think independently and take charge of their work themselves (Jiang & Shen, 2020; Gilal et al., 2019; Burbano, 2019). Thus, the degree of involvement in their jobs is significantly higher when compared to full-time employees. Unlike a full-time workforce, the gig workforce selects the work themselves, making them more autonomous, which indirectly breeds a higher degree of knowledge and intellectual ability. The study extends this understanding by further relating them with the innovation performance of the gig workers. Our results are in line with Gleim et al. (2019), who confirm that intellectual ability and knowledge management skills critically and significantly improve a person's innovation. The results offer theoretical support from knowledge-based view theory to explain the results as white-collared gig workers have knowledge and subject matter expertise as their key resource when offering innovative solutions.

Hayzlett (2018) argued that work engagement often improves employees' mental, physical, and cognitive skills. He also confirmed that with higher work engagement and based on the job's nature, employees show different degrees of cognitive skills. Our study documents counterintuitive arguments in the case of white-collared gig workers. We found that work engagement holds a low or negligible association with collective cognitive engagement that has minimal contribution towards gig workers' innovation performance. Drawing from knowledge-based view theory, the nature of the job and degree of involvement of the employee with the process and other people makes him/her score high on his/her cognitive skills. However, this is falsified in this study that proposed that white-collared gig workers mostly have lesser interaction with peers and employers, which might negatively impact their cognitive skills and cause a dip in their cognition-driven innovative performance in their work. Another explanation for H3a and H3b not being supported could be the nature and scale of cognition measurement in past research. Jiang and Shen (2020) and Mikkelson et al. (2019) asserted that collective engagement improves teamwork and shared knowledge between employees, which was completely lacking in an online gig workplace. Thus, while individual engagement might be higher amongst gig workers, their relationship with collective cognitive engagement is lacking. It further hampers their score on innovative practices. Therefore, unlike frontline employees in an organisation with the power to present and implement innovative ideas, gig workers must perform the assigned tasks alone, which further diminish their innovative performance.

Next, our study positively supports that work engagement leads to gig workers' intrinsic motivation, which has often been debated in past literature. While some studies (Prabowo et al., 2019; Shuck et al., 2017) quote that employees' intrinsic motivation causes workers to be engaged and, therefore, be productive in their work, others (Valerio, 2017) argue that it is the engagement of the work that keeps the intrinsic motivation alive. We confirm the second school of thought as white-collar gig workers are inherently self-driven, which helps them score high on the intrinsic motivation score. Additionally, our study found that intrinsically driven gig workers discovered innovative ways to complete the task with a high score on the innovative performance scale. However, adding a gamification layer positively improved their innovative performance as game mechanics encouraged the gig workers to work for the reward, be it tangible or intangible. Game elements like points, leaderboards, and badges motivated the gig workers to stay engaged in the process, which helped them complete the task on time. Fig. 2 further asserts our understanding of the proposed associations between dependent and independent variables through mediated and moderated routes. The results also offer theoretical and practical contributions.

4.1. Theoretical contributions

This research adds to the knowledge-based view theory by demonstrating how white-collar gig workers can be engaged in improving innovation performance by utilising intellectual and knowledge-based resources. Further, this study contributed to the field by developing a conceptual model to measure the performance of white-collared gig workers using three theoretical perspectives—knowledge-based view theory, theory of employee engagement and self-determination theory—by considering the antecedents to the performance of gig workers, which makes our study contribution novel and different from other studies. Employees' innovation and innovative practices are mostly viewed from the lens of theories, such as the theory of diffusion, which are often linked to technological innovations, creativity, and effective brainstorming-based innovation. However, our study extends the boundaries of innovative performance of white-collar gig workers who are often engaged on an individual basis and have minimal or no connection with concepts such as design thinking, innovative thinking, or theoretical frameworks on innovation bases. This study also helps to integrate self-determination theory to explain how gamification can help to improve white-collared gig workers' intrinsic motivation to perform innovatively (Jabagi et al., 2019).

Thus, our study contributes towards extending theoretical discussions in three ways. First, the knowledge-based perspective of the firm is a modern extension of the resource-based view of the firm that is particularly well suited to the current economic climate. Knowledge is seen as a unique strategic resource that does not depreciate as standard economic producing variables and can offer growing profits (Braganza, Chen, Canhoto, & Sap, 2021; Harpur & Blanck, 2020). Most knowledge-based resources are intangible and dynamic, allowing for idiosyncratic development through route dependency and causal ambiguity, which are the foundation of the mechanism for generating economic rent in the knowledge-based perspective of the enterprise. However, in this field of research, there is still a dearth of cumulative theoretical growth. The plurality of concepts, terminologies, and meanings reflects the theme's theoretical embryonic state; as a result, academic investigations that provide rigour to a clear relevant subject are required (Curado & Bontis, 2006; Pereira & Bamel, 2021).

Second, our findings support current engagement techniques used by businesses when it comes to human resource management. In contrast to prior studies that used resource-based perspective theory to explain the utilisation and efficiency of human resources, our research takes a new approach in analysing innovative methods used by gig workers via the lens of intrinsic motivation. The study expands on the concept of

engagement by utilising gamification as a strategic tool for improving the intrinsic motivation of digital gig workers (Ashford et al., 2018; Thite, 2020). Third, collective cognitive engagement is often studied as a critical antecedent of innovative practices by groups. Our study discovers that digital gig platforms often lack group work and limit interactions among gig workers, which solicits communication lags and lowers the workers' cognitive skills (Sutherland et al., 2020). Gamification as a technique is being successfully used in a variety of areas of business in general to boost employee engagement. Employee engagement is a major concern for many businesses, as performance outcome is dependent on it. Organisations around the world use a variety of strategies, including group meetings, team building, and social gatherings, to encourage employees and improve job quality and operational efficiency. According to several studies, generation Y has always been enthusiastic and inspired by challenges and games, with gaming being considered as a routine activity in new-age companies.

Several studies have revealed success stories with improved levels of employee engagement and implications of gamification in the business setting during the last decade, demonstrating a clear distinction between a gamified and non-gamified corporate environment (Robson et al., 2016). Some of the game-based aspects used to engage and encourage individuals in the workplace include incentives, points, and leader roles. In the workplace, team building, group games, and trivia challenges are commonly utilised to motivate employees. This further highlights the importance of adopting the theoretical constructs of theory of employee engagement which is a framework for technology-based teaching and learning in organisations.

4.2. Managerial implications of the study

The application of this theoretical paradigm to the new context of gig knowledge workers in the gig economy provides important insights for companies who use white-collar gig employees to execute tasks (Wardhana et al., 2020). While job engagement is vital for gig workers, the results show that because these digital employees contribute to the work as individuals, their engagement cannot be developed in new ways. Points, badges, and leaderboards may not help in these instances; instead, businesses must recognise that most of these gig workers are disruptors (one of the player types). The nature of their employment frequently necessitates both inventiveness and independence (Veen et al., 2020; Wardhana et al., 2020). This can be further justified using the recent literature, which demonstrates the need of a new conceptual model to measure the performance of white-collared gig workers using the three theoretical perspectives: knowledge-based view theory (Friedrich et al., 2020; Swacha, 2015), theory of employee engagement (Looyestyn et al., 2017; Lukas et al., 2021) and self-determination theory (Gajanova & Radišić, 2021).

It is also important to understand that the knowledge management and intellectual capability of white-collar gig workers are different (Fischer, 2017). Thus, the degree of innovation could be controlled if the firms focus on constantly engaging the workers. It is also reported that gig workers possess low or little contact with fellow workers and even employers. This impacts their overall innovativeness as they often struggle with being "free spirits", and creativity breeds best when like-minded people work together. The findings of the study demonstrate that work engagement has a positive and significant impact on intellectual ability and knowledge management in scientific knowledge stock, and intrinsic motivation. Hence, organisations should focus on enhancing employees' engagement in the workplace. Organisations should regularly communicate with their employees, invest in their wellbeing and personal growth, procure feedback, and recognise their good work to enhance their engagement in the workplace (Ahmed & Sutton, 2017; Friedrich et al., 2020; Kutun, Martens, & Schmidt). Moreover, the results indicate that intellectual ability and knowledge management in scientific knowledge stock and intrinsic motivation further enhance innovation performance (Friedrich et al., 2020; Prasad et al., 2019; Swacha, 2015). Therefore, it is clear that theoretical constructs on the knowledge aspect are demonstrated through knowledge-based view theory (Friedrich et al., 2020; Swacha, 2015). The employee engagement aspect is demonstrated through theoretical constructs in the theory of employee engagement (Looyestyn et al., 2017; Lukas et al., 2021) and the intrinsic motivation aspect through self-determination theory (Gajanova & Radišić, 2021). Lastly, the results indicate that gamification plays a crucial role in enhancing innovative performance in the workplace. Hence, organisations should use gamification elements in different activities in the workplace to enhance employee's innovative performance (Friedrich et al., 2020; Lukas et al., 2021; Prasad & Mangipudi, 2021).

5. Conclusion, limitations, and future scope of the study

This paper has offered insights into the current literature by developing a conceptual model to measure the performance of white-collar gig workers in the gig economy using an extension of the three theoretical perspectives: knowledge-based view theory, theory of employee engagement, self-determination theory. The study used self-administered cross-sectional data obtained from an online platform that currently engages white-collar gig workers or has engaged them in two previous years (2018 and 2019). Further, this research investigated how knowledge-based view theory is used when working with white-collar gig workers. Work engagement appeared to be high because these workers have strong intellectual skills, autonomy, and competence (Behl et al., 2021a, 2021b). However, understanding the relationship between their job engagement and the degree of innovation they bring to their work through the filters of scientific knowledge stock, scientific knowledge resource, and collective cognitive engagement was crucial. Furthermore, it was critical to assess and improve their intrinsic drive, which is often overlooked by employers. According to the findings, incorporating game-based aspects could assist digitally engaged gig workers to become more intrinsically driven. As a result, we may conclude that the gamification and gigification processes are complementary.

Our study suffers from two main limitations. First, the study collected data from all forms of workers engaged in white-collar gig work. Thus, while the study gives a macro glimpse of the innovative performance of gig workers, it is essential to separate them based on the nature of their work, time, and experience to gain a detailed and deeper understanding of the situation. Second, the study needs to use a simulation-based gamified platform and perform an experimental study to understand which game element is practical and what degree of effectiveness can be measured for different gig workers. This will also help classify strategies that can be used for improving their innovative practices. The study can be extended by performing a case-based approach for crowd work platforms by plugging various game elements onto their existing engagements with gig workers to understand and capture any improvement of innovation in their work.

The current study prompts additional future research directions beyond those prompted by the study's limitations. First, the framework proposed in the current study can be used in other contexts for validation and generalisability of the findings. Second, in this study cross-sectional data has been used to examine the proposed hypotheses. Therefore, a longitudinal empirical study to investigate how the impact of gamification varies over time is warranted. Third, our model can be expanded by investigating various other mediating as well as moderating factors that would alter the proposed relationship. Future studies can extend this research by identifying and including these factors in the proposed model. Finally, in the future, multi-group analysis can be performed based of other demographic characteristics of the employees, such as income, education qualifications, and job levels for deeper understanding of the phenomenon.

Table A1
Convergent validity of constructs.

Item	Factor loading	Variance	Error	SCR	AVE
WE1	0.73	0.53	0.47	0.78	0.75
WE2	0.82	0.67	0.33		
WE3	0.65	0.42	0.58		
WE4	0.71	0.50	0.50		
WE5	0.80	0.64	0.36		
WE6	0.72	0.48	0.52		
WE7	0.69	0.47	0.53		
IA1	0.71	0.50	0.50	0.73	0.63
IA2	0.76	0.58	0.42		
IA3	0.83	0.69	0.31		
IA4	0.72	0.52	0.48		
KM1	0.68	0.46	0.54	0.69	0.72
KM2	0.77	0.59	0.41		
KM3	0.71	0.50	0.50		
KM4	0.73	0.53	0.47		
KM5	0.72	0.52	0.48		
KM6	0.69	0.47	0.53		
CCE1	0.71	0.50	0.50	0.69	0.64
CCE2	0.79	0.62	0.38		
CCE3	0.86	0.74	0.26		
CCE4	0.74	0.55	0.45		
IM1	0.83	0.69	0.31	0.71	0.66
IM2	0.82	0.67	0.33		
IM3	0.75	0.56	0.44		
GM1	0.79	0.62	0.38	0.69	0.62
GM2	0.68	0.46	0.54		
GM3	0.74	0.55	0.45		
GM4	0.69	0.48	0.52		
GM5	0.82	0.67	0.33		
GM6	0.81	0.66	0.34		
IP1	0.73	0.53	0.47	0.72	0.68
IP2	0.78	0.61	0.39		
IP3	0.72	0.52	0.48		
IP4	0.84	0.71	0.39		
IP5	0.66	0.44	0.56		

Table A2
Correlation values among constructs (measures for discriminant validity).

	WE	IA	KM	CCE	IM	GM	IP
WE	0.71						
IA	0.44	0.69					
KM	0.26	0.30	0.75				
CCE	0.32	0.33	0.30	0.67			
IM	0.21	0.13	0.26	0.13	0.70		
GM	0.26	0.24	0.33	0.35	0.36	0.70	
IP	0.32	0.34	0.17	0.28	0.49	0.38	0.68

Table A3
Model Fit and quality indices parameters.

Model fit and quality indices	Values (threshold values, if any)
Average path coefficient (APC)	0.278 ($p < 0.001$)
Average R^2	0.778 ($p < 0.001$)
Average block VIF	3.404 (Acceptable if value ≤ 5)
Tenenhaus GoF	0.703 (Large if value ≥ 0.36)

Table A4
Causality assessment indices.

Causality Assessment Indices	Values (Threshold Values if any)
Sympson's Paradox Ratio (SPR)	0.787 (Acceptable if ≥ 0.7)
R^2 contribution ratio	0.885 (Acceptable if ≥ 0.9)
Statistical Suppression Ratio (SSR)	0.893 (Acceptable if ≥ 0.7)
Nonlinear bivariate causality direction ratio (NLBCDR)	0.780 (Acceptable if ≥ 0.7)

Table A5
Structural estimates.

Hypothesis	Effect of	Effect On	β	p-value	Results
H1a	WE	IA	0.46	***	Supported
H1b	IA	IP	0.38	***	Supported
H2a	WE	KM	0.54	***	Supported
H2b	KM	IP	0.41	***	Supported
H3a	WE	CCE	0.013	*	Not Supported
H3b	CCE	IP	−0.11	*	Not Supported
H4a	WE	IM	0.38	***	Supported
H4b	IM	IP	0.53	***	Supported
H5	IM X GM	IP	0.61	***	Supported

(*** Significance level 0.001; * Significance level 0.1)

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix

See Table A1–A5

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