# The impact of information and communication technology and internal market orientation blending on organisational performance in small and medium enterprises

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Sergey Kazakov
*Graduate School of Business, Higher School of Economics, National Research University, Moskva, Russian Federation and Economics and Business Administration PhD Programme at University of Málaga, Málaga, Spain*
José L. Ruiz-Alba
*University of Westminster, London, UK, and*
María M. Muñoz
*Facultad de Ciencias Economicas y Empresariales, Universidad de Malaga, Malaga, Spain*

## Abstract

**Purpose** – The present study examines the concept of internal market orientation (IMO) and its effects on organisational performance comprising job satisfaction and employees' loyalty in the small and medium enterprises (SMEs) research context. Rooted in administrative theory, human relations theory, conventional theories of IMO and internal marketing, this study develops a novel iIMO theoretical framework that evinces the proliferation of ICTs in SMEs.

**Design/methodology/approach** – The proposed concept was empirically investigated by means of surveying 316 SME employees with the application of a multi-stage sampling procedure.

**Findings** – Research findings confirmed the viability of the ICT-supported iIMO framework, its positive effects on SMEs' organisational performance, and exhibited ample empirical evidence for the proficiency of the iIMO concept and its suitability for operationalisation by SMEs.

**Originality/value** – This study introduces ICTs as a novel IMO dimension which considers the undergoing holistic digitalisation of businesses. In addition, the present research posits the plausibility and confirms the benefits that arise following iIMO implementation in SMEs.

**Keywords** SMEs, Job satisfaction, Market orientation, Organisational performance, Internal marketing, Internal market orientation

**Paper type** Research paper

## 1. Introduction

The notion of internal market orientation (IMO) implies the deployment and application of the marketing paradigm in the settings intrinsic to the organisation (Modi and Sahi, 2018). IMO is



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a nexus of two influential concepts. First, it is rooted in the concept of conventional internal marketing, which suggests organisations consider their employees as internal customers (Sasser and Arbeit, 1976). Employee-oriented implementation of marketing tools benefits the organisation by increasing job satisfaction and leads to improvements in organisational performance (Piercy, 1995). Second, IMO hinges on the market orientation framework, introduced to the academic domain by two independent studies that sparked the onset of the seminal research stream (Narver and Slater, 1990; Kohli and Jaworski, 1990).

In its essence, IMO focuses solely on company employees who are valued similarly to the firm's ordinary customers (Boukis, 2019). This emphasis makes IMO different from a broader approach specific to internal marketing that also encompasses its stakeholders, third-party suppliers and other actors in the layer between internal and external environments of the organisation (Hult *et al.*, 2011). Unlike internal marketing, IMO benefits from the market orientation capabilities that make its implementation more efficient (Lings, 2004).

Until very recently, IMO has been themed by a plethora of studies. Literature indicates research vectoring towards IMO conceptualisation by determination of the organisational behaviours constituting it (Ruizalba and Vallespín, 2014). Another prolific stream of research embraces studies that explicate the outcomes of IMO implementation. IMO outcomes, or consequences, habitually comprise multilateral facets of the organisational and business performance. In this vein, researchers determined positive effects from organisational performance metrics as a result of IMO implementation (Yu *et al.*, 2019).

Organisational performance is an area of prime concern for organisations when they seek effective approaches to allocating their resources, creating customer value, developing and implementing strategies because these efforts may ensure their profitability (Peteraf, 1993). SMEs are not an exception in this regard (Liu and Yang, 2020). These organisations create jobs, generate innovations and contribute to GDP in many countries (Rincón Díaz and Albors Garrigós, 2017). SMEs are often family businesses (Maseda *et al.*, 2019). The social and economic significance of SMEs is well-conceived in academia as they have received a prolific amount of scrutiny in the literature (Noori *et al.*, 2017).

IMO studies have examined various contexts, including service industries, emerging markets or large firms (Kaur Sahi *et al.*, 2013; Ruizalba *et al.*, 2014; Cerqueira *et al.*, 2018). The research settings for SMEs, however, have not received ample consideration from academia to date. Conversely, the SMEs' market orientation, in its extrinsic sense, has been the subject of many studies. In this vein, prior studies have examined the capability of SMEs to adopt a market orientation, and its coherence with SMEs' entrepreneurship and innovativeness. These studies confirmed that market orientation improves SMEs' business performance (Raju *et al.*, 2011; Länsiluoto *et al.*, 2019).

Furthermore, we noted a gap in the extant research pertaining to the limited comprehension of latent drivers behind market-oriented organisational behaviours that have significant effects on SMEs' business performance. We argue that, besides the power of entrepreneurship, there must be essential elements of the organisational performance that gear SMEs towards innovativeness and market orientation. According to the literature, job satisfaction and employee loyalty generate these SMEs behaviours (Yu *et al.*, 2019). We reckon them to be a product that results from IMO implementation.

Next, the canonical IMO literature has a paucity in the examination of technological drivers that enforce IMO implementation. Until recently, an expanding digitalisation of businesses has not received ample consideration by academia in the context of IMO with very few exceptions (Kazakov, 2019). The digitalisation of businesses is enabled by Information and Communications Technologies (ICT) that imply the combination of unified communications (chat boards, instant messaging, video calls and conferencing, cloud computing, etc.) with a hardware/software applications essential for data generation, accumulation, processing, and distribution (Riemer and Taing, 2009). ICT represent a contemporary platform for executing

managerial processes and improve business performance in SMEs (Karakara and Osabuohien, 2020). IMO is relevant to the managerial process thereby, it is important for the theory to address ICT incorporation in IMO antecedents and thus to build comprehension of holistic IMO digitalisation in the setting of SMEs.

An amassed body of research points to several competitive advantages implicit in SMEs in comparison with bigger firms, including their flexibility, organisational resilience, readiness for new technologies, and adoption of advanced human resource management concepts (Cuéllar-Molina *et al.*, 2019). We anticipate that IMO can be successfully adopted by SMEs and may improve their employees' job satisfaction and loyalty utterly shifting SMEs organisational performance. Hence, in accord with the above logic, we pose the purpose of this study that is to develop a theoretical framework that conceptualises ICT-driven IMO implementation in SME settings. This purpose determines our research objectives including (1) discernment of organisational behaviours that initiate IMO in SMEs in grounded in the conventional theory of internal market orientation; (2) corroboration of the IMO implementation effects following its reinforcement by ICT, and (3) confirmation of IMO implementation auspicious consequences on organisational performance in SMEs.

The delineated purpose and research objectives determine the sequential logic of furthering our research. First, we revisit and scrutinise the conventional theoretical approaches to IMO and suggest a concept compatible with the nature of SME. Second, we argue for the importance of embedding ICT into the *i*IMO framework because digitisation increases the quality and speed of managerial processes (Raissi and Matoussi, 2020). Third, grounded in the extant theory, we formulate research hypotheses and propose a research method for their verification. At last, we utilise empirical data retrieved from 316 SME employees in Moscow, Russia, to validate hypotheses, and, ultimately, the *i*IMO framework.

This paper further unfolds in a sequence of literature review, research methodology, findings and implications sections. The paper concludes with a summary of the completed research and recommendations for future researchers interested in the further *i*IMO examination in the context of SMEs.

## 2. Literature review and development of hypotheses

### *2.1 Internal marketing and market orientation*

As noted above, IMO originated in the concept of internal marketing. Sasser and Arbeit (1976) first suggested a firm to consider its employees as the "most important customer" and "jobs as its principal product" (p. 61). Berry (1981) further posited internal marketing as the means for value exchange between companies and employees. It was also documented that internal marketing improves conventional (external) marketing implementation by the organisation (Lings, 2000). Early studies on internal marketing merely examined its impact on job satisfaction and focused more on service industries (Varey, 1995). More recent literature discovered the influence of internal marketing on job satisfaction, which further activates employee loyalty (Tansuhaj *et al.*, 1988). Other researchers argued for internal marketing impacts on job efficiency, employee performance, and customer-centric vision implicit for all employees in a firm (Rafiq and Ahmed, 1998). Further studies determined that internal marketing generates the conditions necessary for inter-departmental alignment and "change-management" activation (Piercy, 2009).

Simultaneously, according to the literature, internal marketing has received some criticism from academia. Researchers have pointed to its ambiguity, limitations, and self-contradicting nature that infringe the smooth flow of HRM processes in the organisation (Hales, 1994). Several academics have perceived internal marketing as "purely academic", too broad, and unrealistic as it lacks an explication of its implementation (Pitt and Foreman, 1999). However, the critical research stream has neither insisted on the redundancy of internal

marketing nor suggested that organisations abstain from its application but posited reasonable open questions to be addressed by researchers. Such questions were relevant to internal marketing development, its conceptual precision, and proper operationalisation in the organisation (Foreman and Money, 1995).

Internal marketing research gained momentum from the introduction and proliferation of the market orientation paradigm, which helped academia to get closer to tackling the above-noted issues. Succinctly, market orientation implies activation of organisational behaviours, namely, market intelligence generation and dissemination, that establish a basis for responsive strategy development and execution (Kohli and Jaworski, 1990). Market orientation also helps companies to develop and maintain a strategic focus on customer orientation, competitor orientation, and inter-functional coordination in the organisation (Narver and Slater, 1990). Market orientation implementation produces effects on the company's functioning and eventually improves its performance (Lings and Greenley, 2009).

A convergence of internal marketing and market orientation gave rise to the term IMO, first coined by Mohrw-Jackson (1991). Until very recently, IMO studies have grown into a seminal and notable research stream in the marketing literature. In the next subsection, we examine the amassed research pertinent to the current state of IMO conceptualisation and develop a rationale for the research hypotheses.

*2.2 ICT application in SME operations*

Researchers have spotted an increasing influence of digitalisation and the application of ICT on SME's business efficiency and performance. Besides, SMEs actively utilise ICT because these technologies aid them in rivalling with bigger-sized businesses (AlBar and Hoque, 2019). SMEs profusely employ CRM, POS, desktop publishing, specialised industry-specific software and Internet solutions to support their routine operations. The recent research points to the growing scale of web-based intranet applications usage in SMEs for HR management purposes, including internal communications and employee engagement (Chertchom *et al.*, 2019).

However, researchers have found several ICT adoption and dissemination issues in SMEs that mitigate the efficiency of technology internalisation. SMEs uniformly lack financial resources, expertise, and suitable solutions in ICT utilisation. Available ICT compatibility with specific SMEs tasks and routines is another notable barrier in technologies acceptance (AlBar and Hoque, 2019). Simultaneously, literature documented a generally faster SMEs' speed in digitalisation processes in comparison with larger organisations (Eze *et al.*, 2019). Thereby, it suffices the necessary grounds to suggest and further examine a blending of ICT and IMO antecedent elements.

*2.3 iIMO theoretical framework*

According to Lings (2004), IMO inherited its essence from the behavioural concept of market orientation originally suggested by Kohli and Jaworski (1990). MARKOR structural elements of Intelligence Generation, Intelligence Dissemination, and Organisational Response imply internal behavioural components. Because of this, whereas MARKOR concept was initially developed for external market orientation, it can be replicated for the labour market intrinsic to the organisation. MKTOR model has a different organisational focus which is truly outward of the firm (Narver and Slater). In this sense, MKTOR constructs, especially Competitor Orientation, cannot be referred to as the unambiguous elements of IMO. Consequently, researchers posited a better suitability MARKOR framework demonstrates better compatibility with the crux and scope of IMO (Lings, 2004; Lings and Greenly, 2009; Boukis, 2019).

By implementing IMO, organisations generate intelligence from both internal and external labour environments. Then, intelligence is disseminated internally, so employees are

aware of the matters relevant to their organisation. Simultaneously, managers benefit from data revealing the psychological climate in the organisation, employees' needs, and demands as this information is essential to developing responsive IMO strategies aimed at organisational performance (Lings and Greenley, 2009).

A prominent amount of recent research has focused on the determination and measurement of IMO antecedents and consequences in various contexts (Gounaris, 2006; Ruizalba *et al.*, 2014). However, little is understood about IMO conceptualisation in SMEs. These particular settings have enticed researchers who have examined the external market orientation capabilities of SMEs (Länsiluoto *et al.*, 2019). Surprisingly, the literature is more committed to the bigger firms whilst showing the unavailability of empirical studies that conceptually scrutinise IMO in SMEs. These organisations have social and economic significance; thus, their performance is essential, and thereby, it is essential to shed more light on the peculiarities of IMO implementation in this particular context. The proposed *i*IMO theoretical model is depicted in Figure 1. It is prefixed with an "*i*" to indicate its digital crux following the ICT and IMO antecedents blending.

### *2.4 Antecedents of iIMO*

The *i*IMO antecedents denote three organisational behaviours, which are essential for its implementation in SMEs. According to administrative theory, these behaviours should be sequentially applied by the organisation (Fayol, 1918). External market orientation literature corroborates this order of execution (Kohli and Jaworski, 1990). In this regard, *i*IMO implementation commences with working environment intelligence that generates the knowledge and proper perception of value exchange in the organisation (Lings, 2004; Gounaris, 2006). This particular *i*IMO construct is constituted by internal labour market research, and by personnel segmentation. The latter is a useful technique to identify groups of employees with similar wants and needs (Ruizalba *et al.*, 2014).

The organisation would benefit from the dissemination of the collected data and information received from the intelligence (Tortosa *et al.*, 2009). These processes are facilitated by the internal communications embedded in the *i*IMO concept. Additionally, internal communications imply informal encounters between managers and employees. According to human relations theory, such contacts build relationships that are motivational factors for employees (Mayo, 1933).

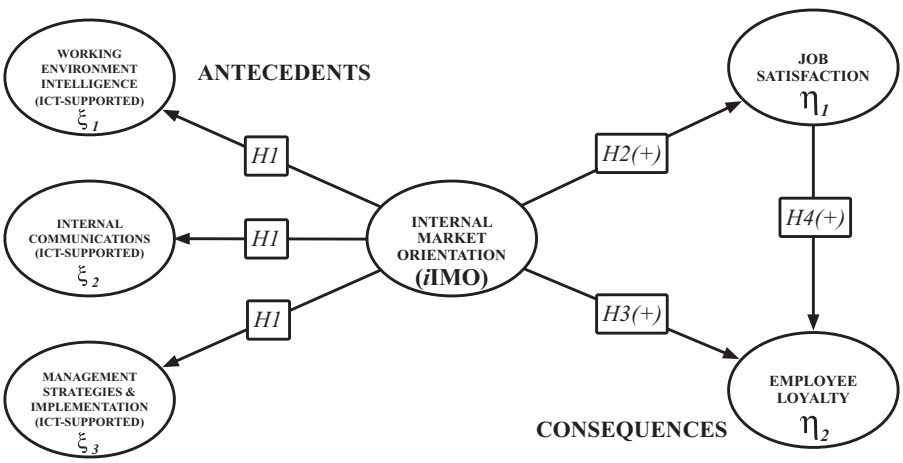


**Figure 1.**
*i*IMO theoretical model

The intelligence dissemination helps managers to obtain an unambiguous and unbiased comprehension of the firms' internal environment adequacy to the external labour market (Gounaris, 2008). Furthermore, managers receive guidance and a rationale for responsive strategies, planning and execution (Kaur Sahi *et al.*, 2013). In the *i*IMO framework, these strategies are developed to activate managers' care of employees, personnel training-development, and work-family balance (Ruizalba *et al.*, 2016).

Earlier, we noted a role that ICT play in SMEs' management routine. ICT speed-up managerial processes execution, increase employee productivity and lead to organisational improvement (Ab Wahab *et al.*, 2020). Accordingly, ICT is a proxy that enforces organisational behaviour elements essential to run *i*IMO implementation in SMEs. In this vein, we argue that the blend of ICT with above-delineated *i*IMO antecedents builds relevant grounds for *i*IMO implementation in SMEs, thus:

*H1.* Internal market orientation (iIMO) is enacted by digitalised organisational behaviours of working environment intelligence, internal communications, and management strategies implementation.

*2.5 iIMO effects on internal organisational performance*

Gauging the outcomes following IMO implementation has been a cornerstone research issue until very recently. In this regard, researchers have scoped numerous organisational performance metrics to measure the effects of IMO. Similarly to the internal marketing research stream, the gauging of job satisfaction has been typical in IMO studies (Tortosa *et al.*, 2009; Modi and Sahi, 2018). Renowned in management academia, the job characteristics model depicts job satisfaction effects on an employee, including increasing productivity and reduction in absenteeism (Hackman and Oldham, 1975). Entwined with this proposition, Gounaris (2006, p. 438) posits that job satisfaction is a prime criterion of organisational performance. Hence, job satisfaction is an essential variable to consider in the proposed *i*IMO framework. On these grounds, we hypothesise that:

*H2.* *i*IMO produces a positive effect on employee job satisfaction in SMEs.

A notable array of studies has articulated job satisfaction with its outcomes. Prior research measured the direct and indirect effects of job satisfaction on the other internal or external facets of organisational performance (Chow *et al.*, 2015). Concerning external performance items, researchers found that job satisfaction improves customer satisfaction, customer orientation, and service quality (Lings and Greenley, 2009; González-Porras *et al.*, 2019). Other studies highlighted internal organisational performance items driven by job satisfaction that include employee motivation and job commitment (Ruizalba *et al.*, 2014). We noted in the IMO literature, however, that the dimension of employee loyalty to her/his respective employing organisation has been overlooked. Employee loyalty has a significant role in the reduction of personnel churn rates (Mueller *et al.*, 1992). Thus, it implies a significant criterion of organisational performance and should be investigated under the *i*IMO framework. Consequently, we argue that:

*H3.* *i*IMO produces a positive effect on employee loyalty to the employing SME.

By embedding employee loyalty, we introduce a dyad of "job satisfaction → employee loyalty" to the proposed *i*IMO concept. Such loyalty is an absolute consequence of internal marketing and determines its ultimate efficacy. Prior studies documented a significantly positive effect created by job satisfaction on employee loyalty (Matzler and Renzl, 2006). Thereby, the IMO theory will benefit from the verification of this effect in the SME context. Moreover, as previous research has neglected to examine the direct and indirect effects of IMO on employee loyalty, there is a chance to determine whether job satisfaction increases

*i*IMO effects on employee loyalty in SMEs both directly or indirectly. In this study, we additionally assign job satisfaction as a mediator variable that conveys *i*IMO effects on employee loyalty in SMEs. In line with the above, we posit that:

*H4.* Employee job satisfaction reinforces the positive effect of iIMO on employee loyalty in SMEs.

## 3. Research methodology

### *3.1 Scales and questionnaire development*

Under the purpose of the study, which concerned measurement of employee perceptions of *i*IMO and its outcomes, we decided that a survey was the most appropriate method for data collection. Researchers often face the dilemma of whether to develop a new questionnaire or use existing measures to assure survey quality (Biemer and Lyberg, 2003). In the domain of IMO studies, Gounaris (2006) suggested developing measurement and structural models grounded in prior reputable research. In this respect, the literature review is helpful for shaping an initial concept and retrieving a set of conventional constructs and measurement items. Then, the researcher may lean on personal experience, ideas, or intuition to draft an estimated conceptual model that may supplement the original items with new scales, measurements, latent variables, alternative liaisons between variables, and so on. If empirically confirmed, the developed concept may imply a theoretical contribution to the field (Hair *et al.*, 2014).

By heeding these practical recommendations, we adapted a questionnaire from Ruizalba *et al.* (2014) to collect survey data. This questionnaire employed scales from notable studies that had previously investigated IMO in various settings (Lings, 2004; Gounaris, 2008). As we planned to examine the influence of ICT on *i*IMO implementation in SMEs in this study, we adapted a suitable part of the Hanclova *et al.* (2015) questionnaire. Next, we established job satisfaction measurements grounded in Hartline and Ferrel (1996), and employee loyalty was measured based on Knox and Freeman (2006). Finally, we favoured the seven-point Likert ordinal metric scale for the developed questionnaire as recommended by the literature (Bendixen and Sandler, 1995).

As a result, the draft questionnaire contained 47 questions, 6 of which were relevant to descriptive statistics, whereas the remaining 41 questions implied *i*IMO measurement scales. The outer model shaped a structural nomological framework that contained twelve first-order, three second-order, and three third-order latent factor constructs as depicted earlier (Figure 1). Before embarking on a study, the IMO literature recommends pretesting drafted models and questionnaires by following the Churchill (1979) research stratagem (Gounaris, 2006). It implies a two-step procedure, including individual in-depth expert interviews followed by a trial survey run with a small number of "dummy" participants.

In the course of the questionnaire pretesting, at first, we arranged ten personal interviews with experts knowledgeable in the present research field. This phase was essential to validate the relevance of the measurement items, latent constructs, and relationships between them, as suggested in the developed model. Aiming to secure a broader scope of research insights, we split the group into two subsamples that included five university professors and five practitioners. Following the discussions, four scholars and five practitioners pointed to low suitability of the personnel segmentation and redundancy of the training – development constructs for the SME setting. Besides this, experts gave several practical recommendations to improve the questionnaire. Considering these recommendations, we removed six measurement items from the drafted model and modified the questionnaire accordingly.

Next, the updated questionnaire underwent a pilot test to ensure the proper questions sequence and understandability for survey participants. We randomly selected 10 SME

employees who completed the survey forms under our observation. Resulting from this part of the pretest procedure, we made minor textual revisions and released a final questionnaire.

*3.2 Sample and data collection*

As SMEs acted the sampling frame for the study, their regular employees were appointed as singular sampling units for data collection. We used a multi-stage sampling procedure (Teddlie and Yu, 2007). Adapted to our study, it included two steps. The first phase implied simple random sampling aimed at building a contact base for questionnaire distribution. This process included a selection of 1,500 local SMEs by using a random digits generator. The second phase involved homogeneous purposive sampling for survey participant recruitment. The chosen sampling technique is suitable for recruiting participants who share the same fixed attributes (Jupp, 2015). We established such attributes to include at least three years of full-time employment in a non-management position in an SME.

An online SMEs database served as a source for the sampling frame construction and aided in building a contact base for targeting potential survey participants. We cooperated with a third-party organisation that approached the randomly selected SMEs through e-mails. The circulated message explained to SMEs the benefits of participation, asked them to engage their employees in our survey, and provided a link to the online questionnaire. To ensure that all selected SMEs had received the first communication, the collaborator sent a follow-up letter two weeks after the first mailing.

It took two months to complete survey data collection. The initial dataset contained 369 (24.6% response rate) forms. We further screened the dataset for incomplete forms, response inconsistency and data outliers. This procedure secured a sample of $n = 316$ (21% rate) observations eligible for data analysis. Such a size of the sample suffices the application of the SEM procedure for the developed *i*IMO model consisting of 6 constructs and a communality value (that is "the average amount of variation among the measured/indicator variables explained by the measurement model" (Hair *et al.*, 2014, p. 573)), equal to 0.6 as the literature suggests (Enders and Bandalos, 2001).

Table 1 illustrates data distributions for descriptive statistics that can provide comprehension of the SMEs sampled under this study.

## 4. Results

*4.1 Composite reliability, convergent and discriminant validity*

The developed *i*IMO theoretical framework implied a sophisticated blend of various variables and their complex relationships. Such complexity demanded a series of separate equations to explain the constitution of latent factors and causalities between the various variables. Thereby, our study required an appropriate analytical technique that could simultaneously scrutinise the concept and reveal essential statistical output relevant to the examined theory. The literature recommends an application of the SEM PLS procedure for this purpose (Hair *et al.*, 2014). Prior IMO studies favoured the same statistical approach (Lings, 2004; Gounaris, 2008).

When applying SEM, first, we ensured the uniformity of manifest variables ($x_n$) that constitute their respective exogenous ($\xi_n$) or endogenous ($\eta_n$) constructs. It was essential to confirm that these variables gauge the same factor to ensure their composite reliability (CR). The received CR values for model constructs exceeded the threshold of 0.7; thereby, the *i*IMO measurement scales conform to CR requirements model-wide. Second, as CR is required but not ample provision to ensure validity, the SEM procedure entails discriminant and convergent validity verification for both measurement and structural models. For such purposes, it is critical to assess additional validity indices, namely, average variance extracted (AVE), average shared squared variance (ASV) and maximum shared squared

| Variables and labels | Count | % |
|---|---|---|
| *Gender* | | |
| – Female | 167 | 53 |
| – Male | 149 | 47 |
| *Position in the organisation* | | |
| – Contracted full-time employee | 190 | 60 |
| – Business owner or partner | 88 | 28 |
| – Contracted top manager | 38 | 12 |
| *Number of employees in the organisation* | | |
| – More than 50 | 65 | 20 |
| – 11 up to 50 | 104 | 33 |
| – 2 up to 10 | 125 | 40 |
| – Self-employed registered business | 22 | 7 |
| *Approximate annual sales of the organisation* | | |
| – Above €43 million | 12 | 4 |
| – Up to €43 million | 24 | 7 |
| – Up to €10 million | 61 | 19 |
| – Up to €2 million | 219 | 70 |
| *Industry of operation* | | |
| – Corporate services | 89 | 28 |
| – Wholesale business | 58 | 18 |
| – Retail business | 50 | 16 |
| – Manufacturing and craftworks | 44 | 14 |
| – Consumer services | 25 | 8 |
| – Other | 50 | 16 |
| *Targeted customer types* | | |
| – B2B | 137 | 43 |
| – B2C | 82 | 26 |
| – B2B2C | 54 | 17 |
| – B2G | 43 | 14 |

**Table 1.**
Descriptive statistics

variance (MSV) (Hair *et al.*, 2014). Table 2 exhibits the results of the reliability and validity tests applied for the *i*IMO model. These tests unveiled that two first-order latent constructs, namely Personnel segmentation and Personnel training/development do not suffice the validity requirements, so we discarded them from the model.

Table 1 shows that the essential requisites [CR > AVE, AVE > MSV, AVE > ASV (Hair *et al.*, 2014, pp. 619, 631–633)] for *i*IMO model convergent and discriminant validity are present. Additionally, we examined covariation values between $\xi_n$ and $\eta_n$ *i*IMO constructs. As all covariation values exceed 0.7 and are statistically significant ($p = 0.000$), they represent a supplementary pillar for the *i*IMO model's validity. Table 3 depicts a covariation matrix between *i*IMO model constructs.

Further analysis demonstrated the sufficient goodness-of-fit statistics of the *i*IMO model (RMSEA = 0.072; $\frac{\chi^2}{df} = 3.86$; CFI = 0.86; TLI = 0.81). The obtained results of reliability, validity and goodness-of-fit analyses confirmed the relevancy of the *i*IMO model and built a rationale for the following hypothesis testing that we delineate in the following subsections.

### *4.2 iIMO antecedents validation*

Following the covariation matrix exhibited in Table 2, *i*IMO highly covariates with its antecedents, which are also substantially interrelated (Table 2). This condition, along with

**Table 2.** *i*IMO composite reliability, convergent and discriminant validity tests

| | Constructs | CR | AVE | ASV | MSV | Cronbach's $\alpha$ |
|---|---|---|---|---|---|---|
| | *iIMO antecedents* | | | | | |
| | Measurement model (1st order) | | | | | |
| $\xi_1$ | Working environment intelligence (ICT-supported) | | | | | |
| $\xi_{11}$ | Personnel research (4 scales, $x_n$) | 0.71 | 0.58 | 0.25 | 0.20 | 0.87 |
| $\xi_{12}$ | Labour market research (3 scales, $x_n$) | 0.71 | 0.51 | 0.21 | 0.37 | 0.84 |
| $\xi_{13}$ | ICT in personnel research (3 scales, $x_n$) | 0.70 | 0.52 | 0.28 | 0.40 | 0.83 |
| $\xi_3$ | Management strategies and implementation (ICT-supported) | | | | | |
| $\xi_{31}$ | Management concern and care (5 scales, $x_n$) | 0.77 | 0.66 | 0.27 | 0.31 | 0.89 |
| $\xi_{32}$ | Work-life balance (3 scales, $x_n$) | 0.74 | 0.58 | 0.27 | 0.45 | 0.86 |
| $\xi_{33}$ | Remuneration policies: salary and incentives (3 scales, $x_n$) | 0.74 | 0.56 | 0.21 | 0.12 | 0.84 |
| $\xi_{34}$ | Job essence and functions (3 scales, $x_n$) | 0.76 | 0.59 | 0.32 | 0.20 | 0.87 |
| $\xi_{35}$ | ICT in management strategies and implementation (3 scales, $x_n$) | 0.75 | 0.66 | 0.28 | 0.25 | 0.79 |
| | Measurement model (2st order) | | | | | |
| $\xi_1$ | Working environment intelligence (ICT-supported) (3 first-order constructs, $\xi_{1n}$) | 0.78 | 0.73 | 0.38 | 0.45 | 0.96 |
| $\xi_2$ | Internal communications (ICT-supported) (7 scales, $x_n$) | 0.79 | 0.54 | 0.34 | 0.45 | 0.94 |
| $\xi_3$ | Management strategies and implementation (ICT-supported) (5 first-order constructs, $\xi_{3n}$) | 0.79 | 0.58 | 0.40 | 0.45 | 0.90 |
| *i*IMO | *i*IMO antecedents (structural model) | 0.79 | 0.66 | | | 0.92 |
| | *iIMO consequences (measurement model)* | | | | | |
| $\eta_1$ | Job satisfaction (3 scales, $y_n$) | 0.73 | 0.56 | 0.34 | 0.20 | 0.83 |
| $\eta_2$ | Employee loyalty (4 scales, $y_n$) | 0.79 | 0.66 | 0.40 | 0.20 | 0.83 |

**Table 3.** *i*IMO model constructs covariation matrix

| | Working environment intelligence (ICT-supported) ($\xi_1$) | Internal communications (ICT-supported) ($\xi_2$) | Management strategies and implementation (ICT-supported) ($\xi_3$) | *iIMO* | Job satisfaction ($\eta_1$) | Employee loyalty ($\eta_2$) |
|---|---|---|---|---|---|---|
| Working environment intelligence (ICT-supported) ($\xi_1$) | 1 | | | | | |
| Internal communications (ICT-supported) ($\xi_2$) | 0.85 | 1 | | | | |
| Management strategies and implementation (ICT-supported) ($\xi_3$) | 0.86 | 0.71 | 1 | | | |
| *iIMO* | 0.92 | 0.85 | 0.86 | 1 | | |
| Job satisfaction ($\eta_1$) | 0.92 | 0.74 | 0.71 | 0.88 | 1 | |
| Employee loyalty ($\eta_2$) | 0.85 | 0.72 | 0.73 | 0.81 | 0.90 | 1 |

statistically significant $\chi^2 = 1028.98$ pertinent to the inner model, generates an initial inference that the prior assumptions of the H1 on the *i*IMO framework were correct. Nevertheless, H1 required a more robust technique for verification. Hair *et al.* (2014) indicated that CFA is a perfect choice to examine and affirm theoretical models that a researcher develops *a priori*. In this regard, we ran CFA on the structural model, which links *i*IMO with its antecedents $\xi_1$, $\xi_2$, $\xi_3$. CFA unveiled the reasonable ($\lambda \geq 0.5$) and statistically significant ($p = 0.000$) values of factor loadings intrinsic to all three *i*IMO antecedent constructs ($\lambda_{\xi 1 \leftarrow i\text{IMO}} = 0.92$; $\lambda_{\xi 2 \leftarrow i\text{IMO}} = 0.67$; $\lambda_{\xi 3 \leftarrow i\text{IMO}} = 0.78$). This finding indicates that ICT-supported working environment intelligence, internal communications, management strategies and implementation jointly constitute *i*IMO. Thereby, H1 is confirmed.

### *4.3 iIMO effects on job satisfaction and employee loyalty*

As noted above, SEM PLS has been credited for its versatility as it makes this method quite suitable for advanced multivariate analysis (Westland, 2015). In addition to simultaneous CFA and covariation computation, SEM is capable of estimating structural parameters ($\gamma$) to examine causal links between constructs $\xi_n$, $\eta_n$. This estimation is also referred to as path analysis in SEM terminology, whereas structural causal estimate value is similar to the regression coefficient (Hair *et al.*, 2014). As this study involved scrutiny of causalities between *i*IMO and its $\eta_n$ consequences, we employed path analysis to test the remaining hypotheses. Covariation matrix (Table 2) provided path analysis application support as covariation values demonstrated a high degree of covariation. Table 4 below presents the consolidated results retrieved from the H2–H4 tests.

Table 3 indicates significant direct *i*IMO effects on job satisfaction ($\gamma_{i\text{IMO} \rightarrow \eta 1} = 0.81$, $p = 0.000$) and moderate positive influence on employee loyalty ($\gamma_{i\text{IMO} \rightarrow \eta 2} = 0.38$, $p = 0.000$). Estimated indirect *i*IMO effects on $\eta_2$ via $\eta_1$ are also moderately positive resulting from the application of two computation techniques employing either path or covariation coefficients ($\gamma_{i\text{IMO} \rightarrow \eta 1} \times \beta_{\eta 1 \rightarrow \eta 2} = 0.36$; $\gamma_{i\text{IMO} \rightarrow \eta 1} \times \varphi_{i\text{IMO} \rightarrow \eta 2} = 0.65$). These outcomes, thereby, support H2 and H3. Likewise, following a gauged path coefficient value, which is positive and statistically significant, H4 is supported ($\beta_{\eta 1 \rightarrow \eta 2} = 0.44$, $p = 0.000$). This result posits that *i*IMO-driven job satisfaction positively influences employee loyalty to an employing SME organisation.

### *4.4 Measurement of iIMO antecedents' direct and indirect effects*

The results obtained so far show that working environment intelligence ($\xi_1$), internal communication ($\xi_2$) and management strategies implementation ($\xi_3$) are three antecedents of *i*IMO, that is, they are three factors that directly influence *i*IMO. Mathematically, we can express these dependencies as follows:

$$i\text{IMO} = f_1(\xi_1, \xi_2, \xi_3);$$

where $\xi_1$, $\xi_2$, $\xi_3$ represent working environment intelligence, internal communication and management strategies implementation, respectively. In turn, *i*IMO influences job satisfaction, which can be expressed in the form of as follows:

**Table 4.** *i*IMO effects on organisational performance (H2–H4 tests)

| | Research hypotheses | $\gamma_{\text{std}}$ | $\beta_{\text{std}}$ | $z$ | $p > \lvert z \rvert$ | Result |
|---|---|---|---|---|---|---|
| H2 | *i*IMO → Job satisfaction ($\eta_1$) | 0.81 | — | 3.03 | 0.000 | accepted |
| H3 | *i*IMO → Employee loyalty ($\eta_2$) | 0.38 | — | 3.87 | 0.000 | accepted |
| H4 | Job satisfaction ($\eta_1$) → Employee loyalty ($\eta_2$) | — | 0.44 | 3.96 | 0.000 | accepted |

$$\eta_1 = f_2(i\text{IMO})$$

IMO also influences employee loyalty, but this output is influenced by *i*IMO and job satisfaction:

$$\eta_2 = f_3(i\text{IMO}, \eta_1) = f_3(i\text{IMO}, f_2(i\text{IMO}))$$

The variation in any of these three inputs affects, therefore, the two outputs, but it is worth wondering which of them affects more. Given that the results have been obtained by employing the technique of structural equations, the measurement must be carried out, necessarily, through the variable *i*IMO, with which we will have to measure a two-stage "chain reaction": first, IMO reacts directly to the change in the input; second, the output reacts to the change in IMO. Mathematically, this two-stage reaction is measured through the chain rule, an important mathematical Calculus rule (see Hammond and Sydsaeter, 2012) with which this "chain reaction" is obtained. To gauge it, we employ the concept of the partial derivative, which measures the variation of one variable (one *i*IMO consequence in our case), before an infinitesimal (very small) variation of another (in our case, it refers to the *i*IMO antecedent).

These interrelations can be delineated using the following dependence tree (Figure 2).

In the case of job satisfaction, a change in one of the inputs will lead to a change in IMO and this, in turn, implies a change in job satisfaction. By application of the chain rule (Hammond and Sydsaeter, 2012), the entire *i*IMO antecedent effect can be exhibited as follows:

$$\frac{\partial \eta_1(\xi_1, \xi_2, \xi_3)}{\partial \xi_1} = \frac{d\eta_1(i\text{IMO})}{di\text{IMO}} \cdot \frac{\partial i\text{IMO}(\xi_1, \xi_2, \xi_3)}{\partial \xi_1} \cong 0.81 \cdot 0.92 = 0.75$$

$$\frac{\partial \eta_1(\xi_1, \xi_2, \xi_3)}{\partial \xi_2} = \frac{d\eta_1(i\text{IMO})}{di\text{IMO}} \cdot \frac{\partial i\text{IMO}(\xi_1, \xi_2, \xi_3)}{\partial \xi_2} \cong 0.81 \cdot 0.67 = 0.54$$

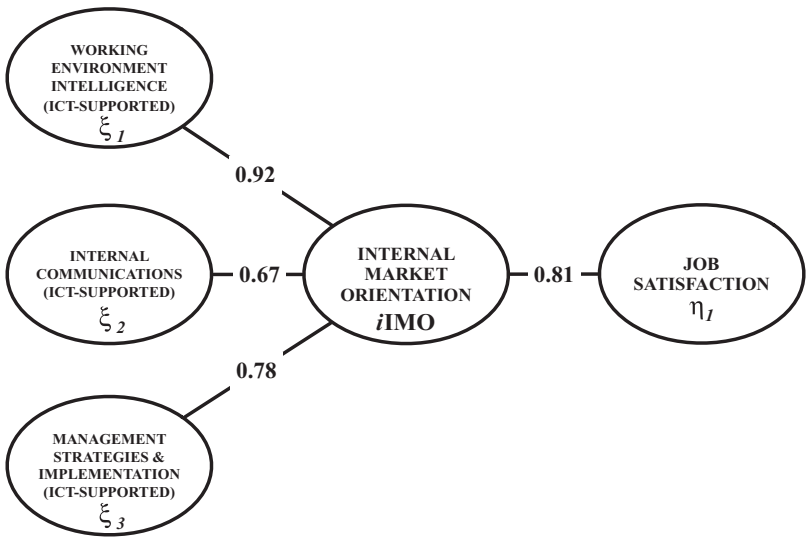


**Figure 2.**
*i*IMO antecedents and job satisfaction dependence tree

$$\frac{\partial \eta_1(\xi_1, \xi_2, \xi_3)}{\partial \xi_3} = \frac{d\eta_1(i\text{IMO})}{di\text{IMO}} \cdot \frac{\partial i\text{IMO}(\xi_1, \xi_2, \xi_3)}{\partial \xi_3} \cong 0.81 \cdot 0.78 = 0.63$$

In this case, the final effect of an infinitesimal change in each *i*IMO antecedent over job satisfaction is proportional (81%) to the effect over *i*IMO. Nevertheless, the effect of a change in one *i*IMO antecedent over employee loyalty is not proportional to the effect over the *i*IMO, due to the influence of job satisfaction on loyalty. Consequently, the application of the chain rule is a bit more complex, but it clearly reflects the importance of the influence of job satisfaction on loyalty:

$$\frac{\partial \eta_2(\xi_1, \xi_2, \xi_3)}{\partial \xi_1} = \frac{\partial \eta_2(i\text{IMO})}{\partial i\text{IMO}} \cdot \frac{\partial i\text{IMO}(\xi_1, \xi_2, \xi_3)}{\partial \xi_1} + \frac{\partial \eta_2(i\text{IMO})}{\partial \eta_1} \frac{\partial \eta_1(\xi_1, \xi_2, \xi_3)}{\partial \xi_1} \cong 0.38 \cdot 0.92 + 0.44 \cdot 0.75 = 1.07$$

$$\frac{\partial \eta_2(\xi_1, \xi_2, \xi_3)}{\partial \xi_2} = \frac{\partial \eta_2(i\text{IMO})}{\partial i\text{IMO}} \cdot \frac{\partial i\text{IMO}(\xi_1, \xi_2, \xi_3)}{\partial \xi_2} + \frac{\partial \eta_2(i\text{IMO})}{\partial \eta_1} \frac{\partial \eta_1(\xi_1, \xi_2, \xi_3)}{\partial \xi_2} \cong 0.38 \cdot 0.67 + 0.44 \cdot 0.54 = 0.78$$

$$\frac{\partial \eta_2(\xi_1, \xi_2, \xi_3)}{\partial \xi_3} = \frac{\partial \eta_2(i\text{IMO})}{\partial i\text{IMO}} \cdot \frac{\partial i\text{IMO}(\xi_1, \xi_2, \xi_3)}{\partial \xi_3} + \frac{\partial \eta_2(i\text{IMO})}{\partial \eta_1} \frac{\partial \eta_1(\xi_1, \xi_2, \xi_3)}{\partial \xi_3} \cong 0.38 \cdot 0.78 + 0.44 \cdot 0.63 = 0.91$$

Given that, in the structural equation models, the underlying relationship between the variables is linear, we can interpret this derivative by the following increments:

$$\Delta\eta_1 \cong 0.75 \cdot \Delta\xi_1, \quad \Delta\eta_1 \cong 0.54 \cdot \Delta\xi_2, \quad \Delta\eta_1 \cong 0.63 \cdot \Delta\xi_3$$
$$\Delta\eta_2 \cong 1.07 \cdot \Delta\xi_1, \quad \Delta\eta_2 \cong 0.78 \cdot \Delta\xi_2, \quad \Delta\eta_2 \cong 0.91 \cdot \Delta\xi_3$$

The entire *i*IMO antecedent effect can be exhibited as follows (Figure 3):

With these results, we can draw two supplementary conclusions. First, the effect of an infinitesimal change in any of the three inputs on employee loyalty is higher than that on the job satisfaction, due to the chain effect generated by influencing job satisfaction on employee loyalty. In this sense, when measuring the total effect of each *i*IMO antecedent on its consequences, it is essential to carry out the analysis through the chain rule, taking into account direct and indirect dependency relationships. This analysis unveils that the *i*IMO effect on job satisfaction is higher than on employee loyalty (81% vs. 38%). However, this effect is given through the *i*IMO consequences, and this effect must be measured globally; also, researchers have to take into account the functional relationships derived from the application of the SEM technique.

Second, our study determined the *i*IMO antecedent construct with the most significant impact on organisational performance. It is working environment intelligence, followed by management strategies implementation, with internal communication being the least influential, both in terms of job satisfaction and loyalty. This impact is measured by the variation in one of the *i*IMO antecedents and without taking into account the cost of each antecedent, something that should also be considered when designing a company strategy. We discuss this particular finding and other obtained research results in the next section of the present paper.

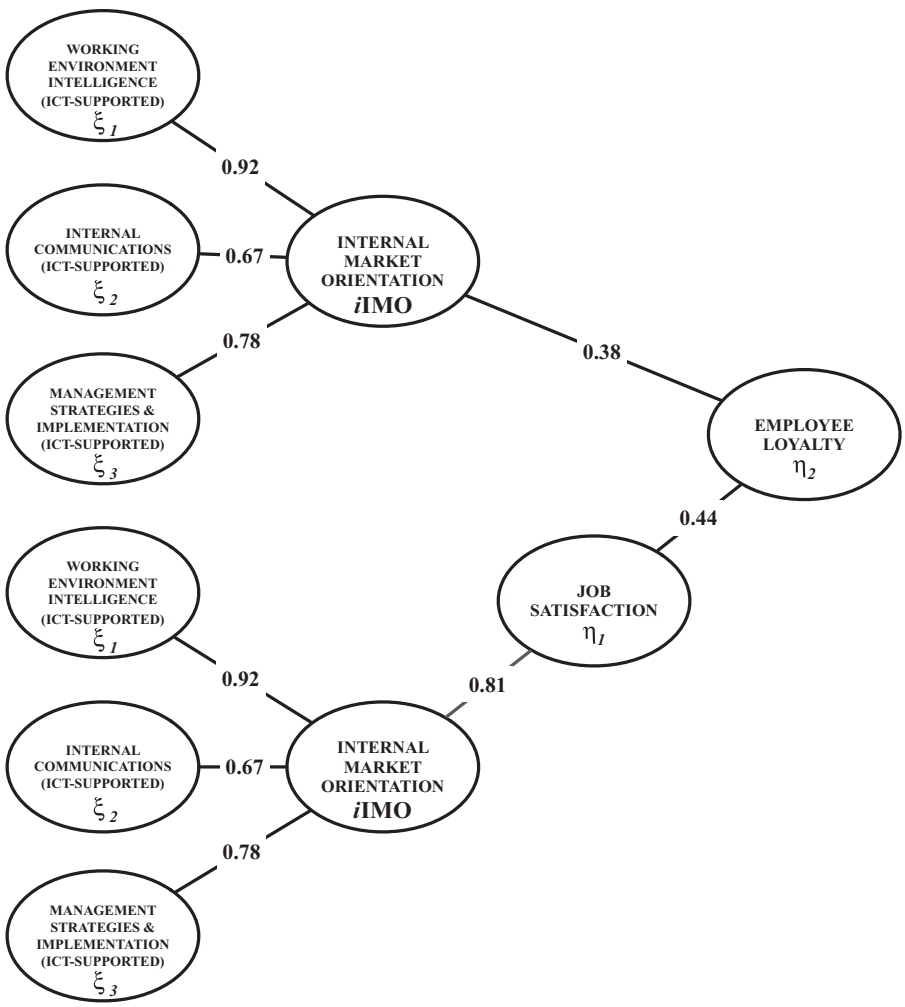


**Figure 3.**
*i*IMO antecedents' direct and indirect effects on organisational performance

By gauging both the direct and indirect effect of *i*IMO antecedents using the chain rule, this study posits that the classical analysis of IMO using SEM can be enriched with instruments such as the derivative, which, on the one hand, allow additional conclusions to be drawn about the results and, on the other hand, offer a global vision of the interrelations between *i*IMO antecedents and consequences.

## 5. Discussion

### *5.1 Implications for marketing theory*

This research raises several theoretical implications. First, we noted a paucity of extant research pertinent to internal marketing and IMO in the SME context, whereas SMEs' external market orientation has received reasonable amount of academic consideration (Länsiluoto *et al.*, 2019). As SME business is an influential economic and social phenomenon important for society's development, we argue that IMO in SMEs should receive more consideration in the literature. In contrast to the prior research, this study sheds more light on

IMO conceptualisation and suggests a practical framework of *i*IMO pursuant to the domain of SMEs.

Our findings manifest the plausibility of IMO operationalisation in SMEs. We posit that the IMO concept is generally applicable in SMEs. However, our research discerned several findings that are not in line with prior studies. In this regard, we determined the redundancy of personnel segmentation and training-development for IMO implementation in SMEs. These findings are in line with preceding studies that documented the issues with the application of these activities in the same settings (Achar, 2013).

Second, the present research introduces ICT as a novel IMO dimension that supports and drives its antecedents. The literature review pointed to a proliferation of ICT adoption in SMEs (Eze *et al.*, 2019). Nevertheless, increasing SME digitalisation still has not received ample consideration in IMO literature. Addressing this noted gap in the theory, we mingled the IMO concept with ICT and employed pursuant measurement scales that were incorporated in all elements of the developed framework. Expert interviews supported the proposition of an ICT-IMO mix. The empirical results demonstrated that ICT are consistent with the *i*IMO framework.

Finally, this study contributes to the theory by positing the benefits that arise following *i*IMO implementation in SMEs. The findings revealed significant positive *i*IMO effects on SMEs' organisational performance and supported the results of prior research (Lings and Greenley, 2009; Ruizalba *et al.*, 2014). As such, *i*IMO drives the improvement of SME employees' satisfaction with their jobs, leading to employee loyalty. Furthermore, employee loyalty may facilitate a reduction in personnel turnover. The latter has been documented as a growing concern for SMEs (Emami *et al.*, 2012). According to our study, *i*IMO both directly and indirectly improves employee loyalty, thus retaining them in their employing organisations. Thus, this study proposes a concept feasible to improve organisational performance that may consequently prevent costly staff turnover in SMEs.

### *5.2 Managerial implications*

The completed study has meaningful implications for SME managers. While surveying SME employees, we noted their favourable perception of the *i*IMO concept. The concluding questionnaire section had an open field where employees could share their opinions and leave suggestions. Most of these text passages were relevant to wished-for improvements in internal communications, management care, and work-family balance. Interestingly enough, most comments highlighted the importance of the complex and systematic application of *i*IMO in their organisations as it would "deliver more sense to the job functions, improve performance, increase wages, and bring more wellbeing to a job routine". In conjunction with positive employees' comments, more importantly, our findings empirically confirmed the positive influence of *i*IMO on SME organisational performance. Thereby, it is essential to apply *i*IMO for the sake of organisational improvements in SMEs.

SME owners and business executives can benefit from the findings stemming from our study in several ways. First, internal labour market intelligence is an invaluable source of information on employees' needs, demands, and expectations. Our study has found that it is the most impactful *i*IMO antecedent on organisational performance. Intelligence is also useful for correct perception of the intrinsic working climate by discovering informal relationships between employees. It also helps to understand employees' feelings and intents. For this purpose, SMEs may intend to employ regular employee online surveys and virtual personal meetings in combination with the latest advances in Data Science, e.g. computer vision solutions that are even capable of employees emotional condition evaluation right at the working place.

Second, management can deliver their strategic decisions, keynotes, appraisals, etc. via internal communications that are also an important part of the *i*IMO framework. Intranet, cloud computing, virtual co-working (e.g. Trello, Miro, Sutori and others) platforms are

helpful in this respect. SME managers may also find internal communications practical for internal labour intelligence dissemination in SMEs when implementing *i*IMO in their organisations. Third, managers may use the best of intelligence in planning their responsive *i*IMO strategies. Intranet social media, messenger chat boards, social team-working, online events, gamification can become useful technologies for *i*IMO implementation in SMEs.

SMEs are flexible and more innovative in comparison with larger organisations (Tsuji *et al.*, 2018). SMEs can capitalise on this advantage in terms of faster, smoother, and more congruent *i*IMO adoption. To operationalise *i*IMO in their firms, first, SME management should realise that *i*IMO is a sophisticated strategic approach that entails routine commitment. Second, as a rule of thumb, it is essential to develop a workable plan, policies, schedule, and assign managers responsible for ICT-driven *i*IMO deployment in the organisation. As our study evinces the significance of ICT in *i*IMO, SME managers must enforce digital solutions deployment to support *i*IMO implementation. Finally, SME managers should acknowledge that *i*IMO requires resources. In this respect, SMEs may invest, for instance, in employee events as a part of internal communications, and training programmes as a part of responsive *i*IMO strategy execution. Although the latter was neglected in the framework following the qualitative research phase, training-development should receive more consideration as it improves SME employees' performance (Achar, 2013).

Our findings point to the significant consequences of *i*IMO, which determine the sense of its implementation in SMEs. In order to facilitate *i*IMO success, it is crucial to develop and execute a proper strategic plan of *i*IMO deployment that includes activities pursuant to internal labour market knowledge generation, internal communications, managerial care of employees, and support for work-family balance. If planned correctly and fully accomplished, *i*IMO implementation will improve employee job satisfaction and, consequently, his/her loyalty to the employing SME. These achievements will signal the success of *i*IMO implementation.

## 6. Limitations, future research, conclusions

This study has a number of research limitations. First, we deem that the role and the essence of internal communications in IMO are ambiguous and misconceived in the literature. Under the conventional theory of market orientation, the pivotal role of internal communications includes the interdepartmental dissemination of external market intelligence (Kohli and Jaworski, 1990). In the realm of IMO, however, organisations collect information that may be sensitive and intimate to the employee; thus, its internal dissemination is somewhat questionable. Besides, other IMO constructs comprise similar interactive activities in their implementation (meetings, inductions, events, conventions, briefings). Thereby, internal communications should be likely embedded in the IMO management strategies. We engage in the dispute on the essence of internal communications in IMO and suggest the need to address this conceptual issue in future studies.

Second, after pretesting the research tools, we discarded personnel segmentation and training-development construct variables from the *i*IMO framework. We agree that given the size of SMEs, personnel segmentation may be negligible, but training-development is a different case. Interviewed experts pointed to a reluctance to invest in employee education by SMEs due to the limited availability of their financial resources. This judgement may be accepted as prior research concurs with it (Achar, 2013). Acknowledging the crucial role of training-development for *i*IMO in SMEs, we believe that it should receive an alternative approach. SME literature points to employee mentoring as a possible substitute for training-development activities (Bozionelos *et al.*, 2016). Under this proposition, we suggest that future researchers should consider employee mentoring instead of training-development as a variable for *i*IMO in the SME context.

Third, we introduced ICT to the *i*IMO concept by blending them with first-order elements in this study, but they seemingly became "masked" within the conceptual framework. Grounded in the growing importance of ICT in SMEs, we deem that ICT should be set apart in conceptual models subjected to future research. In this sense, we recommend that future researchers consider ICT as an independent first-order latent factor that is incorporated in the second-order *i*IMO antecedent constructs. Moreover, prospective *i*IMO studies may also experiment with ICT as a standalone second-order *i*IMO antecedent construct.

Finally, as this research is the first known study relevant to IMO in the context of SMEs, it is not without generalisation issues. Little prior examination of this topic in the literature implied scant theoretical support, thus limitation for the present study. Also, as we investigated SMEs triangulated in a specific geography, namely Moscow, Russian Federation, this research setting combined with the aforementioned complications negatively impacts on theory generalisation further. Future research may address these issues and contribute to theory generalisation by scrutinising the proposed *i*IMO concept in different geographies, industries, and organisation sizes. Additionally, the literature reveals a profuse research stream dedicated to a comparative examination of family vs. non-family SMEs on various topics (Camisón *et al.*, 2016). Prospective *i*IMO studies may also consider this particular research facet.

We expect that the novel *i*IMO concept and our research findings will receive an awareness in both SME and marketing academic communities. We also encourage researchers to advance the theory through their respective contributions to *i*IMO concept conceptualisation, operationalisation and dissemination in the marketing literature. The authors believe that *i*IMO implementation has potential social implications given the number of people employed in SME organisations in many countries. In this respect, SME management should become aware that *i*IMO is not only capable of improving the organisational performance of SMEs, but simultaneously, the application of this concept can contribute to the well-being of society by ensuring that people are satisfied with their jobs.

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## Appendix

| Scales (manifest variables) | Reference |
|---|---|
| *i*IMO ANTECEDENTS | |
| MEASUREMENT MODEL | |
| Working environment intelligence (ICT-supported) | Ruizalba *et al.* (2014) |
| *Personnel research (1st order construct)* | |
| Understanding the needs of employees before any decisions are made | |
| Supervisors meet face to face with employees to understand better their needs | |
| Regular studies to identify employees' needs and expectations | |
| Checking whether employees are satisfied with their job and to identify any problems they might have | |
| *Personnel segmentation (1st order construct)* | |
| Employees classification into well-defined groups according to their individual needs | |
| Policies development considers effects on different segments of employees with similar needs and characteristics | |
| All employees are treated in exactly the same way, regardless of their needs and individual characteristics | |
| *Labour Market Research (1st order construct)* | |
| Management is aware of open positions in the external labour market that can appeal to employees | |
| Organisation continuously monitors remuneration packages and fringe benefits offered by organisations in the external labour market | |
| Management is aware of the remuneration packages and fringe benefits offered by its competitors | |
| *ICTs Utilisation in Market Intelligence (1st order construct)* | Hanclova *et al.* (2015) |
| Organisation utilises electronic means for internal surveys | |
| Organisation uses the latest technologies (Data Science, AI, Machine Learning) for labour market data collection | |
| Organisation employs a specialised analyst for external and internal HR and labour market analysis | |
| Management strategies and implementation (ICT-supported) | Ruizalba *et al.* (2014) |
| *Management Concern and Care (1st order construct)* | |
| Supervisors invest resources (time and/or money) where needed in order to satisfy the specific needs or requirements of employees | |
| The needs of employees are taken seriously by managers, and policies are developed with the aim of satisfying these needs | |
| Supervisors are clearly geared toward solving any problems that employees may have and providing them with the support they need to perform their job well | |
| Supervisors are genuinely interested in employees as people, regardless of how well they perform their job or the results they achieve | |
| Supervisors are genuinely interested in hearing about and understanding their employees' feelings insofar as these affect their work | |
| *Training and development (1st order construct)* | |
| Prior to implementing a new service, or modifying an existing one, employees are given extensive training in relation to the change and how it will affect their way of working | |
| The company systematically and continuously organizes training seminars so that employees can develop their skills | |
| If employee is moved to a new task or department, his/her new supervisor will personally provide training in relation to the new role | |
| *Work-life balance (1st order construct)* | |
| Supervisors understand the family needs of employees | |
| Supervisors support employees so that they can combine their work and family commitments | |

(*continued*)

**Table A1.** iIMO framework scales sheet

| Scales (manifest variables) | Reference |
|---|---|
| Employees are able to find a balance between work and family life | |
| *Remuneration policies: salary and incentives (1st order construct)* | |
| Remuneration raise and career advancement depends solely on employee performance | |
| Remuneration raise and career advancement is grounded on regular employee evaluation with the help of KPIs | |
| Remuneration raise and career advancement is linked to years of service, educational level increase, professional communities memberships etc | |
| *Job essence and functions (1st order construct)* | |
| Job description is realistic to attain employee KPIs | |
| Employee assumes assignments solely upon his/her agreement | |
| Employee assignments, functions and KPIs endorse his/her career advancement | |
| *ICT in management strategies and implementation (1st order construct)* | Hanclova *et al.* (2015) |
| Organisation runs an electronic service where employees may obtain an information on their evaluation scores, remuneration, benefits and other relevant data of employment | |
| Employee receives training and does not have difficulties with connection to intranet services, corporate email etc | |
| Organisation runs special IT services, provides specialised software etc. (e.g. Salesforce, corporate messengers, CRM) for successful job implementation in every business function | |
| STRUCTURAL MODEL | |
| Working Environment Intelligence (2d order construct) | |
| Interior Communications (2d order construct) | Ruizalba *et al.* (2014) |
| Supervisors communicate with employees and listen to what employees have to say about their work, any problems they might have, and the suggestions they put forward | |
| Employees may report a personal problem that has a negative effect on their performance, organisation encourages employees to talk to about it with supervisor | |
| Supervisors are always available to meet personally with an employee if such a meeting is requested | |
| Supervisors spend time with employees, explaining them the company's objectives and how these objectives affect what the company expects from each individual employee | |
| Corporate events (parties, team building workshops) are beneficial for the company and valued by employees | |
| Employees are aware of what is going on in the organisation | |
| Organisation actively utilises electronic means (email, intranet, corporate messengers) of internal communications | |
| Management strategies and implementation (ICT-supported) | |
| STRUCTURAL MODEL | |
| (ICT-supported) Internal Market Orientation (3d order construct) | |
| *Job satisfaction (1st order construct)* | Hartline and Ferrell (1996) |
| Employee perceived satisfaction with the relationship with his/her respective supervisors | |
| Employee perceived satisfaction with the support received from the organisation | |

**Table A1.** (*continued*)

| STRUCTURAL MODEL | |
|---|---|
| Employee perceived satisfaction with the career opportunities I have in this company | |
| *Employee loyalty (1st order construct)* | Knox and Freeman (2006) |
| This company deserves that employees do their best at work | |
| Employees feel the emotional tie to the company | |
| Employee would feel guilt if he/she had to leave the organisation right now | |
| Employee believe that organisation is widely regarded as a highly prestigious employer and can be recommended to friends | |

**Table A1.**

**About the authors**

Sergey Kazakov (Doctor of Economic Sciences – in accord with Russian academic ranking) is Associate Professor at Company Marketing Department, School of Business Administration of the National Research University Higher School of Economics (NRU HSE), Moscow, Russia. He has 30 years of professional experience in sales, marketing, international management and consulting. In his academic career, Dr. Kazakov has liaised with ten universities and business schools for teaching and theses supervising. His list of publications totals 95 journal articles, books, book chapters, monographs and conference papers in the areas of Marketing, Sales, Hospitality and Tourism Management. He was honoured with the "Best Professor of the year" award by NRU HSE in 2019. Sergey Kazakov is the corresponding author and can be contacted at: skazakov@hse.ru

José L. Ruiz-Alba (Ph.D., EMBA, PDG-IESE, SFHEA) is Research Leader of the School of Management and Marketing of the University of Westminster and Senior Lecturer in Marketing (London, UK). He has more than 30 years of professional experience in different service areas: Law firm; Business Schools; Universities; Consultancy and Franchised Group of Quick Service Restaurants. He has broad teaching experience in more than 15 Universities. He has written over 60 academic journal articles, book chapters and conference papers. Member of Editorial Advisory Board of the Journal of Business and Industrial Marketing and Associate Editor of the International Journal of Internet Marketing and Advertising. He has received the best paper award from the Spring Servitization Conference (Manchester, May, 2016). He was Co-chair of the International Conference CBIM2018 and Guest Editor of a Special Issue for the Journal of Business and Industrial Marketing

María M. Muñoz (Ph.D.) is Vice-Dean of Research at the Faculty of Commerce and Management and Senior Lecturer of the Department of Applied Economics (Mathematics) at the University of Málaga (Spain). Currently she teaches quantitative methods applied to Economy and Business. She has published several research papers in scientific journal, such as European Journal of Operational Research, TOP, Journal of Optimization Theory and Applications, TOP, OR Spectrum and Annals of Tourism Research), three books, and several conference proceedings, in the area of areas of Multicriteria Analysis, Stochastic Programming, with theoretical and applied contributions. She has participated in eighteen research projects. Her main research interests are multicriteria decision analysis, economic applications of optimization methods and stochastic programming.

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# The risk management role of nonexecutive directors: from capital expenditure perspective

Tho Anh To
*University of Finance and Marketing, Ho Chi Minh City, Vietnam*
Yoshihisa Suzuki
*Department of Economics, Graduate School of Social Sciences, Hiroshima University, Higashihiroshima, Japan, and*
Hong Thu Thi Ho, Siem Thi Tran and Tuan Quoc Tran
*University of Finance and Marketing, Ho Chi Minh City, Vietnam*

## Abstract

**Purpose** – This study investigates the impact of board independence on firm risk of Vietnamese listed firms and the moderating effect of capital expenditure on this relationship.

**Design/methodology/approach** – This paper applies fixed effects and dynamic generalized method of moments (GMM) models to examine hypothesized associations between the proportion of nonexecutive directors and stock return volatility, as well as the moderating effect of capital expenditure. The robustness tests are implemented by applying alternative measures of overinvestment and firm risk.

**Findings** – The results show that the presence of nonexecutive directors on board increases firm risk. However, the combination of nonexecutive ratio and capital expenditure ratio has a significant negative impact on firm risk. The result is also confirmed by the difference between the monitoring role of nonexecutive directors in overinvesting and underinvesting firms.

**Research limitations/implications** – The results imply that Vietnamese listed firms take stock return volatility into consideration before nominating and appointing nonexecutive directors into their board, especially in overinvesting firms. From another perspective, the shift toward having a majority of nonexecutive directors on boards can play a significant role in pursuing a stable or risky business strategy.

**Originality/value** – This paper investigates the influences of nonexecutive directors on firm risk in the context of Vietnam.

**Keywords** Vietnam, Nonexecutive director, Overinvestment, Firm risk

**Paper type** Research paper

## 1. Introduction

Unlike developed economies, developing countries, especially Southeast Asian countries, have had ineffective corporate governance practices. The weaknesses in corporate governance mechanisms had an important effect on the stock market declines in the Asian crisis (Al Farooque *et al.*, 2019; Ghalib, 2018). The establishment of a good corporate governance code has become a significant concern for many Asian governments to prevent

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financial crises, which usually result from a lack of transparency and disclosure in many companies (Connelly *et al.*, 2017). Nonetheless, the studies from developed countries may not be applicable in developing countries because many different factors often fall beneath contextualization, such as the structures of corporate ownership, the strength of institutions, legal and government intervention and so on. (Waweru, 2020).

Notably, the unclear separation of control and management, one of the most noticeable characteristics in Southeast Asian firms' corporate governance systems, has become a major obstacle to monitoring and thus led to potential risks. Therefore, the Vietnamese government issued the Circular 121/2012/TT-BTC dated July 26, providing further regulations on corporate governance applicable to public companies. This is the first official legal document to define the concept of nonexecutive directors in Vietnam, which has an effect of significantly increasing board independence. Although the increase in nonexecutive director ratio is appreciated as a big step in reforming the board structure toward enhancing transparency, the monitoring role of nonexecutive directors in Vietnamese listed companies may still not be effective since nonexecutive directors in emerging markets are often appointed for reasons other than monitoring (Haniffa and Cooke, 2002). Majority shareholders often interfere with the appointment of nonexecutive directors to strengthen their control of the company. Consequently, nonexecutive directors can hardly influence important decisions and gradually play the role of advisors other than supervisors.

Besides, corporate risk in some industries may also come from poor control of investment spending, in which capital expenditure is likely to be one of the important factors (Amir *et al.*, 2007). One of the reasons for the excessive capital expenditures in Vietnamese listed firms may be due to the agency problems between majority and minority shareholders. As supported in many previous studies, the potential agency conflicts in Asian markets are more likely to be large shareholders versus small shareholders, rather than shareholders versus management. Majority shareholders have an incentive to use their control rights to divert funds and resources to other companies or projects they control. In addition to the improved regulation on the separation between ownership and management, the appointment of qualified nonexecutive directors has attracted the interests of noncontrolling shareholders to partially prevent the self-behavior of entrenched majority shareholders. However, the direct impact of capital expenditure on firm risk (Kothari *et al.*, 2002; Amir *et al.*, 2007) has attracted less attention from researchers than the relationship between capital expenditures and performance (Lev and Thiagrajan, 1993; Chen, 2006; Antia *et al.*, 2010; Mak and Kusnadi, 2005; Chen *et al.*, 2007b), especially for emerging markets. Moreover, the moderating effect of capital expenditure on the above relationship has been a new and unexplored issue, which motivates this paper. It yields an additional insight on the impact of nonexecutive directors on firm risk in the context of Vietnam, a transitional economy characterized by a weak corporate governance system.

This paper is conducted with a sample of 151 listed companies on Vietnamese stock markets from 2007 to 2016, for the purpose of investigating the impact of nonexecutive director ratio on firm risk in the presence of overinvestment. Overall, we find that there is a positive relationship between nonexecutive ratio and firm risk, indicating that the increase in nonexecutive directors makes stock returns more volatile. This result supports the hypothesis that the information and council of executive directors on boards are more important to perform efficiently (De Andres and Vallelado, 2008). However, the risk management role of nonexecutive directors is not completely denied because the incorporation of nonexecutive directors and capital expenditures has a negative impact on firm risk. It implies that companies should maintain boards with a high proportion of nonexecutive directors to reduce risks in the presence of overinvestment.

The remainder of this paper is organized as follows. Section 2 provides the literature and develops hypotheses. The research design is explained in Section 3. Section 4 presents the results of the empirical analysis. The conclusions are summarized in the last section.

## 2. Literature review and development of hypotheses

### *2.1 The role of nonexecutive directors*

The role of nonexecutive directors in corporate risk management has been supported by many theories. Under the agency theory, more nonexecutive directors on board are generally expected to be effective in providing oversight of firm performance and limiting managerial opportunism (DeBoskey *et al.*,2018; Persons, 2006). Nonexecutive directors may protect shareholders' interests by affecting important board outcomes and enhancing comprehensive financial disclosures (Kamardin *et al.*, 2017; Lefort and Urzúa, 2008). In addition to the supervising function, a board of directors also plays a role as a primary linkage mechanism that helps a firm to access essential resources, link with its external environment and overcome adverse environmental conditions (Lu and Herremans, 2019; Lai *et al.*, 2019). Therefore, from the perspective of resource dependence theory, nonexecutive directors may provide strategic directions and influence managerial decisions – thanks to their expertise, prestige and contacts (Salem *et al.*, 2019). Furthermore, nonexecutive directors usually serve as external monitoring and advising specialists in the directorship market, and consequently they need to protect their reputation under reputation theory (Bugeja *et al.*, 2016; Masulis and Mobbs, 2014). This is the reason why nonexecutive directors tend to support less risky projects or pursue the risk-reducing strategies of corporate diversification (Pathan, 2009).

On the contrary, many previous studies suggest that the increasing presence of nonexecutive directors is unlikely to bring proper supervision (Raheja, 2005; Kim *et al.*, 2014). According to Adams and Ferreira (2007), too much monitoring could have a negative influence on shareholder value because too intense supervision may also result in managers' more risk-aversion and underinvestment behavior (Hoskisson *et al.*, 2009). Secondly, executive directors may be better monitors because of being better informed about the firm's constraints and opportunities than outside directors (Harris and Raviv, 2008). Thanks to their firm-specific information, they easily deal with problems arising from information asymmetry between the directors and managers (Raheja, 2005). According to Kim *et al.* (2014), it is costly to transfer firm-specific information to outsiders when these firms have higher information asymmetry. Yammeesri and Kanthi Herath (2010) and Shakir (2008) found that Thai and Malaysian firms with more executive directors performed better. Therefore, there is a little doubt about the monitoring role of nonexecutive directors, especially for firms in developing countries, because nonexecutive directors are often nominated or appointed by majority shareholders who take control of the company.

In Vietnam, although the Vietnam Enterprise Law, which was enacted in 2005, mentioned executive directors, nonexecutive directors and independent directors, the differentiation among them was not clarified (Minh and Walker, 2008). Two years later, they were ambiguously categorized into (1) executive directors and (2) nonexecutive and independent directors in Decision 15/2007/QD-BTC of the Finance Minister on the Model Charter of listed companies and Decision 12/2007/QD-BTC of the Finance Minister on Code of Corporate Governance for Listed Companies on Stock Exchange/Securities Trading Centers, but there was no specific definition of the term "*non-executive and independent directors.*" Until 2012, the Circular 121/2012/TT-BTC on July 26, providing further regulations on corporate governance applicable to public companies, has been considered to be the first official legal document to define nonexecutive directors as members of the board of directors and not by the general manager, deputy general manager, chief accountant or any other managers designated by the board of directors. As an effort to improve and guide the governance of public companies, the government issued Decree 71/2017/ND-CP on June 6th, 2017 and Circular 95/2017/TT-BTC on September 22nd, 2017, which replaced the Circular 121/2012/TT-BTC. However, the definition of "non-executive directors" under article 2.6 of Decree 71/2017/ND-CP and the requirement of at least one-third nonexecutive directors under article

13.2 of Decree 71/2017/ND-CP remained the same for listed public companies. Notably, the roles of the chairman and chief executive officer (CEO) in a public company must be separated under the article 12.2 of Decree 71, but the prohibition against one person simultaneously holding these two positions shall only be effective as from August 1st, 2020. The delays in issuing relevant regulations make the supervisory role of nonexecutive directors not highly appreciated in risk management.

Besides, many state-owned companies have remained dominant in the Vietnam stock market, and thus nonexecutive positions are sometimes nominated or appointed by state shareholders who take control of the business (Robinett *et al.*, 2013). Communist Party Congress in 2016 has still emphasized the importance of state ownership in serving and maintaining the government's political and social goals, so controlling state shareholders could stand behind politically connected directors or managers (Hu *et al.*, 2010; Nguyen *et al.*, 2017). Therefore, nonexecutive directors usually do not have many incentives to monitor.

Under the resource dependence, the advising and supporting role of nonexecutive directors in Vietnamese companies is not much efficient. First, their appointments are usually driven by friend or family relationships with majority shareholders rather than by expertise and experience. Second, nonexecutive directors typically do not engage in the day-to-day management of the organization and play the role of representatives for large shareholders or portfolio managers, so they may not understand the nature of the business. Hence, this study expects that the presence of more nonexecutive directors can lead to higher firm risk.

*H1*. The proportion of nonexecutive directors has a positive impact on firm risk.

### *2.2 Capital expenditures and firm risk*

According to previous studies, there is a positive association between capital expenditure and financial performance (Lev and Thiagrajan, 1993; Chen, 2006; Antia *et al.*, 2010; Mak and Kusnadi, 2005; Chen *et al.*, 2007b). Lev and Thiagrajan (1993) state that capital expenditure is a significant signal required by the analysts in forecasting future profitability and stock returns. Therefore, investment in capital expenditures is expected to increase market valuation (Antia *et al.*, 2010). Mak and Kusnadi (2005) also find that firms with higher capital expenditures have higher accounting performance. Chen (2006) shows a significantly positive average price response to announcements of corporate capital investments. Chen *et al.* (2007b) find that the announcement of an increase in capital investments has a positive impact on the stock prices of announcing firms and a negative impact on the stock prices of rival firms.

In major studies on the impact of investment on corporate risk, capital expenditure is only mentioned as an object of comparison with research and development (R&D) spending. Although capital expenditures are considered as lower risk investments (Kothari *et al.*, 2002), the positive impact of capital expenditures on earnings variability is still confirmed for a sample of roughly 50,000 US firm-year observations from 1972 to 1997 by Kothari *et al.* (2002). Meanwhile, earnings variability has historically been found to be closely associated with market-based measures of firm risk (Dhaliwal *et al.*, 2017). Additionally, Khan and Bradbury (2014, 2015) show that net income volatility has exhibit a strong positive correlation with the volatility of stock returns. Amir *et al.* (2007) also use both operating income variability and monthly stock return variability as the dependent variables to prove that investments in capital expenditures are likely to be key and hence more closely linked to business risk for many industries.

In Vietnam, state ownership has still accounted for a significant proportion in the listed companies since the shift from a centrally planned economy toward a socialist-oriented market economy in 1986. The government has used state-owned enterprises (SOEs) to pursue socioeconomic and political goals rather than profit maximization (Tu and Nguyen, 2019;

Nguyen *et al.*, 2017). In other words, SOEs have been considered as a key component for the intervention and orientation of the government into the market, therefore they must undertake many investments with negative net present values (NPVs), leading to overinvestment problems. Chen *et al.* (2017a) also state that SOEs' investments are less efficient than nonSOEs'. In fact, Nguyen *et al.* (2017) also find that Vietnamese listed firms with higher state ownership have lower firm performance. The weak financial performance and inefficient investments of the SOEs is also caused by many different factors such as unclear objectives, poor management, budget constraints (Yang *et al.*, 2015) and lack of transparency or corruption in SOEs' operations (Hai and O'Donnell, 2017). Therefore, the positive association between capital expenditures and firm risk is expected in this paper.

*H2.* A high level of capital expenditures has a positive impact on firm risk.

*2.3 The interaction of nonexecutive director ratio and capital expenditures*

As mentioned in many research papers related to corporate governance in developed markets, lack of monitoring can increase opportunities for executives to pursue overinvestment strategies to enhance their positions or to maximize their own utility at the expense of shareholders (Titman *et al.*, 2004; Pellicani and Kalatzis, 2019). It is because overconfident executives usually overestimate returns to investment projects, and thus overinvest when they have abundant cash holdings (Malmendier and Tate, 2005). Regarding internal control's role in standardizing corporate investment behavior, strong internal control mechanisms should reduce the likelihood THAT overinvestment becomes a severe problem (Mao *et al.*, 2019). Notably, the presence of outside directors on boards might help mitigate managerial optimism problems and hence reduce the investment distortions inherent to managerial overconfidence (Heaton, 2002; Lai and Liu, 2018). By using the interaction between the proportion of nonexecutive directors and investment, Chung *et al.* (2003) also find a significant and positive correlation between firm value and investment, as measured by both capital and R&D expenditures, for firms with a high proportion of outside directors.

However, overinvestment caused by shareholder–manager conflicts in Vietnam and other emerging markets can be addressed by ownership concentration (Taghavi *et al.*, 2014). It is considered a benefit of ownership concentration, especially in countries with weak legal protection (Kong *et al.*, 2020). However, high levels of concentration between ownership and control might also lead to suboptimal investment or overinvestment (De Andres and Vallelado, 2008). Because concentrated ownership can cause conflicts between majority and minority shareholders, and in that case, majority shareholders will use their control rights to maximize their own interest at the expense of other shareholders (Lozano *et al.*, 2016; Pellicani and Kalatzis, 2019). In other words, they have an incentive to payout a larger proportion of company cash flows to themselves instead of evenly distributing funds among all shareholders. One possibility to do so could be to redirect funds to other companies they control.

For companies that expand their scale of investments or invest excessively, they often face a shortage of capital. This problem is indispensable under the increasing pressure of international integration and competition, but it is also an opportunity for the increasing presence of outside investors into the companies' ownership structure (Choi *et al.*, 2014; Wenwei, 2017; Vo and Ellis, 2018). The Vietnam stock market has also witnessed a significant increase in foreign ownership since Vietnam officially became a member of the World Trade Organization in 2007 (Batten and Vo, 2015). Before that, the Vietnamese government decided to transition from a centrally planned economy into a socialist-oriented market economy in 1986. Consequently, listed companies gradually attract external capitals, but majority shareholders still try to retain control of the company; consequently, the outside owners can only nominate or appoint nonexecutive directors, other than executive ones, into the board of

directors. Despite that, the increasing presence of such nonexecutive directors is expected to change and enhance governance mechanisms in those firms – thanks to their skills and knowledge.

In addition, minority shareholders gradually acknowledge the importance of nonexecutive directors in monitoring and evaluating board's transparency and reliability (Chang *et al.*, 2006) because the selection of qualified nonexecutive directors is also relevant for the protection of minority shareholders with respect to the agency costs of majority shareholders (Wright *et al.*, 2013). In fact, a higher proportion of nonexecutive directors on board could be seen as a significant restructuring of top management under the Circular 121/2012/TT-BTC applicable to listed companies in Vietnamese stock markets (Nguyen and Phan, 2016). Therefore, in the case of overinvestment, the increase in the nonexecutive director ratio may help to bring confidence to investors, lenders and minority shareholders.

*H3.* More nonexecutive directors are needed to control firm risk in the presence of overinvestment

## 3. Research design

### *3.1 Sample*

Our research sample comprises of 151 nonfinancial companies listed on Vietnamese stock markets (including HNX - Hanoi Stock Exchange and HOSE – Ho Chi Minh Stock Exchange) from 2007 to 2016. According to the Industry Classification Benchmark (ICB) 2008 applied in Vietnam, the list of publicly listed companies on the two markets (HOSE and HNX) is classified into ten industry sectors: (1) oil and gas, (2) basic materials, (3) industrials, (4) consumer goods, (5) healthcare, (6) consumer services, (7) telecommunications, (8) utilities, (9) financials (including banks, securities companies, insurance companies, real estate and financial services companies) and (10) technology. Financial companies such as banks, securities, insurance and financial services are excluded from the sample because they act as market makers, and more specifically the board structure of these companies must comply with some regulations from the state bank. The year 2007 is chosen as the starting year because Vietnamese Securities Law, which prescribes additional rules for listing stocks, transparency and the disclosure of information by public companies, was issued in June 2006 and took effect on January 1st, 2007. Meanwhile, the paper also collects data about sales growth to measure managerial overinvestment; therefore, financial reports in 2006 are very necessary. The total numbers of listed financial and nonfinancial companies on two securities trading center HNX and HOSE in 2006 are 87 and 106, respectively. Hence, the selected sample is highly representative.

Data for this paper are collected by reviewing annual reports which are available at http://ezsearch.fpts.com.vn/. The industry classification is provided on www.stockbiz.vn. They are leading websites providing financial information, market data and investing tools for institutional and individual investors in Vietnam (see Table 1).

### *3.2 Empirical model*

We test the impact of nonexecutive director ratio on firm risk as well as the moderating role of capital expenditure using the following regression model:

$$\begin{aligned} \mathrm{RISK}_{it} = {} & \beta_0 + \beta_1 \mathrm{NON\_EX}_{it} + \beta_2 \mathrm{FSIZE}_{it} + \beta_3 \mathrm{PB}_{it} + \beta_4 \mathrm{STDEBT}_{it} + \beta_5 \mathrm{CAPEX}_{it} \\ & + \beta_6 \mathrm{CASH}_{it} + \beta_7 \mathrm{DIV}_{it} + \beta_8 \mathrm{NON\_EX}_{it} * \mathrm{CAPEX}_{it} + \varepsilon_{it} \end{aligned} \quad (1)$$

**Table 1.**
Sample description by industry

| Industry | Number of firms | Percent |
|---|---|---|
| Basic materials | 12 | 7.95 |
| Consumer goods | 38 | 25.17 |
| Consumer services | 12 | 7.95 |
| Health care | 6 | 3.97 |
| Industrials | 54 | 35.76 |
| Oil and Gas | 1 | 0.66 |
| Real estate | 14 | 9.27 |
| Technology | 6 | 3.97 |
| Utilities | 8 | 5.30 |
| *Total* | *151* | *100.00* |

Following the studies by Cheng (2008), Nakano and Nguyen (2012) and Wang (2012), we use daily stock returns as a basis for calculating the annual firm risk. RISK1 (total risk) equals the annualized standard deviation of daily stock returns. RISK2 (unsystematic risk) equals the standard deviation of the residuals estimated from the model: $R_{i,t} = \alpha_i + \beta_i \mathrm{RM}_t + \varepsilon_{i,t}$ (where, $R_{i,t}$ donates the daily stock returns; $\mathrm{RM}_t$ represents the daily market returns based on the VN-index; and $\varepsilon_{i,t}$ stands for the residuals).

While Florackis and Ozkan (2009) and De Andres and Vallelado (2008) calculate nonexecutive director ratio (NON_EX) as the number of nonexecutive directors divided by the total members in a one-tier board, this paper measures this variable by dividing the number of nonexecutive directors by total members in the board of directors because the board structure of companies listed on Vietnamese stock markets is separated into two tiers: a board of directors and an executive board (Nguyen *et al.*, 2015). By applying this measure, this paper may evaluate the impact of the nonexecutive director ratio on firm risk more properly after controlling for the change of executive board members. In addition, nonexecutive directors are required to retain their seats for more than six months in a fiscal year to ensure that their involvement can have an impact on the performance.

*Capital expenditure (CAPEX)* is the change in fixed assets plus depreciation scaled by total assets at the beginning of the fiscal year. Huang and Wang (2015) use this ratio as a control variable to investigate the effect of board size on the variability of firm performance, while Mak and Kusnadi (2005) consider it as a determinant of firm performance.

Our regression models incorporate some control variables that previous studies suggest might affect firm risk. *Firm size (FSIZE)* is calculated as the natural logarithm of total assets. It is selected as a control variable because large firms have more advantages in attracting additional resources, and therefore "*larger businesses tend to have larger pools of financial and managerial resources that help overcome problems that threaten their survival*" (Mitchell, 1994). Malkiel and Xu (1997) also find a negative relation between unsystematic risk and firm size. *Price to book value (PB)* is the ratio of the market value of equity to the book value of equity. Fama and French (1992) suggest that PB may reflect the firm risk. *Debt maturity (STDEBT)*, measured as a short-term debt divided by total debt, plays a significant role in reducing agency costs by increasing frequency of monitoring from lenders to managerial actions and thus enhance information transparency (*Datta et al., 2005*). Based on the agency arguments, firms with more short-term debt are expected to be associated with a lower risk. *Cash ratio (CASH)* is calculated as the ratio of cash and equivalent cash to total assets. Mikkelson and Partch (2003) and Almeida *et al.* (2004) consider cash holdings as an effective risk management tool. *Dividend payment (DIV)* is the ratio of dividend payout to total assets (Jiraporn *et al.*, 2011). Pástor and Pietro (2003) and Bartram *et al.* (2015) indicate the negative association between dividend payment and corporate risk. Paying more dividends to reduce

the cash in hand is usually considered as a mechanism to avoid overinvestment and consequently mitigate agency problems between managers and shareholders (Farre-Mensa *et al.*, 2014).

## 4. Results and discussion

Descriptive statistics of the research variables are presented in Table 2. The average total risk (unsystematic risk) of companies listed on Vietnamese stock markets is 3.1% (2.9%). The average proportion of nonexecutive directors is around 63.1%. It means that on average, there are from three to seven nonexecutive directors serving on a supervisory board because the total number of members on this board for listed companies must comprise 5–11 members (under article 30 of Circular 121/2012/TT-BTC). The mean capital expenditure ratio is 7%, which is not much different from the reported figure (4.8%) in the research by Huang and Wang (2015) for Chinese firms over the period 2003–2011.

Table 3 presents the correlation matrix among the variables. The correlations between nonexecutive director ratio and total risk/unsystematic risk are −0.057 and −0.033, respectively. They demonstrate the role of nonexecutive directors in controlling firm risk. Meanwhile, the correlation with capital expenditure ratio is positive, which indicates that capital expenditures cause the volatility of stock returns. Because all the correlation coefficients are lower than 0.8, the model is not at risk of violating multicollinearity (Gujarati and Porter, 2003).

Table 4 shows the results of the fixed effects estimations. After controlling for serial correlation and heteroskedasticity by using clustered standard errors, firm risk is generally higher when companies have more capital expenditures, as the coefficients on capital expenditure fetch a positive sign and are statistically significant (except for the result in column 3). This finding is consistent with Kothari *et al.* (2002) and Amir *et al.* (2007) that show the positive impact of capital expenditure on corporate risk. Table 4 also displays the positive coefficients on nonexecutive director ratio, indicating that firm risk will increase as the proportion of nonexecutive directors increases. They are statistically significant at 1% level under both risk measures, providing strong evidence to support the arguments of Adams and Ferreira (2007) and Raheja (2005) that companies face high monitoring costs when they increase the number of nonexecutive directors on board. It is because nonexecutive directors

| | Obs | Mean | Std. Dev | 5th percentile | 25th percentile | 50th percentile | 75th percentile | 95th percentile |
|---|---|---|---|---|---|---|---|---|
| RISK1 | 1,405 | 0.031 | 0.009 | 0.018 | 0.025 | 0.030 | 0.036 | 0.047 |
| RISK2 | 1,405 | 0.029 | 0.009 | 0.017 | 0.023 | 0.028 | 0.034 | 0.046 |
| NON_EX | 1,510 | 0.631 | 0.178 | 0.333 | 0.571 | 0.600 | 0.800 | 0.857 |
| FSIZE | 1,510 | 13.215 | 1.340 | 11.111 | 12.292 | 13.153 | 14.006 | 15.651 |
| PB | 1,370 | 1.294 | 1.251 | 0.280 | 0.590 | 0.940 | 1.540 | 3.380 |
| STDEBT | 1,510 | 0.829 | 0.222 | 0.313 | 0.730 | 0.935 | 0.992 | 1.000 |
| CAPEX | 1,510 | 0.070 | 0.174 | −0.055 | 0.005 | 0.030 | 0.093 | 0.304 |
| CASH | 1,510 | 0.105 | 0.113 | 0.007 | 0.029 | 0.066 | 0.147 | 0.332 |
| DIV | 1,510 | 0.033 | 0.044 | 0.000 | 0.001 | 0.021 | 0.044 | 0.116 |

**Note(s)**: The table presents descriptive statistics among the variables of this study, where RISK1 is total risk, RISK2 is unsystematic risk, NON_EX is the percentage of nonexecutive on the supervisory board, FSIZE is natural logarithm of total assets, PB is the market value to book value of equity, STDEBT is the ratio of short-term debt to total debt, CAPEX is the change in fixed assets plus depreciation scaled by total assets at the beginning of the fiscal year, CASH is calculated as cash and equivalent cash divided by total assets and DIV is the ratio of dividend payout to total assets

**Table 2.**
Description statistics

do not engage in the day-to-day management of the organization. In addition, the appointment of nonexecutive directors in Vietnamese listed companies is usually interfered by majority shareholders who take control of the company, so the monitoring activities from nonexecutive directors to resolve disputes between owners and managers become less important. This result is contrary to that of Mathew *et al.* (2016), who suggest that nonexecutive directors' impact on firm risk is negative, for a sample of 260 UK companies in the 2005–2010 period. Sá *et al.* (2017) also find a negative and statistically significant relationship between changes in both total and idiosyncratic risk and the ratio of nonexecutive directors, for companies listed in the Euronext Lisbon (Portuguese Stock Exchange). The difference implies that the monitoring role of nonexecutive directors in Vietnamese firms is not appreciated as highly as in developed countries, where shareholder–manager agency conflict is typical.

However, the risk management role of nonexecutive directors is not completely denied because the estimated coefficients on the interaction terms between nonexecutive director ratio and capital expenditure ratio turn out to be significantly negative at 5% level and 10% level. They demonstrate the moderating role of capital expenditures in the relationship between nonexecutive directors and firm risk. More remarkably, the absolute values of these

**Table 3.**
Correlation matrix

| | RISK1 | RISK2 | NON_EX | FSIZE | PB | STDEBT | CAPEX | CASH |
|---|---|---|---|---|---|---|---|---|
| NON_EX | −0.057 | −0.033 | | | | | | |
| FSIZE | −0.379 | −0.449 | 0.122 | | | | | |
| PB | 0.041 | 0.028 | 0.010 | 0.054 | | | | |
| STDEBT | −0.006 | 0.053 | −0.012 | −0.326 | 0.032 | | | |
| CAPEX | 0.121 | 0.045 | −0.028 | 0.036 | 0.117 | −0.163 | | |
| CASH | −0.092 | −0.078 | 0.066 | −0.012 | 0.159 | 0.167 | −0.012 | |
| DIV | −0.199 | −0.202 | 0.058 | −0.084 | 0.282 | 0.176 | −0.003 | 0.362 |

**Note(s)**: Variables are defined the same as in Table 2

**Table 4.**
Fixed effects regression results

| | RISK1 | | RISK2 | |
|---|---|---|---|---|
| NON_EX | 0.00621*** (2.82) | 0.00702*** (3.08) | 0.00535*** (2.64) | 0.00598*** (2.86) |
| FSIZE | −0.00274*** (−3.49) | −0.00269*** (−3.46) | −0.00339*** (−4.27) | −0.00335*** (−4.26) |
| PB | 0.000396 (1.09) | 0.000390 (1.09) | 0.000407 (1.06) | 0.000402 (1.06) |
| STDEBT | −0.00171 (−1.03) | −0.00130 (−0.77) | −0.00150 (−0.91) | −0.00118 (−0.71) |
| CAPEX | 0.00209** (2.14) | 0.00997** (2.39) | 0.00157 (1.54) | 0.00768* (1.95) |
| CASH | 0.00396 (1.45) | 0.00401 (1.47) | 0.00462* (1.67) | 0.00466* (1.68) |
| DIV | −0.0164** (−2.53) | −0.0167*** (−2.62) | −0.0203*** (−3.17) | −0.0205*** (−3.24) |
| NON_EX*CAPEX | | −0.0116** (−2.08) | | −0.00902* (−1.73) |
| Constant | 0.0675*** (6.52) | 0.0659*** (6.35) | 0.0740*** (7.08) | 0.0728*** (6.93) |
| Year fixed | Yes | Yes | Yes | Yes |
| Firm fixed | Yes | Yes | Yes | Yes |
| *Model fits* | | | | |
| Within *R*2 | 0.2366 | 0.2387 | 0.1263 | 01278 |
| Between *R*2 | 0.2538 | 0.2482 | 0.3736 | 0.3698 |
| Overall *R*2 | 0.2439 | 0.2429 | 0.2523 | 0.2511 |
| *F*-statistics | 17.19*** | 17.60*** | 7.47*** | 7.46*** |
| Hausman test | 0.0003 | 0.0002 | 0.0158 | 0.0097 |
| Obs | 1,360 | 1,360 | 1,360 | 1,360 |

**Note(s)**: Variables are defined the same as in Table 2. Robust t-statistics adjusted for firm-level clustering are reported in parentheses. ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively

coefficients are greater than those of nonexecutive director ratio and capital expenditure ratio. All suggest that a higher proportion of nonexecutive directors tends to weaken the volatility of stock returns in case that companies increase investment. In other words, maintaining a high proportion of nonexecutive directors in firms with more capital expenditures are likely to be effective in reducing firm risk. Hausman tests are also reported in Table 4. They indicate that the fixed effects models are preferred to the random effects models.

To investigate the final hypothesis in more detail, we split the original sample into firms with overinvestment and firms with underinvestment. In this paper, two measures of overinvestment are conducted as follows:

*Measure 1*: According to Biddle *et al.* (2009) and Gomariz and Ballesta (2014), overinvestment is measured based on the deviation from the regression model:

$$\text{CAPEX}_{it} = \beta_0 + \beta_1 \text{SALE\_GRT}_{it-1} + \varepsilon_{it} \quad (2)$$

$\text{CAPEX}_{it}$ is the capital expenditure of company $i$ for year $t$, and $\text{SALE\_GRT}_{it\text{-}1}$ is the growth rate of sales during the last year. We conduct Eqn (2) regression cross-sectionally for each industry-year and define the first variable overinvestment as a dummy variable that takes on the value of 1 if the residual is positive and 0 otherwise.

*Measure 2*: The second overinvestment is also a dummy, which takes on the value of 1 if capital expenditure ratio in a company is more than the median industry-year adjusted capital expenditure ratio and 0 otherwise. This measure follows the approach developed by Bates (2005), which determines whether firms overinvest by comparing the capital expenditure ratios of each firm operating in a given industry in a given year with the median ratio of all firms operating in the same industry during that year.

The estimates presented in Table 5 and 6 show that increasing board independence in firms with overinvestment help to control firm risk. For underinvesting firms, the nonexecutive director ratio is strongly and positively associated with firm risk at the significance level of 1% under two risk measures. On the other hand, the coefficients on nonexecutive director ratio are still positive but weakly significant for firms with

| Dependent variable RISK1 | Overinvesting firms (Measure 1) | Overinvesting firms (Measure 2) | Underinvesting firms (Measure 1) | Underinvesting firms (Measure 2) |
|---|---|---|---|---|
| NON_EX | 0.00596* (1.72) | 0.00776** (2.39) | 0.00837*** (2.96) | 0.0116*** (3.79) |
| FSIZE | −0.00382** (−2.48) | −0.00372*** (−3.15) | −0.00167* (−1.66) | −0.00118 (−0.79) |
| PB | −0.000491 (−1.01) | 0.000377 (0.80) | 0.000113 (0.20) | 0.000358 (0.83) |
| STDEBT | −0.0000638 (−0.02) | 0.000471 (0.17) | 0.000111 (0.05) | −0.00383 (−1.53) |
| CAPEX | 0.0195*** (2.81) | 0.0145** (2.19) | −0.00178 (-0.19) | −0.00391 (−0.46) |
| CASH | 0.00883** (2.20) | 0.0101** (2.27) | −0.00115 (−0.37) | −0.00285 (−0.91) |
| DIV | −0.00216 (−0.23) | −0.0229** (−2.34) | −0.0174* (−1.75) | −0.0123 (−1.31) |
| NON_EX*CAPEX | −0.0228** (−2.26) | −0.0188** (−2.13) | 0.00530 (0.38) | 0.00330 (0.24) |
| Constant | 0.0798*** (3.89) | 0.0775*** (5.02) | 0.0532*** (3.92) | 0.0466** (2.30) |
| Year fixed | Yes | Yes | Yes | Yes |
| Firm fixed | Yes | Yes | Yes | Yes |
| *Model fits* | | | | |
| Within $R2$ | 0.2569 | 0.2766 | 0.1858 | 0.2213 |
| Between $R2$ | 0.1726 | 0.1965 | 0.2540 | 0.0896 |
| Overall $R2$ | 0.2203 | 0.2229 | 0.2123 | 0.1704 |
| $F$-statistics | 9.38*** | 10.52*** | 9.60*** | 7.25*** |
| Obs | 501 | 685 | 764 | 675 |

**Note(s)**: Variables are defined the same as in Table 2. Robust t-statistics adjusted for firm-level clustering are reported in parentheses. ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively

**Table 5.** Effect of overinvestment on the relationship between NON_EX and RISK1

**Table 6.**
Effect of overinvestment on the relationship between NON_EX and RISK2

| | Overinvesting firms | | Underinvesting firms | |
|---|---|---|---|---|
| Dependent variable RISK2 | (Measure 1) | (Measure 2) | (Measure 1) | (Measure 2) |
| NON_EX | 0.00449 (1.42) | 0.00697** (2.30) | 0.00760*** (2.90) | 0.0103*** (3.53) |
| FSIZE | −0.00476*** (−3.23) | −0.00491*** (−4.34) | −0.00251** (−2.42) | −0.00130 (−0.88) |
| PB | −0.000626 (−1.13) | 0.000395 (0.76) | −0.0000738 (−0.14) | 0.000355 (0.75) |
| STDEBT | −0.000108 (−0.04) | −0.0000816 (−0.03) | 0.000354 (0.17) | −0.00285 (−1.15) |
| CAPEX | 0.0175*** (2.65) | 0.0132** (2.19) | −0.00426 (−0.47) | −0.00442 (−0.47) |
| CASH | 0.00857* (1.88) | 0.0114** (2.43) | −0.000185 (−0.06) | −0.00273 (−0.86) |
| DIV | −0.00759 (−0.79) | −0.0275*** (−2.95) | −0.0200** (−2.05) | −0.0150 (−1.53) |
| NON_EX*CAPEX | −0.0198* (−1.98) | −0.0174** (−2.20) | 0.00727 (0.53) | 0.00295 (0.20) |
| Constant | 0.0846*** (4.25) | 0.0912*** (6.07) | 0.0567*** (4.12) | 0.0459** (2.32) |
| Year fixed | Yes | Yes | Yes | Yes |
| Firm fixed | Yes | Yes | Yes | Yes |
| *Model fits* | | | | |
| Within *R*2 | 0.1088 | 0.1821 | 0.0742 | 0.1191 |
| Between *R*2 | 0.2428 | 0.2982 | 0.3649 | 0.1247 |
| Overall *R*2 | 0.2124 | 0.2412 | 0.2510 | 0.1443 |
| *F*-statistics | 3.27*** | 5.50*** | 3.38*** | 3.32*** |
| Obs | 501 | 685 | 764 | 675 |

**Note(s)**: Variables are defined the same as in Table 2. Robust *t*-statistics adjusted for firm-level clustering are reported in parentheses. ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively

overinvestment. Moreover, the coefficients on nonexecutive director ratio have smaller absolute values for firms with overinvestment. One possible explanation is that companies seem to pay more attention to the role of nonexecutive directors as they have more capital expenditures. Regarding the interaction term, its coefficients are only negatively significant for overinvesting firms. Furthermore, the absolute values of these coefficients are greater than those of nonexecutive director ratio and capital expenditure ratio. As expected, these results are in line with our third hypothesis. All the above results support that excessive capital spending in some firms poses risks to noncontrolling shareholders who tend to demand increased supervision from nonexecutive directors to minimize losses for themselves. In addition, increasing the presence of nonexecutive directors can also be explained under resource dependence theory that outside directors serve to coordinate organizational action and provide external links to reduce risk (Lu and Herremans, 2019; Lai *et al.*, 2019), especially for firms with many investment activities.

Although the fixed effects method is quite common for panel data, the estimated results may be inconsistent in case of potential endogeneity problems (Shao, 2019; Sewpersadh, 2019; Eugster, 2020). First, simultaneity can exist in the relationship between firm risk and board structure variables (Cheng, 2008; Wang, 2012; Huang and Wang, 2015; Akbar *et al.*, 2017). For instance, nonexecutive director ratio in a period may lead to an increase in stock return volatility in that period while the reverse relationship can also be accepted. Second, nonexecutive director ratio is not completely independent of the lagged firm risk, which is stated as dynamic endogeneity by Wintoki *et al.* (2012). Both imply that firms with high volatility in the previous or current year can decrease the number of nonexecutive directors in the current year to improve the efficiency of board activities. To prevent the bias in coefficient estimates in Table 4, we re-estimate our models by dynamic GMM panel estimation technique proposed by Blundell and Bond (1998) and Roodman (2009). It allows treating all the explanatory variables as endogenous variables (Roodman, 2009; Papangkorn *et al.*, 2019; Liu *et al.*,2019). Using a list of proper instrumental variables, the application of dynamic GMM helps to solve the endogeneity problems which arise from simultaneity and dynamic endogeneity (Shao, 2019; del Carmen Briano-Turrent and Rodríguez-Ariza, 2016; Akbar *et al.*, 2017; Waheed and Malik, 2019). In many previous studies, dynamic endogeneity is usually ignored because of being difficult to identify exogenous instruments (Wintoki *et al.*, 2012; Sewpersadh, 2019).

By using the same instrument variables for all GMM models on the purpose of comparison, the interpretation of the significant coefficients on nonexecutive director ratio and interaction term in Table 7 remains the same as in Table 4. Regarding the moderating effect of capital expenditure, the coefficients on the interaction term remain negatively significant for all the columns, reinforcing the results in Table 4. Moreover, the robustness of our model estimators is confirmed by the specification tests for system GMM. As expected, the Hansen test indicates that the instruments used in the GMM estimations are not correlated with the error terms. Although there is evidence for negative first-order serial correlation, second-order serial correlation is absent. Wintoki *et al.* (2012) argue that serial correlation might exist in the first differences AR(1), but there should be no serial correlation in the second differences AR(2). All findings further support the conclusion that the instruments are used reasonably and the above GMM model is consistent.

## 5. Conclusion

After controlling for the problem of heteroskedasticity, autocorrelation and potential endogeneity by applying fixed effects with clustered robust standard errors and dynamic GMM for a sample of 151 companies listed on Vietnamese stock markets in the period 2007–2016, this paper shows the positive impact of nonexecutive director ratio on firm risk. It demonstrates that the inclusion of more nonexecutive directors does not benefit the monitoring function. However, the monitoring

**Table 7.**
Dynamic GMM regression results

| | RISK = RISK1 | | RISK = RISK2 | |
|---|---|---|---|---|
| $RISK_{t-1}$ | 0.252*** (3.89) | 0.241*** (3.89) | 0.232*** (4.12) | 0.219*** (4.04) |
| NON_EX | 0.00566* (1.79) | 0.00916** (2.46) | 0.00669** (2.06) | 0.00952*** (2.75) |
| FSIZE | −0.00271*** (−3.94) | −0.00261*** (−3.79) | −0.00281*** (−3.76) | −0.00263*** (−3.47) |
| PB | 0.000305 (0.25) | −0.000234 (−0.17) | 0.000483 (0.44) | −0.000108 (−0.09) |
| STDEBT | −0.00964*** (−2.67) | −0.00996*** (−3.06) | −0.00820** (−2.13) | −0.00893** (−2.54) |
| CAPEX | 0.00679** (2.33) | 0.0320** (2.04) | 0.00548* (1.85) | 0.0328** (2.33) |
| CASH | −0.00676 (−1.05) | −0.00580 (−0.87) | −0.00842 (−1.17) | −0.00835 (−1.33) |
| DIV | −0.0425** (−2.46) | −0.0481*** (−2.78) | −0.0424** (−2.47) | −0.0444*** (−2.71) |
| NON_EX*CAPEX | | −0.0401* (−1.67) | | −0.0443* (−1.95) |
| Constant | | | 0.0595*** (5.02) | |
| Year Dummies | Yes | Yes | Yes | Yes |
| Observations | 1,219 | 1,219 | 1,219 | 1,219 |
| Wald *X*2-statistics | 648.49*** | 641.62*** | 7.62*** | 457.62*** |
| AR(1) | 0.000 | 0.000 | 0.000 | 0.000 |
| AR(2) | 0.258 | 0.200 | 0.269 | 0.196 |
| Hansen Test | 0.162 | 0.174 | 0.182 | 0.226 |
| No. of instruments | 127 | 127 | 127 | 127 |

**Note(s)**: This table reports the two-step GMM system estimators with robust adjustment for a small sample. Variables are defined the same as in Table 2. AR(1) and AR(2) are tests for first-order and second-order serial correlation in the first-differenced residuals, under the null of no serial correlation. Hansen test of overidentification is under the null that all instruments are valid. The instruments are the lags of the explanatory variables and year dummies are treated as strictly exogenous variables. Statistically significant at 1% (***), 5%(**) and 10%(*), respectively

role of nonexecutive directors is improved in the case of overinvestment. This finding is achieved by investigating the moderating role of capital expenditure as well as the difference in the impact of nonexecutive director ratio on firm risk in case of overinvestment and underinvestment. It suggests that the presence of nonexecutive directors in firms with more capital expenditures is likely to mitigate the volatility of stock returns. In other words, firms with high capital expenditures tend to urge nonexecutive directors to increase supervision as well as to provide more links to external resources for minimizing risks.

From an application standpoint, the results recommend that the listed firms should consider stock return volatility before they intend to nominate and appoint nonexecutive directors into their board, especially in overinvesting firms. From another perspective, the shift toward having a majority of nonexecutive directors on boards can play a significant role in pursuing a stable or risky business strategy.

By using alternative measures of overinvestment and firm risk, our findings are robust enough to highlight the importance of adjusting an appropriate proportion of nonexecutive directors in managing risks in Vietnam boardrooms, especially from a capital expenditure perspective. It also helps Vietnamese lawmakers understand more corporate governance practices thoroughly and then improve current legislation.

However, this study has several limitations that call for future research. We do not have enough information to differentiate whether a nonexecutive director is nominated and appointed by controlling shareholders or minority shareholders. Separating nonexecutive directors into two groups is important in assessing whether nonexecutive directors are representing the interests of minority shareholders or they are under the control of controlling shareholders. Besides, the paper was also limited to the detailed identification of nonexecutive directors' characteristics. It would, therefore, be interesting to investigate the effects of nonexecutive directors' specific characteristics such as demographics in terms of age, gender and experience; individual and representative ownership; their foreign ownership ratio and so forth to better explain the role of foreign investors in the stability of the Vietnam stock market.

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**Corresponding author**
Tho Anh To can be contacted at: anhtho27@gmail.com

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# Opportunity, job pressure and deviant workplace behaviour: does neutralisation mediate the relationship? A study of faculty members in public universities in Nigeria

Michael Olalekan Adeoti and Faridahwati Mohd Shamsudin
*Othman Yeop Abdullah Graduate School of Business, Universiti Utara Malaysia, Sintok, Malaysia, and*
AlHamwan Mousa Mohammad
*School of Business Management, Universiti Utara Malaysia, Sintok, Malaysia*

## Abstract

**Purpose** – The purpose of the present study was twofold: (1) to examine the direct effect of the dimensions of opportunity (i.e. ethical climate and institutional policy) and dimensions of job pressure (i.e. workload and work pressure) on workplace deviance (i.e. organisational and interpersonal deviance) and (2) to assess the mediation of neutralisation in the relationship between the dimensions of opportunity, job pressure and workplace deviance.
**Design/methodology/approach** – The present study drew from the fraud triangle theory (FTT; Cressey, 1950) and the theory of neutralisation (Sykes and Matza, 1957) to achieve the research objectives. Survey data from 356 full-time faculty members in Nigerian public universities were collected. Partial least square-structural equation modelling (PLS-SEM) was employed to analyse the data.
**Findings** – The results indicated that opportunity and job pressure significantly affected workplace deviance. As expected, neutralisation was found to mediate the negative relationship between ethical climate and interpersonal deviance and the positive relationship between workload, work pressure and interpersonal deviance. Contrary to expectation, neutralisation did not mediate the relationship between opportunity, pressure and organisational deviance.
**Research limitations/implications** – The sample was drawn from academics in public universities and the cross-sectional nature of this study means that the findings have limited generalisations.
**Practical implications** – This study offers insights into the management of Nigerian public universities on the need to curb workplace deviance amongst faculty members. This study recommends that the management improve the work environment by enhancing the ethical climate and institutional policies and reviewing the existing workload that may constitute pressure to the faculty members.
**Originality/value** – The present study provides empirical support for the fraud triangle theory and theory of neutralisation to explain workplace deviance.

**Keywords** Neutralisation, Opportunity, Job pressure, Workplace deviance
**Paper type** Research paper

## 1. Introduction

The literature on workplace deviance or counterproductive behaviour is growing, which suggests that such a phenomenon, if not managed well, is likely to affect the organisation and

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its members negatively (Bennett and Marasi, 2015). Workplace deviance can be understood as acts that are against the norms and expectations of the organisation that could harm its well-being and stakeholders (Bennett *et al.*, 2018). It was reported that US businesses lost an average of US$113m in 2016 to employee theft. According to the 2017 Hiscox Embezzlement Study (Security Newswire, 2017), US businesses also suffered more than US$120bn a year from workplace violence, according to estimates by the National Institute for Occupational Safety and Health (Neckerman Insurance Services, 2012). Not only companies suffer monetary losses because of workplace deviance but also such an occurrence could also result in emotional costs to the employees. For instance, when employees experience workplace bullying or aggression at work, society could suffer when companies have to stop operating as a result of such incidence (Bennett *et al.*, 2018). Others pointed out that reduced employee productivity and increased staff turnover are some of the adverse consequences organisations face as a result of workplace deviance (Tuna *et al.*, 2016), affecting the organisational financial capacity.

Because workplace deviance could harm organisational effectiveness, many scholarly attempts have been made to theoretically understand the phenomenon and recommend practical measures to prevent such an occurrence. Towards this end, different theoretical perspectives have been employed. Some of these include the theory of reciprocity (Gouldner, 1960), justice theory (Adams, 1965), social exchange theory (Blau, 1964), the theory of strain (Agnew, 1985, 1992) and the theory of social learning (Bandura, 1963), amongst others. The present study is an attempt to add further to the literature on workplace deviance by offering a different theoretical lens. Specifically, it seeks to validate the applicability of the fraud triangle theory (FTT; Cressey, 1950) as a potential theoretical landscape. Although FTT is a theory that deals with fraud, some scholars argue that FTT has a theoretical value in the study of workplace deviance because fraud is a form of workplace deviance, albeit a serious one (Lawrence and Robinson, 2007; Dorminey *et al.*, 2010; Abdullahi and Mansor, 2015). FTT postulates that unethical acts do not occur randomly; instead, it is a conscious act of individuals (Tuna *et al.*, 2016), which is made possible by three factors: opportunity, pressure and rationalisation (Cressey, 1950). Consistent with FTT, the present study sought to investigate to what extent these factors could also explain different facets (organisational vs interpersonal deviance) and degrees of workplace deviance (minor vs major deviance). Specifically, it investigated the influence of ethical climate and institutional policy (facets of opportunity) and pressure (workload and work pressure) on workplace deviance.

However, the present study deviates from the premises of FTT in one significant way. According to FTT, individuals also justify the legitimacy of their fraudulent act by engaging in rationalisation (Cressey, 1950). That is, rationalisation is postulated to be a *direct* predictor of fraudulent behaviour. The present study argues that such theoretical postulation is somewhat problematic. The rational choice theory asserts that individuals are rational human beings who make rational choices based on the understanding of the consequences of his or her behaviour (Harsanyi, 1977). According to Vardi and Wiener (1996), employee deviance is motivational and goal-directed behaviour. Employees are likely to demonstrate harmful behaviour at work as a response to a stimulus (or stimuli) in the organisation (Skarlicki and Folger, 1997; Skarlicki *et al.*, 1998). In this regard, the present study proposes that neutralisation *could not* directly predict workplace deviance; instead, employees use underlying mechanisms (i.e. neutralisation) to exhibit questionable behaviours (Lim, 2002). Hence, the present study theorised rationalisation or neutralisation as a psychological mechanism that explains why individuals engage in workplace deviance as a result of opportunity and pressure at work. The mediation of neutralisation was also investigated in past studies on workplace deviance (e.g. Lim, 2002). The present study, hence, adds to the literature because past studies that considered the underlying mechanism of workplace deviance are limited.

Another contribution of the present study is that it offers empirical evidence of workplace deviance in higher educational institutions (HEIs). Even though workplace deviance is said to occur in many organisational settings, limited attention was given to HEIs, especially public universities in Nigeria. Public universities in Nigeria present an intriguing case because deviance in these institutions is a national problem as attested to by President Muhammadu Buhari (Babachir, 2015). Further, employee deviance is said to be higher in public universities than in private universities (Geidam *et al.*, 2011). For instance, Delta State University, Abraka, Nigeria (DELSU) sacked 14 faculty members and 17 non-academic staff members for unethical acts, such as plagiarism, sexual harassment, property theft, financial extortion from students, alteration of students' scores and absenteeism, amongst others, in 2017 (Dike, 2017). Consistent with the mandate of President Muhammadu Buhari to confront negative deviance in all facets of Nigeria, the present study is a scholarly attempt towards responding to a national call. Also, it is an exercise to test the validity of the FTT theory in such an organisational context since the theory tended to be examined in financial-related institutions and occupations (e.g. Brown *et al.*, 2016).

Towards this end, this paper is organised as follows: a review of the relevant literature on workplace deviance, the factors purported to influence fraudulent behaviour according to FTT and the theoretical role of neutralisation in explaining deviance as expounded by the theory of neutralisation is offered towards the development of the research hypotheses. Then, a description of the methodology, analysis and results are presented, followed by a discussion of the findings and their implications. Finally, this paper ends with some concluding remarks.

## 2. Conceptual framework

The negative consequences of workplace deviance have attracted much scholarly attention and research. The literature is exponentially growing, partly reflected by the various terminologies used to define the concept, enhancing our theoretical understanding of the concept. Some of the terminologies used to describe the phenomenon include organisational misbehaviour (Ackroyd and Thompson, 1999; Vardi and Weitz, 2004), antisocial behaviour of employees (Robinson and O'Leary-Kelly, 1998), dysfunctional work behaviour (Griffin *et al.*, 1998) and workplace incivility (Lim and Lee, 2011; Morrow *et al.*, 2011; Taylor *et al.*, 2012).

Despite the various terminologies used, the growing literature on workplace deviance has benefitted much from the seminal works of Robinson and Bennett (1995), who defined deviant workplace behaviour as "voluntary behaviour that violates significant organisational norms and in so doing threatens the well-being of an organisation, its members, or both" (p. 556). Extending the earlier works of Hollinger and Clark (1982), Robinson and Bennett developed a typology of workplace deviance by using a technique of multidimensional scaling. Based on the target of the deviant acts, they found that workplace deviance could be grouped into two: organisational deviance and interpersonal deviance. While sabotage, theft of organisational property, coming in to work late and sharing company secrets with outsiders are some of the examples of organisational deviance, gossiping about co-workers or physically or verbally abusing co-workers or customers are examples of interpersonal deviance (Bennett *et al.*, 2018). While the former refers to acts targeted at the organisation, the former targets at members of the organisation. Their work has been widely used in the literature ever since the publication of their seminal work (e.g. Chen *et al.*, 2018; Yasir and Rasli, 2018).

Because of the adverse effects of workplace deviance on organisations, researchers tend to focus on identifying contributing factors or antecedents using a variety of theoretical lenses. While it is beyond the scope of the paper to elaborate on the existing studies, it is safe to conclude that some factors seem to play a significant role in contributing to workplace deviance. By using social exchange theory, researchers found such poor working conditions, such as abusive supervision (Thau *et al.*, 2009) and psychological contract breach

(Bordia *et al.*, 2008) were significantly related to workplace deviance. Justice theory has also been used to explain the link between perceived injustice at work and workplace deviance (Holtz and Harold, 2013; O'Neill *et al.*, 2011). Individual factors, such as personality, have also been considered by examining different models of personality structure. For instance, in comparing the validity of the Big Five and HEXACO model, Pletzer *et al.* (2019) found that the HEXACO domains explained more variance in workplace deviance that the Big Five domains (i.e. 31.97 vs 19.05%) in their meta-analytic study. Other studies also suggested that future researchers go beyond the Big Five model to understand the phenomenon (O'Neill and Hastings, 2011).

The present study contributes to the growing literature on workplace deviance by adopting a different theoretical lens, i.e. the FTT. The following discusses how this theory was hypothesised to explain workplace deviance.

### *2.1 Opportunity and workplace deviance*

As mentioned earlier, in explaining workplace deviance behaviour, the present study drew from the FTT developed by Cressey (1950). Consistent with this theory, the present study postulates that opportunity at the workplace is likely to facilitate the engagement of deviant acts by employees. According to the FTT, an opportunity is created by ineffective governance system, absence of ethical climate, lack of internal control systems and poor policy implementation (Thanasak, 2013). That is, opportunity is created when there is a weak internal control system in the organisation or when such system does not exist (Cressey, 1950). This study specifically focused on two aspects of opportunity, i.e. ethical climate and institutional policy, as these have been found to affect employee behaviour significantly (Appelbaum *et al.*, 2005; Taştan, 2019). Also, the present study was an attempt to respond to the call that more studies are needed to diagnose the relationship between ethical climate and deviance, which has remained mostly under-researched (Simha and Cullen, 2012).

Ethical climate reflects the organisational procedures, policies and practices with moral consequences (Martin and Cullen, 2006). Based on this definition, it is reasonable to theoretically speculate that when an organisation's work climate is ethical, employees are less likely to demonstrate undesirable or negative behaviour. Empirical evidence to suggest such a link is extant (Vardi, 2001; Peterson, 2002; Chen *et al.*, 2013). Consistent with the FTT, employees are likely to take an opportunity to engage in deviant acts to achieve their goals when the organisation has a weak ethical climate. In such a climate, the organisation may have a bottom-line mentality in that the organisation is more concerned about financial success at the expense of other values (Appelbaum *et al.*, 2005) and turns a blind eye to such act or maybe the organisation does not have relevant policies to deal with such behaviour. Weak internal control and unfavourable working conditions have been argued to facilitate employee deviance at work (Sauser, 2007). Hence, based on the theoretical argument and the empirical evidence, the following hypotheses were developed:

*H1.* There is a negative relationship between ethical climate and interpersonal deviance.

*H2.* There is a negative relationship between ethical climate and organisational deviance.

Institutional policy represents the facet of opportunity in FTT. A policy serves as a guide to the running of an organisation. It states the boundary within which organisational activities must be performed and gives directions to deterrence measures (Trevino *et al.*, 2005, 2006). Also, it may contain statements on reward and punishment to create the desired work climate. When the organisation does not have an explicit institutional policy regarding negative behaviour and reward and punishment, an opportunity could be created for employees to engage in negative or deviant behaviour at work (Sauser, 2007). According to the general deterrence theory (GDT; Gibbs, 1975), when the institutional policy that prescribes

punishment for distasteful acts and such punishment is assured and severe, employees may be discouraged from such acts because of the pains that accompany such reprimand.

Despite limited empirical evidence, past studies suggest a significant influence of institutional policy on workplace deviance. For instance, the perceived severity of formal sanction was found to significantly relate to information systems security violation behaviours (Cheng *et al.*, 2013). Past research also showed that the severity of the penalty and punishment discouraged employees from engaging in deviance targeted at the organisation (D'Arcy and Hovav, 2009; Kura *et al.*, 2015). The theoretical arguments and evidence thus led to the formulation of the following hypothesis:

*H3.* There is a negative relationship between institutional policy and interpersonal deviance.

*H4.* There is a negative relationship between institutional policy and organisational deviance.

### *2.2 Pressure and workplace deviance*

According to FTT, pressure is the second factor that enables individuals to engage in fraud. Pressure refers to the motivation or needs to engage in fraud (Cressey, 1950). In the present study, pressure referred to job pressure, which is considered as having two dimensions, namely, academic workload and work pressure. Academic workload was operationalised as the professional efforts a faculty member devotes to activities such as teaching, research, publications, administration, community services and other academic-related tasks (Burke, 2011) while work pressure is conceptualised as the degree to which an academic must work fast and hard, has a great deal to do but with too little time (Karasek and Theorell, 1990).

The literature appears to support the key premise of FTT in that the higher the workload and work pressure, the higher the possibility that undesirable behaviour will be exhibited. The general strain theory (GST; Agnew, 1992) seems to have a similar postulation in that strain causes undesirable reactions, which generate inspiration for deviance as a surviving tactic. Past studies have shown that job pressure has a significant effect on employee behaviour and work-related outcomes (Jones *et al.*, 2010; Kayatasha and Kayatasha, 2012; Yadav, 2017), such as bullying in organisations (Yeh, 2015), and dysfunctional behaviours and lower audit quality (López and Peters, 2012). Hence, the following hypotheses were developed:

*H5.* Work pressure is positively related to interpersonal deviance.

*H6.* Work pressure is positively related to organisational deviance.

*H7.* Workload is positively related to interpersonal deviance.

*H8.* Workload is positively related to organisational deviance.

### *2.3 The mediation of neutralisation*

The theory of neutralisation postulates that when individuals engage in undesirable behaviour, they are likely to redefine their behaviour to make it acceptable because they are aware that immoral behaviour is against the societal norms and expectations (Sykes and Matza, 1957; Yu, 2013). By implication, this theory suggests that those who do behave morally do not create an excuse or do not have to justify their immoral action. As workplace deviance is purported to be triggered by events in the environment (Skarlicki and Folger, 1997; Skarlicki *et al.*, 1998; Vardi and Wiener, 1996), employees do not engage in deviant behaviour randomly. They are aware of the organisational expectations and the implications of their behaviour. Consistent with the theory of neutralisation, when employees engage in

deviant acts at work as a result of a stimulus in the work environment, they will rationalise and justify their behaviour to make it acceptable. The present study theorised that opportunity (poor ethical climate and ineffective institutional policy) and job pressure (high workload and work pressure) are used to justify employee engagement in deviant behaviour at work.

Past studies provided support for the theory of neutralisation to explain undesirable behaviour at work. In their study on personal use of the internet while at work, Cheng *et al.* (2013) concluded that employees justified the personal use through the lens of cost–benefit analysis in that the behaviour outweighed the cost of getting detected. In a qualitative study involving 44 restaurant workers, Shigihara (2013) observed that the workers justified restaurant theft by indicating that there was excess food and that no one cared if they took food home without permission, suggesting poor institutional policy implementation. Hence, the following hypotheses were formulated:

*H9*. Neutralisation mediates the negative relationship between ethical climate and interpersonal deviance.

*H10*. Neutralisation mediates the negative relationship between ethical climate and organisational deviance.

*H11*. Neutralisation mediates the negative relationship between institutional policy and interpersonal deviance.

*H12*. Neutralisation mediates the negative relationship between institutional policy and organisational deviance.

Workplace stress may result from excessive workload, work pressure and role ambiguity, or social factors, such as poor leadership and feeling undervalued (Salami, 2010; Ogunsanya and Olorunfemi, 2012). Based on the theory of reciprocity (Gouldner, 1960) and social exchange theory (Blau, 1964), individuals who feel they have been short-changed in an employment relationship may invoke neutralisation to reinstate the impression of fairness. The reward deficit may result in employees being dissatisfied, justifying their deviant act at work (Parker, 2014). Perceived injustice and opportunities for neutralisation may help employees to dissipate internalised norms and social censure, allowing them to engage in undesirable acts without the feeling of guilt and shame (Warkentin *et al.*, 2011; Ogungbamila, 2017). Hence, the following hypotheses were developed:

*H13*. Neutralisation mediates the positive relationship between work pressure and interpersonal deviance.

*H14*. Neutralisation mediates the positive relationship between work pressure and organisational deviance.

*H15*. Neutralisation mediates the positive relationship between workload and interpersonal deviance.

*H16*. Neutralisation mediates the positive relationship between workload and organisational deviance.

Figure 1 shows the proposed research model of the present study that illustrates the hypothesised link between the key constructs consistent with the FTT.

## 3. Methodology

Survey data were collected from 356 faculty members recruited from public universities across Nigeria. Because the incidence of employee deviance was reported to be higher in

public universities than in private universities, the choice of surveying faculty members in public universities was justified (Geidam *et al.*, 2011; Babachir, 2015; Nigerian Feminist Forum, 2015). As with any research that involves human subjects, ethical concerns need to be addressed. One of the ethical issues was the protection of the participants. The participants were made clear before they agreed to take part in the study that their participation was voluntary, and they could stop participating at any time during the survey. They were also assured that they would not be exposed to any harm financially, physically, mentally or socially, that their identity would remain anonymous, and that their responses were kept confidential. The sample profile was as follows: most of the participants were male (77%), married (83.7%), had been working in academia for more than six years (70%), and close to half of them had a master's degree (45.2%). Concerning age, most of them were relatively young aged between 31 and 50 years. The sample also consisted of faculty members of various ranks, from professors to assistant lecturers. Established instruments with good psychometric properties were used to measure the variables of interest.

Bennett and Robinson's (2000) DWB scale was used to measure deviant workplace behaviour. The DWB scale was reported to have sound psychometric properties with internal reliability of 0.81 and 0.78 for organisational and interpersonal deviance, respectively (Bennett and Robinson, 2000). To measure DWB, 28 items were scored on a 5-point scale (1 = Never; 2 = Rarely; 3 = Sometimes; 4 = Often; 5 = Always). The items in the original scale were later validated by six subject matter experts to suit the academic setting. The items went through several validation exercises to ensure that the modified items were valid and relevant. Sample items include "I do not complete the required syllabus in a semester" and "I raise tempers at colleagues/students".

Ethical climate was assessed by seven items ($\alpha$ = 0.79; Schwepker and Hartline, 2005) from the ethical climate scale of Schwepker and Hartline (2005). Participants specified their perceptions of ethical climate on a 5-point scale (1 = Mostly false; 2 = Somewhat false; 3 = Somewhat true; 4 = Mostly true; 5 = Completely true). Sample items include "The climate in this institution allows lecturers to do some unethical things at work" and "Top management does not support ethical behaviour in this institution."

Institutional policy was assessed by five items ($\alpha$ = 0.73–0.82; Comer *et al.*, 1989) adapted from Comer *et al.*'s (1989) measure of company policy. Items were rated on a 5-point Likert scale (1 = Strongly disagree; 2 = Disagree; 3 = Neither disagree nor agree; 4 = Agree; 5 = Strongly agree). Some of the items asked were, "This institution operates efficiently and smoothly because of effective policies."

Workload was assessed by eight items ($\alpha$ = 0.74 to 0.78; Houston *et al.*, 2006), which were taken from the job demands scale of Houston *et al.* (2006). A 5-point Likert scale was used. Participants were asked questions, such as "I often need to work after working hours to meet my work requirements."

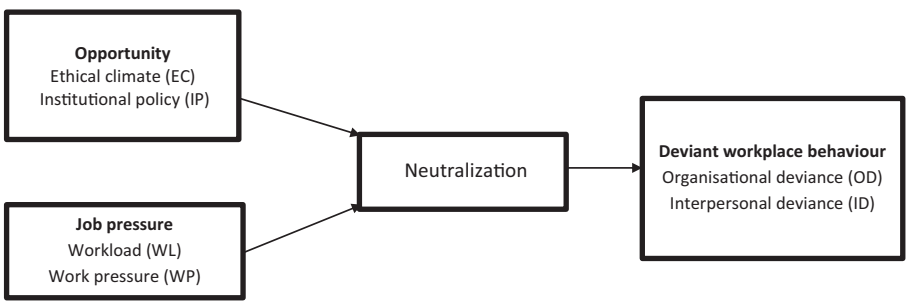



**Figure 1.**
Research model

Five items from Karasek and Theorell's (1990) job pressure scale were used to measure work pressure ($\alpha = 0.73 – 0.85$; Karasek and Theorell, 1990). A 5-point Likert scale was also used.

Neutralisation centres on the cognitive and/or socially interactive stage before individuals exhibit a norm-contradicting behaviour (Sykes and Matza, 1957). Neutralisation was measured by six items ($\alpha = 0.861$; Rogers and Buffalo, 1974) adapted from Rogers and Buffalo's (1974) neutralisation scale. All participants indicated their level of agreement on a 5-point Likert scale (1 = Strongly disagree to 5 = Strongly agree).

Once the data were collected, they were screened for missing values, outliers, non-response bias, common method variance, normality and multicollinearity (Tabachnick and Fidell, 2007; Hair *et al.*, 2010). No significant issues were found, allowing the data to be analysed using partial least square-structural equation modelling (PLS-SEM) on SmartPLS-SEM 3.2.7. PLS-SEM is useful to test a mediating effect where Preacher and Hayes's (2008) bootstrapping technique of estimating indirect effects could be employed (Hair *et al.*, 2013).

## 4. Analysis and results

The PLS-SEM analysis involves two stages of assessment: the measurement model and the structural model (Henseler *et al.*, 2009; Hair *et al.*, 2013). While the first assessment is to ensure the goodness of the measures used, the second assessment is carried out to test the research hypotheses (Hair *et al.*, 2013). In the first stage, the internal consistency of the model was assessed using the composite reliability index (Hair *et al.*, 2012). Table 1 shows that the composite reliability of each construct ranged from 0.883 to 0.975, exceeding the minimum acceptable level of 0.70 (Hair *et al.*, 2014, 2017). Hair *et al.*'s (2017) recommendations were followed in that loadings of 0.60 and above were retained since the average variance extracted (AVE) values for all constructs were higher than 0.50 (refer Table 1). All the parameters for measurement of the model showed that the model had adequate internal reliability.

Convergent validity, discriminant validity and item reliability were also ascertained (Hair *et al.*, 2017). Convergent validity means the degree to which two or more measures of the same theoretical construct assessed by different methods agree. Convergent validity was assessed by examining the AVE for each latent construct. According to Hair *et al.* (2017), the AVE for each latent construct should be 0.50 or more. Table 1 shows that the AVE for each latent construct was greater than 0.50, indicating adequate convergent validity.

Discriminant validity refers to the degree to which one theoretical construct differs from another (Hair *et al.*, 2017). Discriminant validity was ascertained by the Fornell–Larcker criterion and heterotrait-monotrait ratio-HTMT (Fornell and Larcker, 1981; Henseler *et al.*, 2015). Table 2 compares the square root of the AVE for each latent construct with the correlations amongst the latent constructs. The table also demonstrates that adequate discriminant validity had been established in the present study because the square roots of AVEs were greater than the correlations between constructs (Fornell and Larcker, 1981; Hair *et al.*, 2017).

Table 3 shows that discriminant validity was achieved because the highest correlation found between workload and work pressure was 0.828, which was within the conventional yardsticks of 0.85 (Clark and Watson, 1995; Henseler *et al.*, 2015). Figure 2 shows the retained items and the beta values of the constructs. It presents evidence that the individual item reliability was found to be acceptable.

After the goodness of measures of the model was ascertained, the next analysis was to assess the structural model, i.e. evaluating the predictive abilities and the interrelationships (paths) between the latent constructs (Hair *et al.*, 2014). The structural model was evaluated based on the following criteria: the significance of the structural path coefficients, coefficient of determination ($R^2$), the effect size ($f^2$) and predictive relevance of PLS estimates at the construct level ($Q^2$) (Chin, 1998, 2010).

| Constructs and indicators | Loadings | *t*-value | Composite reliability | AVE |
|---|---|---|---|---|
| Ethical climate (EC) | | | 0.889 | 0.668 |
| EC04 | 0.791 | 31.843 | | |
| EC05 | 0.849 | 46.011 | | |
| EC06 | 0.806 | 19.708 | | |
| EC07 | 0.821 | 28.425 | | |
| Institutional policy (IP) | | | 0.909 | 0.666 |
| IP01 | 0.761 | 31.162 | | |
| IP02 | 0.819 | 40.390 | | |
| IP03 | 0.868 | 55.389 | | |
| IP04 | 0.822 | 23.529 | | |
| IP05 | 0.808 | 23.193 | | |
| Workload (WL) | | | 0.903 | 0.651 |
| WL01 | 0.887 | 56.540 | | |
| WL02 | 0.891 | 61.690 | | |
| WL03 | 0.741 | 22.700 | | |
| WL05 | 0.767 | 24.617 | | |
| WL06 | 0.731 | 20.585 | | |
| Work pressure (WP) | | | 0.883 | 0.715 |
| WP01 | 0.891 | 66.020 | | |
| WP02 | 0.781 | 16.081 | | |
| WP04 | 0.861 | 40.643 | | |
| Neutralisation | | | 0.975 | 0.865 |
| NT01 | 0.920 | 69.674 | | |
| NT02 | 0.865 | 20.046 | | |
| NT03 | 0.955 | 107.983 | | |
| NT04 | 0.945 | 76.446 | | |
| NT05 | 0.954 | 113.352 | | |
| NT06 | 0.938 | 80.565 | | |
| Interpersonal deviance (ID) | | | 0.948 | 0.819 |
| ID01 | 0.830 | 25.775 | | |
| ID02 | 0.926 | 72.015 | | |
| ID03 | 0.928 | 100.063 | | |
| ID04 | 0.933 | 85.295 | | |
| Organisational deviance (OD) | | | 0.886 | 0.564 |
| OD01 | 0.811 | 21.227 | | |
| OD02 | 0.802 | 27.064 | | |
| OD03 | 0.761 | 29.843 | | |
| OD04 | 0.786 | 31.844 | | |
| OD05 | 0.605 | 24.639 | | |
| OD06 | 0.624 | 18.878 | | |

**Table 1.**
Result of measurement model (reliability)

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|
| 1. Ethical climate | *0.817* | | | | | | |
| 2. Institutional policy | 0.129 | *0.816* | | | | | |
| 3. Workload | −0.609 | −0.206 | *0.807* | | | | |
| 4. Neutralisation | −0.573 | −0.213 | 0.628 | *0.930* | | | |
| 4. Work pressure | −0.555 | −0.097 | 0.715 | 0.605 | *0.846* | | |
| 5. Interpersonal deviance | −0.515 | −0.037 | 0.524 | 0.607 | 0.571 | *0.905* | |
| 6. Organisational deviance | −0.084 | −0.395 | 0.171 | 0.173 | 0.114 | 0.147 | *0.736* |

**Table 2.**
Discriminant validity (Fornell–Larcker criterion)

In assessing the structural model, direct and indirect effects were analysed. The recommendation of Hair *et al.* (2014) and Henseler *et al.* (2009) was followed. A bootstrapping procedure with 5000 bootstrapped samples and 356 cases were used to evaluate the significance of the path coefficients to generate beta values, standard errors, *t*-values and *p*-values of the estimate to determine the precision of the model. The direct effect model amongst the latent variables without including a mediator was computed to assess hypotheses 1–8.

As shown in Table 4 and Figure 3, the result of the structural path coefficients revealed that only HI, H4, H5 and H7 were statistically significant while H2, H3, H6 and H8 were not. Specifically, a significant negative relationship between perceived ethical climate and interpersonal deviance was found ($\beta = -0.255$; $t = 3.559$; $p < 0.01$), supporting H1. A negative relationship between institutional policy and organisational deviance was also supported (H4) ($\beta = -0.447$; $t = 9.240$; $p < 0.01$). Similarly, workload was found to be significantly and positively related to interpersonal deviance ($\beta = 0.133$; $t = 1.568$; $p < 0.1$), supporting H5. Likewise, a positive relationship between work pressure and interpersonal deviance was observed ($\beta = 0.341$; $t = 3.854$; $p < 0.01$), offering support for H7.

Next, the coefficient of determination and predictive relevance of the model were assessed simultaneously by running the blindfolding procedure (Hair *et al.*, 2017). Table 4 shows that the direct effect model explained 40% of the total variance in interpersonal deviance and 22% of the total variance in organisational deviance. Table 4 also indicates that the $Q^2$ value for interpersonal deviance was 0.30 and 0.11 for organisational deviance. Both values exceeded zero, which suggests satisfactory predictive relevance of the model (Henseler *et al.*, 2009). The standard root mean square residual (SRMR) value of 0.07 also shows that the model had a good fit.

The indirect effect of neutralisation was then analysed. As shown in Table 5, the coefficient of determination ($R^2$) was 36.8% (0.368), which suggests that the indirect effect model explained 36.8% of the total variance in interpersonal deviance and 49.2% of neutralisation. After running the blindfolding procedure, the results showed that the $Q^2$ value for interpersonal deviance was 0.280, organisational deviance was 0.011, and neutralisation 0.394. Statistically speaking, all values were greater than zero, signifying acceptable predictive relevance of the indirect model (Preacher and Hayes, 2008).

Furthermore, standard bootstrapping procedure with 5000 bootstrap samples and 356 cases were applied to assess the significance of the path coefficients (Henseler *et al.*, 2015). Figure 4 lends credence to indirect effect results. Meanwhile, Table 5 indicates that the indirect effect of ethical climate on interpersonal deviance via neutralisation (mediator) was found to be significant ($\beta = -0.090$; $t = 3.420$; $p < 0.01$) and predicted interpersonal deviance in a negative direction, thus supporting H9. In keeping with the classical approach, the direct effect of EC→ED was significant ($t = 3.559$) without the mediator variable. When the mediator variable was introduced, the indirect effect remained significant ($t = 3.420$) but lower than when the mediator variable was not incorporated ($t = 2.553$). As such,

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|
| 1. Ethical climate | – | | | | | | |
| 2. Institutional policy | 0.164 | – | | | | | |
| 3. Workload | 0.707 | 0.228 | – | | | | |
| 4. Neutralisation | 0.630 | 0.228 | 0.670 | – | | | |
| 5. Work pressure | 0.659 | 0.144 | 0.828 | 0.676 | – | | |
| 6. Interpersonal deviance | 0.583 | 0.049 | 0.577 | 0.638 | 0.651 | – | |
| 7. Organisational deviance | 0.105 | 0.512 | 0.207 | 0.153 | 0.138 | 0.141 | – |

**Table 3.**
Discriminant validity – (Heterotrait–monotrait ratio (HTMT))

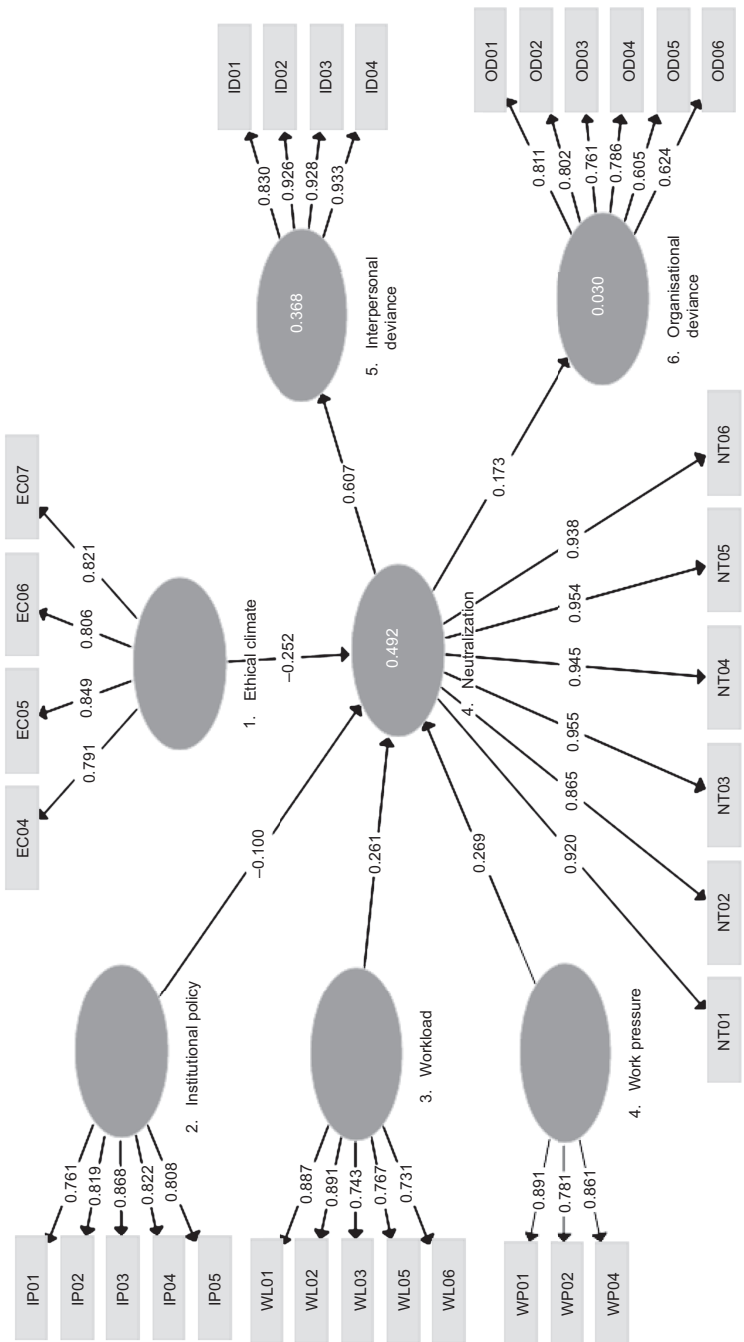
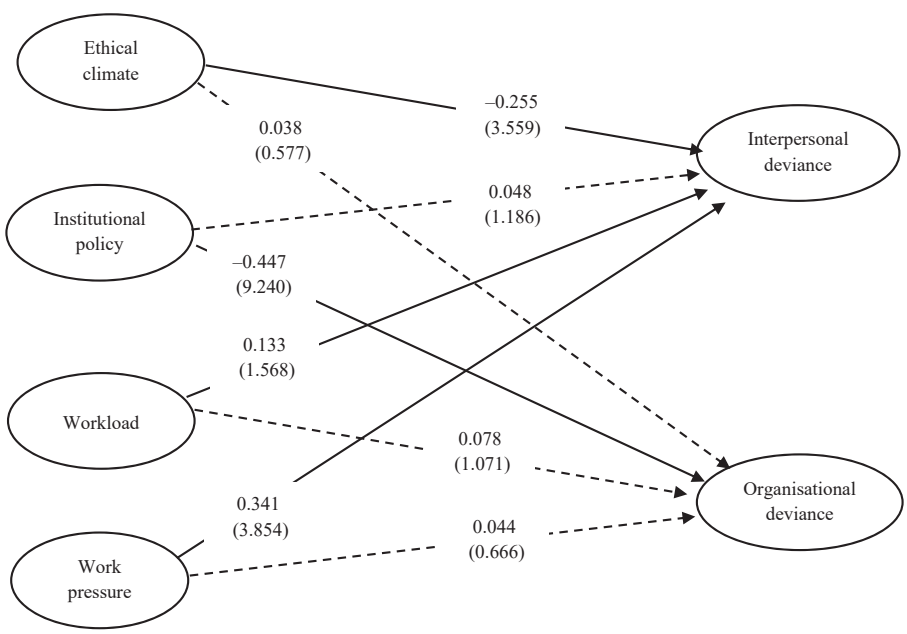



**Figure 2.**
Full measurement model graph

| Hypotheses | Relations | Beta | SE | *t*-value | *p*-value | Findings |
|---|---|---|---|---|---|---|
| H1 | EC → ID | −0.255 | 0.072 | 3.559** | 0.000 | Supported |
| H2 | EC → OD | 0.038 | 0.066 | 0.577 | 0.282 | Not supported |
| H3 | IP → ID | 0.048 | 0.041 | 1.186 | 0.118 | Not supported |
| H4 | IP → OD | −0.447 | 0.048 | 9.240** | 0.000 | Supported |
| H5 | WL -> ID | 0.133 | 0.085 | 1.568* | 0.059 | Supported |
| H6 | WL -> OD | 0.078 | 0.073 | 1.071 | 0.142 | Not supported |
| H7 | WP → IP | 0.341 | 0.089 | 3.854** | 0.000 | Supported |
| H8 | WP → OD | 0.044 | 0.066 | 0.666 | 0.253 | Not supported |
| | | ID | OD | | | |
| | $R^2$ – Interp. deviance | 40% | 22% | | | |
| | $Q^2$ – Org. deviance | 0.30 | 0.11 | | | |
| | SRMR | 0.07 | | | | |

**Note(s)**: **Significant at 0.01 (1-tailed), *Significant at 0.1 (1-tailed). ID = interpersonal deviance, OD = organisational deviance, WL workload, WP = work pressure, IP = institutional policy and EC = ethical climate

**Table 4.**
Direct effect model




**Note(s):** Values in parenthesis represent *t*-values; for solid arrows, results are significant

**Figure 3.**
Direct effect model

neutralisation could be said to partially mediate the relationship between ethical climate and interpersonal deviance, which lent support for H9.

Similarly, the relationship between perceived institutional policy and interpersonal deviance via neutralisation remained statistically significant ($\beta = -0.038$; $t = 2.157$; $p < 0.05$), suggesting that faculty members did not use institutional policy as a justification for interpersonal deviance. Hence, there was statistical support for H11. Neutralisation was also found to mediate the relationship between workload and interpersonal deviance in a positive direction ($\beta = 0.091$; $t = 3.335$; $p < 0.01$), giving support to H13. Similarly, neutralisation was

**Table 5.**
Results of indirect effect model

| Hypothesis | Indirect effect | Beta | SE | *t*-value | 95% CI | *p*-value | VAF | Findings |
|---|---|---|---|---|---|---|---|---|
| H9 | Ethical climate → ID | −0.090 | 0.026 | 3.420 | [0.011; 0.031] | 0.000 | 26% | Partial mediation |
| H10 | Ethical climate → OD | 0.010 | 0.016 | 0.601 | [–0.109; 0.034] | 0.274 | −20% | No mediation |
| H11 | Institutional policy → ID | −0.038 | 0.017 | 2.157 | [0.058; 0.002] | 0.016 | 44% | Partial mediation |
| H12 | Institutional policy → OD | 0.004 | 0.007 | 0.561 | [–0.004; 0.015] | 0.288 | −1% | No mediation |
| H13 | Workload → ID | 0.091 | 0.027 | 3.335 | [0.036; 0.119] | 0.000 | 41% | Partial mediation |
| H14 | Workload → OD | −0.010 | 0.017 | 0.588 | [–0.036; 0.009] | 0.278 | −14% | No mediation |
| H15 | Work pressure → ID | 0.098 | 0.032 | 3.070 | [0.042; 0.139] | 0.001 | 22% | Partial mediation |
| H16 | Work pressure → OD | −0.010 | 0.017 | 0.611 | [–0.040; 0.013] | 0.271 | −31% | No mediation |
| | | ID | OD | Neutra | | | | |
| | $R^2$ – Interpersonal deviance | 0.368 | 0.030 | 0.492 | | | | |
| | $Q^2$ – Organisational deviance | 0.280 | 0.011 | 0.394 | | | | |
| | SRMR | 0.06 | | | | | | |

**Note(s)**: **Significant at 0.01 (1-tailed), *Significant at 0.05 (1-tailed). ID = interpersonal deviance, OD = organisational deviance, WL workload, WP = work pressure, IP = institutional policy and EC = ethical climate

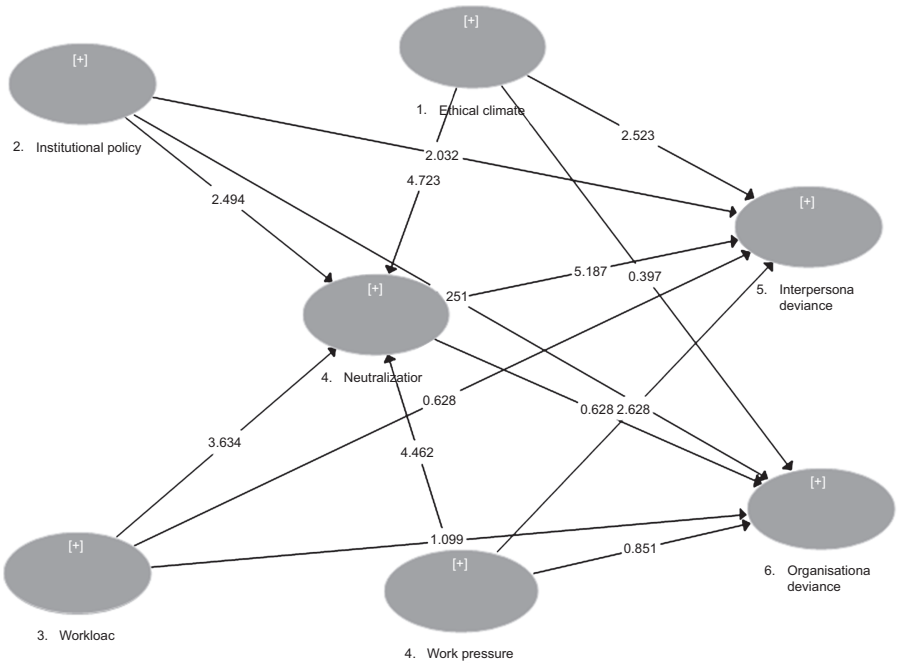



**Figure 4.**
Indirect effect model (mediation)

demonstrated to mediate the relationship between work pressure and interpersonal deviance in a positive direction ($\beta = 0.098$; $t = 3.070$; $p < 0.01$), offering support to H15.

## 5. Discussion

The primary objective of the present study was to validate the application of FTT in explaining deviant workplace behaviour (i.e. organisational and interpersonal deviance). Specifically, our result indicated that the dimensions of opportunity (i.e. ethical climate and institutional policy) and job pressure (workload and work pressure) were significantly linked to workplace deviance. When the ethical climate and institutional policy are perceived to be weak, employees are likely to engage in workplace deviance. Such a finding corroborates the literature (Appelbaum *et al.*, 2005; Lister, 2007; Sauser, 2007; Hooper and Pornelli, 2010; Taştan, 2019). Similarly, high workload and work pressure were also found to increase the likelihood of employee engagement in workplace deviance, supporting past studies (Salami, 2010; Appelbaum *et al.*, 2012). The result also appeared to support the proposition that neutralisation is a psychological mechanism that explains why employees engage in deviant behaviour at work in contrast to the postulation of the FTT that neutralisation or rationalisation is a factor that predicts *directly* undesirable behaviour. That is, faculty staff members justified their engagement in workplace deviance as a result of the poor work conditions. The significant role of neutralisation in mediating the effects of opportunity and job pressure on workplace deviance is in line with the literature (Dabney, 1995; Lim, 2002; Fritsche, 2005).

However, when examining the direct and indirect effects on a specific type of workplace deviance, the result was somewhat unexpected. The faculty members in the present study appeared to engage in interpersonal deviance and not organisational deviance when

opportunity and job pressure were perceived to exist. The result is contrary to the model of and Robinson and Bennett (1995) that employees target their deviant acts at the organisation as a result of the poor treatment they receive. A probable explanation could be contextual. We speculate that despite the weak ethical climate and institutional policy, faculty members did not take the opportunity to engage in organisational deviance because doing so could jeopardise their job. Nigeria is facing a high unemployment rate of 23.1%, an increase from 18.1% in 2017 (Carsey, 2018). In this context, job security becomes a concern for many people, including those working in public universities. The need to retain the job might explain why faculty members did not target the organisation when the work environment was perceived to be poor and unconducive. The literature indicates that employees are likely to be abusive towards their colleagues as a way to vent their anger at the management or the management (De Cuyper *et al.*, 2009; Harold *et al.*, 2016). A survey of 992 employees from employee assistance programme and occupational health provider Health Assured reported that nearly 9 out of 10 (86%) workers regularly vent their anger and frustration at co-workers (Frith, 2018). In the context of the present study, faculty members vented the frustration or anger from the organisation to the colleagues and/or students because the latter was in a more vulnerable position than the former (i.e. colleagues) due to the power gap. Despite the possibility of explaining the result, the job insecurity explanation should be validated further.

The findings of this study provide a theoretical insight into FTT, an alternative framework to understand deviant workplace behaviour. Especially through the mechanism of neutralisation, how opportunity (in this case, poor ethical climate and institutional policy) and pressure (high workload and work pressure) could be used by employees to justify and rationalise their engagement in deviant behaviour at work is better understood. In the literature of workplace deviance, the mechanism to explain why engages in deviant behaviour at work is less explored; only a handful of studies considered the role of the psychological or cognitive process as mentioned earlier. The present study provides empirical evidence that such a process is important to enhance our theoretical understanding of the negative phenomenon at work. While the mediation role of neutralisation is observed in this study, more research is needed to further confirm its significance or other psychological or affective states as a result of the perceived negative work environment. Also, future studies may want to explore the neutralisation techniques used by employees in the context of poor work conditions or environment. Moreover, contrary to expectation, the significant effect of opportunity and job pressure on interpersonal deviance and not on organisational deviance deserves more attention.

The findings benefit policymakers and management of public higher education institutions in Nigeria, particularly in managing workplace deviance. The result points out the need to strengthen the implementation of institutional policies and enhance the ethical climate of the institutions in curbing workplace deviance. Weak enforcement of institutional policy and ethical climate provides an avenue for employees to engage in workplace deviance because of the perception that such behaviour may not bring any adverse consequences to the perpetrator. Much is known about the high level of workload and work pressure faculty members in public universities in Nigeria are facing (Ofoegbu and Nwadiani, 2006; Ogunsanya and Olorunfemi, 2012; NEEDS Report, 2012; Ikonne, 2015). Even though the present study did not explore the antecedents of workload and pressure because such investigation is beyond the scope of the study, it could be speculated that inadequate government funding could explain the poor work conditions of the sampled institutions (Okiy, 2005; Ikonne, 2015). In short, as the finding indicates that poor work environment can be used to justify workplace deviance, the management of public universities should take concerted effort to make the work environment more conducive to mitigate the opportunity to justify the deviant behaviour.

While the results of the present study are insightful, they need to be interpreted by considering the following limitations. Firstly, the cross-sectional nature of the present study

makes it impossible for causal inferences. Hence, this study needs to be replicated using longitudinal research or experimental design. Secondly, the sample was drawn from faculty members in public universities, which may limit the generalisation of the findings. In Nigeria, private universities tend to have better financial standing, which translates to better facilities and infrastructure for the faculty members (Akpotu and Akpochafo, 2009; Ajadi, 2010). Hence, if our speculation is correct, in such institutions, issues related to workload and pressure may be less likely (Akpotu and Akpochafo, 2009; Ajadi, 2010). However, to what extent this is likely to affect workplace deviance needs to be examined. By considering the faculty members in private universities, a better generalisation of the phenomenon under study could be achieved. Also, because the present study was conducted in Nigeria, we recommend future studies to consider cross-country investigations to compare the present findings with the results from other countries.

Various opportunities exist for future research in addition to those mentioned above. One of them is the possibility of investigating a boundary condition that will either mitigate or reinforce the neutralisation process. Personality traits, such as self-control or personal values, may be able to help us understand when one is likely to strengthen his/her justification to engage in deviant behaviour at work in a particular work environment. Secondly, since the dimensions of opportunity and pressure are widely defined in FTT, future researchers may consider predictors or variables that fall within each domain. In these two instances, the theory is likely to be further refined and improved. Thirdly, for a meaningful comparison, future researchers may wish to carry out the same survey outside Nigeria and across organisations. By doing so, it is possible to gauge the level of the pervasiveness of workplace deviance and demonstrate the need to address it because of the harm it could bring.

## 6. Conclusion

To ignore deviant workplace behaviour is to allow the erosion of organisational standards, regulations and norms, which are likely to lead to organisational deterioration. Although deviant workplace behaviour is an international phenomenon, the present study focussed on public universities in Nigeria because such a phenomenon has been personally acknowledged as a national problem by President Muhammadu Buhari (Babachir, 2015). As the present study has demonstrated, deviant behaviour may not be exhibited when the organisation is perceived to have a good work environment, characterised by ethical climate, proper enforcement of institutional policy, and reasonable workload and work pressure. However, more research needs to be carried out to support the finding further and by considering other institutional and work-related factors so that a better understanding of the phenomenon and the implementation of preventive measures can be undertaken.

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**Corresponding author**
Michael Olalekan Adeoti can be contacted at: adeoti_michael@oyagsb.uum.edu.my

# Perceived understanding of supply chain integration, communication and teamwork competency in the global manufacturing companies

Yudi Fernando
*Business Engineering Department, Faculty of Industrial Management, Universiti Malaysia Pahang, Kuantan, Malaysia and Management Department, BINUS Online Learning, Bina Nusantara University, Jakarta Barat, Indonesia, and*
Puspita Wulansari
*School of Economics and Business, Telkom University, Bandung, Indonesia*

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## Abstract

**Purpose** – This study empirically examines a model that describes the direct path from perceived understanding of supply chain integration (PUSCI) to perceived understanding of supply chain responsiveness (PUSCR) to leverage supply chain manager's communication and teamwork competencies. This study also examines whether knowledge and task skill and proficiency mediate the relationship between PUSCI and PUSCR to improve the communication and teamwork competency of a supply chain manager.

**Design/methodology/approach** – The data were collected using a survey questionnaire that was mailed to the 413 supply chain managers of global manufacturing companies in Indonesia.

**Findings** – The result from model testing shows that PUSCR significantly and positively affected the communication and teamwork competency of supply chain manager and knowledge, task skill and proficiency as mediating variables improved communication and teamwork competency. The results found that PUSCI was related to supply chain manager's competency.

**Practical implications** – Supply chain managers are advised to focus on PUSCI and consistently improve effective communication and teamwork competency.

**Originality/value** – This study will extend the literature by utilizing the competency-based theory to investigate the perceived understanding and communication capabilities of supply chain managers.

**Keywords** Perceived understanding, Supply chain integration, Supply chain responsiveness, Supply chain manager, Global manufacturing

**Paper type** Research paper

## Introduction

Globalization is inevitably shaping our daily lives, as the interrelationships and interdependencies among and between countries have increased and steadily grown (Kim and McLean, 2015). The globalization of supply chains implies that various infrastructures, climates and cultures now affect the production of many goods and services (Simangunsong



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*et al.*, 2016). Global sourcing and cost reduction initiatives drive companies to work with a diverse set of suppliers (Kattman, 2014) and these cause supply chain management (SCM) to be more complex than ever before (Hohenstein *et al.*, 2014). The role of a supply chain manager has become critical in both achieving a company's operational objectives and in successfully implementing its business strategy, especially when competing globally. The supply chain managers need to improve a set of skills consistently. They should not rely much on personal relationship in inter–firm relationships. It will be triggered of various conflicts when the supply chain underperforms (Butt and Ahmad, 2019). Therefore, nowadays to have a competent supply chain manager is a key driver of business success (Prajogo and Sohal, 2013). Thus, the globalization phenomenon has impacted the development of SCM in practice and in research (Shou and Wang, 2017).

To recruit, train and retain a qualified supply chain manager is not an easy task. A company must perform a series of human resource activities, which are selecting, training and retaining competent supply chain managers (Harvey *et al.*, 2013). A successful supply chain manager must possess the necessary talents to execute a comprehensive SCM strategy, tackle the day-to-day operational challenges and interact with other departments and external network partners on a global scale. Unfortunately, even though supply chain is known to be a critical management function of a company in competing globally, the literature on talent management in SCM remains scarce. The limited literature on the development of talented supply chain managers has caused increasing challenges to measure the competence of supply chain professionals. The skills needed are several and include technical skills and soft skills. Technical skills and soft skills are two main competency domains that contribute to the knowledge of a supply chain professional, and these will assist them in making business decisions. A supply chain manager is expected not only to have technical knowledge and job competencies, but the ability to communicate and coordinate effectively via teamwork. This is critical because the supply chain involves multiple companies across the countries.

Two crucial competencies that a supply chain manager faces in a rapidly changing environment are communication and teamwork. Prajogo and Sohal (2013) and Essex *et al.* (2016) concurred that communication and teamwork were critical domains for a competent supply chain professional in facing future business challenges. The ability to communicate with others is critical for practitioners (Gammelgard and Larson, 2001). Good communication and negotiating skills means that they can connect with other businesses, suppliers and customers (Wu *et al.*, 2013; Cotrill, 2010). Indeed, Barhem *et al.* (2011) and Tabassi *et al.* (2016) believed that among the most important competencies for a successful supply chain manager were good communication skills. Additionally, however, supply chain managers should be able to integrate, communicate and analyze financial performance, maintain good industry and customer relations and understand regulations and laws from international perspective (Wu *et al.*, 2013).

A dearth of studies exists in both supply chain and strategic human resource management literature with respect to a lack of a proper understanding of supply chain integration and responsiveness of supply chain managers. It leads to lack of resource to design and delivery of proper technical and strategic training for supply chain managers. This study will extend the literature by utilizing the competency-based theory to investigate the perceived understanding and communication capabilities of supply chain managers.

Conducing more comprehensive study to develop programs that lead to the preparation of more competent supply chain manager is now more necessary than ever before. In rapidly globalizing economies, supply chain managers must be able to quickly identify and react to the marketplace, customer needs and environmental changes. Especially with respect to dealing with routine activities regarding cross-functional activities in a company and inter-organizational activities in the global context, supply chain managers should be able to cope

with integration and be responsive to supply chain requirements. Effective communication and teamwork will come after the supply chain manager has achieved technical competencies, knowledge and task contextual. The supply chain manager must be proficient in technical competencies including how to assess the integration and responsiveness of supply chain networks. Therefore, supply chain integration (SCI) and supply chain responsiveness (SCR) are among the key activities involved in supply chain process that supply chain managers must master (Wu *et al.*, 2006).

Both SCR and SCI are activities in SCM that are closely related to the interactions of people within a company or people in an inter-organizational context. Ghosh *et al.* (2014) defined SCR as the ability to react to sudden or immediate changes in the marketplace and responding to customer needs in a reliable and timely manner. SCR is an issue with which supply chain manager in a global context must deal (Prajogo and Sohal, 2013), and SCI has become the centerpiece of today's SCM (Huo *et al.*, 2015). In their daily operation activities, supply chain managers should master communication and teamwork competencies because the successful implementation of SCI relies on human resources (Bendoly *et al.*, 2006). Unfortunately, many scholars have neglected the role of human resources in SCI (Sweeney, 2013; Ellinger and Ellinger, 2014). From the HR perspective, two major challenges that a supply chain manager faces during supply chain integration are collaboration across companies that involves supply chain networks and real-time communication. Effective communication and teamwork are the main domains of soft factors influencing supply chain integration. Customer satisfaction, flexibility, agility and operational performance will impact the effective implementation of a supply chain strategy. If a supply chain manager is not competent and a company is unable to cope with market requirements, then these deficiencies potentially will lead to business losses.

This paper sheds light on emerging research areas of SCM which investigate the supply chain manager's competency. This paper is designed to extend the literature on SCM talent development by looking at that development from a human resource perspective. The intersection of SCM and HR will open a new field of research especially in conceptualization of the model emphasizing the management of SCI and SCR to improve the communication skills and teamwork competency of supply chain managers. Thus, this paper makes a practical contribution on the drivers of supply chain manager competency. Supply chain managers can need to enhance the perceived understanding of supply chain integration (PUSCI) and perceived understanding of supply chain responsiveness (PUSCR) as key SCM practice success factors. SCI and SCR are critical contents to be included in the design of training and development programs of a professional supply chain manager. If a supply chain manager does not have the ability to understand how a company's operation can be integrated strategically, the supply chain manager is unable to communicate with other supply chain networks across companies, then this inability will impact the overall supply chain performance.

## *Review of the literature*

SCM has gained popularity because of intensified global competition and value-seeking initiatives (Fernando and Saththasivam, 2017). The essence of supply chain is a business process, comprising technical, operational and social integration (Elbanna, 2007). Technical integration is hardware and software integration, operational integration is streamlining the business processes and social integration in the ability to work in teams, groups and as individuals, taking care of technical and operational integration (Ghosh *et al.*, 2014).

SCI is the degree to which a firm strategically collaborates with its supply chain partners and collaboratively manages intra- and inter-organization processes (Ghosh *et al.*, 2014) to achieve effective and efficient flows of products and services, information, money and

decisions to provide maximum value to the customer (Flynn *et al.*, 2010). Business costs can be reduced by conducting collaborative integration between supply chain partners through the better alignment of incentives and reward systems to minimize inefficient resource utilization and non-value adding activities (Ellinger and Ellinger, 2014).

The ability to understand the integration and teamwork between supply chain participants has become necessary in SCM practices (Sweneey, 2013). Integration means sharing information, resources and risks, proactive communication, joint development of supply chain processes and coordinating plan and decision-making within and among supply chain participants. Teamwork means developing a co-operative relationship between supply chain participants as a requirement in creating customer value. To achieve a competitive advantage in the marketplace, a unified effort among an interdependent supply chain's participants is required (Ellinger and Ellinger, 2014).

The effectiveness of a company's supply chain and how fast that supply chain reacts to the rapidly changing marketplace can create competitive advantage for a firm and the ability of a firm's supply chain to respond is called SCR (Kim *et al.*, 2013; Ghosh *et al.*, 2014). Most previous scholars have highlighted that the scope of supply chain responsiveness mostly resides in the network of players operating the supply chain, which represents the ability of a company to respond to market changes whether these come from company itself, supply chain partners and how their collaborative effort to overcome the changes (Squirre *et al.*, 2009).

SCI and SCR are SCM practices that must face rapid changes in the market as the consequence of globalization. Both activities rely on the ability of a person to manage the technical and managerial challenges in an organization. Previous scholars have found a shortfall in SCM talent management to do so, caused by lack of understanding by senior level managers about the importance of SCM strategy, so that priority placed on improving SCM resources remains limited (Ellinger and Ellinger, 2014).

To resolve the SCM talent shortfall, scholars must reconsider the development of SCM personnel with the necessary skills and business-related competencies in managing strategically important and complex supply chain processes (Cotrill, 2010; Christhoper, 2012). Thus, developmental approaches to overcome the SCM talent shortfall are required (Ellinger and Ellinger, 2014), especially for supply chain managers who hold a strategic function in a company and who hold critical position for business decision-making. This study defines PUSCI as the ability of a supply chain manager to understand how to create a network with strategic supply chain partners for business integration in four functional areas including procurement, production, inventory and distribution. The PUSCR is defined as the ability of a supply chain manager to understand the variety of customer's needs and the ability to respond to unpredictable changing market demands using qualitative and quantitative metrics.

In facing rapidly changing markets, companies must be able to respond quickly and effectively by integrating intra- and inter-organizational supply chain partners. Supply chain managers who have effective communication and teamwork competencies can be expected to resolve challenges. To achieve those competencies, supply chain managers must be provided with qualified training and development programs from HR departments, and competency-based training and development must be conducted continuously. To conceptualize the relationship among variables in the research model, this study extended the task-contextual competency model (Ajayi *et al.*, 2016). The proposed extended model was designed to conceptualize competency-based training and development to create a qualified manager. The research model used was based on competency-based training and competency theory (McClelland, 1973; Boyatzis, 1982; Spencer *et al.*, 1993).

The definitions of competency theory include knowledge, skills and attitudes that allow individuals to express job behavior and achieve that which an organization needs to provide a

particular performance for each workplace (McClelland, 1973; Meethongjan and Tachpetpaiboon, 2015). The competency-based approach to human resource management has become integral during the last thirty years, the competency theory involving some pillars including knowledge, skills, attitude, traits and behaviors that allow individuals to perform tasks within a specific function or job (Boyatzis, 1982). Below are competencies and skills that must be mastered by a supply chain manager (Table 1).

*Theoretical framework*

This study has conceptualized the SCM constructs based on the perceived understanding of the supply chain manager of SCI and SCR. The perceived understanding of SCI and SCR will lead to a competent supply chain manager who performs tasks proficiently and knowledgeably. This is in line with competency theory that posits if the supply chain manager has skills and knowledge of the SCI and SCR, then these will allow them to perform their tasks better. Thus, supply chain managers must have PUSCI and PUSCR to leverage the knowledge and task skills proficiency to communicate and develop teamwork effectively to manage the complexity of global supply chains. Figure 1 shows the theoretical framework research model. Based on the review of literature, this study proposed research hypotheses that seek empirical justification.

According to Cahn (1983), the perception of understanding is part of an individual's assessment of his or her success based on his/her understanding of certain interactions and experience. The feeling of being understood about something will then lead to the ability to convey the information or solution to others. Effective communication assists an individual with working in a team effectively. Perceived understanding is critically essential when an individual needs to be capable of handling technical competency. Viitala (2005) defined technical competencies as the managers' ability to handle procedures, tools and methods in a specialized field that usually represent skills and knowledge. Suttiwatnaruput *et al.* (2014) found that managerial skills, technical knowledge and application are among complementary drivers to achieve a higher level of supply chain integration. Thus, the implementation of supply chain integration needs technical competence, and one of critical domains for business performance improvement is SCI. Besides that, good communication is an enabler to mutual trust among the supply chain partners (Mandal and Sarathy, 2018). To integrate the business function including business processes and information among supply chain networks, the strong commitment of stakeholders and resource allocation from management is needed. A perceived high level of understanding on how the supply chain integration can be implemented successfully will help a supply chain manager to communicate effectively with a team. The link from one variable to another is stated in H1.

*H1.* The perceived understanding of supply chain integration by supply chain managers will have a positive and significant impact on communication and teamwork.

The complexity of supply chain network across countries has increased the demand for better SCM practices. Christopher (2012) argued that companies' ability to cope with supply chain complexity will impact on business competitiveness improvement. A supply chain manager needs to build responsive supply chains to meet the market demands. Lau and Lee (2000) posit that organizations restructure and streamline using knowledge work teams, and information flow in the supply chain can improve company capacity to become more responsive to changing market demands. The company can use a range forecast, supply capacity, visibility and analysis to build responsive supply chains. To accommodate market demands, a range forecast is useful to foresee price, product/service varieties and supply volume. The supply capacity, visibility and analysis can provide the risk mapping, monitoring and risk mitigation strategy to manage the bullwhip effect (demand fluctuation),

**Table 1.**
Supply chain manager competencies and skills

| No | Dimensions | Wu *et al.* (2013) | Gunasekaran (2015) | Harvey *et al.* (2013) | Prajogo and Sohal (2013) | Shou and Wang (2017) | Derwik *et al.* (2016) | Barhem *et al.* (2011) | Essex *et al.* (2016) | Kiessling *et al.* (2014) | Thai *et al.* (2011) | Christopher (2016) | Tatham *et al.* (2017) | Jordan and Bak (2016) | Dubey *et al.* (2018) | Campos *et al.* (2019a, b) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | International perspective | √ | | | | | | | | √ | | | | | | |
| 2 | Perform financial | √ | | | | | | | | | | | | | | √ |
| 3 | Understand law, ethics and regulations | √ | √ | | √ | | | | | √ | | | | √ | | √ |
| 4 | Communication | √ | √ | √ | √ | √ | √ | √ | | | √ | | √ | | √ | √ |
| 5 | Statistical analytical | √ | | | | √ | | | | | | | | | √ | |
| 6 | Cross-functional awareness | √ | | | | | | | | | | √ | | | √ | |
| 7 | Risk management | √ | | | | √ | | | | | | | | | | |
| 8 | Influencing people | √ | √ | | | | | | | | √ | | | | | |
| 9 | Raw material planning | √ | | | | | | | | | √ | | | | | |
| 10 | Organizing | √ | | | | | | | | | | | | | √ | |
| 11 | Listening | √ | | | | | | | | | | | | | √ | |
| 12 | Negotiation | | √ | | | | | | | | √ | | √ | | √ | |
| 13 | Conflict management | | √ | | | | | | | | | √ | √ | | | |
| 14 | Team building | | √ | | | | | | | √ | | | | | | |
| 15 | Strategic business | | √ | | | | | | | √ | | | | | | |
| 16 | Quantitative methods | | √ | | | | | | | | | | | | √ | |

(*continued*)

| No | Dimensions | Wu *et al.* (2013) | Gunasekaran (2015) | Harvey *et al.* (2013) | Prajogo and Sohal (2013) | Shou and Wang (2017) | Derwik *et al.* (2016) | Barhem *et al.* (2011) | Essex *et al.* (2016) | Kiessling *et al.* (2014) | Thai *et al.* (2011) | Christopher (2016) | Tatham *et al.* (2017) | Jordan and Bak (2016) | Dubey *et al.* (2018) | Campos *et al.* (2019a, b) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 17 | Leadership | | √ | | | √ | | | | | | | √ | | | √ |
| 18 | Continuous learning | | √ | | | √ | | | | | | √ | | | | |
| 19 | Spreadsheet Modeling | | √ | | | | | | | | | | | | √ | |
| 20 | Cultural learning | | | √ | | | | √ | | √ | | | | | | |
| 21 | Initiative and enterprise | | | | √ | | | | | | | | | | | |
| 22 | Technology (computer) | | | | √ | | √ | √ | √ | | | √ | √ | √ | √ | √ |
| 23 | Exposure to ERP | | | | | | | | | | | | | | √ | |
| 24 | Problem solving | | | | | | | | | | √ | | | √ | | √ |
| 26 | Diversity management | | | | | √ | | | √ | √ | | | | | | |
| 27 | Change management | | | | | | | | | | | √ | | | | |
| 28 | Project management | | | | | √ | | | | | | | | | √ | |
| 29 | Knowledge to industry | | | | | | | | | | | | | | √ | |
| 30 | Decision-making | | | | | √ | | | | | | | | | √ | |
| 31 | Cost control | | | | | | | | | | √ | √ | | | | √ |
| 32 | Collaborative | | | | | | | | √ | | | √ | √ | √ | | |

**Table 1.**

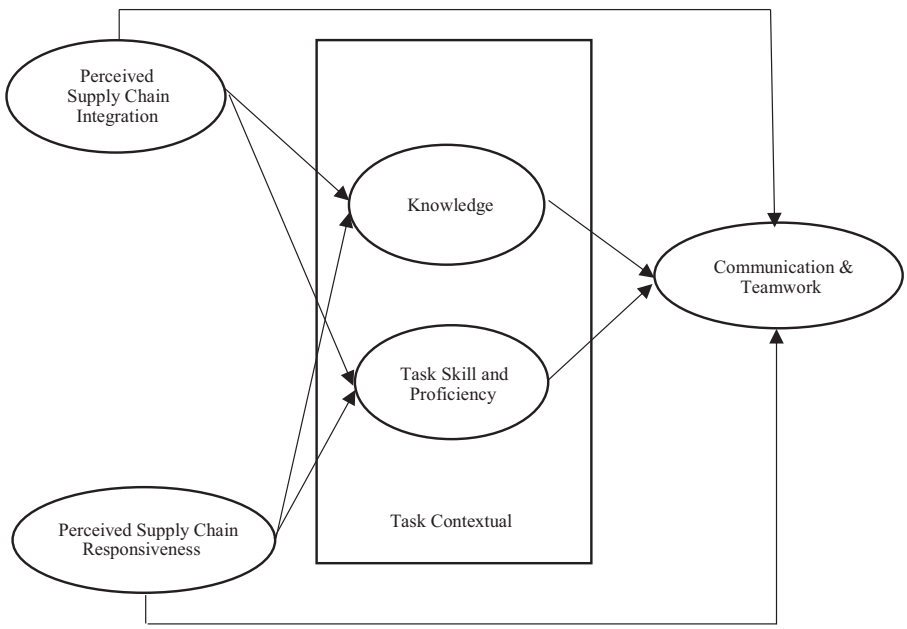


**Figure 1.**
Theoretical framework

supplier risk etc. The collaboration among supply chain networks will assist a supply chain manager in designing a supply chain strategy that is able to respond to market demand that fits with a firm's resources. According to Katiyar *et al.* (2018), a common issue for firms is that they are sometimes unaware of the appropriate performance metrics for SCM. Supply chain responsiveness is part of operational performance, and the supply chain should be capable of being responsive. The supply chain professionals need knowledge of a broad range of technologies to respond and communicate both intra-company and inter-company (Prajogo and Sohal, 2013). An understanding of a supply chain manager about how fast they should respond to market demand is based on how good they can use communication skills and technologies. If they are capable of communicating a request from the market to supply chain networks, then the established teamwork will deliver fast and reliable support to the market. Thus, H2 is stated as follows.

*H2.* The perceived understanding of supply chain responsiveness by supply chain managers will have a positive impact on communication and teamwork.

Understanding the concept and practice of supply chain integration will assist a supply chain manager in continuously improving firm operational performance to achieve integration at both the strategic and tactical level, and an effective SCM framework must coordinate all the scheduling and rescheduling across supply chain mechanisms (Parwez, 2016). Truly understanding best practices for supply chain integration is not an easy task because supply chain integration encompasses technical and managerial domains. The technical domains cover the horizontal (the same level of chains) and vertical integration (different levels of chains) needed to understand the outsourcing process and supply chain activities. Enabling supply chain integration is a dynamic process, if need be, supply chain designs can be reviewed and modified (Bhaumik, 2015). Managerial competency will focus on accessibility to utilize firm resources for supply chain integration and work closely with supply chain networks. Only by understanding the concept will a supply chain manager be able to have

knowledge to link global networks into a closer working relationship. Thus, this paper hypothesized in H3a.

*H3a.* The perceived understanding of supply chain integration by supply chain managers has a positive and significant impact on knowledge.

A supply chain manager needs to design supply chain integration to reduce costs and improve firm flexibility. The different development level of supply chain integration has different capabilities for cost reduction (Kim, 2006). The idea of supply chain integration is to bring all the networks involve in the supply chain to work closely together. The outcome is expected to reduce costs and improve productivity. The supply chain manager is expected to design, supply chain integration that fit with business strategy. There are two options that a supply chain manager can consider to design the supply chain integration for cost reduction. The first option is horizontal integration. The supply chain manager can bring all the vendors/ suppliers into the same level of the chain. The cost reduction can be achieved if the all networks can be integrated into the similar level with the central processing unit to control raw materials supply price and quantity. Vertical integration can be considered as the second option. To reduce cost, the supply chain manager can design the movement of procurement from the different tier or level of the chain. This is can tighter coordination with other supply chain networks by purchase materials or supply of semi-finished product ahead before the company. Vertical integration will assist the firms to handle the movement from upstream and downstream level of the supply chain.

A capable supply chain manager will be able to achieve integration among supply chain networks across the countries if their have sufficient task skill and proficiency. Despite the supply chain managers have rich analytical skills and the ability to evaluate and select the supply chain partners, the lack experience to deal with soft skills to support the effective team building still needs improvement. The soft skills like empathetic and intuitive (right brain) are required task skills and proficiency for supply chain manager to achieve successful supply chain integration (Christopher, 2012). Task skills and proficiency in the implementation of supply chain integration will help a supply chain manager to leverage firm performance and assist a firm to compete effectively. One reason for implementing supply chain integration is to reduce costs. A firm needs to find best way to leverage supply chain competencies, firm resources and skills across its supply chain network (Mohammaddust *et al.*, 2017). An understanding of how to coordinate supply chain integration will help a supply chain manager to improve his/her task skill and proficiency in handling the complexity of supply chain. To solve the supply chain integration issues, a supply chain manager need to be creative. According to Sia and Appu (2015), the freedom given to an employee has a significant impact the on employee creativity. Thus, this paper postulated H3b as follows.

*H3b.* The perceived understanding of supply chain integration by supply chain managers will have a positive and significant impact on task skill and proficiency.

Supply chains frequently encounter business issues that a need quick response with the support of decision-making tools regarding uncertain demand, raw materials price, availability of production capacity and costing, logistics, custom and distribution channels. To increase firm level responsiveness, supply chain managers often collect useful information regarding the drivers, which affect both demand and supply (Williams *et al.*, 2013). A critical part of the success of supply chain implementation resides in the knowledge and experience of *s* supply chain manager to respond to market demand wisely. According to Walters and Rainbird (2004), the SCM should be driven by the market and not driven by suppliers. A combination of knowledge, skills and work experience deals with market demand are critical factors to create the competencies required for supply chain

managers to excel in their careers (APICS, 2014). A supply chain manager is considered a being in a strategic position in a firm and must exhibit the required leadership skills and behavior. Thus, supply chain managers should act like leaders and managers. Their leadership skills are required to develop human capital in supply chain networks. To some extent these leadership behaviors have effects on employees' skills, knowledge, capability and commitment (Birasnav, 2013). Thus, this paper posits the following hypothesis in H4a.

*H4a.* The perceived understanding of supply chain responsiveness by supply chain managers will have a positive and significance impact on knowledge.

Understanding the best practices about how to respond market demand will lead to ability of a supply chain manager to deliver task skill and proficiency. Williams *et al.* (2013) said that supply chain managers need find clarity with respect to what information is actually valuable. Their findings indicated that a strategy for achieving supply chain responsiveness requires a dual-pronged approach aligns increased visibility of valuable information with extensive information processing capabilities. In turn, a greater level understanding of supply chain managers on how to respond market demand and supply will help to leverage their task skills and proficiency to design an integrated information flow and handle the bullwhip effect. Supply chain responsiveness refers to the firm ability to provide the right product at the right time to the customer (Moyano-Fuentes *et al.*, 2016). Thus, hypothesis H4b is posited as follows.

*H4b.* The perceived understanding of supply chain responsiveness by supply chain managers will have a positive and significant impact on task skill and proficiency.

Knowledge that was derived from the ability to understand supply chain integration and responsiveness will be effective if the manager can communicate to with supply chain partners using people skills and establish teamwork among supply chain network. Körner *et al.* (2016) postulated that knowledge integration come from the process of building shared mental models. Knowledge integration has been confirmed to positively affect teamwork and team performance. The supply chain managers should share their supply chain knowledge and practice open communication. According to Rubel *et al.* (2017), open communication will lead to employee commitment in a long-lasting relationship. The relationship among variables is postulated in the H5.

*H5.* Knowledge will have a positive and significant impact on communication and teamwork.

Supply chain managers are required to have task skill and proficiency in handling supply chain complexity, which often with multiple channels and the conflicting business strategy with profit-cost analysis, responsiveness and service level, among others (Bhaumik, 2015). Supply chain managers need to demonstrate their leadership capabilities by practicing effective communication and teamwork. The task skills and proficiency required will be more challenging if supply chain managers are required to coordinate supply chain networks that have different cultures and languages. Supply chain managers are role models in a firm and have a responsibility to serve as a coach and mentor. Hypothesis H6 will be stated below.

*H6.* Task skill and proficiency will have a positive and significant impact communication and teamwork.

Knowledge is among the most critical resources to compete in a market based on a knowledge economy (Pillania, 2006). Sufficient knowledge that can be derived from an understanding of supply chain integration will help in leveraging resource utilization to integrate the upstream and downstream supply chain networks with good communication

skills and teamwork. Knowledge about supply chain integration will be conveyed properly to multiple channels, yet solid teamwork is only established if a supply chain manager can use people skills to coordinate supply chain networks and achieve mutual goals. Thus, H7a below is posited.

*H7a.* There is a mediating effect of knowledge on the relationship between perceived understanding of supply chain integration and communication and teamwork.

The relationship between the PUSCR in handling market volatile and the ability of a supply chain manager to communicate to a team will be greater if the knowledge of a supply chain manager is sufficient to immediately make a strategic decision. The supply chain managers need to quickly respond to market demand and requirements with a better understanding of supply chain responsiveness concepts and tools. The intervening variable of knowledge will leverage the link from understanding responsiveness concept in supply chain to effective communication and teamwork. According to Mandal and Sarathy (2018), the adaption on the rapid responses to environmental changes is a prerequisite for supply chain resilience. In fact, the adaptation requires good communication. The paper postulated H7b as follows:

*H7b.* Knowledge mediates the relationship between perceived understanding of supply chain responsiveness and communication and teamwork.

The ability to understand the concept of supply chain integration will be helpful in effectively communicating supply chain teamwork across sectors and countries, if supply chain managers have a greater capacity to grasp the task skills and proficiency needed to manage the strategical and operational levels. Task skills and proficiency will mediate the relationship perceived understanding integration and communication in teamwork, and if managers truly understand how supply chain integration will be established via an understanding can be garnered from the facts and figures at hand. It will work if supply chain managers have the ability to track critical events and activities in supply chain sharing systems. Parwez (2016) highlighted that SCM systems are supporting tools to assist a supply chain managers handling abnormal business trends. As events unfold, the system can track critical events and activities and will out alerts and messages to notify appropriate managers to take corrective actions. Supply chain managers should communicate the unexpected event from a market requirement to the supply chain team to gain business sustainability. Thus, hypothesis H8a is posited.

*H8a.* There will be a mediating effect of task skill and proficiency on the relationship between perceived understanding of supply chain integration and communication and teamwork.

Being quickly responsive to market demand will reduce negative impacts to business performance, and supply chain managers are expected to have sufficient task skill and proficiency to manage inaccurate forecasting in the market. Furthermore, the task skills and proficiency of supply chain managers can mediate the relationship between understanding of supply chain responsiveness on effective communication and teamwork. If these task skills and proficiency do not react to market demand wisely, this will yield supply chain inefficiencies as supply chain managers will wrongly predict market demand and fluctuations. The ability to respond to the uncertainty of market demand can be developed if supply chain managers can create atmosphere of open participation for its supply chain members. In turn, open participation can create opportunity for sharing and exchanging valuable risk management knowledge and expertise (Mandal and Sarathy, 2018). The connection between variables is stated in H8b.

*H8b.* There is a mediating effect of task skill and proficiency on the relationship between perceived understanding of supply chain responsiveness and communication and teamwork.

## Methodology

The data were collected using a survey questionnaire that was mailed to the 413 supply chain managers of global manufacturing companies in Indonesia. The supply chain managers were key informants from managerial positions (Fernando *et al.*, 2015). The survey was restricted to global manufacturing companies that were actively conducting export and import activities, including raw materials, semi-finished products and final products. The data collection procedure involved several steps. The first was contacting the companies to ensure their interest and that they met the survey requirements and to see if they were interested and would agree to participate, a questionnaire was mailed with a follow-up contact. The questionnaires were sent to 413 companies who agreed to participate. The companies were given three weeks to respond the survey with follow up a procedure. However, 209 respondents unable to meet the deadline given due to a hectic workload, and 204 useable responses were ultimately collected for a response rate of about 49%. The survey instrument used a 5-point Likert-type scale with answers ranging from 1 strongly disagree) to 5 (strongly agree).

### *Data*

More than one-half of the respondents were male (60.8%), and the rest were female (39.2%). As for age, the majority of the respondents were between 41 and 45 years old (43.6%), whereas other respondents were more than 45 years old (29.9%), 35–40 years old (21.6%) and less than 35 years old (4.9%). Regarding the company profile, the sample represented a wide variety of industries, food, beverage and tobacco comprised 21.6%, textile and garment/leather goods and footwear (19.6%), automotive and heavy machinery (15.2%), cement and non-metal minerals/basic metal products (12.3%), fertilizer and agriculture (10.3%), information technology and telecommunications/electrics and electronics/green technology/renewable energy (8.3%) and chemical and rubber products and paper and printing products/timber and forest products (6.4%). Most of the companies imported their raw materials (38.6%) from China and India. About 68.6% sold their products to Asian, the United States, Europe and Middle East counties.

*Construct validity.* To test construct validity, Hair *et al.*'s (2017) procedure was used to ensure that the data were suitable for structural equation modeling (SEM) with partial least square (PLS) statistical software. SmartPLS was used to analyze the data collected for this study (Fernando *et al.*, 2018). Construct validity helped to ensure that items underlying the constructs of an instrument were derived from an extensive review of relevant literature and evaluation by academicians or practitioners (Hair *et al.*, 2017). Convergent validity tested the degree to which multiple items that measured the same concept agreed with that concept (Hair *et al.*, 2017). Hair *et al.* (2017) suggested using factor loading, composite reliability (CR) and average variance extracted (AVE) to access convergent validity.

The assessment results of convergent validity and CR are given in Table 2. Table 2 indicates that all the outer loadings were greater than 0.7, while the value of average variance extracted (AVEs) were greater than 0.5, and CR values were more than 0.7. Therefore, convergent validity and CR of construct are considered satisfactory, which means that the research model is valid and reliable.

In addition to convergent validity and CR, discriminant validity measures the degree to which items differentiate among constructs or measure distinct concepts. It examines the

| Measurement items | CT | *K* | SCI | SCR | *S* |
|---|---|---|---|---|---|
| 1 | 0.895 | 0.850 | 0.835 | 0.746 | 0.832 |
| 2 | 0.890 | 0.835 | 0.789 | 0.745 | 0.922 |
| 3 | 0.886 | 0.798 | 0.783 | 0.867 | 0.893 |
| 4 | 0.796 | 0.757 | 0.804 | 0.903 | 0.912 |
| 5 | 0.901 | 0.750 | N/A | N/A | 0.816 |
| AVE | 0.764 | 0.638 | 0.645 | 0.670 | 0.768 |
| CR | 0.942 | 0.898 | 0.879 | 0.890 | 0.943 |

**Note(s)**: CT = Communication and Teamwork; *K* = Knowledge; PUSCI = Perceived Understanding of Supply Chain Integration; PUSCR = Perceived Understanding of Supply Chain Responsiveness; *S* = Skill; N/A = Not Applicable (SCI & SCR only have 4 measurement items)

**Table 2.**
Convergent validity

| | CT | *K* | PUSCI | PUSCR | TP |
|---|---|---|---|---|---|
| CT | | | | | |
| *K* | 0.381 | | | | |
| PUSCI | 0.218 | 0.466 | | | |
| PUSCR | 0.112 | 0.340 | 0.245 | | |
| TP | 0.349 | 0.273 | 0.149 | 0.315 | |

**Note(s)**: CT = Communication and Teamwork; *K* = Knowledge; PUSCI = Perceived Understanding of Supply Chain Integration; PUSCR = Perceived Understanding of Supply Chain Responsiveness; *S* = Skill

**Table 3.**
Discriminant validity: heterotrait-monotrait ratio

correlation between the measures of potentially overlapping constructs. Items should load more strongly on their own constructs in the model and the average variance shared between the construct and other constructs (Compeau *et al.*, 1999). To test the discriminant validity, this study used the Heterotrait-Heteromethod (HTMT) correlation. The result of HTMT values is shown in Table 3. The table indicates that the highest HTMT values was 0.466 which is lower than the threshold value of 0.850. Additionally, based on PLS bootstrapping, the HTMT confidence interval was not zero. Thus, discriminant validity was established, and the measurement model has adequate construct validity.

*Hypothesis testing.* The path coefficient analysis was used to measure the path coefficient sizes and determine if relationship among the variables was statistically significant. The path coefficient is analyzed in two steps in PLS path modeling. The first step is to conduct the iterative algorithm that solves the blocks of the measurement model. Once a satisfactory measurement is obtained, then the analysis executes the second step. This step is to test the structural model validity and fit by determining the significance of path coefficients. The bootstrap resamples made up the number of sample drawn in the bootstrapping procedure and values must be higher than the number of bootstrap cases (204 cases). In bootstrapping, critical t-values can be generated to test the statistical significance of the path coefficient at $*p < 0.10$ ($t$-value = 1.282), $**p < 0.05$ ($t$-value = 1.645) and $***p < 0.01$ ($t$-value = 2.326) confidence level. This study used a multiple regression analysis with the consistent PLS bootstrapping in the SmartPLS 3.2.9 (Fernando *et al.*, 2019).

According to Greenwald *et al.* (1996), $p$-values are a meaningful common language translation for statistical test. These values provide a measure of confidence in the replicability of null hypothesis rejections. According to Hair *et al.* (2014), the most commonly used $t$ critical values are: (1) two-tailed tests (non-directional) that are greater than 2.57, 1.96 and 1.65 for significance levels of 1, 5 and 10% and (2) one-tailed tests (one-way, positive

**Table 4.**
Summary of hypothesis testing PLS path model

| Hypothesis | Relationship | Std. Beta | Std. Deviation | *t*-values | Confidence interval bias corrected 2.50% | 97.50% |
|---|---|---|---|---|---|---|
| H1 | PUSCI → CT | 0.054 | 0.086 | 0.631 | −0.108 | 0.221 |
| H2 | PUSCR → CT | 0.277 | 0.068 | 2.372* | 0.142 | 0.401 |
| H3a | PUSCI → *K* | 0.355 | 0.059 | 5.999* | 0.233 | 0.456 |
| H3b | PUSCI → TP | 0.080 | 0.066 | 1.203 | −0.044 | 0.213 |
| H4a | PUSCR → *K* | 0.239 | 0.058 | 4.140* | 0.099 | 0.325 |
| H4b | PUSCR → TP | 0.256 | 0.069 | 3.710* | 0.120 | 0.386 |
| H5 | *K* → CT | 0.310 | 0.072 | 4.271* | 0.147 | 0.432 |
| H6 | TP → CT | 0.290 | 0.066 | 4.410* | 0.158 | 0.411 |
| H7a | PUSCI → *K* → CT | 0.110 | 0.035 | 3.179* | 0.050 | 0.178 |
| H7b | PUSCR → *K* → CT | 0.074 | 0.027 | 2.733* | 0.022 | 0.128 |
| H8a | PUSCI → TP → CT | 0.023 | 0.021 | 1.107 | −0.010 | 0.074 |
| H8b | PUSCR → TP → CT | 0.074 | 0.029 | 2.573* | 0.026 | 0.139 |

**Note(s)**: *$p < 0.05$

direction) that are greater than 2.33, 1.65 and 1.28 for significance levels of 1, 5 and 10%, respectively (Hair *et al.*, 2014). This study used a one-tailed (*t*-value > 1.645) significant level.

The results of the PLS analysis for the research model are presented in Figure 1 and Table 4. Bootstrapping with 5,000 samples was used to evaluate the standard error and *t*-values of the path coefficients (Hair *et al.*, 2014). The result in Table 3 showed that, for the direct effect of the hypothesized positive relationship between PUSCR, a direct relationship existed on supply chain manager's communication and teamwork competency (H1, path coefficient = 0.277, $p < 0.05$), between knowledge and supply chain manager's communication and teamwork competency (H5, path coefficient = 0.310, $p < 0.05$), between task skill and proficiency and supply chain manager's communication and teamwork competency (H6, path coefficient = 0.290, $p < 0.05$). Thus, these hypotheses were supported. This indicates that global manufacturing companies need to improve their SCR, knowledge and task skill and proficiency to achieve better supply chain manager's communication and teamwork competency.

A positive relationship was also found in the relationship between SCI and knowledge (H3a, path coefficient = 0.277, $p < 0.05$), between SCR and knowledge (H4a, path coefficient = 0.239, $p < 0.05$). Thus, these hypotheses are supported. This indicated that to achieve a supply chain manager's knowledge, global manufacturing companies should improve their SCI and SCR. Moreover, the hypothesized positive relationship between SCR and task skill and proficiency (H4b, path coefficient = 0.256, $p < 0.05$) is supported, indicating that global manufacturing companies need to improve their SCR to achieve a better task skill and proficiency among supply chain managers.

Meanwhile the result for hypothesized indirect effect that significant knowledge would mediate the relationship between SCI and SCR with respect to communication manager's communication and teamwork competency (H7a, path coefficient = 0.110, $p < 0.05$; H7b, path coefficient = 0.074, $p < 0.05$) was supported. Task skill and proficiency have a significant mediating effect in the relationship between SCR and supply chain manager's communication and teamwork competency (H8b, path coefficient = 0.074, $p < 0.05$), while the mediation of the relationship between SCI and supply chain manager's communication and teamwork competency (H8a, path coefficient = 0.074, $p < 0.05$) was not supported.

## Discussion

SCR has the greatest influence on this model, which established a relationship with supply chain manager's communication and teamwork competency. SCM also positively and significantly influenced knowledge and task skill and proficiency. This result implies that an understanding of SCR led to an improvement in a supply chain manager's communication and teamwork competency, knowledge and task skill and proficiency. The positive relationship between analytical/communication skills and supply chain responsiveness was supported by Carr and Smeltzer (2000), and the results were consistent with Lorentz *et al.* (2013) that posited that SCR is needed to improve the competitiveness of global manufacturing companies in a global context. Therefore, a supply chain manager should understand the concept of SCR to meet market requirements and maintain relationship with partners. This might help especially in handling supply chain disruptions and cost reductions.

The perceived understanding of SCR mediates knowledge and task skill and proficiency and also mediated supply chain manager's communication and teamwork competency. This means that supply chain managers who have an understanding of SCR as part of the knowledge and skills required will be able to react and adapt quickly and effectively for sudden and rapid changes in the market or business environment and collaboratively and, thus, make some effort to resolve the issues. The results were consistent with previous findings such as Ghosh *et al.* (2014).

This study confirmed the findings by Prajogo and Sohal (2013) that perceived understanding of SCR is a critical component of SCM practices activities that supply chain managers should master and be embedded as a knowledge and skills. Nowadays, managing SCR in SCM practices has become a driver of competitive force to handle a turbulent marketplace (Melnyk *et al.*, 2014). Supply chain managers should able to communicate changes in technology, currency exchange, costs, pricing and the quality of materials to the suppliers. Besides that, communicating SCR well to suppliers and business partners will escalate teamwork competency. A perceived understanding of SCR will help companies, suppliers and buyers to handle market turbulence in the local and global context.

In term of indirect effect, SCI showed different result. Of two SCI indirect effects, only one was positive and significantly linked to supply chain manager's knowledge. The results were in line Prajogo and Sohal (2013) that emphasized that PUSCI is needed as fundamental knowledge for a better supply chain professional. Understanding the concept and tools of SCI will make supply chain managers better able to integrate operational areas such as technical, operational and social facet on business processes. The company should improve global competencies, which are highly volatile and rapidly changing (Hui and Fernando, 2018). By having this knowledge, supply chain managers would be successful in managing these facets and able to ensure a business is better able to achieve its objectives and make correct decisions with uncertainty markets.

In term of direct paths, the PUSCI found to be insignificant with respect to task skill and proficiency, yet it had a significant relationship on knowledge enhancement thru an indirect path. The indirect relationship demonstrated that task skill and proficiency were not significantly related to leveraging the relationship between SCI and communication and teamwork. Therefore, a human resource department should design a SCI training program that relates to task skill and proficiency in handling global supply chain activities. The integration should coordinate effective communication and teamwork among supply chain networks. Managing supply chain networks and supplier involvement have become critical for businesses because they are the backbone of operations (Fernando *et al.*, 2016). The findings were in line with the Esper *et al.*'s (2010) study that a company should establish SCI to create values for customer's using knowledge sharing, which connects supply chain networks including sourcing materials, production and market requirements.

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**Corresponding author**
Yudi Fernando can be contacted at: yudi@ump.edu.my, yudi.fernando@binus.ac.id

# Evaluating the customers' dining attitudes, e-satisfaction and continuance intention toward mobile food ordering apps (MFOAs): evidence from Bangladesh

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Md. Al Amin
*Department of Marketing,*
*Bangabandhu Sheikh Mujibur Rahman Science and Technology University,*
*Gopalgonj, Bangladesh*
Md. Shamsul Arefin
*Department of Management Studies,*
*Bangabandhu Sheikh Mujibur Rahman Science and Technology University,*
*Gopalgonj, Bangladesh*
Nayeema Sultana
*Department of Business Administration, East West University, Dhaka, Bangladesh*
Md. Rakibul Islam
*Department of Management Studies,*
*Bangabandhu Sheikh Mujibur Rahman Science and Technology University,*
*Gopalgonj, Bangladesh, and*
Israt Jahan and Ayeasha Akhtar
*Department of Marketing,*
*Bangabandhu Sheikh Mujibur Rahman Science and Technology University,*
*Gopalgonj, Bangladesh*

## Abstract

**Purpose** – This study was designed to specifically explore confirmation and perceived usefulness associated with mobile food ordering apps (MFOAs) in consideration of their impacts upon attitudes, satisfaction and intention to continuously use.

**Design/methodology/approach** – The research utilized the convenience sampling to gather data from 250 respondents having prior experience with MFOAs during COVID-19 pandemic period in Bangladesh. The Structural Equation Modeling technique was applied to analyze the data using SmartPLS 3 software.

**Findings** – This study's results showed that customers' perceived confirmation and usefulness were significant in determining their dinning attitudes. Besides, customers' dining attitudes were positively related to e-satisfaction. Finally, the customers' continuance intention to use MFOAs was significantly influenced by their e-satisfaction.



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**Research limitations/implications** – Restaurants managers should focus on online sales through MFOAs during the pandemic period since social distancing is a key strategy to manage COVID-19. Customers should be assured that the safety measures are undertaken while delivering the food.

**Originality/value** – This study incorporated the expectation-confirmation theory and technology acceptance model and tested it in the context of MFOAs.

**Keywords** E-satisfaction, Confirmation, Dining attitudes, Continuance intention, Mobile food ordering apps (MFOAs), Restaurants

**Paper type** Research paper

## 1. Introduction

Owing to the massive growth of information communication technology (ICT) and smartphones, smart technologies and mobile application (app) software have become an essential part of modern life (Baabdullah *et al.*, 2019; Koiri *et al.*, 2019; Tang, 2019; Shareef *et al.*, 2012; Shah *et al.*, 2020). The mobile apps have also shifted people's lifestyles and society at large (Ray *et al.*, 2019; Xu and Huang, 2019). Mobile food ordering apps (MFOAs) have been considered one of the most popular mobile apps in Bangladesh since its inception in 2013. For example, Pathao Foods has 7,000 registered Bangladeshi restaurants, while Sohoz Food has 6,000 restaurants, and Foodpanda has 6,500 restaurants until 2019 (Hasan, 2020). Bangladeshi restaurants have started to consider mobile commerce applications as new mechanisms to attract new customers and retain the existing customers in the intense competitive restaurants' sector, comprising more than 30,000 restaurants (Khan and Khan 2020). It is also possible to categorize the services provided by various MFOAs as providing orders, monitoring, payment, and tracking facilities. Still, they are not responsible for the actual preparation of foods (Pigatto *et al.*, 2017). On the other end, customers can search for a restaurant, compare offers of alternative restaurants, purchase and provide reviews through mobile apps (Carlson *et al.*, 2019; Thakur, 2014; Yang, *et al.* 2016, 2017).

With the introduction of HungryNaki, an online food delivery service provider, different MFOAs were expanding in Bangladesh since 2013. In contrast, similar services in other parts of the world began around the 2000s. Bangladesh is a densely populated nation of 162 million people, with 1,251 people residing per square mile (UN, 2020). There are 165.34 million mobile phone subscribers, of which 94.24 million are Internet subscribers (BTRC, 2020). About 50% of the population is under 25 of age, mostly fascinated with fast food and restaurants. The MFOAs are becoming popular in Bangladesh because people's lifestyles are changing with higher buying capability, increased busy hours, and enhanced dependence on technology, leading them to take readymade foods. The growing number of restaurants has also played a role in pushing the demand for online food service. All of these attributes have stimulated MFOA growth in Bangladesh. According to several industry insiders of Bangladesh, the total daily delivery was 25,000 orders per day in 2019 on average (Future Startup 2020). The overall current market size for food delivery is $10 million in 2019, and it could grow to over $5 billion by 2025 (Future Startup, 2020).

The surge of online orders and delivery has been witnessed in this COVID-19 pandemic situation (Hospitality Insights, 2020). An online food delivery survey among 3,606 consumers in UK, Italy, Brazil, and South Korea reveals that COVID-19 has a positive impact on frequency and spending on online food delivery and the majority of new users (57%) are likely to use it again (Citi Velocity, 2020). In the pandemic period, people are likely to avoid social cohesion and gathering. Gössling *et al.* (2020) discuss the impact of COVID-19 on tourism, including the food and beverage sector. Social distancing will have to remain a key strategy to manage COVID-19 in many countries for several months; it can be expected that restaurants will face problems recovering, specifically as they usually have limited liquidity and small profit margins. Where restaurants are allowed to stay open for takeaway

customers, this is an operational alternative that requires limited staff. Many smaller places, including cafés, may have decided to stay closed, as diminished customer flows do not make it possible to operate at a plus. The initial easing of social distancing is likely to advantage fast food over fine-dining restaurants. Further research on the impact of COVID-19 on mobile ordering apps will be useful as safe distancing could mean more consumers using mobile apps to order food delivery rather than visiting restaurants. Bangladesh has more than 204,525 infected cases as at July 19, 2020 (Worldometers 2020).

This study aims to examine how usefulness, expectations' confirmation (EXPC), dinning attitude (D-ATT) and satisfaction (E-SAT) influence customers' continuance intention (CI) using MFOAs. This study focuses on customers' post-adoption behavior based on the expectation-confirmation theory (ECT) (Bhattacherjee, 2001). It was intended to explain users' CI after their initial adoption and use of a specific information system. In addition to the ECT model, customers' dining attitude is incorporated from the technology acceptance model (TAM) (Davis *et al.*, 1989). The sustainability of the MFOAs depends on how much they serve their existing consumers' needs and expectations (Ray *et al.*, 2019). Customers prefer using mobile apps in ordering foods because of their convenience and speed. Therefore, it is crucial to identify why customers use MFOAs by understanding relevant factors influencing customers' continued use intention. The previous studies primarily focused on the segmented view of MFOAs adoption and its impact on customers' CI to use (Alalwan, 2020; Okumus and Bilgihan, 2014; Cho *et al.*, 2019; Izzati, 2020). Addressing this gap, this study develops and examines a holistic model by incorporating usefulness, confirmation, attitude, e-satisfaction and continuance intention to use MFOAs in the Bangladeshi context. Besides, the impact of confirmation on attitude, e-satisfaction, and continuance intention to use MFOAs is further investigated and is one of the unique contributions of this study.

Researchers identified a variety of factors that affect the user's selection and continuance intention to use MFOAs. However, few studies have attempted to employ dining attitudes in the context of MFOAs. Grounding on TAM (Davis *et al.*, 1989), we further argue that user's dining attitudes toward MFOAs plays a crucial role in explaining their satisfaction and continuance intention to use. There has been little research investigating usefulness, confirmation, attitudes, and satisfaction simultaneously in the context of MFOAs. More importantly, to the best of our knowledge, the ECT and TAM have not been employed combinedly to explain users' continuance intention in relation to MFOAs. Thus, this study intended to integrate ECT and TAM in the context of MFOAs.

The present study focuses on the gap mentioned earlier by examining the factors that impact the use of MFOAs in Bangladesh. It is essential to understand the underlying variables behind the use of MFOAs for three main reasons. First, it is well known that the food industry is a rapidly growing sector with a revenue estimate of around US$137.6 billion by 2023 (Statista Report, 2018). Despite this vast potential, however, no prior study has investigated the impact of confirmation and usefulness on customers' attitudes, satisfaction, and intention to use MFOAs. We argue that understanding the impact of confirmation will provide new insight into the current literature of MFOAs. Second, this study will allow us to understand better consumers' perspectives in culturally diverse countries like Bangladesh. The previous study has articulated to conduct an empirical study in culturally diverse countries (Yeo *et al.*, 2017) with a large sample. Most of the prior studies examined based on culturally similar countries and small samples (See-Kwong *et al.*, 2017; Suhartanto *et al.*, 2019; Yeo *et al.*, 2017). Third, since the data were collected in the pandemic period from Bangladesh, this study will provide an understanding of the factors that influence customers' attitude, satisfaction, and continuance intention in an unusual situation that might intensify the usage. Due to customers' preferences to maintain social distancing in the pandemic situation, the service providers of MFOAs continue its delivery services with limited resources.

The next part of the paper discusses the theoretical development and research hypotheses. Then, the subsequent part covers the methodology, followed by the empirical results and discussion elaborating on the theoretical contributions and practical implications. Finally, the paper concludes with limitations and future research implications.

## 2. Literature review

MFOA refers to the mobile-based system by which customers can order foods through mobile and appropriate application systems. While MFOAs systems have become common among the customers around the world, the academic interests in the study of MFOAs are still at its initial level (Okumus and Bilgihan, 2014; Alalwan, 2020). Recent studies have shown a keen interest in exploring the adoption of MFOAs among consumers. For example, Pigatto *et al.* (2017) conducted a qualitative study that sought to discover critical aspects that promoted MFOAs adoption of Brazilian, which signifies the usability, content, and functionality in the usage of MFOAs.

Prior research on MFOAs examined the numerous drivers of the user acceptability of MFOAs grounding on several theoretical foundations. The most prominent theory in the field of MFOAs acceptance is the TAM. Okumus and Bilgihan (2014) found that perceived usefulness, perceived enjoyment, social norms, ease of use and self-efficacy are the main predictors of a consumer's willingness to use MFOAs. Okumus *et al.* (2018) examined consumers' willingness to use mobile diet apps based on the Unified Theory of Acceptance and Use of Technology (UTAUT). They found that effort expectancy, social influence, and performance expectancy are important predictors of consumers' willingness to use. Moreover, Yeo *et al.* (2017) examined the Contingency Framework and Extended Model of IT Continuance. They found the support of the structural relationships of convenience motivation, post-usage usefulness, hedonic motivation, price saving orientation, time-saving orientation, prior online purchase experience, consumer attitude and behavioral intention towards online food delivery services.

Moreover, several researchers have considered consumers' attitudes as an essential variable toward MFOAs. In China, Cho *et al.* (2019) identified that consumers' attitudes and perceived value toward food delivery apps were significantly influenced by the level of trust, product verity, and design, and the customer perceptions of differences on these apps were observed between single-person and multi-person families. Alagoz and Hekimoglu (2012) have focused that factors like innovativeness, trust, and usefulness shaped consumers' attitudes towards online food delivery. Several researchers have focused on the outcomes of using MFOAs satisfaction, namely, customer conversion and customer experience. Wang *et al.* (2019) have proposed a model based on the IS success model predicting the critical outcomes of consumers' usage of mobile catering applications. They have found that when consumers perceive adequate quality in terms of services, system, product, and information, they create positive value towards mobile catering apps. Moreover, in Southern Taiwan Spyridou (2017) found perceived service quality is considered as one of the important determinants to predict CI (customer revisiting intention). Additionally, Kapoor and Vij (2018) found relevant evidence concerning the impact of mobile app features, including information design, visual design, collaboration design, and navigational design on the level of consumer conversion. For understanding the impact of customers' perception of the usefulness and confirmation on consumer's attitude, satisfaction, and continued intention to use, further research is needed to explore the key aspects that may impede or support effective implementation of MFOAs in South Asian context, Bangladesh.

## 3. Conceptual framework

Over the last few decades, one of the most important research subjects is identifying the underlying factors that impact the continued usage of information systems (IS). Previous studies confirmed the variables, such as expectation, confirmation and satisfaction (e.g. Bhattacherjee, 2001 and Qazi *et al.*, 2017), perceived usefulness and ease of use (e.g. Karahanna *et al.*, 1999), and habit (e.g. Alalwan, 2020), have all been examined to better predict users' continued information system use in various contexts. Drawing on the expectation-confirmation theory (ECT) (Oliver, 1980), Bhattacherjee (2001) introduced a theoretical model demonstrating the continuance of the information system. The theory emphasizes the impact of the user's expectation, and subsequent acceptance of the use of an IS on their satisfaction, and perceived usefulness, which ultimately influences IS continuance intention. Different IS literature adopted and expanded the ECT model, including several variables such as perceived playfulness (Lin *et al.*, 2005), habit (Limayem and Cheung, 2008) and resource quality (Joo and Choi, 2016). Despite the ECT's benefits as a research model, it has not been widely adopted in the MFOAs system context yet. This study integrated TAM and ECT model in the context of MFOAs.

### *3.1 Customer expectation's confirmation and dinning attitudes*

Confirmation refers to the users' perception of the expected benefits of MFOAs' use and its actual performance (Bhattacherjee, 2001). Bhattacherjee (2001) claimed that confirmation positively affects perceived satisfaction, as it implies the realization of the expected benefits of information system use. Bhattacherjee (2001) suggested that confirmation had a positive effect on perceived satisfaction, as it indicated the anticipated value of information system utilization.

EXPC is the beliefs of customers regarding how they judge or evaluate a product, service, or technology artifact in comparison to their expectations (Oliver, 1977 and Kim, 2010). According to Oliver (1988) is "the summary psychological state resulting when the emotion surrounding disconfirmed expectations is coupled with a consumer's prior feelings about the consumer experience." Attitudes refer to the customers' overall reaction about performing a specific behavior in terms of particular device and technology usage (Ajzen, 1991). When the actual outcome of MFOAs exceeds customer expectations, customers are more likely to be satisfied and use those apps (Trivedi *et al.*, 2018). Most of the time, customer perceptions are shaped by the customers' past experiences and determined their intention about the continuous use of MFAOs (Shaw, 2016). The number of times customers remain satisfied with the apps that the number of times customer trends to use them (Mundy, 2018). Customers' confirmations may positively affect the dinning of their attitudes to using MFOAs when the technology's evaluations match their specific expectations.

Contrary to *n* time, the customers are more dependent on the MFOAs in the COVID-19 pandemic period when the maintenance of social distancing has become or as an essential part of everyone's life due to confined situations. Customers' confirmation of their preferred service might be more favorable towards MOFAs in the pandemic period. Therefore, MOFAs can be alternative media to maintain safe distancing (adapting to a new normal situation) to customers to order food rather than visiting the restaurant physically. To the best of our knowledge, no research was found to determine the relationship between confirmation and attitudes. Thus, to measure the impact of EXPC on D-ATT to use MFOAs in an emerging economy and culturally diverse country like Bangladesh MFOAs increasingly due to any confirmed situations has become necessary. Hence, we posit the following hypothesis:

*H1.* Customers' Confirmation has a positive relationship with dining attitudes.

*3.2 Perceived usefulness and dining attitudes*

PU is defined as "the degree to which a person believes that using a particular system would enhance his or her performance" (Davis, 1989). Following TAM (Davis, 1989), one of the most significant predictors of customers' attitudes to adopt new technology is PU. When customers believe that technological applications are useful and easy to use, they show positive attitudes toward using MFOAs (Kang and Namkung 2019). Moreover, Nguyen *et al.* (2019) demonstrated that the more customers think that MFOAs is useful, the more they build positive attitudes toward MFOAs. It is because FDA service providers may covey the apps' usefulness to educate customers and connect restaurants by providing useful features such as nutrition details, map directions, direct telephone calls, online coupons, and notifications. In addition, TRA model suggested that perceived usefulness significantly affects consumer's attitude. For example, in the context of online food delivery systems, PU was found as an antecedent of customers' attitudes and behavioral intention use (Alagoz and Hekimoglu, 2012). Although few studies confirmed the relationship between PU and D-ATT in ordering food, such as online food purchasing (Nguyen *et al.*, 2019), online food ordering system (Alagoz and Hekimoglu, 2012), this study emphasizes the influence of PU on D-ATT in the pandemic period in the context of Bangladesh. Hence, we predict the following hypothesis:

*H2.* Perceived usefulness has a positive influence on dining attitudes.

*3.3 Dinning attitude and e-satisfaction*

E-satisfaction refers to the customer's contentment concerning other or her prior purchasing experience with a given electronic commerce firm (Alalwan 2020). Anderson and Srinivasan (2003, p. 125) define E-SAT "as the contentment of the customer concerning his or her prior purchasing experience with a given electronic commerce firm." Customer attitude is one of the elements to measure satisfaction as dining attitudes determine the customers through technology adoption (e.g. MFOAs). When customers' dining attitudes toward MFOAs are positive, they become more satisfied using MFOAs. More specifically, the positive attitudes towards MFOAs influence customers to be more satisfied with the service of MFOAs. Due to the social distancing and limited interaction with the service people are maintained in service transactions, customers may grow favorable attitudes and prefer MFOAs. Previous research paid less attention to investigate the relationship between dining attitudes and e-satisfaction of MFOAs. This study argues that customers' positive attitude toward MFOAs directly influences their e-satisfaction. Therefore, we posit the following hypothesis:

*H3.* Dining attitudes have a positive impact on e-satisfaction using MFOAs.

*3.4 Customer e-satisfaction and continuance intention*

Continuance intention means "to repurchase a product or continue service use" (Bhattacherjee, 2001, p. 353). If the service of MFOAs confirms customers' expectations, the customers are more likely to be delighted about their prior purchasing experiences and repeatedly order foods through MFOAs. Moreover, it can be constructed that E-SAT creates a unique position in the mind of a customer through positive perceptions regarding the value of a technology artifact. E-SAT has a causal effect on the intention to consistently use a particular IS (Bhattacherjee, 2001; Joo and Choi, 2016; Tran *et al.*, 2019 and Lee *et al.* (2019). Few are known about how customers' e-satisfaction influences their continuance intention to use MFOAs. Recently, Alalwan (2020) found that e-satisfaction is positively related to customers' continuance intention to use MFOAs in Jordan. This study focused on the customers' e-satisfaction and continuance intention to use MFOAs in the pandemic period when customers are more likely to be cautious about maintaining the safety of their food and health. Thus, we propose the following hypothesis:

*H4.* Customers' e-satisfaction has a positive impact on continuance intention to use MFOAs.

Figure 1 depicts the conceptual framework of the present study.

## 4. Methodology

### *4.1 Research design*

The data were collected from the users of MFOAs of Bangladesh. In Bangladesh, MFOAs has become an integral part of urban users, mostly resided in large cities. The survey was conducted during the COVID-19 pandemic situation in Bangladesh. Due to the COVID-19 pandemic situation, the restaurants were allowed to keep operation and provide home delivery. While the social distance, home confinement or home quarantine was normed among the people, customers were likely to use MFOAs, and eventually, the service of MFOAs had been boosted. MFOA service providers had to maintain appropriate hygiene for safe food handling and delivery. The data has been collected during March and April 2020.

The MFOAs operators mostly provide their services in big cities in Bangladesh. HungryNaki, Uber Eats, Pathao Food, Food Panda and Sohoj Foods are the primary MFOAs services that operate within Dhaka city. A convenience sampling approach was taken in this study. The respondents reside in Dhaka city, the capital of Bangladesh, with 20 million people. As per Khan and Khan (2020), over 10,000 restaurants are operating in only Dhaka, and 60% of them are connected to at least one MFOAs. For the convenience of research, the respondents were chosen from the five major parts of Dhaka city, including Kalabagan, Gulshan, Banani, Puran Dhaka and Uttara. The respondents had at least one MFOA service experience and ordered through smartphones or computers from one of the MFOA services.

### *4.2 Measurement items*

To ensure content validity, the survey instruments were reviewed by two faculty members from the first author's university, who have extensive experience in survey measurements. Based on their feedback, some of the wording of the items was modified. Twenty-five MFOA users were asked before the survey was released. Some minor wording has been modified from the pre-test. We used a five-point Likert scale from 1 (strongly disagree) to 5 (strongly agreed) to measure the items for the latent constructs. All items have been derived from existing researches. The study items were provided in Table A1. The questionnaire covered five identified constructs and demographic information. Items for Expectation Confirmation (EXPC) were adapted from Bhattacherjee (2001); Joo and Choi (2016) and Kim (2010). E-satisfaction (E-SAT) was validated using scale items extracted from Alalwan (2020), and Anderson and Sullivan (1993), Dining attitudes (D-ATT) were tested from items suggested by Cho *et al.* (2019). Perceived usefulness (PU) was tested with the items adapted from Okumus and Bilgihan (2014) and Davis *et al.* (1989)The items to measure continuous intention (CI) were extracted from Alalwan (2020), Faraoni *et al.* (2019) and Lee *et al.* (2019).

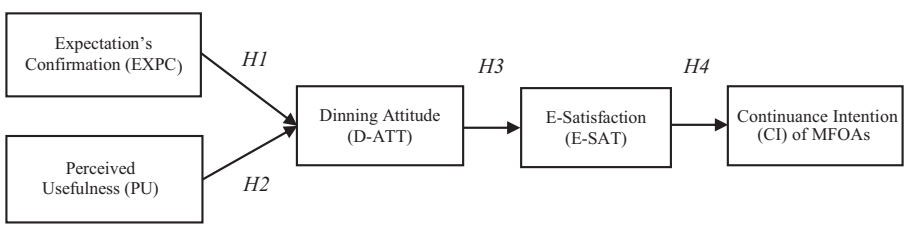


**Figure 1.**
Conceptual framework

*4.3 Data collection*

A questionnaire with demographic and measurement items was developed for this study. All the items in the questionnaire were initially been in English. The questionnaire was translated into Bengali using the back-translation process (Brislin, 1976). The respondents were sent the questionnaire via face-to-face and emails following the convenience sampling that is used by previous studies in food delivery (e.g. Cho *et al.*, 2019). We sent a mail that includes a questionnaire and a cover letter to ensure the convenience of giving responses. An email to each respondent had been sent after two weeks from the prior email date with a request to fill up the questionnaire and send back the filled questionnaire document. Another two weeks had been given as a final try to the respondent who has failed to respond earlier. After two weeks, a final request had been delivered for the remaining respondents who did not respond to the survey. A total of 580 questionnaires were sent to the respondents. Among them, 277 responses were received. After discarding the incomplete responses, 250 respondents (43.10% response rate) were taken for data analysis. Among them, 137 (56%) were men, and 113 (44%) were women. In terms of age, 109 respondents are below 24 years old, 61 respondents were between 25 and 40 ages, and 50 respondents were between 40 and 55 ages. Almost 10 respondents had a secondary level, 40 respondents had a higher secondary level, and 150 respondents had the university level of education. Most of the respondents (170 users) used Wi-Fi, and the rest of the respondents (80 users) used mobile data. Table 1 shows the demographic profile of the respondents.

**Table 1.**
Demographic profile of the respondents

| Variables | Number | Percentage |
|---|---|---|
| *Gender* | | |
| Male | 137 | 56 |
| Female | 113 | 44 |
| *Age* | | |
| Below 24 | 109 | 54.5 |
| 25–40 | 61 | 40 |
| 40–55 | 50 | 5.5 |
| *Geographical Area(s)* | | |
| Kalabagan | 50 | 20 |
| Gulshan | 50 | 20 |
| Banani | 50 | 20 |
| Puran Dhaka | 50 | 20 |
| Uttara | 50 | 20 |
| *Educational Background* | | |
| Secondary level | 10 | 3 |
| Higher Secondary level | 40 | 19.5 |
| University level | 150 | 60 |
| Other | 50 | 17.5 |
| *Internet Users* | | |
| Mobile Broadband | 80 | 40 |
| Wi-Fi- | 170 | 70 |
| *MFOAs* | | |
| Food Panda | 100 | 40 |
| Pathaoo | 50 | 20 |
| Uber Eats | 30 | 10 |
| Others | 80 | 30 |

*4.4 Data analysis*

Structure equation modeling (SEM) was used to measure the relationship between the variables. Covariance-based SEM (CB-SEM) and Partial least square SEM (PLS-SEM) are the two categories of SEM. CB-SEM analyzes the relation between measured covariance-related variables. In contrast, PLS-SEM analyzes the dependent and independent variables depending on the projection and the prediction to optimize the explained variances (Wang *et al.*, 2019). According to Wang *et al.* (2019), in maximizing the explained variances, PLS-SEM analyzes the dependent and independent variables based on the forecast and approximation. Based on a series of exogenous structures, PLS-SEM estimates the degree of changes in endogenous constructions. To measure structural relations and confirmatory factor analysis between study variables, we used SmartPLS 3.0 (Hair *et al.*, 2017).

*4.5 Common method bias*

Since the data were collected from a single source, the possibility of CMB involves the measurement of both dependent and independent variables. Besides, for the minimization of the possible common method variance, this paper focused on both statistical and procedural remedies before and after data collection. We used the marker variable technique and Harman's single-factor test for determining the CMB. The principal component factor analysis revealed five factors with Eigenvalues greater than 1.0, while these factors accounted for 66% of the variance. Moreover, the first factor did not account for the majority of the variance (19.53%). We can conclude that the CMB is not a concern for this study based on these findings (Podsakoff and Organ, 1986). We have conducted Lindell and Whitney's (2001) test that is suggested by various researchers. This test was designed to conduct a theoretically unrelated structure as a marker variable that examines the prospects for common method bias. An indicator of CMB can be evident when there is a high correlation between the marker variable and any other marker variable. We have utilized another survey variable as a marker (the information security), which is not used in this study. The correlation coefficients and $R^2$ between variables in the model and the marker show that the correlations were low (maximum $R^2 = 0.041$) – this suggests that common method bias was not a problem in our survey data.

## 5. Results

*5.1 Measurement model*

We evaluated construct reliability, composite reliability, convergent validity and discriminant validity following procedures suggested by Hair *et al.* (2017). Hair *et al.* (2017) suggested that the composite reliability (CR) should be greater than 0.7, and the value of Cronbach's alpha and roh_A close to 1.00 shows a superior consistency. Table 2 showed that the criteria for the internal consistency of the five constructs were satisfied. To ensure the convergent validity, the value of AVE should be greater than 0.5 which means that the construct is accountable for more than 50% of the items included in the proposed model. All latent variables achieve convergent validity, given that their AVEs surpass the 0.5 level (Table 2).

| | CR | Cronbach's alpha | roh_A | AVE |
|---|---|---|---|---|
| CI | 0.809 | 0.910 | 0.814 | 0.680 |
| D-ATT | 0.771 | 0.781 | 0.813 | 0.627 |
| E-SAT | 0.832 | 0.842 | 0.951 | 0.554 |
| PU | 0.830 | 0.819 | 0.756 | 0.620 |
| EXPC | 0.838 | 0.921 | 0.716 | 0.721 |

**Table 2.** Construct reliability and AVE

Table 3 showed the Fornell and Lacker criteria to demonstrate the discriminant validity. As per the suggestion of Fornell and Lacker (1981), we have compared the square root of AVE of every construct and the correlation of coefficients with the rest of constructs. According to Hair *et al.* (2017), the diagonal values (square root of AVE) must be higher than the off-diagonal values (the correlations among the variables) in the correlation matrix. Table 3 demonstrated that all the diagonal values were higher than the off-diagonal values. Thus, the results of the study confirmed the discriminant validity of the study constructs. Moreover, Hair *et al.* (2017) suggested that the factor loadings more than 0.50 are considered to be acceptable. Table 4 showed that all of the items in the each construct were ranged from 0.676 to 0.857.

Table 5 showed the results of the model fit. The measurement model showed that the hypothesized five-factor model ($\chi^2 = 84.317$, df = 55, $\chi^2$/df = 1.533, $p < 0.01$, CFI = 0.986, TLI = 0.981, RMSEA = 0.046, SRMR = 0.034) had a better data fit. In addition, the structural model also demonstrated that the model fit indices ensured good structural fit ($\chi^2 = 149.466$, df = 60, $\chi^2$/df = 2.491, $p < 0.01$, CFI = 0.959, TLI = 0.946, RMSEA = 0.067, SRMR = 0.052).

**Table 3.** Discriminant validity: Fornell and Lacker criteria

| Endogenous variables | CI | D-ATT | E-SAT | EXPC | PU |
|---|---|---|---|---|---|
| CI | *0.825* | | | | |
| D-ATT | 0.516 | *0.792* | | | |
| E-SAT | 0.529 | 0.631 | *0.849* | | |
| EXPC | 0.661 | 0.694 | 0.655 | *0.744* | |
| PU | 0.643 | 0.592 | 0.631 | 0.714 | *0.787* |

**Table 4.** Cross loading

| | CI | D-ATT | E-SAT | EXPC | PU |
|---|---|---|---|---|---|
| CI1 | *0.805* | 0.435 | 0.414 | 0.587 | 0.513 |
| CI2 | *0.843* | 0.419 | 0.457 | 0.508 | 0.546 |
| D-ATT1 | 0.256 | *0.773* | 0.309 | 0.415 | 0.386 |
| D-ATT2 | 0.551 | *0.811* | 0.629 | 0.674 | 0.546 |
| E-SAT1 | 0.351 | 0.266 | *0.841* | 0.500 | 0.464 |
| E-SAT2 | 0.543 | 0.198 | *0.857* | 0.692 | 0.604 |
| EXPC1 | 0.485 | 0.578 | 0.390 | *0.775* | 0.553 |
| EXPC2 | 0.478 | 0.527 | 0.504 | *0.746* | 0.553 |
| EXPC3 | 0.548 | 0.520 | 0.573 | *0.775* | 0.558 |
| EXPC4 | 0.461 | 0.424 | 0.424 | *0.676* | 0.452 |
| PU1 | 0.498 | 0.206 | 0.517 | 0.471 | *0.808* |
| PU2 | 0.266 | 0.477 | 0.530 | 0.003 | *0.803* |
| PU3 | 0.448 | 0.376 | 0.433 | 0.506 | *0.750* |

**Table 5.** The results of model fit

| Models | $\chi^2$ | df | $\chi^2$/df | CFI | TLI | RMSEA | SRMR |
|---|---|---|---|---|---|---|---|
| Measurement Model | 84.317 | 55 | 1.533 | 0.986 | 0.981 | 0.046 | 0.034 |
| Structural Model | 149.466 | 60 | 2.491 | 0.959 | 0.946 | 0.067 | 0.052 |

**Note(s)**: CFI = Comparative Fit Index; TLI = Tucker–Lewis Index; RMSEA = Root Mean Square Error of Approximation; SRMR = Standardized Root Mean Square Residual

*5.2 The structural model*

According to the suggestion of Hair *et al.* (2017), the structural model was verified by the coefficient of determinations (squared multiple correlations, $R^2$), the strength of the effect ($f^2$) and the significance level of path coefficient. Bootstrapping (5,000 resamples) was used to generate *t*-statistics and confidence intervals. Figure 2 showed the coefficient of determinations ($R^2$). E-SAT attains the largest explained variance (0.679), whereas CI attains the lowest explained variance (0.331). According to Chin (1998) and Henseler *et al.* (2015), we tested the effect sizes (Cohen $f^2$ value) for analyzing the significance of the strength of effect size for the independent variables. Table 5 showed that all $f^2$ values were well above the base level of 0.02.

The results of the path coefficient showed that EXPC ($\beta = 0.553$, $p < 0.000$) and PU($\beta = 0.198$, $p < 0.000$) positively influenced D-ATT (Table 6). Thus, H1 and H2 were supported. Moreover, D-ATT ($\beta = 0.861$, $p < 0.000$) also had a positive effect on customers' E-SAT. Hence, H3 was also supported. Finally, the path coefficient results showed that E-SAT ($\beta = 0.529$, $p < 0.000$) had a positive impact on continuance intention to use MFOAs. Therefore, H4 was accepted. Finally, we have computed the standardized root mean square residual (SRMR) of our model as the root mean square discrepancy between the correlations observed and the model-implied correlations (Henseler *et al.*, 2016). Our research model achieves an SRMR of 0.043. The structural model of the study is depicted in Figure 2.

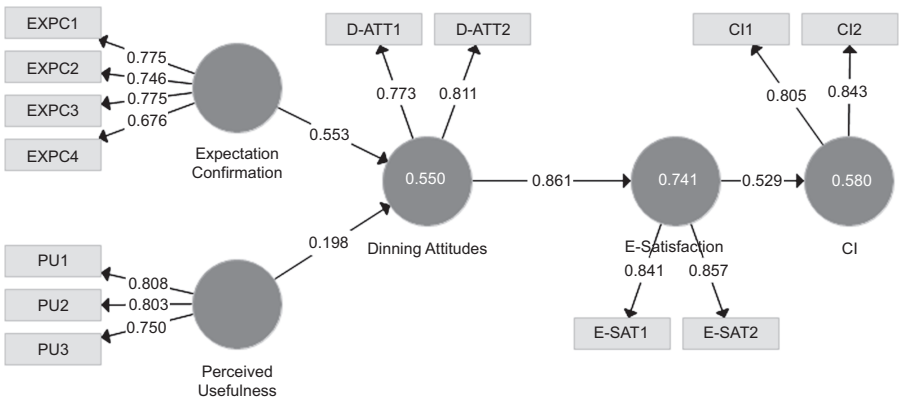


**Figure 2.**
The structural model

| Hypotheses | Relationship | Path coefficient | SD (STDEV) | *T* statistics (\|O/STDEV\|) | *p* values | Strength of effect ($f^2$) | Decision |
|---|---|---|---|---|---|---|---|
| H1 | EXPC → D-ATT | 0.553 | 0.072 | 7.710 | 0.000 | 0.300 | Supported |
| H2 | PU → D-ATT | 0.198 | 0.070 | 2.807 | 0.005 | 0.038 | Supported |
| H3 | D-ATT → E-SAT | 0.861 | 0.036 | 24.059 | 0.000 | 2.856 | Supported |
| H4 | E-SAT → CI | 0.529 | 0.086 | 6.146 | 0.000 | 0.389 | Supported |

**Table 6.**
The results of path coefficient and strength of effect ($f^2$)

## 6. Discussion

The study aimed to analyze the hypothetical relationships among perceived usefulness, confirmation, attitudes, satisfaction and continuance intention using MFOAs during the COVID-19 pandemic period in Bangladesh. The results of the path coefficient analysis confirmed the four hypotheses of this study.

In hypothesis 1, we predicted that EXPC positively influenced D-ATT. As per our prediction, we found support in favor of the hypothesis. This finding suggested that EXPC was considered as one of the essential determinants predicting D-ATT of Bangladeshi customers. In the ECT model, Bhattacherjee (2001) provides the debates on varying and conflicting conceptualizations of the satisfaction construct. Some authors view satisfaction as synonymous with attitude and emotion. While attitude is an emotion, others argue that satisfaction is an evaluation of the emotion (Hung *et al.*, 2007). This study included and tested attitude and satisfaction in a single study and found that EXPC as an antecedent of D-ATT.

In hypothesis 2, this study posited and found that PU had a positive impact on D-ATT. This finding is analogous with the study of Nguyen *et al.* (2019) and Alagoz and Hekimoglu (2012), who identified PU as an antecedent of customers' attitudes to order food using technology. Roh and Park (2018) found that PU has positively influence customers' attitude in case O2O food delivery services in South Korea, considering the moderating role of moral obligation in meal preparation. Moreover, the positive relationship between PU and CI was found by Okumus and Bilgihan (2014) Bhattacherjee (2001) and Suhartanto *et al.* (2019) in context of different forms of IS usage. The advantageous features of MFOAs motivate customers to show a positive attitude towards purchasing and ordering foods through mobile apps.

Hypothesis 3 predicted that D-ATT might impact E-SAT. The result of the study found that D-ATT significantly influences E-SAT. Previous studies focused on the role of attitude in explaining satisfaction (Butt and Aftab, 2013; Currás-Pérez *et al.*, 2013). Currás-Pérez *et al.* (2013) mentioned that a positive attitude in case of using the social networking sites is considered as one of the powerful predictors of satisfaction. In this regard, Oliver (1980) mentioned satisfaction as the assessment of the customers' attitudes before actual consumption. Moreover, Hunt (1977) emphasized that attitude is assumed to be an emotion and satisfaction as the assessment of that particular emotion. Thus, the customer's positive attitudes toward MFOAs lead to E-SAT.

In hypothesis 4, the current study hypothesized that E-SAT had a positive influence on CI. When customers are pleased with the service of MFOAs, customers are more likely to have a continued intention to use MFOAs. This finding is associated with the study of Alalwan (2020), who found that customer satisfaction with MFOAs is positively related to CI. Moreover, Christodoulides and Michaelidou (2010) analogized the same relationship in case of online retailing business in UK and found that the satisfied customers of online shopping are more likely to use the same systems repeatedly. Accordingly, the intention to reuse can strongly be predicted by the extent to which a customer is pleased or satisfied with the IS's prior experience.

### *6.1 Theoretical contributions*

This study has three main theoretical contributions. First, the current research is the first empirical study that has examined the ECT theory in the context of MFOAs incorporating consumers' dinning attitudes toward MFOAs from TAM. Consequently, the study findings significantly contribute to the emerging literature on MFOAs by exploring the influence of the factors of customers' perceived usefulness, confirmation, attitudes, e-satisfaction and continuous usage intention. Also, the present study examined the behavioral intention of users of MFOAs in a culturally diverse country, like Bangladesh. Bangladesh is facing a

profound digitization transition in recent years, and the MFOAs industry in the country is expected to expand as well. Moreover, this research is one of the first that investigates the behavioral intention of Bangladeshi MFOAs users. Finally, this study undertook a large sample to measure the study model. Most of the previous studies focused on a small sample in the field of MFOAs.

*6.2 Practical contributions*

In addition to theoretical contributions, this study provides a practical understanding of the factors that should be considered in designing and marketing MFOAs. MFOAs could be the ideal way to educate users and connect restaurants by providing ease-of-access features such as complete foods, nutrition details, map directions, direct telephone calls, online coupons and notifications. For example, it should allow users to identify the menus with calories. By using different nutritional food apps, consumers are now more aware of the nutritional benefit of different foods. This could presumably lead to the problem of avoiding unhealthy menu items by the customers, so MFOAs should collaborate with restaurants to include nutritional information of each food item. MFOAs should convince restaurants to avoid offering unhealthy food and include healthier food options. Besides, designing apps to facilitate healthy eating may create long-term customer relationships. To enhance the perceived usefulness, MFOAs should improve services that allow users to monitor their calorie intake, maintain records of food consumed, and track the feedback of other users. MFOAs can enable users to fix daily value targets for daily calorie, fat, fiber, carbs, and protein and assist users in monitoring their consumption (Okumus and Bilgihan, 2014). MFOAs can also provide information related to boosting immunity and the time of exercise required to burn the calorie intake since, during the COVID-9 pandemic period, it is essential to take care of the user's health.

Perceived confirmation was the most significant determinants explaining users' attitude using MFOAs. To help users confirm their expectations, apps service providers need to understand better what they expect of MFOAs by conducting regular needs assessment and evaluating how the MFOAs are currently meeting those expectations. The results reveal a greater effect of e-satisfaction on continuance intentions. MFOA operators should aim to strengthen consumers' e-satisfaction because this will lead to more continuance intentions to use MFOAs. This means that MFOA operators must take measures concerning variables such as perceived confirmation and usefulness. Additional financial incentives (e.g. price discounts, quantity discounts, and points) and loyalty schemes should be implemented for active users. Loyal customers should be given extra benefits since they play an essential role in promoting sales by attracting and recommending new customers. To make the platform more useful, MFOA providers may link mobile payment service providers for giving extra cash discount for payment through mobile payment service.

The FMOAs experienced substantial attention from Bangladeshi users. FMOAs operators should, therefore, make more efforts to promote this market. The expectations of new users are generally determined by previous users' experience shown in the review systems. As the number of customers evaluating and reviewing their experiences with MFOAs is significant, MFOA operators can encourage users to rate and evaluate, and make the assessment and evaluation process more comfortable. All customers' comments and reviews should also be monitored to ensure that reviews are updated, appropriate, and reliable so that other customers can regard them as a valuable information resource. The online rating system should also be designed to make it easier for customers to find top-notch restaurants (Alalwan, 2020).

MFOAs service providers need to concentrate more on promotional campaigns to persuade consumers that MFOAs takes minimum time and effort compared with

conventional means of ordering food that include the physical presence in restaurants or telephone calls. MFOAs should pay much attention to delivery accuracy and speed since the users relate the delivery speed with the usefulness of the MFOAs. In addition, frequent maintenance is necessary to ensure the reliability and quality of the platform of MFOAs to ensure that customers can easily and reliably access and order food via MFOAs. The technical support and services required for customers' access and efficient use of MFOAs should also be taken into account. The MFOAs should provide the customer care service for immediate problem solving to make the platform effective. The service providers should constantly search for ways to innovate new features to district their platform of MFOAs from the competitors (Okumus *et al.*, 2018).

The usual service of MFOAs was hampered in the interim period of COVID-19 due to the limited operations of most restaurants in Bangladesh. Customers should be assured that the safety measures are undertaken while delivering the food. Restaurants managers should focus on online sales through MFOAs during the pandemic period since social distancing is a key strategy to manage COVID-19. Given the limited physical presence of customers at premises and diminished customer flows, restaurants might face recovery problems, especially as they usually have little liquidity and profit margins. With fewer resources such as staff and raw materials, restaurant managers should balance their operational activities, emphasizing the survival with marginal profit. MFOA service providers should provide the necessary supports to the restaurants with constraints to cope with the emergent situation.

### *6.3 Limitation and further study*

Like most studies, this study is not free from limitations. First, this study is cross-sectional nature; thus, the study variables' causal relationships cannot be confirmed. A longitudinal study may be conducted in the future to reveal causal relationships. Second, since the data were collected from a single source, i.e. from the customers, the common method variance (CMV) might impact the study. Although the CMV test results showed the absence of CMV problem, the future study may collect data from different periods. Third, the data were collected from Bangladesh during the COVID-19 pandemic period, which limits the generalization of the study results to other countries.

Since the present study focused on the expectation-confirmation theory and technology acceptance model in MFOAs, further study may incorporate the Theory of Acceptance and Use of Technology (UTAUT2) to unveil the study relationships. Future research should explore whether there are specific mobile application functions that would make consumers who are currently ambivalent about apps intend to use them, or whether other factors such as perceived ease of use or price values, which were not fully explored in this study, are more important. Finally, additional research should investigate how a combination of mobile touch points (e.g. a coupon for a free item, mobile ordering and mobile payment) influences food purchasing decisions. It will be interesting if the future study extends the current study by contrasting the picture with other developing countries in South Asia (e.g. India, Pakistan).

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## Appendix

| Constructs and source | Measurement items |
|---|---|
| Expectations' Confirmation (EXPC) | EXP1: My experience with using MFOA was better than what I expected |
| Bhattacherjee (2001) | EXP2: The service level provided by MFOA was better than what I expected |
| Joo and Choi (2016) | EXP3: Overall, most of my expectations from using MFOA were confirmed |
| Kim (2009) | EXP4: The expectations that I have regarding MFOAs were correct |
| Perceived Usefulness (PU) | PU1: MFOA can be useful in managing my food orders |
| Okumus and Bilgihan (2014), Davis *et al.* (1989) | PU2: The app can be beneficial to me |
| | PU3: The app can be valuable to my diet |
| Dining Attitudes (D-ATT) | D-ATT1: Using the MFOA is useful |
| Cho *et al.* (2019) | D-ATT2: I am strongly in favor of ordering food through MFOA |
| E-Satisfaction (E-SAT) | E-SAT1: I am generally pleased with MFOA |
| Alalwan (2020), Anderson and Srinivasan (2003) | E-SAT 2: My choice to purchase from MFOA was a wise one |
| Continuance Intention (CI) | CI1: I intend to continue using MFOA rather than discontinue its use |
| Alalwan (2020) | CI2: If I have an opportunity, I will order food through MFOA |
| Faraoni *et al.* (2019) | |
| Lee *et al.* (2019) | |

**Table A1.**
Measurement items

**Corresponding author**
Md. Al Amin can be contacted at: alamin.bsmrstu21@gmail.com

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# The missing link between medical science knowledge and public awareness: implications for tourism and hospitality recovery after COVID-19

Jun Wen
*School of Business and Law, Edith Cowan University, Joondalup, Australia*
Haifeng Hou
*School of Public Health, Shandong First Medical University, Shandong, China*
Metin Kozak
*School of Tourism, Dokuz Eylul University, Izmir, Turkey*
Fang Meng
*School of Hotel, Restaurant, and Tourism Management, University of South Carolina, Columbia, South Carolina, USA*
Chung-En Yu
*Department of Innovation and Management in Tourism, Salzburg University of Applied Sciences, Salzburg, Austria, and*
Wei Wang
*School of Medical and Health Sciences, Edith Cowan University, Joondalup, Australia*

## Abstract

**Purpose** – As the world grapples with the pervasive effects of the coronavirus pandemic, a notable disconnect has emerged in the public's understanding of scientific and medical research. Particularly, the travel industry has become unquestionably vulnerable amid the COVID-19 outbreak; this pandemic has interrupted the industry's operations with devastating economic consequences. This paper aims to highlight the importance of deconstructing barriers between medical science and public awareness related to COVID-19, taking tourism as a case in point. It also discusses the role of interdisciplinary research in facilitating the tourism and hospitality industry's recovery and alleviating tourists' uncertainties in the wake of COVID-19.

**Design/methodology/approach** – This paper offers a synthesis of news coverage from several media outlets, framed within the literature on knowledge transformation across disciplines. This framing focuses on the medical sciences (e.g. public health) and social sciences (e.g. tourism management) to identify gaps between medical scientific knowledge and public awareness in the context of COVID-19. The authors' experience in public health and tourism management further demonstrates a missing link between academic research and the information made available in public health and everyday settings. A potential research agenda is proposed accordingly.

**Findings** – This paper summarizes how salient issues related to knowledge transfer can become intensified during a global pandemic, such as medical research not being communicated in plain language, which leads

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some citizens to feel apathetic about findings. Reporting on the prevalence and anticipated consequences of disease outbreaks can hence be difficult, especially early in the development of diseases such as COVID-19.

**Research limitations/implications** – By assuming a cross-disciplinary perspective on medical/health and social science research, this paper encourages academic and practical collaboration to bring medical research to the masses. This paper also outlines several research directions to promote public health, safety and sustainability through tourism.

**Practical implications** – This paper highlights that it is essential for medical knowledge to be disseminated in a manner that promotes public understanding. The tourism and hospitality industry can benefit from an essential understanding of medical findings, particularly during this pandemic. Without a firm grasp on COVID-19's origins and treatment, the tourism and hospitality industry will likely struggle to recover from this catastrophe.

**Social implications** – Taking COVID-19 as a case in point, this study advocates leveraging the strengths of disparate domains to bring medical findings to a wider audience and showcase cutting-edge developments for the greater good. This study also emphasizes the importance of engaging the general public in reputable scientific research findings to increase public awareness in a professional and accurate manner.

**Originality/value** – This paper presents a unique and critical discussion of the gap between medical science knowledge and public awareness, as well as its implications for tourism and hospitality recovery after COVID-19, with a focus on applying medical scientific knowledge to post-pandemic industry recovery.

**Keywords** Coronavirus, COVID-19, Interdisciplinary research, Tourism recovery, Medical science, Social science, Public health crisis

**Paper type** Research paper

## Introduction

The novel coronavirus (COVID-19), emerged in Wuhan, Hubei province, China, in late December 2019, has brought unforeseen consequences to nearly every sector of the global economy. Supply chains have been disrupted, the world's stock markets are collapsing and a global recession looms (Fernandes, 2020). Experts around the world are striving to examine the pandemic in hopes of being able to curtail it. COVID-19 is an infection of zoonotic origin; that is, the disease was initially transferred from animals to humans and is now transmissible between persons (Huang *et al.*, 2020). The virus has been tied to the Huanan Seafood Wholesale Market in Wuhan where live animals were available for consumer purchase (Li *et al.*, 2020). COVID-19 symptoms are reminiscent of those associated with the SARS outbreak in 2003 (Wilder-Smith *et al.*, 2020); the virus attacks the respiratory system and is highly contagious, potentially leading to hospitalization and death. Countries have taken drastic measures to control the spread of the virus. In fact, the pandemic has thrown everyday life into upheaval with the closure of national borders, businesses, schools and other establishments.

The tourism and hospitality industry has been a major casualty of COVID-19: restaurant business has plummeted due to local and global shutdowns, and hotels worldwide have lost billions from cancelled reservations (Ozili and Arun, 2020). While these economic shocks are jarring, economic vulnerability in the tourism context remains underexplored (Canh and Thanh, 2020), and the ultimate consequences of economic downturns remain to be seen. Essentially, vulnerability is a fatal aspect of tourism. Researchers must therefore consider the interactions between people, environments, and space and time within tourism ecosystems (Student *et al.*, 2020). Scholars have already underlined the significance of reconceptualizing problems to better understand how the industry has been affected and disrupted by external impacts (Duvat *et al.*, 2017).

At present, researchers in various domains are exploring COVID-19 and striving to address its catastrophic effects. Early efforts to blunt the virus have focused on physical distancing (Prem *et al.*, 2020) and treating the sick. Meanwhile, medical researchers and practitioners continue to explore the epidemiology of COVID-19 to differentiate it from similar illnesses (Wu and McGoogan, 2020). Studies of genome sequencing (Brüssow, 2020; University of Cambridge, 2020), symptomology (Huang *et al.*, 2020) and risk factors (Ji *et al.*, 2020) have provided valuable insight into the transmission, detection and

progression of COVID-19. Researchers in fields such as tourism and hospitality have also considered how this pandemic may alter human behavior over the longer term, such as by changing tourists' food consumption (Ying *et al.*, 2020) or their lifestyle and holiday behavior (Wen *et al.*, 2020b; Jiang and Wen, 2020).

However, not all information presented in scholarly research enters the public consciousness; medical science is highly technical and not necessarily accessible to a wide audience (National Academies of Sciences, Engineering, and Medicine, 2017). As the world seeks to combat COVID-19 collectively, it is imperative that experts aim to surmount relevant communication barriers. The gap between medical science and public awareness is especially dire in this case. For our purposes, "public awareness" refers to a generalized (i.e. non-specialized) understanding of the pandemic, namely, that exhibited by members of the public. The disconnect muddies public health crisis control and prevention strategies, hinders inter-country coordination in consistent and effective disease control, compromises public protection and hampers industry recovery and resilience. By providing pandemic-related information that a general audience can understand, citizens and professionals will be better able to use research findings to promote their communities' recovery from this public health crisis.

This paper is conceptual and based on a synthesis of news coverage from multiple media outlets (e.g. *The Conversation*), positioned within related literature on the medical and social sciences with a focus on tourism management amid COVID-19. Ferguson *et al.* (2021) indicated that most government information on COVID-19 is too dense for the average Australian to comprehend, as citizens may struggle to understand writing as required for broader participation in work, education and training, and society. Ferguson *et al.* (2021) further stated that much government-produced COVID-19 information is difficult to read and thus unlikely to be of great practical use. Pandemic-related warnings from the media (e.g. Ferguson *et al.*, 2021) have brought closer attention to the ways that knowledge is presented to the public – especially during a pandemic – and how science-based communication can enhance public awareness of pandemic prevention and safety. This warning also applies to academics working in the medical and social sciences. Regarding tourism, Wen *et al.* (2020) discussed the importance of interdisciplinary studies on COVID-19 in and beyond tourism by absorbing knowledge from medical and health sciences to promote public understanding. In the same vein, the current study draws from medical and health scientists' experiences applying medical research–based knowledge through evidence-based medicine (EBM) to effectively translate academic knowledge into practice. Furthermore, academics in the medical, health and social sciences have collaborated to investigate possible roadblocks to science-based communication. They have particularly sought to determine how to bring medical science into public awareness in the tourism context during COVID-19.

Overall, this paper takes COVID-19 as an example to highlight gaps between the academic literature and practice. The authors then call for more interdisciplinary research at the intersection of medical science, communications and marketing to foster the global tourism and travel industry's recovery. The remainder of this paper is structured as follows. First, an overview of roadblocks to communicating science highlights the information gap between the public and medical science. Second, ways to bring medical science into public awareness are briefly discussed as a means of enhancing the public's understanding of research implications. Third, tourism is taken as a case in point, having been one of the industries most affected by COVID-19. Finally, the authors advocate for bridging medical science and tourism through interdisciplinary research via cross-domain collaboration.

## Roadblocks to communicating science

A clear gap exists between the research academics performance and the information made available in public health and everyday settings (Carbone and Thomas, 2018). The role of

research in academia differs from that in practice; for example, scholars are incentivized to study novel topics and develop new theories for academic journals, while innovation in public health and medicine is driven by different motivations (Carbone and Thomas, 2018). Inter-industry communication presents other obstacles: experts in medical science and public health may struggle to share their concerns with scholars in a way that promotes relevant research. As COVID-19 spreads across the globe, professionals in the medical and health sciences are facing mounting public pressure to address the outbreak. Meaningful discoveries continue to be made. However, the importance of medical findings is not always duly emphasized to the public. For instance, disease-related information that is shared with the government may not be transparently disseminated to a country's citizens (Brownell *et al.*, 2013). Citizens without a medical background do not always understand how government-released information applies to them (National Academies of Sciences, Engineering, and Medicine, 2017). Also, scholars outside of the medical sciences – and even professionals working on the front lines of this pandemic – may not fully grasp the minutiae of COVID-19 given the speed at which data are being released.

Indeed, numerous issues related to knowledge transfer can become intensified in the context of a pandemic. Many academic research articles are hidden behind paywalls, and medical research is not always written in plain language for a wide readership (Brownell *et al.*, 2013). Additionally, everyday citizens may have little interest in scientific and medical research. From a logistical standpoint, forecasting the global effects of pandemics such as COVID-19 is notoriously difficult (Petropoulos and Makridakis, 2020). Such predictions call for extensive historical data that can only be collected over time. Therefore, reporting on the prevalence and anticipated consequences of disease outbreaks is difficult, especially early in a disease's development. Pandemic-related reporting thus calls for a balance between providing information as accurately and comprehensively as possible while minimizing unnecessary panic.

A major concern with these communication challenges is that they can prevent individuals from fully protecting themselves during public health emergencies. Government decisions will not be as effective as they could be unless officials have sufficient information. Additionally, for better or worse, the media plays a central role in shaping individuals' perceptions of COVID-19 (Zheng *et al.*, 2020). For instance, South Korea has been largely complimented on its handling of the pandemic (Leslie *et al.*, 2020): the national government implemented strict risk reduction measures nearly as soon as the COVID-19 outbreak began in February. The country also implemented a comprehensive testing program and contact tracing to control the virus. Yet not all citizens agreed with officials' decisions; in some cases, the media painted these choices as draconian. In Italy, one of the countries that has been most affected by COVID-19, individuals were initially reluctant to abide by physical distancing measures to stem the spread of the virus. The nation's officials were similarly hesitant to implement strict guidelines at first (Leslie *et al.*, 2020; Remuzzi and Remuzzi, 2020). This delayed response partially led to Italy's hospital system becoming overwhelmed with its COVID-19 caseload. The United States has also faced criticism for its gradual response to the outbreak: the federal government appeared not to recognize the gravity of the situation until after the virus had already begun to spread (Leslie *et al.*, 2020). America has since surpassed Europe as the epicenter of the outbreak.

While no decision is expected to be perfect, government officials and citizens will be more empowered to make well-informed choices when armed with reliable information. Clear and unified communication is thus essential during these times. If officials and citizens do not (or cannot) leverage evidence-based findings to manage public health issues, people's lives are more likely to be risked unnecessarily. A bridge must therefore be built to bring established health findings to the public. COVID-19 has touched almost every corner of the world to an unanticipated degree, and governments and citizens are seeking concrete strategies to

manage the outbreak. Bringing medical science into public awareness will help citizens understand the implications of existing research and what the results mean for them.

## Bringing medical science into public awareness

The spread of COVID-19 has understandably evoked panic as people attempt to navigate life under the looming threat of disease. It is therefore crucial that media outlets report timely information to help individuals prepare to face this emergency. Advocacy efforts to bring medical research findings to the public, especially to practitioners on the front lines of medicine, are not new. Medical scholars and practitioners have long realized that cutting-edge, research-based knowledge should be incorporated into practice to have the greatest impact. Over the past decades, EBM has come to play a major role in public health intervention and policy (Oliver and Pearce, 2017). EBM embodies knowledge transfer in medical science, referring to "the conscientious, explicit and judicious use of current best evidence in making decisions about the care of individual patients" (Sackett, 1997). This is a laudable and certainly worthwhile task, but one that can also seem daunting given the nature of medical practitioners' work.

The American College of Physicians (ACP) Journal Club was developed to partly alleviate this burden (Haynes, 1991). The club's aim is to pore over internal medicine journals and identify articles that meet specific selection criteria. Abstracts are then created for chosen studies, supplemented by professional commentary from physicians specializing in the field featured in a given article. The developed abstract and professional commentary are then shared with the article's original author for verification prior to being released to clinicians (Haynes, 1991). This process results in concise, easily digestible medical information that practitioners can adopt in their practice without needing to review associated articles in great depth (Glasziou and Aronson, 2018). It also enables doctors to incorporate high-value clinical evidence into their work to better serve the public.

Essentially, EBM is grounded in the belief that high-quality research can reveal effective interventions to prevent and treat disease. EBM has paved the way to evidence-based practice, wherein clinicians apply EBM in treatment settings. EBM and relevant practices also have evolved since their inception. A wide range of stakeholders has been incorporated into the generation and application of evidence over time. For example, patient and public involvement boards in healthcare are intended to bring lay persons on board during health research to enhance public participation (Oliver and Pearce, 2017). Despite these advances, some scholars have argued that systemic problems continue to plague academic research – even going so far as to suggest that EBM has been "hijacked" (Ghinea, 2020; Ioannidis, 2016). For example, randomized controlled trials are the gold standard in EBM for determining the efficacy of clinical interventions. Yet these trials can apparently be gamified; clinical researchers may be offered authorship on manuscripts reporting randomized controlled trials based on the number of patients they recruit (Ioannidis, 2016). While such "gift authorship" does not uniformly characterize medical research by any stretch, this concern does highlight the general need to consider research critically rather than at face value.

The same care is needed when consuming COVID-19-related traditional and social media coverage. During this Internet era, misinformation can spread rapidly. For example, if media outlets and public figures possess a superficial understanding of a given disease, widespread miscommunication can result. The effects of biased media coverage can be especially problematic for specific populations. For example, in the case of COVID-19, Asians have been unfairly targeted in the media (Misra *et al.*, 2020). This bias has led to inequitable and even violent treatment against individuals of Asian descent (Zheng *et al.*, 2020). Researchers have also suggested that media bias could contribute to or exacerbate mental health concerns among Chinese diaspora (Wen *et al.*, 2020a).

Although limited empirical data are currently available to demonstrate how the media's and public's response to COVID-19 has influenced Asians directly, misleading media reports could inform individuals' perceptions of the Chinese as carriers of the virus. These misconceptions have already influenced the tourism industry, as evidenced by apparent distrust of Chinese restaurants and goods given COVID-19's inherent connotations with China (Depoux *et al.*, 2020).

## The impacts of COVID-19 on tourism and hospitality

The tourism and hospitality industry tends to be the initial and primary affected sector upon most negative political, economic, environmental or social occurrences. To date, COVID-19 pandemic has incurred staggering losses on the tourism and hospitality industry. A report released in early February 2020 (Dass and McDermott, 2020) suggested that the tourism industry can expect to lose $22 billion in revenue from Chinese outbound tourists and see nine million fewer inbound trips due to the pandemic. Certain niche tourism behaviors, such as game eating (Ying *et al.*, 2020), are also likely to fall out of favor (at least temporarily) based on the presumed association between COVID-19 and wildlife. Tourism stakeholders thus need to focus on industry recovery and resilience, but to do so effectively, stakeholders must first have a thorough understanding of this disease.

The transmissibility of the virus has led to sweeping regulations to constrain tourist mobility. Many countries have enacted travel bans to limit traffic into and out of the country, with border closures adversely affecting the travel industry (Ozili and Arun, 2020). Perhaps more concerning than these transient changes in the international tourism landscape is the fact that traveler behavior is likely to shift until the virus is better controlled. As a case in point, the Chinese are known for participating in group tours (Chen *et al.*, 2019; Jin and Sparks, 2017) and engaging in high-frequency travel during public holidays such as the Spring Festival during Lunar New Year (Li *et al.*, 2019). The COVID-19 outbreak is likely to change these tourists' perceptions of travel: they may prefer to travel alone or in small groups, and they may visit less popular tourist destinations to avoid crowds. Behavioral changes such as these manifested after the SARS outbreak in 2003 (Mao *et al.*, 2010; Wen *et al.*, 2005), and similar outcomes can be expected post-COVID-19.

Tourism scholars have begun to propose ways to address these behavioral changes and promote the industry's resilience (Wen *et al.*, 2020b). Although such suggestions can be insightful, they also exemplify a lack of connection between medical science and other industries. First and foremost, such recommendations are merely speculative at this point. Insufficient data are available on the tourism-related effects of COVID-19 to inform appropriate recovery decisions, and the pandemic evolves every day. At the same time, if tourism practitioners do not have a clear understanding of how COVID-19 functions, it will be difficult to adopt risk mitigation measures to ensure tourists' safety. The tourism and hospitality industry will also need to reconceptualize its operations for the foreseeable future. A solid understanding of COVID-19 based on medical knowledge will help affiliated businesses and consumers adapt to a "new normal."

## Bridging medical science and tourism through interdisciplinary research

COVID-19 must be managed to protect the public and various industries, particularly because this outbreak will likely not be the last of its kind. Therefore, experts in the health and social sciences should cooperate to determine ways to disseminate relevant information to the general public and tourism key stakeholders. Doing so will promote a shared understanding of disease outbreaks such as COVID-19 to help government officials

and the public better protect themselves in times of crisis. Indeed, the collaboration between tourism scholars and medical/public health experts would better examine the influence of COVID-19 and similar outbreaks on the travel industry, which assists tourism and hospitality businesses to adopt effective strategies to recover sooner. Tourism practitioners and travelers will benefit from clear information to make smart decisions in the aftermath of COVID-19.

Kozak and Kozak (2016) noted that tourism, as an inter-, multi- and trans-disciplinary field (e.g. Jamal and Higham, 2021), has received greater attention from a range of academic domains over the last few decades. Due to its unique characteristics and relative immaturity as a field, tourism has often imported more knowledge than it has exported to other areas (e.g. Crouch and Perdue, 2015). Its background dates back to the early 1900s when scholars began to unearth tourism's economic impacts. This revelation was followed by contributions from disciplines such as geography, anthropology and sociology. Tourism later became more management-oriented in the 1980s (e.g. Xiao and Smith, 2006).

Social scientists have already begun to take a proactive approach to pandemic-related research. In one case, Yang *et al.* (2020) constructed a macroeconomics model to evaluate the economic impacts of COVID-19 on tourism, and their method can be applied to future disease outbreaks. As daily life, lifestyles and the academic landscape continue to change – both amid COVID-19 and otherwise – interdisciplinary collaboration is likely to become even more common (Wen *et al.*, 2020c). Tourism research welcomes contributions from an array of disciplines and is well suited to cooperation that will enhance consumers' and stakeholders' satisfaction now and in the future.

To this point, interdisciplinary research will play an integral part in discovering how the tourism and hospitality industry can recover from these catastrophes such as COVID-19. For example, public health scholars and tourism researchers can devise risk reduction strategies for the industry. Interdisciplinary findings can also inform public health policy to enhance the tourism and hospitality industry's resilience against pandemic outbreaks and other health threats. For instance, tourism and hospitality employees could participate in safety-related trainings to improve cleanliness throughout their establishments (e.g. by instituting thorough cleaning and disinfection protocols). Employees could also be informed about disease transmission and how to lower the risk of viral spread. COVID-19 is spread via respiratory droplets and can survive for several hours to days on surfaces (Lai *et al.*, 2020; Wong *et al.*, 2020); raising awareness of these facts will promote better hygiene. To put research findings into practice more directly, subject area experts could also assume temporary or longer-term roles to assist businesses on site. For instance, hoteliers could be required to hire public health consultants to oversee facility sanitation procedures or to recommend specific interventions, such as checking employees' and guests' temperatures upon arrival to prevent potential viral transmission. Public health experts could also recommend control measures related to food preparation to ensure on-site eateries are following safety guidelines.

Other actionable suggestions to reduce disease transmission could include adopting smart tourism devices in place of face-to-face contact. In hotel settings, service robots could be used during visitor check-in/-out and for service delivery (e.g. in on-site restaurants or for room service). In a restaurant context, managers could continue to emphasize takeaway in addition to providing contactless delivery options to reduce interpersonal interaction during food delivery. As COVID-19-related dining restrictions begin to be lifted once the outbreak subsides, restaurant managers may wish to move tables farther apart to reduce unnecessary crowding, at least in the short term. More broadly, destination managers could be encouraged to manage tourist attraction queues more closely to discourage crowding and disease transmission.

It is also likely that domestic tourism will be gradually accepted over international travel as the pandemic begins to subside. This trend is especially probable given the risk of additional waves of the COVID-19 (Xu and Li, 2020). To maintain social distancing, people could opt to travel by car, while hotels and public transportation (e.g. airlines and motor coaches) could work under capacity. At the same time, fares would likely increase to compensate for lower visitor traffic. Relevant research-based recommendations can maintain public awareness of COVID-19 and other public health issues over time. These types of recovery strategies could also be applied intermittently, such as to minimize the effects of subsequent waves of the virus.

It is important to note that service-related suggestions in the hospitality industry are likely to evolve as scientists and other experts learn more about COVID-19. Because the virus is new, few aspects of the illness are for certain. More concrete conclusions will take shape as the outbreak persists and more epidemiological studies are performed (Lipsitch *et al.*, 2020). As a supplement to medically focused work, interdisciplinary research about COVID-19 and other diseases could lead to business-focused technological and practical innovations. These advances will enable businesses to serve more customers and maintain revenue while prioritizing consumer safety. In line with the prior discussion, a conceptual model was developed to situate this study's key points as shown in Figure 1.

## Conclusion and implications

It is essential for medical knowledge to be disseminated in a manner that promotes public understanding, similar to the ACP's journal club. The tourism and hospitality industry particularly needs to acquire the essential understanding and "know-how" from the medical perspective. Without a firm grasp of COVID-19's origins and treatment, the tourism and hospitality industry will likely struggle to recover from this catastrophe. For example, if tourism professionals do not have comprehensive information from public health organizations on how to prevent the spread of COVID-19 in their establishments, customers will not feel comfortable patronizing these businesses.

Even now, as the tourism industry seeks ways to recover from COVID-19, stakeholders' decisions must be informed by scientific evidence whenever possible. Indeed, COVID-19 is not the only outbreak to affect the tourism community; SARS had similarly detrimental effects on this industry in 2003. Although the similarities between these viruses suggest that the

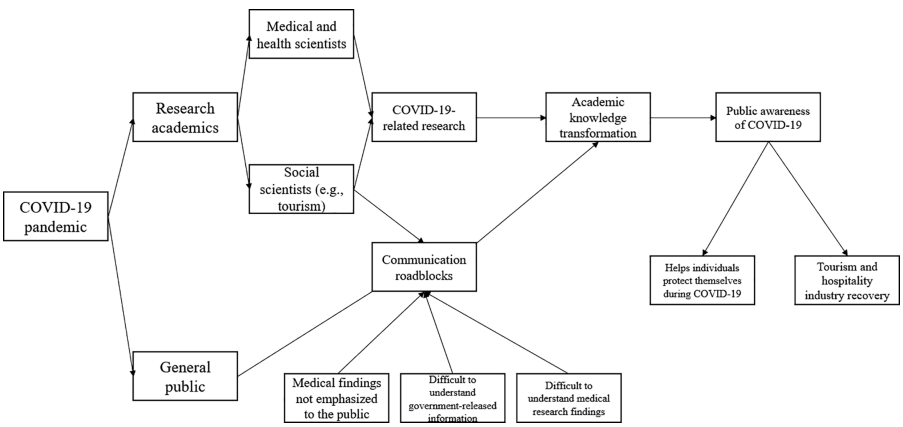


**Figure 1.**
Conceptual framework

tourism industry could recover over time as it did from SARS, the scale of the COVID-19 pandemic is much greater; therefore, extensive recovery measures will be needed to ensure the tourism industry's sustainability and continued success.

Naturally, the potential for pandemic-related interdisciplinary research involving the natural and social sciences extends beyond medicine and tourism. But it is important to note that such collaboration is highly salient amid COVID-19. As noted earlier, many subsectors of tourism offer promise for interdisciplinary research around pandemic recovery: business management, public health, nutrition and technology (e.g. artificial intelligence and robotics), among others. Relevant insight will not only promote business recovery, it will also help to alleviate potential travelers' concerns about the steps being taken in various service settings, such as hotels and restaurants, to protect visitors' and employees' health.

Additional directions of interest include identifying strategies to prevent COVID-19 and similar diseases or developing policies to protect and enhance public health. Furthermore, early research into pandemic-related effects on mental health, including depression and anxiety (e.g. Holmes *et al.*, 2020; Vahia *et al.*, 2020), suggests the need for additional studies involving psychology and psychiatry that could potentially include tourism. In particular, because a 14-day quarantine is often mandatory for tourists, people may have difficulty transitioning from quarantine to ordinary life after experiencing loneliness and negative emotions due to social isolation (Fu and Lee, 2020). Similarly, it is urgent to study how tourists or international students manage their mental health when they cannot return home during crisis situations (e.g. if their host country is under lockdown or upholding a COVID-19-related travel ban). Scholars could also continue investigating the implications of pandemic-associated discrimination, including how such behavior affects targets' and perpetrators' mental health and self-esteem.

Such endeavors will amplify benefits for researchers, readers and communities while raising awareness. Furthermore, leveraging the strengths of disparate domains can bring medical findings to a wider audience and showcase cutting-edge developments for the greater good. On the whole, as COVID-19 upends transactions, operations and experiences in the tourism industry, it is necessary to acknowledge the importance of cross-disciplinary research to promote understanding and awareness. In this vein, medical/health and social scientists must work together toward eradicating COVID-19 and prevent other pandemic outbreaks in the future.

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## About the authors

Dr Jun Wen is a lecturer in tourism and hospitality management in the School of Business and Law at Edith Cowan University. His current research interests lie in Chinese outbound tourism marketing, behaviors and other related aspects.

Dr Haifeng Hou is an associate professor in epidemiology in the School of Public Health at Shandong First Medical University. His current research interests lie in epidemiology of chronic diseases, evidence-based medicine and glycomics.

Metin Kozak is Professor of Tourism Marketing at Dokuz Eylül University, Turkey (metin.kozak@deu.edu.tr). His main research interests focus on consumer behavior, benchmarking and competitiveness. He has widely published in top-tier journals. He sits on the editorial board of several journals including *Annals of Tourism Research, Journal of Travel Research* and *Journal of Business Research*. He also acts as the co-editor of *Anatolia: An International Journal of Tourism and Hospitality Research*. Metin Kozak is the corresponding author and can be contacted at: m.kozak@superonline.com

Dr Fang Meng is an professor in the School of Hotel, Restaurant, and Tourism Management, University of South Carolina. United States. Her research mainly focuses on tourism destination marketing and management, tourism economic development, tourist behaviour/experience and international tourism.

Chung-En Yu received a BSc in tourism event management from the Institute for Tourism Studies (1FT) Macau. Currently, she is a master student in innovation and management in tourism at Salzburg University of Applied Sciences. Her research interests center on the psychological and sociological phenomena, consumer experiences and emerging technologies in tourism and hospitality.

Dr Wei Wang is a professor in public health in the School of Medical and Health Sciences at Edith Cowan University. His current research interests lie in molecular epidemiology, genomics and glycomics.

# Tourist purchases in a destination: what leads them to seek information from digital sources?

Alba García-Milon, Cristina Olarte-Pascual, Emma Juaneda-Ayensa and Jorge Pelegrín-Borondo
*Universidad de La Rioja, Logroño, Spain*

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## Abstract

**Purpose** – In a context where retail stores are closing down and high streets are declining, the purpose of this paper is to analyse on-site shopping by tourists. This work identifies the drivers that lead tourists to use digital information sources at the beginning of the shopping process. Understanding these drivers can help destination managers and retailers encourage tourists to shop.

**Design/methodology/approach** – A personal survey was conducted in a Spanish city noted for its shopping facilities (Logroño), using a sample of 430 tourists with purchase intention. The survey was designed based on the extended unified theory of acceptance and use of technology (UTAUT2) model. A multivariate analysis, based on structural equation modelling, was carried out using partial least squares (PLS), based on variance.

**Findings** – The study's finding is that performance expectancy, effort expectancy, social influence, facilitating conditions and habit influence intention to use digital sources of information to make purchases in a destination. Tourists prioritise utilitarian over hedonic motivations in the intention to use digital sources of information in tourist shopping.

**Originality/value** – It has been recognised that tourists are the perfect target to revitalise on-site shopping and, therefore, destinations must provide attractive shopping experiences from the outset. Prior to purchase, the search for available information is the first stage of the tourist shopping journey. Although many studies have analysed tourist shopping behaviour, none have focused, using the UTAUT2, on the digital information sources tourists consult pre-purchase. This research develops understanding of tourist shopping behaviour in this new technological context. This can help retailers/destinations provide better services and optimise the shopper's experience from the first stage of the process.

**Keywords** Tourist shopping, Digital information sources, Technology, UTAUT2, Logroño

**Paper type** Research paper

## Introduction

Retail shops and on-site shopping are endangered; according to Coresight Research, in the United States of America (USA) more than 9,300 stores shut down in 2019, a very significant increase on the 5,800 that closed in 2018 (Coresight Research, 2020); also, in Spain, an average of 23 retail stores have closed down every day since 2015 (Montero, 2019). In this context, tourists have been recognised as the perfect target public to maintain the high street vitality (García-Milon *et al.*, 2021; Lindberg *et al.*, 2019; Rabbiosi, 2015). Tourist shopping provides



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benefits for destinations; it is of significant interest as it contributes to a positive image (Jin *et al.*, 2017; Tosun *et al.*, 2007) and is an important income source (Chang *et al.*, 2006; Jin *et al.*, 2017). Fortunately, in the last decades, shopping at destinations has become one of the most important activities that the tourist undertakes (Chen, 2013; Lloyd *et al.*, 2011; Silva *et al.*, 2019; Yüksel, 2007). For many, shopping is an essential element and, without it, their tourism experience would be incomplete (Brochado *et al.*, 2018; Chang *et al.*, 2006; Chen, 2013; Timothy and Butler, 1995; Tosun *et al.*, 2007). In some cases, it can be the main motivation for travel (Timothy and Butler, 1995; Wong and Wan, 2013). Moreover, tourists derive great value from the satisfaction and pleasure associated with their purchases and by experiencing local culture (Hsieh and Chang, 2006; Way and Robertson, 2013).

But what triggers tourist purchasing in a destination? In tourism, as in other consumer scenarios, after identifying a need, the tourist's first step is to search out the shopping possibilities (Coromina and Camprubí, 2016; Gursoy and McCleary, 2004). For this reason, consumer information search has been considered to be among the most influential factors in the purchase decision-making process (Akalamkam and Mitra, 2018). Tourists today can consult many information sources, from the traditional, such as friends, advertising and travel guides, to sources provided by new technologies and the Internet, which make it possible to access information about any product or service anytime and anywhere (Piotrowicz and Cuthbertson, 2014; Rodríguez-Torrico *et al.*, 2017). Consumers now habitually use multidevices (e.g. smartphones, tablets, wearables) to access the Internet (Fritz *et al.*, 2017). There are 4.021 tn Internet users worldwide (Ditrendia, 2018). This new technological context has changed tourists' behaviours, giving rise to practices where, in the pre-purchase stage, tourists consult various information sources (García-Milon *et al.*, 2019; Verhoef *et al.*, 2015). In particular, tourists mainly use digital devices, which are now considered indispensable, and essential for touristic activities (Rodríguez-Torrico *et al.*, 2020).

To promote such a significant activity as shopping at destinations, it is crucial to understand tourists' purchasing behaviours from the first stage of the process, that is, the search for information. This understanding can help destinations develop tools to encourage tourists to embark on the process. Although many studies have analysed tourist shopping behaviour, none have focused on the tourist's consultation of digital information sources as the start point of the process. To bridge this gap, we have set as the main aim of this study the identification of the drivers for tourists in their search for information, using digital devices, in their purchases in destinations. As the use of digital information sources is a behaviour clearly related to the acceptance of new technologies, we apply unified theory of acceptance and use of technology2 (UTAUT2) (Venkatesh *et al.*, 2012). This is a model that has been tested in various technological contexts and has been validated in several research papers (e.g. Gupta *et al.*, 2018; Macedo, 2017; Morosan and DeFranco, 2016). Moreover, their developers encourage its application to new technological behaviours (Venkatesh *et al.*, 2012), our case, the use of digital information sources in tourist shopping is a behaviour clearly related to the acceptance of new technologies in a new context. The present study contributes to the tourism/retail literature by setting three specific objectives: (1) to provide a hierarchy of those aspects most important to tourists when seeking shopping information, (2) to highlight the important elements that technological sources of information must provide the tourist and (3) to make an initial contribution to the understanding of the tourist's purchase behaviour at the first stage of the process and to call for further research.

## Theoretical framework

As has been noted, shopping during a tourist visit adds value to the tourist's experience (Hsieh and Chang, 2006; Way and Robertson, 2013) and to the destination (Chang *et al.*, 2006; Tosun *et al.*, 2007). The concept of *shopping tourism* was introduced, as a leisure activity, for

the first time into the academic arena by Jansen-Verbeke (1991), where the purchases are inessential (Martin and Mason, 1987). It was not until 2005 that Timothy provided a definition of the concept of shopping tourism in the research field: shopping tourism is an activity in which shopping is the main motivation to travel or the main element of the tourist experience (Timothy, 2005). This definition has been widely accepted by numerous scholars (e.g. Choi *et al.*, 2016; Jin *et al.*, 2017; Rabbiosi, 2011). However, this paper focuses on a practice more widely undertaken by tourists: *tourist shopping*, defined as a secondary or additional activity undertaken during a trip (García-Milon *et al.*, 2021; Rabbiosi, 2011) in which tourists seek, select and buy goods (Jin *et al.*, 2017). Information seeking is integrated into tourist shopping (Jin *et al.*, 2017), and is the first step of the complete purchasing process of a tourist in a destination or tourist shopping journey (García-Milon *et al.*, 2020).

Recent technological advances have created a revolution in retail by broadening the options for obtaining information. New channels (e.g. mobile channels, Internet, social networks and chat) and devices (e.g. smartphones, tablets, smartwatches, wearables and televisions) have precipitated changes in consumer purchasing habits and behaviours (Verhoef *et al.*, 2015). Some years ago, consumers had access only to offline channels (i.e. stores and other physical resources provided by retailers) to obtain information; new technologies have now created self-informed consumers. These technologies allow consumers to inform themselves anywhere, and at any time, in an autonomous way (Melero *et al.*, 2016; Rodríguez-Torrico *et al.*, 2017). The intangibility of tourism prompted tourists to depend on digital information sources (Koo *et al.*, 2015), and they are regarded as helpful tools when planning a trip (Lee *et al.*, 2019). Due to their initial unfamiliarity with the shopping offer, tourists need information from the available information sources to begin the tourist shopping journey (García-Milon *et al.*, 2020). Here, digital sources of information allow an exponential growth in tourists' autonomy as they can obtain information on the go (Rodríguez-Torrico *et al.*, 2017).

New challenges have arisen in tourism research that need to be addressed to satisfy highly connected tourists (Kozak *et al.*, 2018). Tourism is one of the sectors that needs a most rapid and convenient incorporation of new technologies to meet the demands of tourists, who are increasingly more informed and "hyperconnected" (Castañeda *et al.*, 2019; Cohen *et al.*, 2014). In the understanding of tourists' shopping behaviour, the intention to use digital information sources is crucial as it is the first stage of the process. Consequently, this paper identifies the antecedents that lead tourists to consult digital information sources.

## Hypotheses development

In the present study, the extended UTAUT2 model (Venkatesh *et al.*, 2012) has been employed. This model identifies the key elements in the consumer's acceptance and use of technologies (Venkatesh *et al.*, 2003, 2012; Venkatesh and Davis, 2000). The developers of the UTAUT2 do not suggest that the model should be limited to narrow contexts, indeed they encourage researchers to extend it to different fields and situations (Venkatesh *et al.*, 2012). Therefore, the UTAUT2 model could contribute to the understanding of important technological phenomena such as, as in this case, the use of digital device-based information sources, a newly emerged technology-based behaviour (Venkatesh *et al.*, 2012). The UTAUT2 (1) has higher explanatory power than other technology acceptance models (Pan and Jordan-Marsh, 2010; Verdegem and De Marez, 2011); (2) focuses on consumers and provides an understanding of their acceptance of new technologies and (3) has a strong empirical basis in a variety of disciplines and subjects (e.g. Alalwan *et al.*, 2017; Baptista and Oliveira, 2015; Morosan and DeFranco, 2016; Tamilmani *et al.*, 2019).

The model was developed from the UTAUT model (Venkatesh *et al.*, 2003), which is the synthesis of eight theoretical models used in the behaviour literature (Ajzen, 1991; Davis *et al.*, 1989; Moore and Benbasat, 1991; Thompson *et al.*, 1991). The UTAUT2 proposes that

consumers' intentions to use technologies are formed by seven factors (Figure 1): (1) performance expectancy, (2) effort expectancy, (3) social influence, (4) facilitating conditions, (5) hedonic motivation, (6) price-value and (7) habit (Venkatesh *et al.*, 2012). In the following subsections, these factors are discussed in the development of the research hypotheses (Figure 1):

*Performance expectancy*

Performance expectancy has been defined as the degree to which the consumer (in our case, tourist) considers that using sources of information to make purchases will be beneficial to his or her performance (Venkatesh *et al.*, 2003, 2012). This factor is considered essential in new technology acceptance by consumers (Venkatesh *et al.*, 2003). In general terms, if consumers perceive that using new technologies is advantageous and useful for their activities, they will be more motivated to use and accept them (Alalwan *et al.*, 2017; Davis *et al.*, 1989; Venkatesh *et al.*, 2003). Previous studies have shown the positive effect of performance expectancy on behavioural intention (e.g. Alalwan *et al.*, 2017; Baptista and Oliveira, 2015; Macedo, 2017; Venkatesh *et al.*, 2003), and that it is an influencer of technology-use behaviour during the shopping process (Mosquera *et al.*, 2018). In the tourism field, it has been determined that performance expectancy is significant, and that it is an antecedent of the acceptance of technologies and innovations (Herrero *et al.*, 2017; Ibukun *et al.*, 2016; Uphaus *et al.*, 2019). Taking this into account in the context of this study, we posit the following hypothesis:

*H1.* Performance expectancy has a positive effect on the tourist's intention to use digital sources of information in tourist shopping.

*Effort expectancy*

Effort expectancy has been defined as the degree of ease associated with using sources of information to make a purchase in a destination (Venkatesh *et al.*, 2003, 2012). In the existing

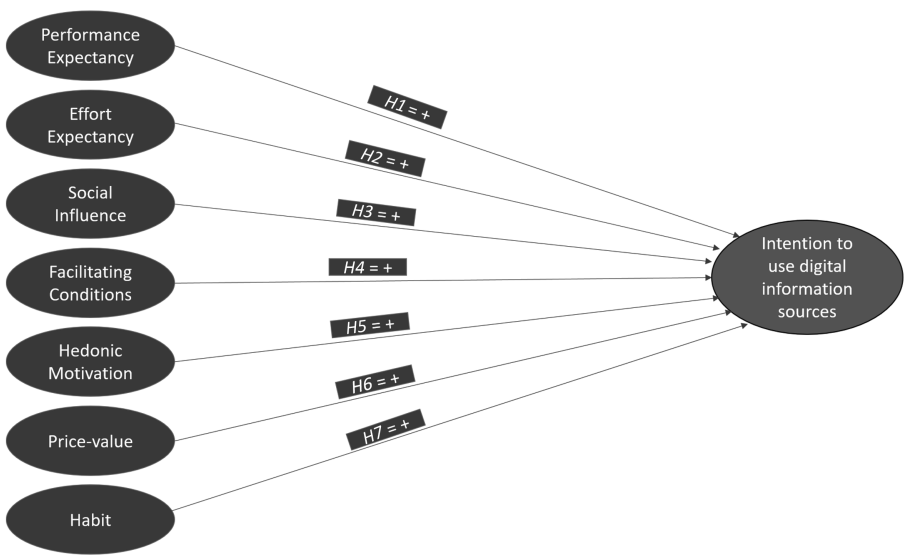


**Figure 1.**
Measurement model of the influence of the UTAUT2 factors on the tourist's intention to use digital information sources

**Source(s)**: Adapted from Venkatesh *et al.*, 2012

models, there are three effort expectancy-related constructs: perceived ease of use (TAM-*technology acceptance model* / TAM2), complexity (MPCU-*model of PC utilisation*) and ease of use (IDT-*innovation diffusion theory*) (Venkatesh *et al.*, 2003). The predictive power of effort expectancy for behavioural intention is widely accepted (e.g. Baptista and Oliveira, 2015; Macedo, 2017; Raman and Don, 2013), including the tourism field (Ibukun *et al.*, 2016; Uphaus *et al.*, 2019). To take forward the knowledge of this factor in the context of using online sources of information to make purchases at a tourist destination, we propose the following hypothesis:

*H2.* Effort expectancy has a positive effect on the tourist's intention to use digital sources of information in tourist shopping.

*Social influence*

Social influence has been defined as the degree to which tourists perceive that people who are important to them believe they should use sources of information to make purchases (Venkatesh *et al.*, 2003, 2012). Social influence is defined as a subjective norm in the TRA (*theory of reasoned action*), the TAM2, the TPB *(theory of planned behaviour)*/the DTPB *(decomposed theory of planned behaviour)* and the C-TAM-TPB *(combined TAM and TPB),* as social factors in the MPCU, and is used as a direct determinant in behavioural intention (Davis *et al.*, 1989; Moore and Benbasat, 1991; Venkatesh *et al.*, 2003). People close to the consumer can affect his/her awareness of, and attitude towards, technologies (Alalwan *et al.*, 2017). In general, the predictive power of social influence for behavioural intention is accepted (Ibukun *et al.*, 2016; Macedo, 2017; Raman and Don, 2013; Venkatesh *et al.*, 2003). It has also been considered as an important factor in tourists' purchases (Gupta *et al.*, 2018). Taking into account the findings of previous studies, we posit the following hypothesis about social influence:

*H3.* Social influence has a positive effect on the tourist's intention to use digital sources of information in tourist shopping.

*Facilitating conditions*

Facilitating conditions refer to the degree to which an individual considers that there is an organisational and technical structure to support him/her to use sources of information to make purchases in destinations (Venkatesh *et al.*, 2003, 2012). The facilitating conditions factor has its antecedents in constructs developed in earlier theories: control of perceived behaviour (TPB / DTPB, C-TAM-TPB), facilitating conditions (MPCU) and compatibility (IDT) (Venkatesh *et al.*, 2003). The factor is important because, when the consumer tries to use a technology to perform a certain task, it will be impossible to carry it out if the necessary conditions for doing so are absent (Morosan and DeFranco, 2016; Venkatesh *et al.*, 2012). Facilitating conditions are important in predicting behaviour towards technologies, in general (Macedo, 2017; Raman and Don, 2013; Venkatesh *et al.*, 2003, 2012), and in the tourism field, in particular (Ibukun *et al.*, 2016). Given this background, we propose the following hypothesis:

*H4.* Facilitating conditions have a positive effect on the tourist's intention to use digital sources of information in tourist shopping.

*Hedonic motivation*

The present study characterises hedonic motivation as reflecting the fun or pleasure derived from using sources of information to make a purchase (Venkatesh *et al.*, 2012). Consumers perceive that enjoyment is a very important determinant in relation to acceptance and use of

technology, given its direct role in behaviour (Brown and Venkatesh, 2005; Childers *et al.*, 2001; Ibukun *et al.*, 2016). It is a significant indicator of behavioural intention (Baptista and Oliveira, 2015; Macedo, 2017; Morosan and DeFranco, 2016; Raman and Don, 2013; Venkatesh *et al.*, 2012). Moreover, hedonic motivation has been seen as an important factor when using tourism-related technologies (Escobar-Rodríguez and Carvajal-Trujillo, 2014; Ibukun *et al.*, 2016; Uphaus *et al.*, 2019). Taking into account the previous research, we propose the following hypothesis in relation to hedonism and the use of digital information sources in tourist shopping:

*H5.* Hedonic motivation has a positive effect on the tourist's intention to use digital sources of information in tourist shopping.

*Price-value*

Price-value is understood to be the consumer's awareness of the perceived benefits of using sources of information in relation to the monetary cost of using them (Dodds, 1991; Venkatesh *et al.*, 2012). When the benefits of using a technology are greater than its monetary cost there will be a positive effect on the price-value variable (Venkatesh *et al.*, 2012). Some studies have shown that its influence on behavioural intention towards technologies is not significant (e.g. Baptista and Oliveira, 2015; Macedo, 2017), although others have concluded it is a good indicator (e.g. Ibukun *et al.*, 2016; Venkatesh *et al.*, 2012). We propose the following:

*H6.* Price-value has a positive effect on the tourist's intention to use digital sources of information in tourist shopping.

*Habit*

Habit is the degree to which tourists automatically display learnt behaviour in terms of using sources of information to make purchases in destinations (Venkatesh *et al.*, 2012). Previous experiences influence beliefs and, consequently, future behaviour (Ajzen and Fishbein, 2005). Previous research has found that habit has a significant, positive effect on behavioural intention (Baptista and Oliveira, 2015; Ibukun *et al.*, 2016; Macedo, 2017; Morosan and DeFranco, 2016; Venkatesh *et al.*, 2012). Other studies also support the positive effect of habit in technology use in tourism activities (Cássia de Moura *et al.*, 2017; Castañeda *et al.*, 2019). Taking this into account, we put forward the following hypothesis:

*H7.* Habit has a positive effect on the tourist's intention to use digital sources of information in tourist shopping.

## Methodology

*Data collection and sample*

To test our hypotheses, after evaluating important commercial and tourism aspects, an urban tourism destination was chosen. The city selected had to meet the following criteria: (1) to have a homogeneous central commercial zone; (2) to promote shopping as a motivation to visit the destination; (3) to have typical, local independent shops with high value for non-residents; (4) to have a recognisable, attractive shopping offer; and (5) to be readily accessible from other cities and have good tourist infrastructure. As a result, Logroño (Spain) was chosen. Logroño, unlike other larger cities that integrate a variety of districts, has a distinct central zone with a range of unique shops. Its excellent shopping facilities are used by the public administration to promote tourism: it was officially recognised as the first Spanish "City of Commerce" in 1997. In addition, it was nominated to become the first Commercial City of Europe in 2020 (EFE, 2016). Logroño is a medium-sized urban destination located at a strategic point in the northern part of Spain. It is

the capital of the La Rioja region, renowned worldwide for its wine (Denomination of Origin Rioja), which accounts for 47% of Spanish wine production (Nielsen, 2014).

A personal survey was conducted in the city of Logroño using a sample of 430 tourists (marginal error 4.72%, at a confidence interval level of 95%). As our objective was to analyse intention to use digital sources of information to make purchases, we chose only tourists with purchase intention, asking an initial filter question. To obtain a diverse sample of tourists, three locations were chosen for the recruitment of potential respondents, all of them located near the city centre: the tourist information office, a three-star hotel and a four-star hotel (Logroño does not have any one-star or five-star hotels). The interviews were conducted soon after the tourists' arrivals, to assess their intentions before they began shopping. The respondents gave their consent to be interviewed and participate in the study. The data were collected by trained pollsters between December 2017 and March 2018.

*Measurement scales and data analysis*

The measure used was an 11-point Likert-type scale, from 0 (totally disagree) to 10 (totally agree), based on the UTAUT2 model proposed by Venkatesh *et al.* (2003, 2012). The variables used to test the model are shown in Table 1.

The survey questions were specifically framed to test the use of technology-based information sources, such as Google and other search engines, Tripadvisor and other forums and social networks. At the beginning of the survey, the interviewers stated that the purpose of the study was to measure the usage of digital sources of information.

Partial least squared (PLS) structural equation modelling (SEM) was used for the data analysis. PLS was selected because it is less sensitive to violation of assumptions of normality (Chin, 1998). Hair *et al.* (2011, p. 144) recommended using PLS-SEM "if the goal is predicting key target constructs or identifying key 'driver' constructs," as in our case. Similarly, other authors have suggested that PLS-SEM is appropriate when the research has a predictive aim (Shmueli *et al.*, 2016) and an explanatory purpose (Henseler, 2018), as in the case of our study.

## Results

*Sample profile*

Of the total sample of 430 tourists, 40.4% were male, and 59.6% were female, 95.6% were domestic tourists, and 4.4% international tourists. In terms of the number of nights spent in Logroño, 39.2% stayed for 1 night, 37% for 2 nights, 14.5% for 3 nights and 9.3% for more than 3 nights.

The results showed the types of product that the tourists intended to buy. Some 86.5% intended to buy packaged food or beverages. As previously noted, Logroño is the capital of La Rioja, a region known for its Denomination of Origin Rioja wine; this result confirms that this type of product is very important to the city and the region. It is not surprising, therefore, that wine is the main product purchased in the city. In the second place, we found that 36.4% intended to buy gifts and souvenirs, followed by 24.6% who intended to buy clothing, footwear and/or accessories.

*Evaluation of the measurement model*

First, the validity of the items was examined by assessing the standardised loadings (>0.70) and *t*-values (>1.96) (Figure 2). Although two indicators (FC4 and Ha2) returned scores below 0.70, there is flexibility if the indicator contributes to the validity of the factor (Hair *et al.*, 2013) and has a *t*-value > 1.96. The indicators met these conditions and, therefore, we included them in the model.

The measurement model was verified in terms of construct reliability (i.e. composite reliability and Cronbach's *alpha*), convergent validity and discriminant validity. Both the

| Construct | Items | Source |
|---|---|---|
| Performance expectancy (PE) | PE1. Using digital sources of information to buy is very useful | Adapted from Venkatesh *et al.* (2003) |
| | PE2. Using them will increase the chance of buying what I want | |
| | PE3. Using them allows me to buy faster | |
| | PE4. Using them improves my purchasing performance | |
| Effort expectancy (EE) | EE1. Learning how to use digital information sources to buy is easy | |
| | EE2. Using them is clear and understandable | |
| | EE3. It's easy to use them | |
| | EE4. Using them involves little effort | |
| Social influence (SI) | SI1. People important to me think I should use digital information sources in my purchases | |
| | SI2. People who influence me think I should use them | |
| | SI3. People whose opinions I value prefer that I use them | |
| Facilitating conditions (FC) | FC1. I have the resources necessary to use digital sources of information to buy | |
| | FC2. I have the knowledge to use them | |
| | FC3. They are compatible with each other | |
| | FC4. I can get help from others if I have difficulty using them | |
| Hedonic motivation (HM) | HM1. Using digital sources of information to buy is fun | Adapted from Venkatesh *et al.* (2012) |
| | HM2. It's nice | |
| | HM3. It's entertaining | |
| Price-value (PV) | PV1. Using digital sources of information to buy is reasonably priced | |
| | PV2. They are good value for money | |
| | PV3. At the current price, it's a good option to use them | |
| Habit (Ha) | Ha1. To use digital sources of information to buy is a habit for me | |
| | Ha2. I'm addicted to using them | |
| | Ha3. I think I should use them | |
| | Ha4. Using them is natural for me | |
| Intention to use digital information sources (IUDIS) | I intend to use digital information sources to buy in the destination | |
| | I will probably use digital information sources to buy in the destination | |
| | I have decided to use digital information sources to buy in the destination | |

**Table 1.**
Variable measurement items scale

composite reliability and Cronbach's *alpha* were greater than 0.70 (Table 2). The convergent validity of the constructs was also confirmed, as the average variance extracted (AVE) is greater than 0.50 in all cases (Table 2). Discriminant validity was also confirmed (Table 3): the square root of the AVE of each construct was greater than the inter-construct correlations.

*Evaluation of the structural model*

We calculated the effect of the UTAUT2 factors on intention to use sources of information by tourists (Table 4). The $R^2$ showed a value of 0.474, indicating that it explained 47.40% of the

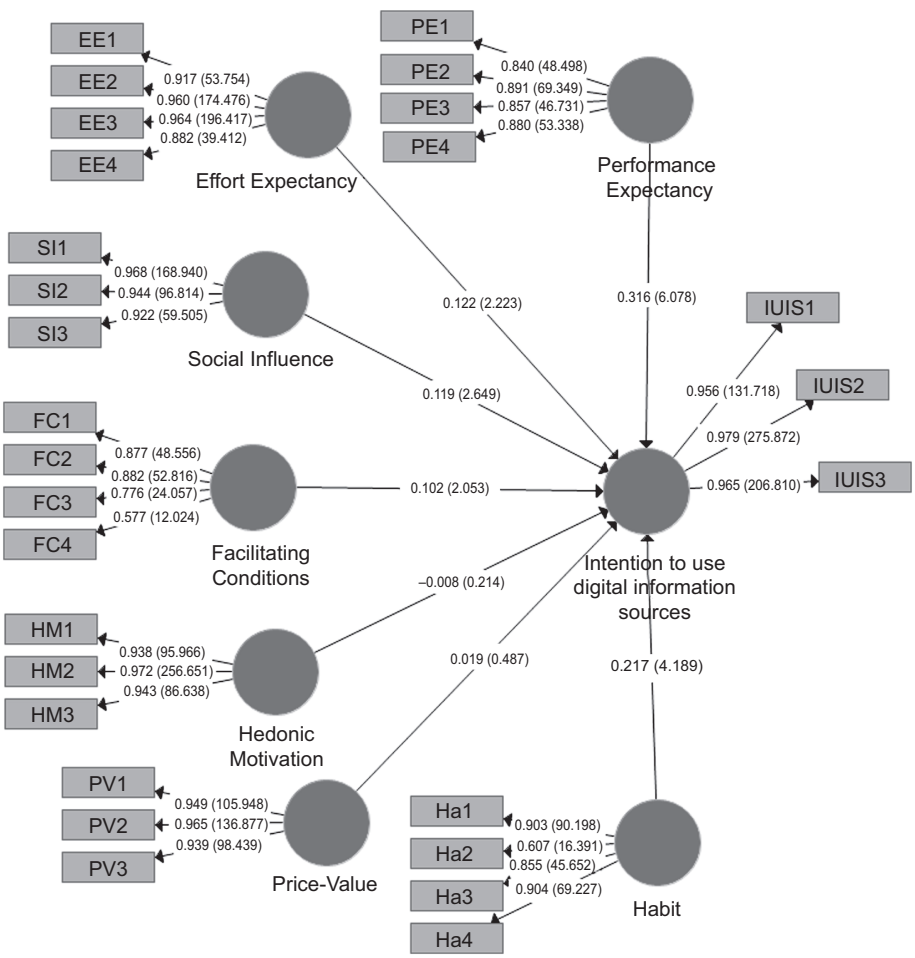


**Figure 2.**
Results of the measurement and structural models: Path coefficients (*t*-values)

| Construct | Composite reliability | Cronbach's alpha | Average variance extracted (AVE) |
|---|---|---|---|
| Performance expectancy | 0.924 | 0.891 | 0.752 |
| Effort expectancy | 0.963 | 0.948 | 0.867 |
| Social influence | 0.961 | 0.940 | 0.893 |
| Facilitating conditions | 0.864 | 0.786 | 0.620 |
| Hedonic motivation | 0.966 | 0.947 | 0.905 |
| Price-value | 0.966 | 0.947 | 0.904 |
| Habit | 0.894 | 0.841 | 0.683 |
| Intention to use information sources | 0.977 | 0.965 | 0.935 |

**Table 2.**
Construct reliability and convergent validity

| Construct | PE | EE | SI | FC | HM | PV | HA | IUIS |
|---|---|---|---|---|---|---|---|---|
| Performance expectancy (PE) | *0.867* | | | | | | | |
| Effort expectancy (EE) | 0.560 | *0.931* | | | | | | |
| Social influence (SI) | 0.371 | 0.247 | *0.945* | | | | | |
| Facilitating conditions (FC) | 0.449 | 0.731 | 0.187 | *0.788* | | | | |
| Hedonic motivation (HM) | 0.406 | 0.419 | 0.401 | 0.318 | *0.951* | | | |
| Price-value (PV) | 0.324 | 0.323 | 0.358 | 0.250 | 0.410 | *0.951* | | |
| Habit (Ha) | 0.605 | 0.556 | 0.431 | 0.392 | 0.479 | 0.363 | *0.827* | |
| Intention to use information sources (IUIS) | 0.608 | 0.526 | 0.383 | 0.443 | 0.363 | 0.304 | 0.570 | *0.967* |

**Table 3.**
Discriminant validity

**Note(s)**: Diagonal elements (in italic) are the square root of the AVEs. Off-diagonal elements are the inter-construct correlations

| | $R^2$ | $Q^2$ | Direct effects | *p*-value | Support for hypothesis |
|---|---|---|---|---|---|
| Intention to use information sources (IUIS) | 0.474 | 0.415 | | | |
| H1: Performance expectancy → (+) IUIS | | | 0.316*** | 0.000 | Supported |
| H2: Effort expectancy → (+) IUIS | | | 0.122* | 0.015 | Supported |
| H3: Social influence → (+) IUIS | | | 0.119** | 0.004 | Supported |
| H4: Facilitating conditions → (+) IUIS | | | 0.102* | 0.021 | Supported |
| H5: Hedonic motivation → (+) IUIS | | | −0.008 n.s | 0.418 | Non supported |
| H6: Price-Value → (+) IUIS | | | 0.019 n.s | 0.303 | Non supported |
| H7: Habit → (+) IUIS | | | 0.217*** | 0.000 | Supported |

**Table 4.**
Effects on the endogenous variables

**Note(s)**: *$p < 0.05$; **$p < 0.01$; ***$p < 0.001$; n.s. not significant (based on a one-tailed Student's $t$ (4.999) distribution)

variance. The $Q^2$ was 0.415, which establishes that the model is highly predictive of the tourist's intention to use digital sources of information in his/her purchases (Hair *et al.*, 2011). However, differences were found in the impact of the variables on intention to use sources of information, with five (performance expectancy, effort expectancy, social influence, facilitating conditions and habit) having a direct positive effect, and two (hedonic motivation and price-value) having no effect on the dependent variable. Therefore, H1, H2, H3, H4 and H7 are supported, and H5 and H6 are not supported.

## Conclusions and discussion

It has been recognised that tourists are the perfect buyers to revitalise on-site shopping (García-Milon *et al.*, 2021; Lindberg *et al.*, 2019; Rabbiosi, 2015). Tourists use different sources of information to reduce their feelings of uncertainty and lack of awareness of the shopping process in unfamiliar destinations (García-Milon *et al.*, 2019). The importance of this lies in the fact that the sources of information consulted are the tourist's first contact with the destination, so they can increase or decrease his/her purchase intentions (Gursoy and McCleary, 2004) and shape the shopping experience. Given that tourists possess the technologies to inform themselves when visiting destinations, the UTAUT2 model has been applied to understand the tourists' acceptance of these technologies, and their intention to use digital sources of information in their purchases at destinations.

Tourists today seek information from different technological devices to make their purchases. So, what theoretical background explains their motivation to do so? It has been

established that the factors that influence the tourist's intention to use digital sources of information are, in order of importance, performance expectancy, habit, effort expectancy, social influence and facilitating conditions.

First, as H1 shows, performance expectancy is an essential factor in the use of digital sources of information. Previous studies have also found it is important in the adoption of new technologies, such as mobile banking (Alalwan *et al.*, 2017) and in the acceptance of E-tourism (Herrero *et al.*, 2017; Ibukun *et al.*, 2016). It has also been considered the most important factor in the adoption of mobile applications by tourists (Gupta *et al.*, 2018) and in technological location-based services in tourism (Uphaus *et al.*, 2019). It has been confirmed that, if tourists perceive that it is advantageous and useful to draw on information sources, they are motivated to use them at destinations because this helps them make better decisions, improving performance.

Habit leads tourists to use digital information sources in their purchases and has a positive effect on use intention. The results obtained are consistent with previous studies on intention to use Near-Field Communications (NFC) to make mobile payments in hotels (Morosan and DeFranco, 2016). Habit has also been found to be important in other technological uses in various tourism activities (e.g. Cássia de Moura *et al.*, 2017; Castañeda *et al.*, 2019). In addition, the more normal the use of information sources becomes, the more frequently they will be used. Thus, tourists who already are in the habit of regularly using sources of information are more likely to use them in the future.

Another supported hypothesis regards effort expectancy, that is, the degree of ease that the tourist associates with the use of information sources. This has been found to be a significant factor in predicting behaviour in technological innovations in mobile banking (Alalwan *et al.*, 2017; Baptista and Oliveira, 2015), in education (Raman and Don, 2013) and in tourism (Ibukun *et al.*, 2016; Uphaus *et al.*, 2019). In our case, we found that tourists are more predisposed to use digital information sources to make purchases in a destination if they are easy to manage and do not require much effort.

H3 suggests that social influence makes tourists consider the opinions of others when they use sources of information to make their purchases. The results revealed that others' views are, indeed, important and, therefore, the opinions of the people around the tourist affect his/her intention to use sources of information. This was not seen as significant in the acceptance and use of mobile banking (Alalwan *et al.*, 2017; Baptista and Oliveira, 2015) but was considered an important factor in the acceptance of new information and communication technologies (Macedo, 2017; Venkatesh *et al.*, 2003, 2012). Regarding its role in the acceptance of technological applications in tourism, some studies have supported its influence (e.g. Gupta *et al.*, 2018) and others have not (e.g. Uphaus *et al.*, 2019).

The facilitating conditions associated with digital information sources support the tourist in making his/her purchases. As H4 has been supported, we can conclude that tourists need to have the knowledge, resources and support to use the digital information sources available; it has been shown that this affects use intention. In the field of E-tourism, it has been found that facilitating conditions are an influential factor in technology acceptance (Ibukun *et al.*, 2016). They have also been considered as an important predictor (Raman and Don, 2013) of the acceptance of educational management systems in teaching and in tourism (Ibukun *et al.*, 2016).

H5 and H6 were not supported. The influence of hedonic motivation and price-value on intention to use sources of information to buy was ruled out. The price-value results are in line with other studies that show that its influence on the behavioural intention of consumers when using new technologies is not significant (e.g. Baptista and Oliveira, 2015; Macedo, 2017). However, the hedonic motivation result contradicts previous studies (e.g. Baptista and Oliveira, 2015; Ibukun *et al.*, 2016; Macedo, 2017; Morosan and DeFranco, 2016; Raman and Don, 2013; Uphaus *et al.*, 2019; Venkatesh *et al.*, 2012) that found it to be a good indicator of behavioural intention. Our research results suggest that utilitarian motivations do explain

intention to use digital information sources, while hedonic motivations do not. This lack of hedonic motivation could be caused by the nature of the search for information which is mainly functional, as a result, hedonism is not a predictor of this tourists' technological behaviour. Price has no effect, mainly because the digital information sources commonly available to tourists, particularly since the Internet has become almost universal, are free or low cost. Therefore, tourists do not perceive price as an important element in their intention to use this type of information sources.

*Theoretical implications*

This paper contributes to the scarce literature on intention to use digital information sources in tourist shopping, this practice is important since it is the first step of the tourist shopping journey at the destination. While some previous studies have highlighted the need for research into the influence of technological developments on tourist shopping, given its importance in the tourism context (e.g. Jin *et al.*, 2017), little academic attention has been paid to this specific activity. Thus, this paper represents an initial contribution to the understanding of the tourist's on-site purchase behaviour and his or her tourist shopping journey in a digital context.

The most important contribution of this work is that the most relevant driver of the intention to use digital information sources in tourist shopping is utilitarian, that is, performance expectancy. This result is different from Goossens (2000) who highlighted the importance of both hedonic and utilitarian aspects in tourists' behaviour, suggesting that emotional factors are more important than utilitarian. Therefore, any future model that combines tourist shopping and technology should consider the utilitarian aspect.

Furthermore, the other main predictors for tourist's intention to use digital sources of information when shopping in a destination, in order of relevance, are habit, effort expectancy, social influence and facilitating conditions. Especially, habit has demonstrated its explicative capacity in this digital context which reinforces its accurate integration into the model (Venkatesh *et al.*, 2012) compared to its antecedent UTAUT (Venkatesh *et al.*, 2003). However, it must be highlighted that although in this specific practice, tourists are influenced by the majority of the UTAUT2 factors, hedonic motivation and price-value were not significant and were ruled out from the model.

A further implication is that this study supports the versatility of the UTAUT2 model for diverse technological contexts. It can be successfully tested for entirely technological activities but also for supportive or secondary practices of a non-technological activity, such as, in this case, tourist shopping. This work represents a step forward in research for employing the model in activities where technology is not the executing element, but a support resource.

*Managerial implications*

Understanding why tourists intend to use digital information sources is a key because it relates to the start of the tourist shopping journey. This is especially important in tourism, because tourists are generally unfamiliar with their destinations and what possibilities they offer. Thus, if retailers and destinations do not have digital information sources suitable for their target market, they may face a drastic reduction in visibility and, consequently, sales. The results obtained provide a series of practical implications for destinations, retail stores and businesses regarding tourists' shopping information-search processes and motivations behind their intention to use digital information sources such as social networks, forums, search engines, etc.

First, the tourist's perception of the usefulness of an information source must be high for it to encourage him/her to begin shopping. Tourists have limited time and want to optimise it in

their shopping activity. Therefore, their information search processes must provide advantages, be useful and improve their performance of the activity (Castañeda *et al.*, 2019); otherwise, the purchasing process will not begin. Understanding their search objectives is crucial for providing the best possible service. Moreover, the tourist must believe that using sources of information will improve his/her performance; searching for information will therefore become a habit and a natural part of the shopping process.

It has been shown that digital information source designers need to develop hedonic features when utilitarian systems are insufficient to persuade users to accept a technology (Tamilmani *et al.*, 2019). In our case, the information search activity, far from being hedonic, is mainly functional. Although purchases in themselves are seen as being hedonic, the task of seeking information, even if it is to facilitate a purchase, has a utilitarian purpose. This is because using information sources improves results and efficiency, and thus helps the consumer to be more productive (Pahnila and Warsta, 2010).

It is also imperative that destinations and businesses have well-designed digital information platforms that are intuitive to use and involve minimal consumer effort (Vijayasarathy, 2003). In this respect, following the structure of existing information sources that have high rates of consumer usage will reduce tourists' learning efforts (and foster standardisation). Moreover, the Internet must be provided by destinations and easily accessible to tourists. Also, technical and human support must be provided, and suppliers must resolve tourists' doubts; this will add value to the information sources and should increase their use by tourists. Our results showed that tourists are influenced by their social environment, for example, relatives, friends and/or the famous, when making decisions about the technologies they use to seek information. Therefore, an effective way to encourage the use of particular digital information sources would be to influence the attitude of this social environment.

Furthermore, the new coronavirus disease 2019 (COVID-19) context means that tourists' activities will, in future, be based more on contactless interactions (O'Leary, 2020). Therefore, it is important for destination managers to provide suitable digital sources of information to help tourists begin the buying process at destinations while respecting social distancing.

*Limitations and future lines of research*

As the use of digital information sources is not static, and this study takes account of only the search stage at the point the tourists arrived, this research could be replicated at other points in the tourists' shopping journey. It could also be expanded to other cities and countries to test if the results differ from those obtained in this paper.

An interesting question, not posed in this study, is the issue of repeat visits to the same destination, as this may affect intention to use sources of information, based on whether the tourist is already familiar with the destination. This data could be incorporated into future, related studies. Another possible enhancement would be to connect intention to use digital information sources to shop at a destination with actual technological behaviours, level of purchase intention and even with completed purchases. Other issues such as the actual use of digital sources before the trip or tourists' ages could be considered in future studies. In addition, it may be that there is a relation between increased levels of shopping, in terms of volume/value, and the use of information sources. It would be interesting to identify, in this case, the type of sources used.

Given that this research is quantitative, it could be enhanced by a qualitative assessment of sources of information usage by tourist shoppers. Also, other theories, such as risk perception and rational decision-making, could be applied in a similar study. In addition, future studies could consider UTAUT2 moderators in the conceptualisation and analysis. Another research line could focus on specific types of tourist purchases (e.g. compulsive

purchases, cross shopping, high-involvement purchases, low-involvement purchases, emergency purchases and impulse buying).

Finally, on March 11, 2020, the World Health Organization (WHO) declared the global pandemic COVID-19 that has paralysed economies, tourism and tourist purchases; therefore, it is necessary to continue researching in this field, advancing theory and practice. This will help overcome the situation and provide solutions for destination managers.

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**Corresponding author**
Alba García-Milon can be contacted at: algarcm@unirioja.es

# Bitcoin and CEE stock markets: fresh evidence from using the DECO-GARCH model and quantile on quantile regression

Ngo Thai Hung
*Faculty of Economics and Law, University of Finance-Marketing, Ho Chi Minh City, Vietnam*

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## Abstract

**Purpose** – This study examines the inter-linkages between Bitcoin prices and CEE stock markets (Hungary, the Czech Republic, Poland, Romania and Croatia).

**Design/methodology/approach** – The dynamic contemporaneous nexus has been analyzed using both the multivariate DECO-GARCH model proposed by Engle and Kelly (2012) and quantile on quantile (QQ) methodology proposed by Sim and Zhou (2015). Our study is implemented using the daily data spanning from 6 September 2012 to 12 August 2019.

**Findings** – First, the findings show that the average return equicorrelation across Bitcoin prices and CEE stock indices are positive, even though it is found to be time-varying over the research period shown. Second, the Bitcoin-CEE stock market association has positive signs for most pairs of quantiles of both variables and represents a rather similar pattern for the cases of Poland, the Czech Republic and Croatia. However, a weaker and primarily negative connectedness is found for Hungary and Romania, respectively. Furthermore, the interconnectedness between the co-movements in the Bitcoin market and stock returns changes significantly across quantiles of both variables within each nation, indicating that the Bitcoin-stock market relationship is dependent on both the cycle of the stock market and the nature of Bitcoin price shocks.

**Practical implications** – The evidence documented in this study has significant implications for divergent economic agents, including global investors, risk managers and policymakers, who would benefit from a comprehensive knowledge of the Bitcoin-stock market relationship to build efficient risk-hedging models and to conduct appropriate policy reactions to information spillover effects in different time horizons.

**Originality/value** – This paper is the first study employing both the multivariate DECO-GARCH model and QQ methodology to shed light on the nexus between Bitcoin prices and the stock markets in CEE countries. The DECO model uses more information to compute dynamic correlations between each pair of returns than standard dynamic conditional correlation (DCC) models, declining the estimation noise of the correlations. Besides, QQ approach allows us to capture some nuanced features of the Bitcoin-stock market relationship and explore the interdependence in its entirely. Therefore, the main contribution of this article to the related literature in this field is significant.

**Keywords** CEE stock markets, DECO, Bitcoin, Quantile on Quantile approach

**Paper type** Research paper

## 1. Introduction

Cryptocurrencies are considered as an attractive and alternative investment asset for the purposes of portfolio diversification, since they represent various variations in returns that



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show lower connections versus other traditional financial assets (Kang *et al.* 2019a). The rapid development of cryptocurrency markets and the upsurge in cryptocurrencies as novel financial asset classes consequently provides a robust opportunity to examine several as yet unexpected aspects of cryptocurrencies (Gil-Alana *et al.*, 2020). Specifically, during recent global economic and financial crises, the contentious traits of Bitcoin have been considered as a hedge or safe haven like gold. Bitcoin market is also considered as hedge or safe haven asset by an array of academics and international investors (Wei, 2018; Brauneis and Mestel, 2018; Bouri *et al.*, 2019; Antonakakis *et al.*, 2019; Paule-Vianez *et al.*, 2020). Also, Bitcoin has been considered as an indispensable asset that demonstrates both the standard financial asset and a speculative asset (Wang *et al.*, 2020b). Therefore, the information transmission running from Bitcoin prices to other traditional financial markets might help in investment and policy decision purposes (Salisu *et al.*, 2019).

According to Zhang *et al.* (2021), it is a potential source of instability to financial markets since the Bitcoin market has witnessed rapid development and presented extreme price volatility. As a result, it is necessary to systematically understand the interconnection between Bitcoin and other financial markets for the sake of decision in connection with asset allocation, risk management and financial stability. Moreover, it is also essential to select the advanced and refined models to analyze the dynamic risk transmission from Bitcoin to other conventional financial assets due to the sophistication of the Bitcoin market (Bouri *et al.*, 2019; Antonakakis *et al.*, 2019).

Furthermore, the research of the relationship between the Bitcoin market and stock returns is useful for policymakers to enhance the regulatory systems in various economies. Several scholars have argued that the Bitcoin market is a bubble that will burst in the future and have risk spillover effects on other financial asset classes (Zeng *et al.*, 2020). Hence, any evidence of transmission from Bitcoin prices to other markets and vice versa, may impact asset allocation and risk management for investors.

Nevertheless, there remains a lack of a better understanding of the interplay between cryptocurrencies and other financial markets (Zeng *et al.*, 2020). Consequently, the purpose of this article is to unveil the equicorrelation and interconnectedness between Bitcoin and stock markets in five Central and Eastern European countries (Hungary, Poland, Romania, the Czech Republic and Croatia) via the combination of the multivariate DECO-GARCH model of Engle and Kelly (2012) and quantile on quantile (QQ) methodology proposed by Sim and Zhou (2015). These models allow for capturing the linkages and measuring intercorrelation of Bitcoin and the CEE stock markets to enrich the literature on this subject.

The current study belongs to the literature on Bitcoin finance and economics and connects to studies on the connectedness between Bitcoin prices and stock markets. As a result, this paper adds to the existing literature in serval ways. The first contribution is that it estimates the dynamic correlations between Bitcoin prices and CEE stock market indices by using an MGARCH model with the DECO specification. Engle and Kelly (2012) proposed the dynamic equicorrelation GARCH (DECO-GARCH) model in which the average of the conditional correlations is set to equal the average of all pair correlations. Thus, the time variations in the connectedness of all markets under study are measured (Kang *et al.* 2019a, b; Kang and Yoon, 2019; Bouri *et al.*, 2020; McIver and Kang, 2020). In addition, we employ the QQ approach to capture the relatedness between co-movements in Bitcoin prices and CEE stock markets to be conditional on the stock market cycle and the size and sign of Bitcoin prices (Ferrer *et al.*, 2019). More precisely, the QQ methodology not only measures the heterogeneous interaction between Bitcoin market and stock return variations in the CEE countries at distinct points of the conditional distribution of Bitcoin market, since the standard quantile regression does, but it also models the quantile of Bitcoin prices as a function of the quantile of stock market indices (Shahbaz *et al.*, 2018; Haseeb *et al.*, 2020; Sinha *et al.*, 2020).

We find a positive equicorrelation between Bitcoin and the CEE stock markets, which is relatively weak during the period shown. What is more, we provide evidence that the interconnectedness between the co-movements in the Bitcoin market and stock returns changes significantly across quantiles of both variables within each nation, indicating that the Bitcoin-stock market relationship is dependent on both the cycle of the stock market and the nature of Bitcoin price shocks. Besides, our findings illustrate the important heterogeneity Bitcoin market in the degree of correlation to the CEE stock indices over time, boosting our significant understanding of the economic channels through which the Bitcoin-stock market relationship in the CEE region are linked. Finally, our analysis has crucial implications concerning risk management, asset allocation and regulatory formulation.

The rest of this paper is structured as follows. Section 2 provides a literature review. Section 3 presents a description of the data and methodologies. Section 4 documents the empirical results. Section 5 concludes the study with policy implications.

## 2. Literature review

The emergence of Bitcoin and other cryptocurrencies in the market has been studied during this decade (Gil-Alana *et al.*, 2020). The literature on cryptocurrencies has covered a wide range of divergent aspects, beginning with the technical and investment characteristics of Bitcoin in relation to risk and returns (Wei, 2018; Tan *et al.*, 2020; Omane-Adjepong *et al.*, 2019; Kosc *et al.*, 2019; Da Gama Silva *et al.*, 2019; Brauneis and Mestel, 2018; Bouri, *et al.*, 2019; Antonakakis *et al.*, 2019; Yi *et al.*, 2018; Koutmos, 2018). There are vast sum of studies focusing on Bitcoin suitability as an asset to diversify the risks of other traditional assets, which is consistent with the purpose of this paper. We effectively restrict our concentration on the literature with regard to the connectedness between Bitcoin and other traditional asset classes.

This article brings an additional to fruit-bearing studies on the interdependence across traditional assets. The relationship among different markets is reinforced by the financial globalization. For instance, López-Cabarcos *et al.* (2019) analyze the natural behavior of Bitcoin and the impact that investor sentiment, S&P 500 and VIX returns have on Bitcoin volatility. They find that Bitcoin volatility is more unstable in specific period, while S&P 500, VIX returns and sentiment impact Bitcoin volatility in stable periods. Wang *et al.* (2020a) show that Bitcoin prices represent noticeably higher trading volume and volatility during hours that occur simultaneously with the daytime trading hours of European and US stock markets. More recently, Corbet *et al.* (2020) investigate the connectedness between news coverage and Bitcoin returns and provide evidence of macroeconomic indicators have a significant effect on Bitcoin returns. They also suggest that the developing cryptocurrency market is further maturing through associations with macroeconomic news. Paule-Vianez *et al.* (2020) look into whether Bitcoin behaves as a safe-haven asset and conclude that Bitcoin's spillover effects increase during more uncertain times like gold. As a result, Bitcoin illustrates characteristics of investment assets, in particular safe havens.

Recently, the majority of studies center on the interactions between cryptocurrency and stock markets. Mensi *et al.* (2020) investigate the connectedness between Bitcoin and the World stock market, regional Islamic stock markets and Sukuk markets. They provide many interesting findings on the co-movements among asset classes. The relationship is stronger and similar direction at lower frequencies, but in the opposite direction at high frequencies, indicating the benefits from diversification with Bitcoin are somewhat less for long-term investors and benefits of hedging in the short run through diversification in Bitcoin and Islamic equity markets. In the same vein, Wang *et al.* (2020b) focus on the relationship between Bitcoin and the stock markets and reveal that the S&P 500 and Dow Jones indices has a relatively impact on Bitcoin, while the effect caused by them on Bitcoin is significantly weak. Using daily data, Zhang *et al.* (2021) find that reasonable evidence to imply the persistence of downside risk spillover between Bitcoin and equity markets would be time dependent. Similar

to our approach, Zeng *et al.* (2020) explore the connectedness between Bitcoin and conventional financial assets. Their results show that the relationship between Bitcoin and traditional assets is significantly weak. Specifically, the presence of a nonlinear and asymmetric pattern of the spillover effects between Bitcoin and conventional assets is highlighted.

A limited number of studies have analyzed the interrelatedness between cryptocurrencies and financial and economic assets utilizing various methodologies. Salisu *et al.* (2019) investigate the role of Bitcoin market in stock markets of the G7 countries. The authors provide evidence that Bitcoin prices better predict the stock returns of the G7 countries than their respective macroeconomic variables. Kang *et al.* (2019b) give straightforward insights into for investors to manage their investment risk by examining the dynamic equicorrelation nexus between Bitcoin and four major investment assets (S&P 500, US dollar, Treasury bonds and Bitcoin other asset classes. They find that Bitcoin can be used as an effective safe haven for investors by offering invaluable information to reduce downside risk, hence enhancing diversification benefits in optimal asset allocation.

At the same time, more efforts have been made to estimate the risk-return, volatility and benefits for investors. Gil-Alana *et al.* (2020) explore the bilateral relationship between six major cryptocurrencies and six stock market indices, showing that there is no evidence of cointegration between the cryptocurrencies and the stock market indexes, which means that the cryptocurrencies are decoupled from the mainstream financial and economic assets. Besides, their results also suggest the important role of cryptocurrencies in investor portfolios as they serve as a diversification option for investors. In a similar fashion, Corbet *et al.* (2018) analyze the connectedness between the common cryptocurrencies and an array of other financial assets in the different time scales and frequency domains. They provide evidence of the relative isolation of the cryptocurrencies from the financial and economic assets and show that cryptocurrencies would give diversification benefits for investors with short investment horizon. In the same year, Zhang *et al.* (2018) confirm several major cryptocurrencies are inefficient markets and indicate that Cryptocurrency Composite Index and Down Jones Industrial Average are persistently cross-correlated.

Various studies have used divergent estimation techniques to capture the Bitcoin-financial asset relationship with regard to the specification of econometric models. Several papers have employed linear models, while others have utilized nonlinear models to analyze the Bitcoin prices and other traditional financial asset classes. However, the most popular techniques used are GARCH family models (López-Cabarcos *et al.*, 2019), Granger causality test (Wang *et al.*, 2020b; Kang *et al.*, 2019b), Spillover index (Mensi *et al.*, 2020; Zeng *et al.*, 2020; Corbet *et al.*, 2018), MF-DCCA (Zhang *et al.*, 2018). In this paper, we employ the DECO-GARCH model alongside QQ regression approach to shed light on the dynamic interplay between the Bitcoin market and CEE stock returns. Engle and Kelly (2012) introduce the dynamic equicorrelation GARCH (DECO-GARCH) model in which the average of the conditional correlations is set to equal the average of all pair correlations. Thus, the time variations in the connectedness of all markets under study are measured. Many studies have used a DECO-GARCH framework for financial markets and asset classes to measure the time-varying correlation functions (Kang *et al.* 2019a, b; Kang and Yoon, 2019; Bouri *et al.*, 2020; McIver and Kang, 2020). Additionally, in order to capture both the heterogeneous interaction between Bitcoin and stock returns at distinct points of the conditional distribution of Bitcoin returns and the quantile of Bitcoin prices as a function of the quantile of stock movements, the QQ approach proposed by Sim and Zhou (2015) has been used (Shahbaz *et al.*, 2018; Haseeb *et al.*, 2020; Sinha *et al.*, 2020; Ferrer *et al.*, 2019). Therefore, the present study intends to fill this gap by examining the interdependence between Bitcoin prices and the CEE stock markets, which takes into consideration structural breaks, nonlinearity, asymmetry and regime shifts, among others.

The majority of the literature results are reported in Table 1.

| Authors | Assets | Periods | Method | Result |
|---|---|---|---|---|
| Brauneis and Mestel (2018) | Cryptocurrencies | 2015–2017 | GARCH | Cryptocurrencies become less predictable |
| Wei (2018) | Cryptocurrencies | 2013–2018 | Amihud illiquidity ratio | Signs of autocorrelation and non-independence |
| Yi *et al.* (2018) | Cryptocurrencies | 2013–2018 | LASSO-VAR | Tightly interconnected |
| Koutmos (2018) | Cryptocurrencies | 2015–2018 | Spillover index | Return and volatility spillovers have risen steadily over time |
| Corbet *et al.* (2018) | MSC GSCI, COMEX, S&P 500, VIX and ITTR110 | 2013–2017 | Spillover index | Relative isolation of these assets from the financial and economic assets |
| Zhang *et al.* (2018) | Dow Jones Industrial Average and cryptocurrencies | 2013–2018 | MF-DFA and MF-DCCA | Bitcoin, Ripple, Ethereum, NEM, Stellar, Litecoin, Dash, Monero and Verge are inefficient markets |
| Omane-Adjepong *et al.* (2019) | Cryptocurrencies | 2015–2018 | ARFIMA-FIGARCH, Wavelet analysis | Efficiency and volatility persistence to be highly sensitive to time-scale |
| Kosc *et al.* (2019) | Cryptocurrencies | 2014–2017 | Portfolio performance | Dominance of the short-term contrarian effect over both momentum effect and the benchmark portfolios |
| Da Gama Silva *et al.* (2019) | Cryptocurrencies | 2015–2018 | Herding behavior | Extreme periods of adverse herd behavior |
| Bouri *et al.* (2019) | Cryptocurrencies | 2013–2017 | Copula-Granger-causality | Trading volume Granger causes extreme negative and positive returns of all cryptocurrencies |
| Antonakakis *et al.* (2019) | Cryptocurrencies | 2015–2018 | TVP-FAVAR | Connectedness across several cryptocurrencies exhibits large dynamic variability |
| López-Cabarcos *et al.* (2019) | S&P 500 Index, VIX Index, Bitcoin prices | 2016–2019 | GARCH and EGARCH | Bitcoin volatility is more unstable in speculative periods |
| Wang *et al.* (2020a) | Bitcoin | 2015–2018 | HSVol | Bitcoin market exhibits noticeably higher trading volume |
| Salisu *et al.* (2019) | The stock price indexes of the G7 countries, Bitcoin | 2010–2017 | Baseline predictive model | The stock returns of the G7 countries are better predicted by Bitcoin |
| Corbet *et al.* (2020) | Bitcoin, S&P 500 and macroeconomic indicators | 2010–2019 | Regression | News related to durable goods and unemployment to significantly affect Bitcoin returns |
| Paule-Vianez *et al.* (2020) | Bitcoin and EPU | 2010–2019 | Simple linear regression and quantile regression models | Bitcoin shows characteristics of investment assets |

(*continued*)

**Table 1.** Summary of literature

| Authors | Assets | Periods | Method | Result |
|---|---|---|---|---|
| Mensi *et al.* (2020) | Bitcoin, the Dow Jones World Stock Market Index, regional Islamic stock markets and Sukuk markets | 2010–2018 | Wavelet analysis | The co-movement is stronger and in the same direction at lower frequencies |
| Wang *et al.* (2020b) | Cryptocurrencies, S&P 500, NASDAQ and Dow Jones Industrial Average) | 2013–2018 | VAR | The S&P 500 and the Dow Jones indexes have an advantageous effect on Bitcoin |
| Zhang *et al.* (2021) | Bitcoin, Dollar index, MSCI, Bond and GSCI | 2011–2020 | Expectile VaR | Existence of downside risk spillover between Bitcoin and four assets |
| Zeng *et al.* (2020) | Cryptocurrencies, S&P 500, VIX, WTI and Gold | 2012–2019 | Spillover index | Connectedness between Bitcoin and conventional assets is weak |
| Gil-Alana *et al.* (2020) | Cryptocurrencies, Bond, Dollar, Gold, VIX, GSCI and S&P 500 | 2015–2018 | Fractional integration and Cointegration | No cointegration between the six cryptocurrencies and stock markets |

**Table 1.**

## 3. Methodology

### *3.1 The DECO-GARCH model*

Engle and Kelly (2012) develop the dynamic equicorrelation GARCH (DECO-GARCH) model at which the average of the conditional correlation is referred to as equal the average of all pair correlations. Therefore, we can estimate the time-varying linkages across markets over the study period shown. Unlike the standard DCC model proposed by Engle (2002), the DECO framework allows large-scale correlation matrices to be addressed.

We have a vector of $n$ return series $r_t = [r_{1,t}, \cdots, r_{n,t}]'$. The following ARMA(1,1) process has been estimated:

$$r_t = \mu + \phi r_{t-1} + \varepsilon_t + \xi\varepsilon_{t-1}, \text{ with } \varepsilon_t = u_t h_t \tag{1}$$

where $\mu$ is a constant vector, and $\varepsilon_t = [\varepsilon_{1,t}, \cdots, \varepsilon_{n,t}]'$ is a vector of residuals.

The dynamic conditional correlation (DCC) is employed. Engle (2002) introduced this estimator to capture the dynamic time-varying behavior of conditional covariance. The conditional covariance matrix $H_t$ is now defined as,

$$H_t = D_t R_t D_t \tag{2}$$

where $D_t = \text{diag}\sqrt{\{H_t\}}$ is the diagonal matrix with conditional variances along the diagonal, and $R_t$ is the time-varying correlation matrix.

A GARCH (1,1) specification of each conditional variance can be written as,

$$h_{ii,t} = c + a_i \varepsilon_{i,t-1}^2 + b_i h_{ii,t-1} \tag{3}$$

$$h_{ij,t} = \rho_{ij}\sqrt{h_{ii,t}h_{jj,t}},\ i, j = \overline{1, n} \tag{4}$$

where $c$ is a $n \times 1$ vector, $a_i$ and $b_i$ are diagonal $(n \times n)$ matrices.

Eqn (2) can be re-parameterized with standardized returns as follows, $e_t = D_t' \varepsilon_t$

$$E_{t-1} e_t e_t' = D_t^{-1} H_t D_t^{-1} = R_t = [\rho_{ij,t}] \tag{5}$$

Engle (2002) suggests the following mean-reverting conditionals with the GARCH(1,1) specification:

$$\rho_{ij,t} = \frac{q_{ij,t}}{\sqrt{q_{ii,t}q_{jj,t}}} \tag{6}$$

where

$$q_{ij,t} = \overline{\rho}_{ij}(1-\alpha-\beta) + \alpha e_{i,t-1}e_{j,t-1} + \beta q_{ij,t-1}$$

And $\overline{\rho}_{ij}$ is the unconditional correlation between $e_{i,t}$ and $e_{j,t}$. Scalar parameters $\alpha$ and $\beta$ must satisfy,

$$\alpha \geq 0, \beta \geq 0, \text{ and } \alpha + \beta < 1$$

The value of $(\alpha + \beta)$ close to one reveals high persistence in the conditional variance.

In matrix form,

$$Q_t = \bar{Q}(1-\alpha-\beta) + \alpha e_{t-1}e_{t-1}^{'} + \beta Q_{t-1} \tag{7}$$

where $\bar{Q} = Cov[e_t, e_t^{'}] = E[e_t, e_t^{'}]$ is unconditional covariance matrix of the standardized errors $Q$ can be estimated as,

$$\bar{Q} = \frac{1}{T}\sum_{t=1}^{T} e_t e_t^{'} \tag{8}$$

$R_t$ is then obtained by

$$R_t = \left(Q_t^*\right)^{1/2} Q_t \left(Q_t^*\right)^{1/2} \tag{9}$$

where $Q_t^* = \text{diag}\{Q_t\}$.

Nevertheless, Aielli (2003) suggests that the estimation of the covariance matrix $Q_t$ is inconsistent because $E[R_t] \neq E[Q_t]$. He illustrates the following consistent model with the correlation-driving process (cDCC):

$$Q_t = (1-\alpha-\beta)S^* + \alpha\left(Q_{t-1}^{*1/2}\varepsilon_{t-1}\varepsilon_{t-1}^{'}Q_{t-1}^{*1/2}\right) + \beta Q_{t-1}, \tag{10}$$

where $S^*$ is the unconditional covariance matrix of $Q_t^{*1/2}\varepsilon_t$.

Engle and Kelly (2012) suggest modeling $\rho_t$ using the cDCC process to gain the conditional correlation matrix $Q_t$ and then taking the mean of its off-diagonal elements. DECO specification reduces the estimation time. The scalar equicorrelation can be written as:

$$\rho_t^{\text{DECO}} = \frac{1}{n(n-1)}\left(K_n^{'}R^{\text{cDCC}}K_n - n\right) = \frac{2}{n(n-1)}\sum_{i=1}^{n-1}\sum_{j=i+1}^{n}\frac{q_{ij,t}}{\sqrt{q_{ii,t}q_{jj,t}}} \tag{11}$$

Where $q_{ij,t} = \rho_t^{\text{DECO}} + \alpha_{\text{DECO}}(\varepsilon_{i,t-1}\varepsilon_{j,t-1} - \rho_t^{\text{DECO}}) + \beta_{\text{ECO}}(q_{ij,t} - \rho_t^{\text{DECO}})$, $K$ is a vector of ones and $q_{i,j,t}$ is the $(i, j)$th components of the matrix $Q_t$ from the DCC model. Then we apply $\rho_t^{\text{DECO}}$ to capture the conditional correlation matrix.

$$R_t^{\text{DECO}} = (1-\rho_t)I_n + \rho_t K_n \tag{12}$$

where $I_n$ is the $n$-dimensional identity matrix.

Hence, the DECO modeling is less burdensome and computationally quicker to estimate. In addition, it reports the relationship of a group with a single DCC coefficient.

*3.2 Quantile on Quantile approach*

The QQ approach was developed by Sim and Zhou (2015) as a generalization of the quantile regression, which identifies to investigate how the quantiles of an independent variable affect the provisional quantiles of the dependent variable. The QQ approach is employed on the combination of the nonparametric technique and quantile regression. More precisely, the connectedness between the two examined variables can be different at each point of the respective distributions.

In this paper, the QQ approach is utilized to model the impacts of the quantiles of Bitcoin prices on the quantiles of CEE stock markets. The following nonparametric quantile regression equation can be briefly written as

$$S_t = \gamma^{\sigma}(\mathrm{BIT}_t) + \mu_t^{\sigma} \tag{13}$$

where $\mathrm{BIT}_t$ represents Bitcoin returns at period $t$, $S_t$ denotes stock market returns of the CEE countries at period $t$, $\sigma$ is the $\sigma$th quantile of the conditional distribution of Bitcoin prices, and $\mu_t^{\sigma}$ is the quantile error term whose conditional $\sigma$th quantile is equivalent to zero. $\gamma^{\sigma}$ is an unidentified function as we have no prior information on the interplay between Bitcoin prices and CEE stock markets.

Such a quantile regression technique allows us to capture the changing impacts of Bitcoin price empirically across various quantiles of CEE stock returns. The primary advantage of this regression framework is to shed light on the efficient procedure of the dependency interplay between Bitcoin market and stock indices in the CEE countries.

The specific framework is presented in Figure 1.

*3.3 Data*

In this paper, we study the time-varying relationship between cryptocurrency and stock markets in the CEE region, our dataset includes time series of equity price indexes with daily frequency for a sample of S&P 500 (SP), Bitcoin (BIT) and five stock markets in the CEE region: Hungary (BUX), Poland (WIG), the Czech Republic (PX), Romania (BET) and Croatia (CRON). Our study period spans from 6 September 2012 to 12 August 2019, yielding a total of 2,515 observations. Bitcoin data are obtained from https://www.coindesk.com/, and the rest of the financial assets are collected from Bloomberg terminal.

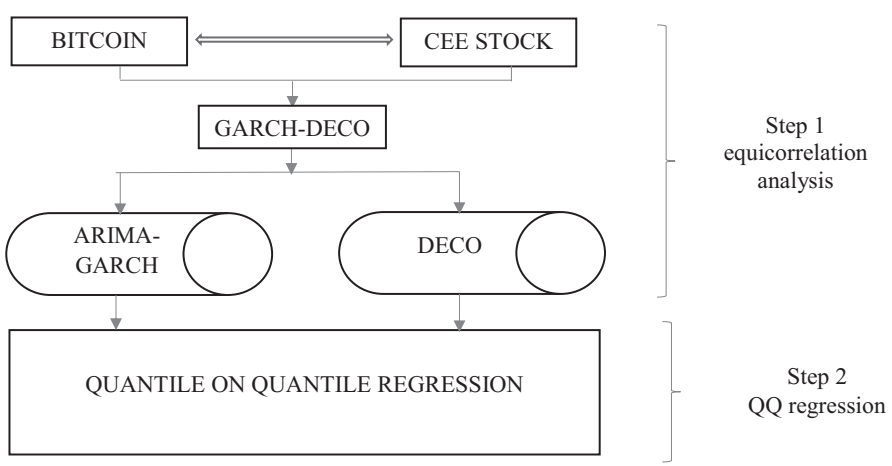


**Figure 1.**
The framework of the methodology

We calculate the log returns by taking the difference in the natural logarithm of two consecutive prices.

Our sample covers stock markets with various degree of financial development. Figure 2 shows the evolution of market size between 2015 and 2019 from the World Development Indicators. Market capitalization as a share of Gross Domestic Product reveals that stock markets in these countries have remarkably risen their relative significance over the period shown. Put it another way, it is worth noting the CEE's capitalization growth in recent years. In general, the largest stock market in the CEE was Poland, while the other members of the group had only deficient levels of market capitalization. Furthermore, the emerging stock markets of our sample have become more established and more mature through time. We observe that the developing markets in the selected economies with a relatively high and stable growth rate in the CEE region in recent years are significant, and they are frequently good choices for investors hunting for diversifying their portfolio globally (Hung, 2019, 2020).

More importantly, the CEE emerging markets examined in this study are those that joined the EU in 2004 (Poland, Hungary and the Czech Republic) and 2007 (Croatia and Romania). The reasons why we select these countries are that joined EU in 2004 along with the ones that joined the EU in 2007 to explore the difference between the CEE stock markets. Besides, we have chosen the CEE markets to observe if they have a connection with Bitcoin.

Table 2 represents the descriptive statistics for the log-returns of all seven variables under examination. It is obvious to observe that the means of all return series are near zero. The BIT and BET show the highest volatility, about 4.5 and 4.9%, respectively. In addition, all return series are not normally distributed, with regard to the Jarque-Bera test for normality. Specifically, the augmented Dickey-Fuller (ADF) test demonstrates, for its part, that log returns are stationary. The ARCH test statistics reject the null hypothesis of no ARCH effects. All variables illustrate no evidence of serial correlation owing to the significance of the squared residuals $Q^2(10)$, which emphasizes the need to use the GARCH-DECO model in investigating them and is suitable for further statistical analysis.

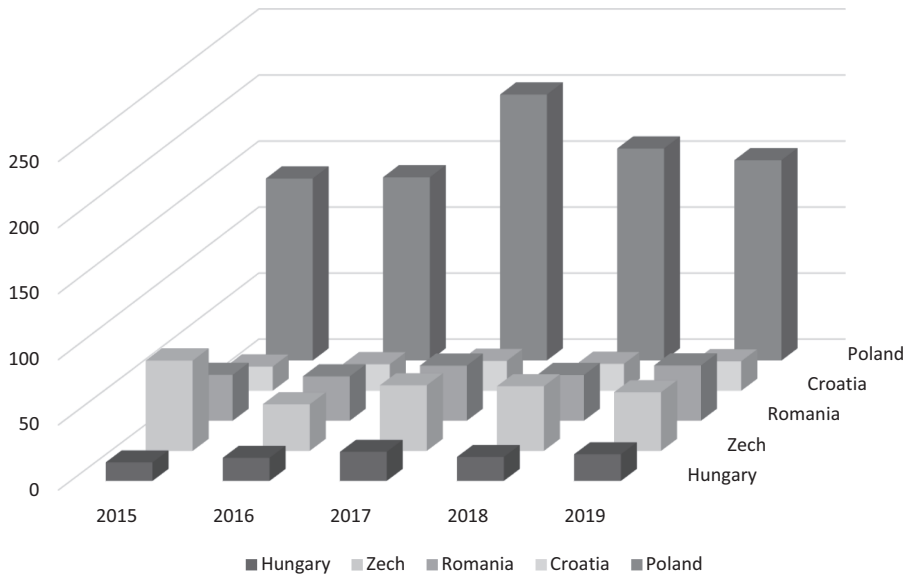


**Figure 2.**
Market capitalization between 2015 and 2019 (% of GDP)

**Table 2.**
Descriptive statistics of daily returns over the in-sample period

| | BIT | BUX | BET | PX | WIG | CRON | S&P 500 |
|---|---|---|---|---|---|---|---|
| Mean | 0.276836 | 0.028810 | −0.065881 | 0.000172 | −0.006078 | −3.46E-05 | −0.044728 |
| SD | 4.553943 | 1.210791 | 4.915599 | 0.978430 | 1.147806 | 0.638861 | 0.067592 |
| Max | 30.85640 | 10.67431 | 10.56451 | 7.248696 | 5.063068 | 8.562884 | 0.00310 |
| Min | −34.53162 | −6.984201 | −24.3233 | −6.134577 | −7.543131 | −4.682503 | −1.144620 |
| Skew | −0.406686 | −0.007917 | −46.47980 | −0.393833 | −0.345233 | 0.576963 | −5.327269 |
| Kurt | 11.46915 | 7.912864 | 22.920 | 7.603256 | 5.605253 | 18.74752 | 51.68837 |
| J-B | 7582.646*** | 2528.297*** | 5.40E+04*** | 2284.638*** | 760.9132*** | 26115.86*** | 260207.1*** |
| ADF | −49.88251*** | −50.06878*** | −49.90998*** | −48.85227*** | −37.09686*** | −46.37162*** | −14.70012*** |
| $Q^2(10)$ | 986.85*** | 332.30*** | 135.46*** | 778.75*** | 292.48*** | 60.200*** | 84.785*** |
| ARCH-LM | 340.2568*** | 117.3235*** | 391.0142*** | 168.9891*** | 30.52745*** | 52.00067*** | 13.47854*** |

**Note(s)**: $Q^2(10)$ is the Ljung–Box statistics for squared series for the 10th lag
The asterisks *** illustrate significance at the 10%, 5 and 1% levels, respectively

Figure 3 shows pairwise correlation coefficients across variables under consideration, while the price movements of all variables are introduced in Figure 4. A high correlation is not observed between the variables. All price series have demonstrated both increasing and decreasing trends over the sample period shown.

## 4. Empirical results

### *4.1 Estimation of the DECO-GARCH model*

Table 3 reports the estimation results for the ARMA (1,1)-DECO-GARCH (1,1) model among variables under study. The lag order of the ARMA(1,1)-GARCH($p$,$q$) has been selected to minimize the Akaike (AIC), Schwarz (SIC) information criteria to identify at an appropriate ARMA-GARCH model. We choose the univariate ARMA(1,1)-GARCH(1,1) for all combination returns.

In panel A of Table 3, the terms of ARCH and GARCH are statistically significant, and their sum is close to unity. This evidence shows a high persistence in the conditional volatility in BIT and the CEE stock markets. In panel B of Table 3 represents the results of the DECO model. The time-varying equicorrelation is positive and significant, with the value of 0.006726, which shows the presence of co-movement between the Bitcoin market and the CEE stock returns. The estimated DCC parameter $a_{\mathrm{DECO}}$ is positive and statistically significant for all the Bitcoin-stock markets, which implies the importance of shocks between Bitcoin market

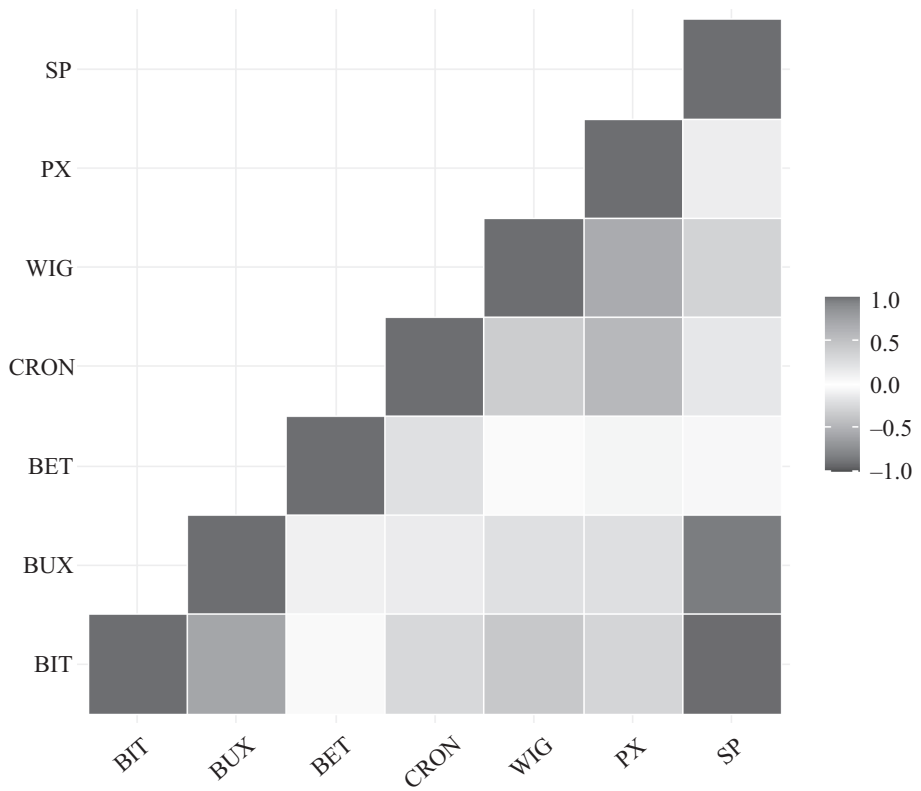


**Figure 3.**
Heat map of pairwise correlations

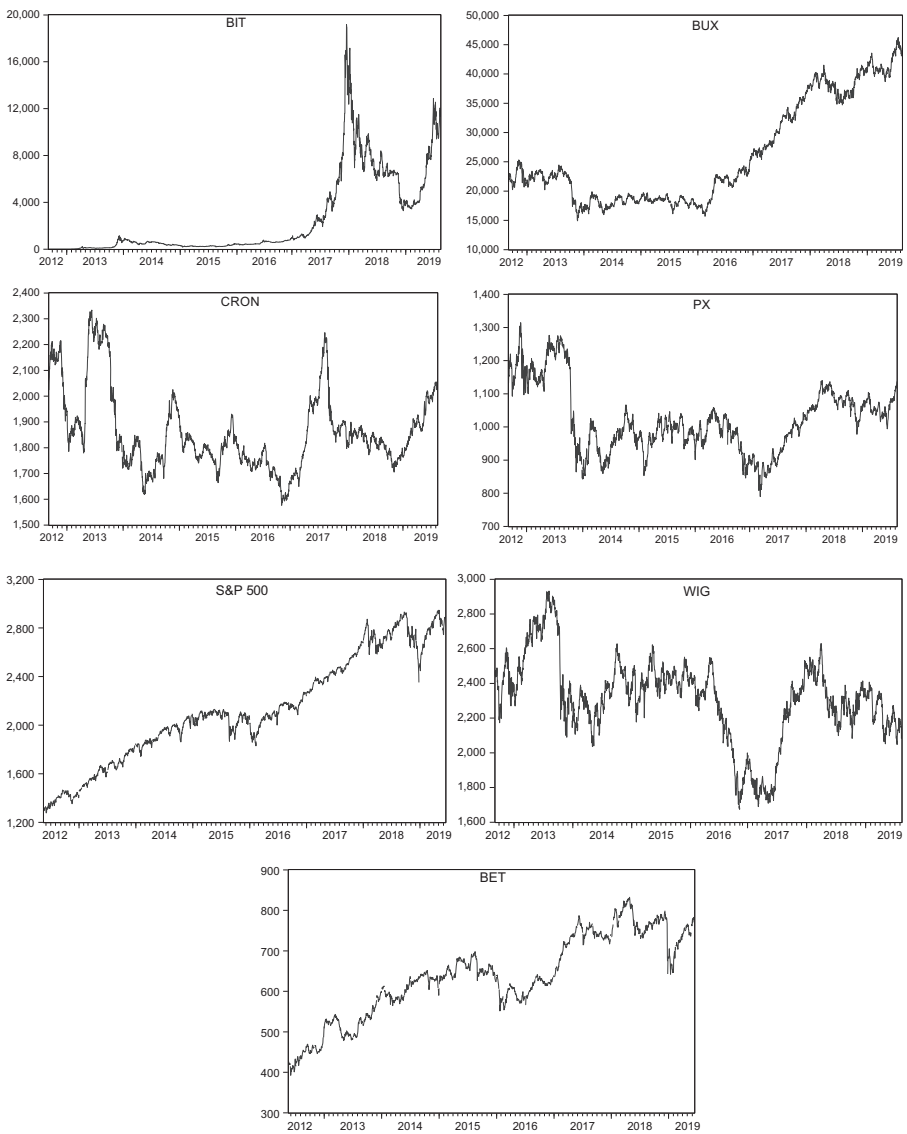


**Figure 4.**
Plots of the data series

and CEE stock returns. More precisely, this result shows that market innovations have an impact on equicorrelations. In the same vein, the coefficient of $b_{\mathrm{DECO}}$ is statistically significant, confirming the existence of volatility across Bitcoin and CEE stock markets. Put it another way, equicorrelations are highly dependent on past correlations. Furthermore, the sum of $a_{\mathrm{DECO}}$ and $b_{\mathrm{DECO}}$ estimates is close to unity, suggesting that the volatility equicorrelation is integrated. Besides, the significance of the two parameters justifies the appropriateness of the DECO-GARCH model, and we could believe that the DECO parameters lie in the range of standard estimates stepping from GARCH(1,1) models. It

| | BIT | BUX | BET | PX | WIG | CRON | S&P 500 |
|---|---|---|---|---|---|---|---|
| *Panel A: estimates of the univariate ARMA (1,1)- GARCH (1,1) model* | | | | | | | |
| Const (M) | 9.775640*** (2.669879) | −17.33689 (9.998029) | 6.660606*** (0.212933) | 7.002234*** (0.047845) | 7.763190*** (0.055096) | 7.535196*** (0.057166) | 9.247504*** (0.166865) |
| AR(1) | 0.999405*** (0.000431) | 1.000006*** (2.64E-05) | 1.001399*** (0.000150) | 0.995940*** (0.001716) | 0.995902*** (0.002029) | 0.997999*** (0.001442) | 1.000173*** (1.98E-05) |
| MA(1) | 0.013259 (0.022752) | 0.021118 (0.021642) | 0.151261*** (0.008077) | 0.009867 (0.021062) | 0.030251 (0.020840) | 0.037399* (0.020894) | 0.151316*** (0.017255) |
| Const(V) | 9.15E-05*** (6.67E-06) | 3.15E-06*** (6.21E-07) | 2.69E-05** (2.13E-06) | 2.11E-06*** (3.50E-07) | 3.30E-06*** (7.92E-07) | 1.39E-06*** (2.11E-07) | 5.08E-09*** (6.85E-10) |
| ARCH | 0.139564*** (0.011495) | 0.076330*** (0.007276) | 0.126727*** (0.135215) | 0.109873*** (0.008799) | 0.053869*** (0.007029) | 0.093067*** (0.008998) | 0.231699*** (0.007333) |
| GARCH | 0.819334*** (0.011348) | 0.902017*** (0.009982) | 0.700750*** (0.001952) | 0.869687*** (0.010162) | 0.920652*** (0.010915) | 0.875643*** (0.012877) | 0.821997*** (0.003396) |
| *Panel B: estimates of the DECO model* | | | | | | | |
| Average $\rho_{ij}$ | 0.006726*** (0.009218) | | | | | | |
| $A_{DECO}$ | 0.039647* (0.025078) | | | | | | |
| $B_{DECO}$ | 0.758740** (0.376529) | | | | | | |
| *Panel C: diagnostic tests* | | | | | | | |
| $Q^2(5)$ | 1.5678 (0.905) | 4.2676 (0.512) | 0.8009 (0.990) | 8.7224 (0.121) | 4.6068 (0.466) | 0.6621 (0.985) | 0.6230 (0.987) |
| ARCH-LM | 0.467131 (0.4943) | 1.616419 (0.2036) | 0.000218 (0.9882) | 1.162962 (0.2809) | 0.921189 (0.3372) | 0.219853 (0.6392) | 0.338064 (0.5609) |
| Hosking$^2$ | 56.740 (0.7014) | | | | | | |
| McLeod-Li$^2$(20) | 32.144 (0.7912) | | | | | | |

**Note(s):** $Q^2(5)$ represents the Ljung–Box test statistics employed to the squared standardized residuals. The asterisks *, **, *** illustrate significance at the 10%, 5 and 1% levels, respectively. The *p*-values are in brackets, and the standard errors are in parentheses

**Table 3.**
Estimation results of the ARMA-GARCH with DECO specification

simply means that the equicorrelation between Bitcoin return and CEE stock markets would be stable. These findings support the papers of (Kang *et al.* 2019a, b; Kang and Yoon, 2019).

Panel C performs the diagnostic tests that support the DECO-GARCH model's statistical appropriateness because of the insignificance of the Ljung–Box and ARCH-LM test statistics. We can conclude that there is no misspecification in our model. More importantly, the Hosking and McLeod and Li test results demonstrate that the null hypothesis of no serial correlation in the conditional variances estimated by the DECO-GARCH model is accepted, which supports the suitability of this model in the Bitcoin and CEE stock markets.

Figure 5 depicts the dynamic conditional equicorrelation across the CEE stock and Bitcoin markets, which is obtained from the ARMA-GARCH model with the DECO approach. Because the equicorrelation offers an idea of the correlation in the market, the DECO dynamics hold itself an interpretative value. As shown in Figure 5, the equicorrelation dramatically fluctuated over time, with a correlation level varying from a minimum of −2.5% to a maximum of 12.5%. Overall, Bitcoin-stock returns experienced a slight connectedness over the sample period shown.

To assess the robustness of the estimation results, we also estimate the dynamic correlational correlation (DCC) models between the returns of each CEE stock and the Bitcoin market as shown in Figure 6. Apparently, the pairwise DCC estimates support our findings gained for the CEE stock markets based on the DECO model.

### *4.2 Quantile on Quantile estimates*

This section reports the main findings of the application of the QQ approach between Bitcoin market and CEE stock returns under analysis over the full sample. Figure 7 describes the slope estimates $\gamma_1(\theta, \tau)$ which quantify the influence of the $\tau$th quantile of Bitcoin returns on $\sigma$th quantile of stock markets in each CEE country, for an array of combinations of both variables. The slope coefficient estimates are presented on the $z$-axis, while the quantiles of CEE stock markets and Bitcoin prices lie on the $x$-and $y$-axes, respectively. A grid of 19 quantiles spanning from 0.05 to 0.95 with a step of 0.05 are considered for each indicator. Hence, the QQ framework offers a more complete and reliable description of the association structure between Bitcoin prices and CEE stock markets. It is clear from the figures that the interrelatedness between Bitcoin and CEE stock markets is not similar for all the countries. More precisely, there is significant heterogeneity across countries in connection with the BIT-CEE stock relationship.

In Hungary, the impact of Bitcoin prices on Budapest stock exchange is very small or even negative at low quantiles of Bitcoin returns. In fact, a comparative influence with the positive sign was found in the region that combines lower quantiles of stock markets (0.05–0.5) with the link across all quantiles of Bitcoin prices (0.05–0.30). In general, the effect of Bitcoin on the

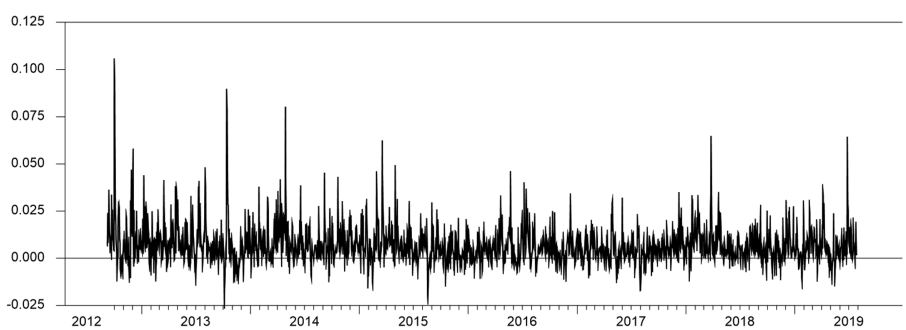


**Figure 5.**
Dynamic equicorrelation for returns Bitcoin and CEE stock markets

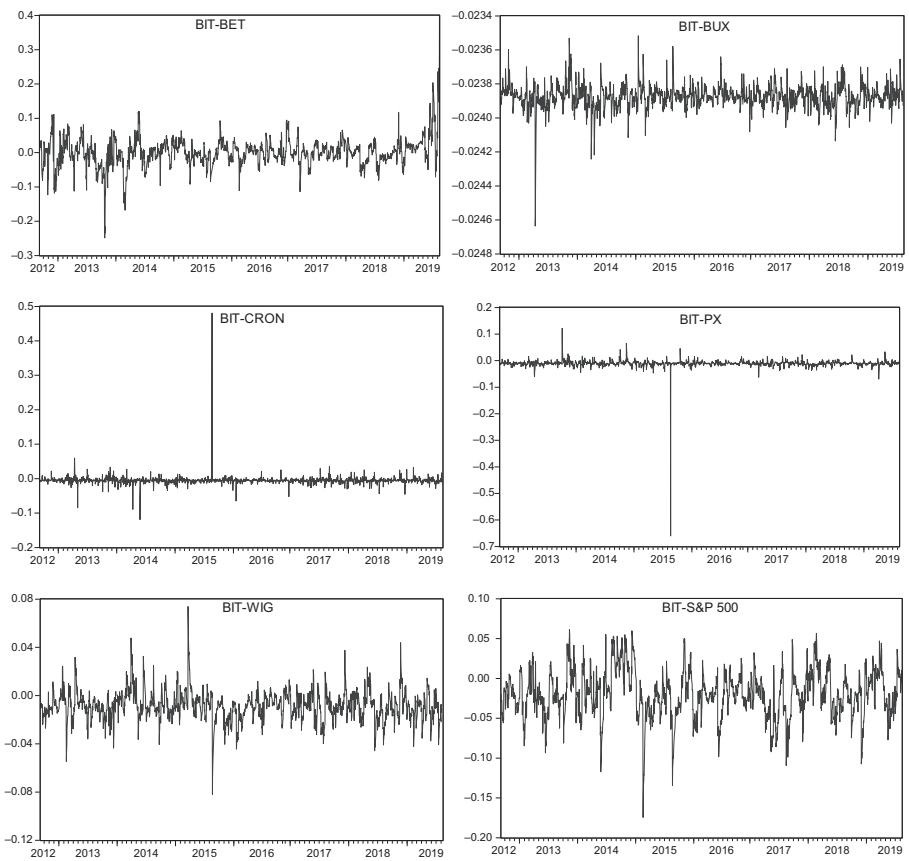


**Figure 6.**
Dynamic conditional correlation between Bitcoin and CEE stock markets

stock market in Hungary is weak across all the quantiles of stock markets. Nevertheless, the positive influence gets weaker on middle quantiles of Bitcoin prices. The somewhat low positive relationship observed in the remaining area can be explained in the sense that a slight increase in Bitcoin prices seems to raise stock returns in Hungary.

In Romania, the overall positive impact of Bitcoin prices on the stock market is found in the region that combines the lower to upper quantiles of Bitcoin prices (0.05–0.95) with the lower to upper quantiles of the stock market (0.05–0.95). The Bitcoin prices and stock returns associations provide negative value for the different number of groups of quantiles, suggesting that there is a negative but weak impact of Bitcoin on the Bucharest Stock Exchange.

In the case of Croatia, the effect of Bitcoin prices on Zagreb stock exchange is positive for all quantiles of both variables. This positive impact is powerful at high quantiles of Bitcoin prices (0.2–0.8) and moderate to high quantiles of stock returns (0.4–0.8). However, the negative is also detected in both low and high the quantiles of Bitcoin prices. This result implies that the stock market in Romania is decreased during periods of low levels of Bitcoin volatility, while it is high during the periods of high levels of Bitcoin volatility. Therefore, the connectedness between the Bitcoin market and stock returns in Romania is not stable through time.

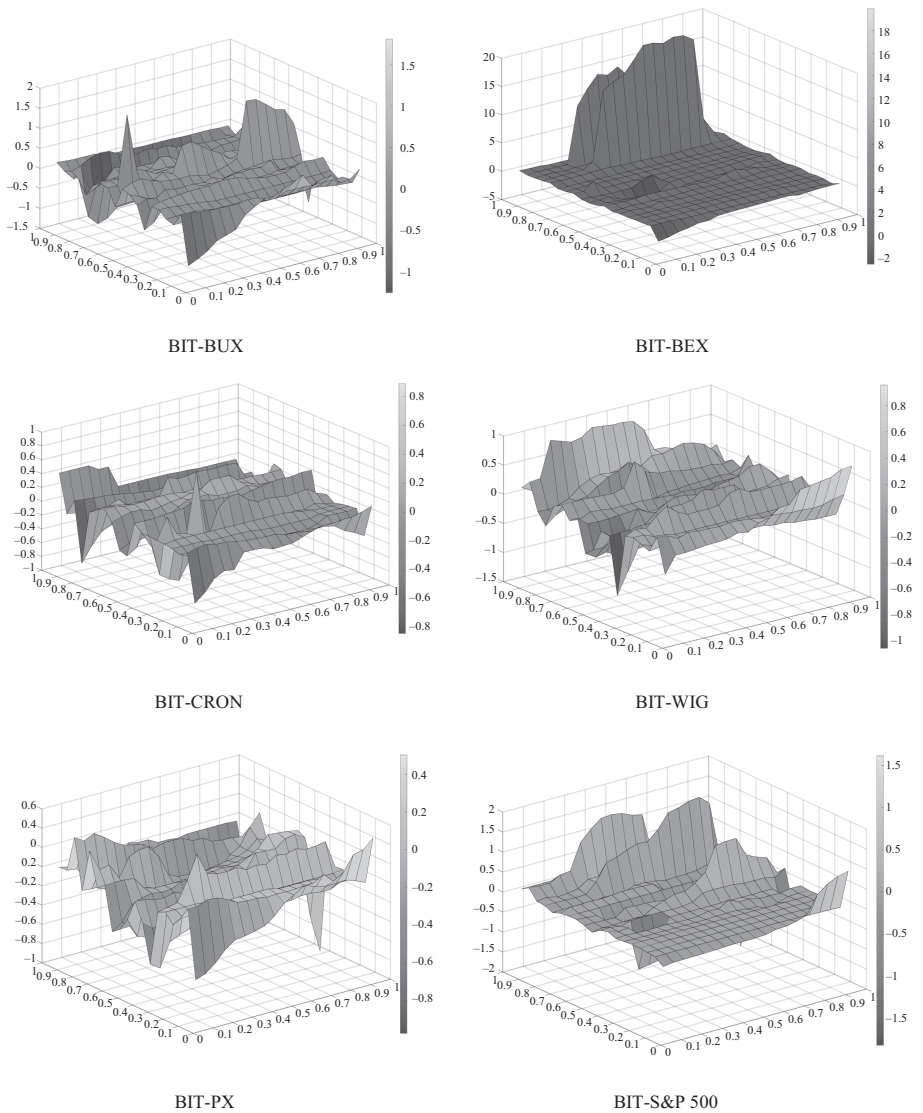


**Figure 7.**
Quantile-on-quantile (QQ) estimates

In the Czech Republic and Poland, the results on the interconnection between Bitcoin and stock markets are quite similar. The overall strong and positive impact is identified from Bitcoin prices to stock markets in these nations. The Bitcoin and stock market connections confirm a strong and positive value for the significant number of groups of quantiles, indicating that there is a positive impact of Bitcoin prices on stock markets in these countries. In fact, a comparatively obvious impact with the positive sign was seen in the region that pools the middle quantiles of Bitcoin prices (0.3–0.95) for both countries with the link across all quantiles of stock indices (0.05–0.95). Briefly, the influence of the Bitcoin market on stock indexes in these countries is relatively strong across all the quantiles of Bitcoin returns.

This consequence highlights and quickly boosts the stock markets by Bitcoin prices which are described by the highest quantiles of Bitcoin prices.

Similarly, the effect of Bitcoin prices on the S&P 500 is significantly positive. The impact is weak at low quantiles of Bitcoin prices and becomes relatively strong at the upper quantiles of Bitcoin variable, which means that there are unidirectional price spillovers from the Bitcoin market to the S&P 500 index. The results validate the findings of López-Cabarcos *et al.* (2019) and Wang *et al.* (2020a).

Overall, Figure 7 summarizes the key findings of the QQ model, performing the combinations of quantiles of Bitcoin price changes and CEE stock returns which produce the most intense Bitcoin-stock market relationship for each country. It is clear that the strong positive relationship between Bitcoin and stock markets was found in the Czech Republic and Poland, while Hungary and Croatia experienced a weak correlation. However, the negative relationship was identified in Romania over the period shown. Our results support most of the literature that shows the significantly weak intercorrelation between Bitcoin prices and other conventional financial markets (Wang *et al.*, 2020b; Zhang *et al.*, 2021; Zeng *et al.*, 2020). However, these findings contradict with the studies of Gil-Alana *et al.* (2020), Corbet *et al.* (2018), Zhang *et al.* (2018) and Bouri *et al.* (2019) who reveal the isolation of Bitcoin from the global financial system.

## 5. Conclusion

This paper aims to empirically address the dynamic linkages between changes in Bitcoin prices and stock returns for five CEE countries (Hungary, Poland, Czech Republic, Croatia and Romania) by employing both the multivariate DECO-GARCH model of Engle and Kelly (2012) and QQ methodology proposed by Sim and Zhou (2015). DECO refers to as a novel covariance matrix estimator, which bases on the assumption that any pair of variables is equicorrelated at every period, but this correlation varies over time. We use a QQ regression to examine the reaction of the CEE stock markets to different uncertainty proxies under various Bitcoin market conditions. In addition, the QQ approach goes a step further than the standard quantile regression, which captures the conditional dependence between Bitcoin and stock markets.

We find several impressive results. First, the findings show that the average return equicorrelation across Bitcoin prices and CEE stock indices are positive, even though it is found to be time-varying over the research period shown, with a correlation level varying from a minimum of $-2.5\%$ to a maximum of $12.5\%$. Second, the Bitcoin-CEE stock market association has positive signs for most pairs of quantiles of both variables and represents a rather similar pattern for the cases of Poland, the Czech Republic and Croatia. However, a weaker and primarily negative connectedness is found for Hungary and Romania, respectively. Furthermore, the interconnectedness between the co-movements in the Bitcoin market and stock returns changes significantly across quantiles of both variables within each nation, indicating that the Bitcoin-stock market relationship is dependent on both the cycle of the stock market and the nature of Bitcoin price shocks. This may reveal the presence of a nonlinear and asymmetric nexus between Bitcoin and CEE stock markets at the international level.

The evidence documented in this study has significant implications for divergent economic agents, including global investors, risk managers and policymakers, who would benefit from a comprehensive knowledge of the Bitcoin-stock market relationship to build efficient risk-hedging models and to conduct appropriate policy reactions to information spillover effects in different time horizons. More importantly, investors and portfolio managers should pay close attention to the conditions in stock and Bitcoin markets because the optimal capital allocation, diversification and risk hedging strategies might change dramatically depending on the specific phenomena in both markets. The findings also have

implications with regard to the design and implementation of procedures for monitoring and maintaining financial stability. Given the ability of Bitcoin price volatility to alter the risk of the stock markets, policymakers have to observe the Bitcoin market for the sake of financial stability in the CEE region by accurately assessing the Bitcoin-stock market relationship. By doing so, they may be able to take adequate measures at any given time with the purpose of restricting steady simultaneous decreases in Bitcoin and stock markets and hence, preserving financial and macroeconomic stability.

The significant level of bilateral links between Bitcoin and CEE stock markets found in this study might help the investor's choice of the asset class to invest in due to price spillovers. From a portfolio perspective, Bitcoin can contribute to the construction of better-diversified portfolios. Further, according to Paule-Vianez *et al.* (2020), Bitcoin would be a safe haven like gold, which allows investors to consider Bitcoin as a tool to protect their savings in times of economic uncertainty.

Despite the exciting idea, we neglected the causal associations between variables during the COVID-19 outbreak period, the effect of COVID-19 pandemics should be considered. Hence, in the future, we suggest expanding the research period covering the COVID-19 outbreak to unveil the connections between the examined asset classes in this paper and provide grounds for further research because the study on cryptocurrencies is at the experimental stage and requires more rigorous econometric techniques to construct stylized facts in the market.

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**Corresponding author**
Ngo Thai Hung can be contacted at: hung.nt@ufm.edu.vn