Investigating Relationships between Digitalisation and Warehouse Performance: An Application of fsQCA Approach

Alaa Aljedaani
School of Accounting, Information Systems, and Supply Chain
RMIT University
Melbourne, Australia
s3711703@student.rmit.edu.au

Shams Rahman
School of Accounting, Information Systems, and Supply Chain
RMIT University
Melbourne, Australia
shams.rahman@rmit.edu.au

Aswini Yadlapalli
School of Accounting, Information Systems, and Supply Chain
RMIT University
Melbourne, Australia
aswini.yadlapalli2@rmit.edu.au

Abstract

Digital transformation (DT) of warehousing systems has become crucial for logistics firms in Saudi Arabia to become and remain competitive. It will help to streamline the supply chain and improve warehouse performance, which, in turn, will enable Saudi Arabia to be positioned as a global logistics hub. Therefore, the aim of this study is to investigate the antecedents of digitalisation and their impact on warehouse performance in Saudi Arabia. Data were collected from warehouse managers who are involved in the IT deployment. The study uses a fuzzy set qualitative comparative analysis (fsQCA) approach to analyse the collected data. The results show that achieving high warehouse performance in Saudi Arabia depends on the configurational effects of both resource orchestration theory (ROT) and digitalisation. Specifically, they reveal that digitalisation has the most significant effect on warehouse performance. This study will contribute to the theory by assessing the configuration design of the dimensions to gain an understanding of the digitalisation process. Additionally, it will guide managers to develop a step-by-step procedure for implementing the digitalisation process in their warehouses and assess the type and level of the resources required for the digitalisation of their warehouses. In addition, this study will help managers to clearly identify the various roles of digitalisation in improving performance.

Keywords
Digitalisation, Digital Transformation, Warehousing, Resource Orchestration Theory, Saudi Arabia.

1. Introduction

Digital transformation (DT) is defined as a process whereby digital technologies create disruptions that trigger strategic responses from organisations to alter their value creation paths (Vial 2019). DT is essential to fulfil growing customer expectations, reduce operating expenses, and maintain continued relevance in the market (Steiber et al. 2020). Organisations are rapidly implementing DT in their operations (Cichosz et al. 2020), and it has become a key driver for organisations to improve operational efficiency and organisational performance. As such, warehouses require DT to improve their performance, make their systems more reliable and efficient, and simplify their processes (Fatorachian and Kazemi 2021).

Saudi warehouses require DT to help streamline the supply chain and improve warehouse performance, which would position Saudi Arabia as a global logistics hub (Jaziri et al. 2020). Saudi Vision 2030 focuses on achieving a diversified technology-enabled economy. DT has become crucial for organisations in Saudi Arabia that want to remain competitive. While Saudi organisations support the implementation of DT, they are still in the early stages of DT (Alharbi 2019). This study uses resource orchestration theory (ROT) to explain the phenomena of digitalisation and DT.

Many studies on warehousing have been conducted in both developed and developing countries (Gu et al. 2007; Khemavuk 2010; Shah and Khanzode 2017). For example, in the United Kingdom, a study on warehouse safety was conducted to investigate how warehouse safety can be assessed and facilitated. There are also studies on digitalisation of warehousing in different contexts (Lee et al. 2018; Min 2006; Younis et al. 2013). For example, in the context of Jordan, studies have explored the impact of warehouse management systems on supply chain performance. However, only a few studies on warehousing have been conducted in the context of Saudi Arabia. These studies have investigated warehouse management and sustainability initiatives in warehouses (Ali et al. 2022; Bajunaid and Attia 2021). Furthermore, the main focus of these studies was on using only some of the technologies and software to expedite the management process, which can be classified under digitisation or changing from analogue to digital systems (Saarikko et al. 2020). To date, no research has examined the antecedents of digitalisation in warehouses in Saudi Arabia. Therefore, this study aims to address this gap in the literature by investigating the antecedents of digitalisation and their impact on warehouse performance. This study presents new findings about the way digitalisation impacts warehouse performance. Moreover, it provides important insights for the warehousing community by assessing the type and level of the resources required for the digitalisation of warehouses, thereby improving warehouse performance.

1.1 Objective
The aim of this study is to investigate the antecedents of digitalisation and their impact on warehouse performance in Saudi Arabia.

2. Literature Review
2.1 Warehouse Performance
Warehouse performance is related to running warehouse operations effectively and ensuring it adds value to the overall supply chain management (Buzu 2021). It is measured using key performance indicators (KPIs), some of the most common of which are storage space optimisation, advancement of technology usage, reduced order arrangement and placement errors, and warehouse layout for effective goods movement. Staudt et al. (2015) elaborated that there are various other key efficiency metrics that can help to evaluate warehouse performance. The inventory accuracy, receiving cycle time, cost of operation per unit, fulfilment accuracy rate, and order damage per year are some of the metrics that are tracked to evaluate warehouse performance. Laosirihongthong et al. (2018) added that warehouse performance is measured using productivity and quality metrics. The productivity is tracked in terms of the warehouse's employee efficiency, number of orders processed each day, and technology-enabled productivity. Quality involves ensuring the warehouse is managed with minimum order damages, timely and accurate order inward, and outward placement.

2.2 Digital Transformation Strategy
The formulation of a DT strategy (DTS) provides a firm with a blueprint for integrating the processes of coordinating, prioritising and implementing a complete DT in real time by focusing on the transformation of products, processes and organisational aspects owing to new technologies (Matt et al. 2015). The majority of the literature reviewed reveals that DTS has been primarily studied from an organisational perspective (Matt et al. 2015).

The framework adopted by Matt et al. (2015) consists of four dimensions: use of technologies, changes in value creation, structural changes, and financial aspects. Use of technologies refers to a firm's approach and its ability to explore and exploit new digital technologies. Changes in value creation relate to the influence of DT on a firm's value creation. Structural changes refer to the modifications in organisational structures, processes and skill sets that are essential to cope with and exploit new technologies. The financial aspect refers to a firm's need to take action in response to a struggling core business and its ability to finance a DT endeavour. Matt et al. (2015) emphasise that it is critical that firms methodically align each dimension with initiating and executing an effective DT. Accounting for each dimension in this DT framework permits firms to assess their current abilities and formulate an appropriate DTS.

2.3 Resource Orchestration Theory

ROT refers to how firms can gain a competitive advantage through active resource orchestration actions (Cui and Pan 2015; Koentjoro and Eliyana 2015; Sirmon et al. 2011). ROT consists of three variables that would help to transform the warehousing system by implementing digitalisation. Each of these variables has numerous sub-variables (Ahuja and Chan 2017). Structuring refers to building a portfolio of resources via three sub-variables: acquiring, accumulating, and divesting (Li and Jia 2018). These three sub-variables determine the degree of structure of a resource portfolio. Bundling refers to the managing of resources to build capabilities as well as the stabilising, enriching and pioneering of resources (Koentjoro and Eliyana 2015). Leveraging refers to applying the developed capabilities of a firm to improve its financial performance by adequately meeting customer needs and demands (Sirmon et al. 2007). The leveraging of bundled resources is usually required for a firm to achieve value creation.

2.3.1 Aligning DT Dimensions with ROT Variables

This study applies ROT to analyse the three dimensions of DT (use of technologies, structural changes, and financial aspect) proposed by Hess et al. (2016). The remaining dimension, value creation, is considered as an aspect of the dependent variable (performance). We align DTS dimensions with ROT variables.

To gain an understanding of the integration of DT and ROT, it is important to know that they implement a similar method and have similar desired results. ROT focuses on how to use resources to achieve a specific goal, such as competitive advantage. DT can be achieved by managing resources. In Hess et al.'s (2016) three dimensions related to ROT, the financial dimension has two sub-processes to consider. The first relates to the method used for financing the DT endeavour. The firm can finance the DT endeavour either internally using internal funds or externally by obtaining external financing. This is part of structuring, as it explains how resources are required to make changes. The other sub-process of the financial dimension relates to how strong the financial pressure on the current core business is, which is considered part of leveraging.

The second dimension of the model is the use of new technologies. This dimension is also divided into two sub-processes. The first sub-process is related to the significance of the firm's IT in achieving strategic goals. The second sub-process relates to how ambitious the firm's approach to new digital technologies is. This involves using digital technologies as an enabler of strategic goals or to support functions to attain strategic goals, as well as taking advantage of opportunities provided by digital technologies to enter new markets. These two sub-processes are aligned with leveraging since they focus on using digital technologies to achieve strategic goals and exploit opportunities in the market (Baert et al. 2016; Sirmon et al. 2011).

The third dimension of the model is structural changes. This dimension includes four sub-processes, three of which are related to ROT while the fourth is related to the operational performance construct. The first sub-process related to ROT is the need to acquire new competencies. Acquiring new competencies can involve internally relying on the resources that already exist, fostering partnerships or takeovers, and using external sourcing. All these are aligned with structuring, as it involves purchasing resources from external markets as well as developing resources internally in the firm's resource portfolio (Carnes et al. 2017). The second sub-process of structural changes focuses on knowing whether the firm plans to integrate new operations into existing structures or create separate entities. This can be achieved by incorporating fully integrated digital operations into an organisation's current structures or implementing them separately from the core business. This sub-process is aligned with bundling, as it focuses on making minor incremental changes to the existing capabilities of the firms and extending the current capabilities of the firms. The third sub-process of the structural changes dimension focuses on knowing who is in charge of the DT endeavour. Those with responsibility may include the group's Chief Executive Officer (CEO), the group's CEO of the business unit, or the group's Chief Digital Officer. These are considered to be parts of leveraging.

3. Methods

This study adopted a quantitative methodology, as the literature review indicates that there is a lack of empirically designed and theoretically grounded studies that investigate the DT of warehouses. Employing a quantitative methodology in this study addresses this gap (Newman et al. 1998). Several steps were followed in the quantitative methodology, which include developing the questionnaire, translating it, pre-testing it through a pilot study, using a sampling technique, collecting data via an online questionnaire, and analysing the collected data.

In this study, a five-point Likert scale was employed in the questionnaire to measure the items due to its ability to provide accurate and consistent results that can be used for data analysis (Nemoto and Beglar 2014). It is also suitable for quantifying constructs such as resources and capabilities (Kumar et al. 1993). The five-point Likert ranges from '1', which indicates 'strongly disagree', to '5', which indicates 'strongly agree'.

This study used a simple random sampling technique to obtain a highly representative sample of the entire population. To participate in this study, prospective participants had to meet the following criteria: have a minimum of 10 years' experience in the warehousing industry/have 5 years' IT experience in the warehouse context/ currently hold a managerial role. Using fuzzy set qualitative comparative analysis (fsQCA) is particularly useful when studying a small number of cases (10–50), and this is one of its strengths (Fiss 2011; Ragin 2000, 2009). Therefore, the sample in this study comprises 31 responses, which is adequate for fsQCA. These responses were collected from participants who work in Saudi Arabian firms of different sizes and within different sectors or industries and who are involved in IT deployment in Saudi Arabia. Table 1 presents the demographic analysis of the respondents.

Table 1: Demographic analysis of respondents

Category		**Percentage (%)**
Education	Bachelor	64.52
	Master	19.35
	Doctoral	16.13
Experience in warehousing industry	5-10	6.45
	11-15	61.29
	16-20	22.58
	21-25	6.45
	> 25	3.23
Warehousing experience is in IT	5-10	3.23
	11-15	48.39
	16-20	48.39
	21-25	0.00
	> 25	0.00
Job title	Chief executive	12.90
	Director	19.35
	Head of the department	25.81
	Manager	41.94
Job function	Logistics	22.58
	Warehouse	35.48
	Distribution	6.45
	IT	35.48

This study used Cronbach's alpha to test the reliability of the proposed scale to be used. A Cronbach's alpha value of > 0.70 is considered an acceptable value for reliability (Ursachi et al. 2015). Table 2 presents the reliability and validity results of the study. All the intended scales representing the three constructs are greater than 0.70, which indicates that these three scales and the overall questionnaire are reliable.

Table 2: Reliability and validity results

Scale	**Number of items**	**Number of participants**	**Cronbach's alpha**	**Validity**
Structuring (S)	14	31	0.694	0.8331
Bundling (B)	14	31	0.840	0.9165
Leveraging (L)	13	31	0.908	0.9529

Resource orchestration (ROT)	41	31	0.922	0.9602
Digitalisation (DG)	6	31	0.873	0.9343
Value creation (VC)	5	31	0.775	0.8803
Operational performance (OP)	3	31	0.747	0.8643
Performance (PRF)	8	31	0.862	0.9284
Overall reliability	55	31	0.943	0.9711

4. Data Analysis Using fsQCA

We investigated the configurations using fsQCA, which is utilised to identify the combinations of conditions (i.e. variables) that lead to the outcome (i.e. PRF) even though they are not needed to cause it, establishing conjectural causation (Kopplin and Rösch 2021). We used fsQCA software to analyse the data. We tested four possible combinations of variables: ROT*DG; DG*VCOP; ROT*VCOP; and a combination of ROT*DG*VCOP. Here, '*' denotes 'and'. For example, 'VC*OP' represents 'value creation' and 'operational performance'. In addition, 'S*B*L' represents 'structuring', 'bundling' and 'leveraging'. Based on Boolean algebra, the fsQCA results were calculated; the tilde symbol '~' indicates 'negation of condition' (i.e. low level of study variable). For example, '~DG' represents low digitalisation.

Performing fsQCA involved three main stages. First, the survey data were calibrated into different fuzzy sets using values from 0 to 1 (Ragin 2009). We used the rating of 5 for full membership, the rating of 3 for the crossover point, and the rating of 1 for full non-membership (Afonso et al. 2018). Second, the necessary conditions were checked. To consider a condition to be necessary, the consistency value and coverage value should be equal to or greater than 0.9 and 0.5, respectively (Pappas and Woodside 2021). Third, counterfactual analyses were performed to refine sufficient causal recipes for expecting high (and low) performance scores (see Table 3). Both the consistency value and the coverage value were checked to accept a configuration (Roy et al. 2018). A configuration can be considered sufficient when the consistency value and coverage value are higher than 0.75 and 0.5, respectively (Roy et al. 2018).

The fsQCA result for ROT*DG (Table 3), with ROT and DG as input variables [PRF = ƒ(S, B, L, DG)], showed that two causal recipes led to a higher performance score. In configuration 1 (C1), a high-performance score was achieved with high S and low B and L. According to C2, high DG, S and B indicated high performance. This means that the presence of good digitalisation, structuring and bundling leads to high performance. Next, considering the ROT and VCOP variables [PRF = ƒ(S, B, L, VC, OP)], the fsQCA results revealed that performance may be improved with three different combinations: S, B, L, OP (C3); S, B, VC, OP (C4); or S with a low level of B, L, VC and OP (C5). Regarding the DG and VCOP configuration [PRF = ƒ(DG, VC, OP)], two cases suggested that high performance would be achieved: C6, which was a combination of low VC, OP and DG; and C7, which was a combination of high VC, OP and DG. We found that C7 was the best solution, as it had very high consistency (1) and adequate coverage (0.9305). This configuration suggests that to achieve high PRF, strategists could focus on achieving high VC, OP and DG. Finally, C8 indicated the combination of high S, B, VC, OP and DG; C9 combined low B, L,VC,OP, DG and high S. For low-performance scores (Table 4), we focused on the concurrent effect of all variables on low performance. We found that C11 was the best solution, as it had very high consistency (1) and adequate coverage (0.64433). Our fsQCA results confirm that achieving high warehouse performance in Saudi Arabia indeed depends on the configurational effects of related (ROT, DG, VCOP) variables as opposed to individual effects.

Table 3. Configurational variables for high performance

Configurations	**Raw Coverage**	**Unique Coverage**	**Consistency**
ROT*DG: PRF = ƒ(S*B*L*DG)			
C1. S*~B*~L	0.17355	0.00635427	0.927813
C2. S*B*DG	0.875695	0.708499	0.986136
ROT *VCOP: PRF = ƒ(S*B*L *VC*OP)			
C3. S*B*L*OP	0.878475	0.0150914	0.989709
C4. S*B*VC*OP	0.873312	0.00992852	1
C5. S*~B*~L*~VC*~OP	0.136616	0.00397146	0.917333
DG*VCOP: PRF = ƒ(DG*VC*OP)			
C6. ~VC*~OP*~DG	0.127879	0.00516278	0.875

C7. VC*OP*DG	0.9305	0.807784	1
ROT*DG * VCOP: PRF = ƒ(S*B*L*DG*VC*OP)			
C8. S*B*VC*OP*DG	0.859015	0.749007	1
C9. S*~B*~L*~VC*~OP*~DG	0.115171	0.00516278	0.903427

Table 4. Configurational variables for low performance

Configurations	Raw Coverage	Unique Coverage	Consistency
ROT*DG: ~PRF = ƒ(S*B*L*DG)			
C10. S*~B*~L	0.699313	0.699313	0.864119
ROT *VCOP: ~PRF = ƒ(S*B*L *VC*OP)			
C11. S*~B*~L*~VC*~OP	0.64433	0.0704468	1
C12. S*B*L*~VC*OP	0.871134	0.297251	0.875648
DG*VCOP: ~PRF = ƒ(DG*VC*OP)			
C13. ~VC*~OP*~DG	0.632302	0.632302	1
ROT*DG * VCOP: ~PRF = ƒ(S*B*L*DG*VC*OP)			
C14. S*~B*~L*~VC*~OP*~DG	0.551546	0.0756014	1
C15. S*B*~L*VC*OP*DG	0.62543	0.149485	0.796499

5. Discussion

The study results indicate that ROT and digitalisation influence the performance of warehouses. Additionally, they show that ROT could improve performance since firms are often willing to enhance their ability to effectively manage their internal and external resources (Kristoffersen et al. 2021). This means that making better use of existing resources can lead to better performance, and this is consistent with the findings of a study conducted by Raghuram and Arjunan (2021).

Furthermore, the results of the study confirm that digitalisation has a significant influence on warehouse performance. This suggests that a low level of adoption of digital technologies could lead to low performance, meaning that implementing digitalisation is considered critical for improving warehouse performance. This result is in line with those of previous studies that highlight the significant impact of digitalisation on performance (Truant et al. 2021; Verhoef et al. 2021). Hess et al. (2016) consider digitalisation as increasingly critical for firms' success since it results in value creation, which leads to increased revenue, enhanced customer satisfaction, and access to new business areas. In addition, they suggest that digitalisation may lead to enhanced operational performance by improving the products and services, developing a new set of skills, and improving business processes.

Overall, the high performance of warehouses in Saudi Arabia is dependent on the level of resources required for the digitalisation of warehouses. However, Saudi Arabia is only using some of the technologies and software to expedite the management process (Alias et al. 2018; AlMulhim 2021), which can be classified under digitisation or changing from analogue to digital systems (Saarikko et al. 2020). Therefore, there is an opportunity for Saudi warehouses to implement digitalisation. This is in line with Saudi Vision 2030, which suggests that they need to start implementing digitalisation.

The study's contribution to the theory is the assessment of the dimensions and the configuration design of the dimensions to gain a theoretical understanding of the digitalisation process. The study will guide managers to develop a step-by-step procedure for implementing the digitalisation process in their warehouses. It will also assist managers to assess the type and level of the resources required for the digitalisation of their warehouses. In addition, the study will help managers to clearly identify the various roles of digitalisation in improving performance.

6. Conclusion

Although many countries are implementing digitalisation for various reasons, research indicates that Saudi Arabia is still behind advanced economies in the contribution of their digitalisation to gross domestic product. Therefore, it is important to gain an understanding of the impact of digitalisation on Saudi warehouses. In the present study, our fundamental aim was to examine the digitalisation of warehousing and to investigate the effect of digitalisation on warehouse performance in Saudi Arabia. ROT helps to explain the phenomena of DT and digitalisation. ROT processes would help the warehousing system to transform by implementing digitalisation. The results show that ROT and digitalisation could improve warehouse performance. Data have only been collected from one country, however, namely Saudi Arabia. This means that the results may vary in other developing countries.

References

Afonso, C., Silva, G.M., Gonçalves, H.M. and Duarte, M., The role of motivations and involvement in wine tourists' intention to return: SEM and fsQCA findings, *Journal of Business Research*, vol. 89, pp. 313-321, 2018.

Ahuja, S. and Chan, Y.E., Resource orchestration for IT-enabled innovation, *Kindai Management Review*, vol. 5, no. 1, pp. 78-96, 2017.

Alharbi, A.S., Assessment of organizational digital transformation in Saudi Arabia, *Proceedings of the 2019 6th International Conference on Computing for Sustainable Global Development (INDIACom)*, pp. 1292-1297, New Delhi, India, March 13-15, 2019.

Ali, S.S., Kaur, R. and Khan, S., Evaluating sustainability initiatives in warehouse for measuring sustainability performance: an emerging economy perspective, *Annals of Operations Research*, vol. 316, pp. 1-40, 2022.

Alias, C., Nikolaev, I., Magallanes, E.G.C. and Noche, B., An overview of warehousing applications based on cable robot technology in logistics, *Proceedings of the 2018 IEEE International Conference on Service Operations, Logistics and Informatics (SOLI)*, pp. 232-239, Singapore, July 31-August 02, 2018.

AlMulhim, A.F., Smart supply chain and firm performance: the role of digital technologies, *Business Process Management Journal*, vol. 27, no. 5, pp. 1353-1372, 2021.

Baert, C., Meuleman, M., Debruyne, M. and Wright, M., Portfolio entrepreneurship and resource orchestration, *Strategic Entrepreneurship Journal*, vol. 10, no. 4, pp. 346-370, 2016.

Bajunaid, T. and Attia, A., Effect of market dynamics on warehouse management in Saudi Arabia: a case of universal motors agencies (UMA), *PalArch's Journal of Archaeology of Egypt/Egyptology*, vol. 18, no. 15, pp. 85-93, 2021.

Buzu, A., *The effect of warehousing management on warehouse performance*, thesis, Jimma University, 2021.

Carnes, C.M., Chirico, F., Hitt, M.A., Huh, D.W. and Pisano, V., Resource orchestration for innovation: structuring and bundling resources in growth-and maturity-stage firms, *Long Range Planning*, vol. 50, no. 4, pp. 472-486, 2017.

Cichosz, M., Wallenburg, C.M. and Knemeyer, A.M., Digital transformation at logistics service providers: barriers, success factors and leading practices, *The International Journal of Logistics Management*, vol. 31, no. 2, 2020.

Cui, M. and Pan, S.L., Developing focal capabilities for e-commerce adoption: a resource orchestration perspective, *Information & Management*, vol. 52, no. 2, pp. 200-209, 2015.

Fatorachian, H. and Kazemi, H., Impact of Industry 4.0 on supply chain performance, *Production Planning & Control*, vol. 32, no. 1, pp. 63-81, 2021.

Fiss, P.C., Building better causal theories: a fuzzy set approach to typologies in organization research, *Academy of Management Journal*, vol. 54, no. 2, pp. 393-420, 2011.

Gu, J., Goetschalckx, M. and McGinnis, L.F., Research on warehouse operation: a comprehensive review, *European Journal of Operational Research*, vol. 177, no. 1, pp. 1-21, 2007.

Hess, T., Matt, C., Benlian, A. and Wiesböck, F., Options for formulating a digital transformation strategy, *MIS Quarterly Executive*, vol. 15, no. 2, pp. 123-139, 2016.

Jaziri, R., Korbi, K. and Gontara, S., The application of physical internet in Saudi Arabia: towards a logistic hub in 2030, *Journal of Management and Training for Industries*, vol. 7, no. 1, pp. 1-16, 2020.

Khemavuk, P., *A Model for Warehouse Performance Measurement*, thesis, University of New South Wales, 2010.

Koentjoro, S. and Eliyana, A., Resource orchestration: consolidation, integration, entrepreneurial and affective commitment in creating sustainable competitive advantage in the family firm, *International Journal of Business and Social Science*, vol. 6, no. 3, 2015.

Kopplin, C.S. and Rösch, S.F., Equifinal causes of sustainable clothing purchase behavior: an fsQCA analysis among generation Y, *Journal of Retailing and Consumer Services*, vol. 63, 102692, 2021.

Kristoffersen, E., Mikalef, P., Blomsma, F. and Li, J., The effects of business analytics capability on circular economy implementation, resource orchestration, capability and firm performance, *International Journal of Production Economics*, vol. 239, 108205, 2021.

Kumar, N., Stern, L.W. and Anderson, J.C., Conducting interorganizational research using key informants, *Academy of Management Journal*, vol. 36, no. 6, pp. 1633-1651, 1993.

Laosirihongthong, T., Adebanjo, D., Samaranayake, P., Subramanian, N. and Boon-itt, S., Prioritizing warehouse performance measures in contemporary supply chains, *International Journal of Productivity and Performance Management*, vol. 67, no. 9, pp. 1703-1726, 2018.

Lee, C., Lv, Y., Ng, K., Ho, W. and Choy, K., Design and application of Internet of things-based warehouse management system for smart logistics, *International Journal of Production Research*, vol. 56, no. 8, pp. 2753-2768, 2018.
Li, M. and Jia, S., Resource orchestration for innovation: the dual role of information technology, *Technology Analysis & Strategic Management*, vol. 30, no. 10, pp. 1136-1147, 2018.
Matt, C., Hess, T. and Benlian, A., Digital transformation strategies, *Business & Information Systems Engineering*, vol. 57, no. 5, pp. 339-343, 2015.
Min, H., The applications of warehouse management systems: an exploratory study, *International Journal of Logistics: Research and Applications*, vol. 9, no. 2, pp. 111-126, 2006.
Nemoto, T. and Beglar, D., Likert-scale questionnaires, *Proceedings of JALT 2013 Conference*, JALT, Tokyo, pp. 1-8, 2014.
Newman, I., Benz, C.R. and Ridenour, C.S., *Qualitative-Quantitative Research Methodology: Exploring the Interactive Continuum*, SIU Press, 1998.
Pappas, I.O. and Woodside, A.G., Fuzzy-set Qualitative Comparative Analysis (fsQCA): guidelines for research practice in information systems and marketing, *International Journal of Information Management*, vol. 58, 102310, 2021.
Raghuram, P. and Arjunan, M.K., Design framework for a lean warehouse – a case study-based approach, *International Journal of Productivity and Performance Management*, 2021.
Ragin, C.C., *Fuzzy-set Social Science*, University of Chicago Press, 2000.
Ragin, C.C., *Redesigning Social Inquiry: Fuzzy Sets and Beyond*, University of Chicago Press, 2009.
Roy, S.K., Balaji, M., Quazi, A. and Quaddus, M., Predictors of customer acceptance of and resistance to smart technologies in the retail sector, *Journal of Retailing and Consumer Services*, vol. 42, pp. 147-160, 2018.
Saarikko, T., Westergren, U.H. and Blomquist, T., Digital transformation: five recommendations for the digitally conscious firm, *Business Horizons*, vol. 63, no. 6, pp. 825-839, 2020.
Shah, B. and Khanzode, V., A comprehensive review of warehouse operational issues, *International Journal of Logistics Systems and Management*, vol. 26, no. 3, pp. 346-378, 2017.
Sirmon, D.G., Hitt, M.A. and Ireland, R.D., Managing firm resources in dynamic environments to create value: looking inside the black box, *Academy of Management Review*, vol. 32, no. 1, pp. 273-292, 2007.
Sirmon, D.G., Hitt, M.A., Ireland, R.D. and Gilbert, B.A., Resource orchestration to create competitive advantage: breadth, depth, and life cycle effects, *Journal of Management*, vol. 37, no. 5, pp. 1390-1412, 2011.
Staudt, F.H, Alpan, G., Di Mascolo, M. and Rodriguez, C.M.T., Warehouse performance measurement: a literature review, *International Journal of Production Research*, vol. 53, no. 18, pp. 5524-5544, 2015.
Steiber, A., Alänge, S., Ghosh, S. and Goncalves, D., Digital transformation of industrial firms: an innovation diffusion perspective, *European Journal of Innovation Management*, vol. 24, no. 3, pp. 799- 819, 2020.
Truant, E., Broccardo, L. and Dana, L.-P., Digitalisation boosts company performance: an overview of Italian listed companies, *Technological Forecasting and Social Change*, vol. 173, 121173, 2021.
Ursachi, G., Horodnic, I.A. and Zait, A., How reliable are measurement scales? External factors with indirect influence on reliability estimators, *Procedia Economics and Finance*, vol. 20, pp. 679-686, 2015.
Verhoef, P.C., Broekhuizen, T., Bart, Y., Bhattacharya, A., Dong, J.Q., Fabian, N. and Haenlein, M., Digital transformation: a multidisciplinary reflection and research agenda, *Journal of Business Research*, vol. 122, pp. 889-901, 2021.
Vial, G., Understanding digital transformation: a review and a research agenda, *The Journal of Strategic Information Systems*, vol. 28, no. 2, pp. 118-144, 2019.
Younis, N., Naseeb, R.A. and Kausar, U., Warehouse management system as locomotive of supply chain management: some evidences from United Kingdom manufacturing sector, *International Journal of Management Sciences and Business Research*, vol. 2, no. 12, 2013.