

The Interrelationships Among Industry 4.0 Technologies, Cloud ERP and Industries Performance: A Quantitative Study Using Amos

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Abstract

Little is known about the interrelationships among the key practices namely Industry 4.0 technologies (IN4), Cloud Enterprises Resource Planning (CE) and Industries Performance (IP) within the context of Palestinian environment. This paper examines the linkages between these to realize their conceivable combination. Accordingly, a conceptual model is developed to better understand the nature of this nexus. Three direct hypothesis and one mediation structure for CE is formulated. The developed questionnaire with multi items is validated from relevant academics and industry experts. Refer to key respondents' opinion, Amos 25 were considered for data analysis and hypotheses testing. Findings show that the impact of IN4 on both IP and CE are supported; these can be combined together, whereas the link between CE and IP is not supported. Besides, CE is not indicated as mediator among IN4 and IP. These findings can direct Palestinian managers to focus more on real adoption of resource planning system as these modern technologies may generate benefits on the long run approach.

Keywords

Industry 4.0, Cloud ERP, Conceptual Model, Mediation, Amos-25, Interrelationships, Palestinian Development

1. Introduction

Recently, the advent of Industry 4.0 (In-4) has reshaped the global industrial landscape, presenting a wave of advanced technologies such as the Internet of Things (IoT), Artificial Intelligence (AI), Big Data analytics, Cloud Computing, and Cyber-physical systems. These aspects entail the integration of information, and knowledge; therefore, Enterprise Resource Planning (ERP) can be managed and compatible with In-4 requirements. For industries transitioning to In-4.0, upgrading or customizing the ERP to align with digital transformation goals is often necessary steps to follow incrementally. Scholars argue that these affect how enterprises work professionally and try to affect decision-making processes in better manner. Moreover, in the literature, notions become different including material requirement planning (MRP), manufacturing resource planning (MRPII), extended ERP, cloud-based ERP and others (Al-Amin et

al.2023). To Palestinian case, the integration of these practices into ERP systems shows different complexities and difficulties. These are due to the limited access to global markets, the available infrastructure and other possible factors that may affect these linkages. Even though managers may obtain remarkable benefits. Jayeola et al. (2022) argue that the impact of cloud ERP implementation on business performance remains inconclusive. Additionally, even though there are some success stories with ERP adoption, its implementations are filled with high failure rates Sun et al. (2015). Actually, its adoption successfully is quite complex, difficult, and risk for success. According to Bandara et al.(2023) in the literature review, there is diverse results obtained upon examining ERP with business performance. According to AlBar, and Hoque (2019), till now there has been little research on cloud ERP adoption, particularly in developing Middle Eastern countries. Cloud ERP concept with the key advantages and disadvantages are not clearly understood by enterprises (Christiansen et al.2022). Scholars Al-Amin et al. (2023) claim that very few papers discussed ERP with respect to Industry 4 practices. Both Lee and Kim (2016) claim that ERP implementation is complicated and costly and enterprises are redundant whether to conduct it or not within their business. The main objectives of this paper is empirically investigate the impact of Industry 4.0 technologies on ERP implementation and performance in Palestinian industries. Besides, the nature and mechanism of this integration is not clearly discussed before.

2. Literature review

2.1 Industry 4.0 and ERP linkage

Industry 4.0 (In-4), often referred to as the Fourth Industrial Revolution, represents a paradigm shift in manufacturing and industrial practices through the integration of advanced digital technologies. These technologies include the Internet of Things (IoT), cyber-physical systems, big data analytics, cloud computing, artificial intelligence (AI), and robotics. These technologies which managers and manufacturers try to adopt and change their mind towards realization and adoption these in the several branches can include wide aspects of real observed and expected benefits to key managers while these are clearly practiced. For instance, IoT incorporation with ERP systems significantly improves supply chain perceptibility, inventory management, and production planning (Majstorovic et al.2020). ERP developments are changing every day and several enterprises are trying to customize this system into their operations, processes and algorithm. It is supposed that it includes all aspects inside firms. It is deployed widely by different enterprises to achieve competitive advantages and thus improved performance (Gupta et al.2019). In Malaysian environment, Haseeb (2022) examined how ERP system affects the financial performance of biotechnology firms using two mediators.

2.2 Industry 4.0 and industries performance linkage

Industry 4.0 (In-4) and institutional performance association is widely reflected by researchers such that Mukred et al.(2023) in both developing and developed nations. However, findings obtained vary due to different ideologies and themes including size of the firm, complexities of processes, how these practices and technologies are implemented by manufacturers or managers. In the Palestinian environment, there is still clear gap in understanding this complex link and whether these practices bring values to enterprises or not. Both Ali and Xie (2021) studied these practices from the perspective of Pakistan retail industry only and reflect these as core values and factors for In-4. Scholars Ooi et al.(2023) examined Industry 4.0 as moderator between lean manufacturing and organizational performance and found that it as moderator construct that positively affect this association. They argued that In-4.0 technologies are great process facilitators for achieving a sustainable organizational performance.

2.3 ERP and industries performance linkage

Cruz-Torres et al. (2021) examined how ERP affects employee performance and used structural equation modeling for data analysis. It is advocated that ERP improves coordination, enhances order management, information visibility, customer responsiveness, and boosts accountability and discipline (Kamhawi, 2008). In the Saudi Arabian listed firms, both Bazhair and Sandhu (2015) examined relevant issues of ERP acceptance and the perceived benefits and ease of use by different end users. Mukred et al.(2023) confirmed that ERP has powerful role in implementing best practices in higher education institutions. Al Bar and Hoque (2019) examined the key factors affecting cloud ERP in Saudi Arabia and deliberate its influence on cost efficiency, scalability, adaptability, availability and configurable data to any type of company. Christiansen et al.(2022) studied the key factors namely organizational and technological of cloud ERP and argue that 13 elements are useful for this successful adoption. Acar et al. (2017) used the operational performance to further understand the nature of these interrelationships.

2.4 Conceptual model and hypotheses

Due to new technologies elaborated, scholars are trying to establish a saturated ERP model to be compatible with In-4 practices. The conceptual model developed in this study is grounded in the premise that In-4 practices serve as the exogenous latent construct that drives changes within organizational systems, specifically influencing the implementation and effectiveness of ERP systems, which is treated as the endogenous latent construct. Majstorovic et al.(2020) advocate that ERP is based on the use of I4 different elements. This system is concerned with production and planning control and it integrates I4 paradigm. Jayeola et al.(2022) empirically examine the mediating and moderating effects of top management support of cloud ERP. Jayeola et al. (2020) examine cloud ERP as mediator construct within Malaysian SMEs in an improved conceptual model. The new ERP delivery model propose to integrate all processes within the different enterprises divisions successfully in a complete interrelated data management technology system starting from human resources, inventory management, accounting towards the other different departments. Consistent with Gupta et al.(2019) the conceptual model is designed according to contingent resource based view (RBV) theory. Figure 1. depicts the conceptual model developed refer to Palestinian environment. Based on the literature and the proposed model, the following four hypotheses proposed to be empirically examined in the Palestinian industries context.

- H1: In-4 technologies affects positively Palestinian Industries Performance (IP).
- H2: In-4 technologies affects positively cloud ERP system adoption.
- H3: Cloud ERP system affects positively the IP.
- H4: Cloud ERP mediates the relationship between In-4 and IP

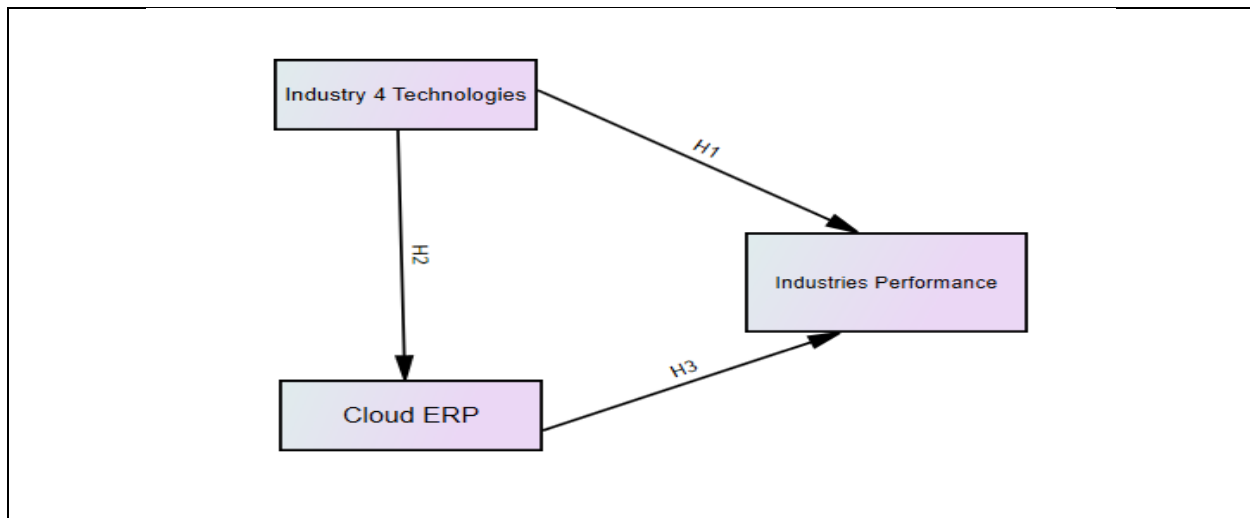


Figure1. The developed conceptual model

3. Methodology

3.1 Design and sample size determination

This paper adopts a quantitative research design to examine the postulated direct and indirect hypotheses within Palestinian manufacturing industries. The total population was defined as all registered Palestinian industrial companies, including small, medium, and large enterprises across various sectors. According to data from the Palestinian Central Bureau of Statistics and the Ministry of National Economy, this population comprises several thousand firms. Using standard sample size calculation methods for a finite population, with a 95% confidence level and a 5% margin of error, the minimum required sample size was estimated to be approximately 350 respondents. To ensure adequate representation and account for potential non-responses or incomplete surveys, a larger sample of 500 firms was targeted. Final dataset consisted of 364 valid responses, which exceeds the minimum recommended sample size for structural equation modelling (SEM), ensuring the reliability and statistical power of the analysis.

3.2 Conceptualization of constructs, data collection and analysis

Primary data collected through a cross-sectional survey distributed to large sample of manufacturing firms across various regions in the West Bank region of Palestine. The prepared questionnaires distributed using the electronic method, ensuring wide geographical and sectoral coverage. This mechanism is followed by authors as it is very quick method to gather the necessary data from key respondents. A structured survey instrument developed based on validated measurement items from former studies, with necessary modifications to reflect the Palestinian industrial context. Five academics specialized in industrial and manufacturing engineering contacted for validity purposes. Besides, three industry managers added useful inputs to enhance questionnaire items shown in Table 1. 12 items identified for In-4 coded as (IN4 1 to IN4 12) and these are adapted based on the literature of Ooi et al.(2023) , and Bibby and Dehe(2018). Three items related to Cloud ERP usage (CE1 to CE3) are modified from Jayeola et al.(2022) whereas (CE4 to CE12) are related to Strategic Alignment of Cloud ERP. Industries Performance items (IP1 to IP8) are adapted based on the literature of Makathimo(2016). The survey included multiple constructs related to Industry 4.0 technologies—such as IoT usage, data analytics capability, and system automation—as well as ERP performance indicators like system integration, real-time processing, and user satisfaction. Structural Equation Modeling (SEM) through Analysis of Moment Structure (AMOS 25) used to analyze the gathered data from key respondents.

Table 1. Latent constructs and items used

Construct	Items	Cronbach alpha
IN41	Our employees understand the benefit of big data analytics	0.77
IN42	Our company uses autonomous robots to facilitate work inside our divisions	0.76
IN43	Our company uses computer simulation to manage and capture products, processes and systems widely.	0.81
IN44	Our employees have an awareness of the integrated engineering systems for product development and manufacturing	0.70
IN45	Our employees use Internet of Things technology to enhance their work environment.	0.83
IN46	Cyber security is used effectively in our company	0.82
IN47	Additive manufacturing is effectively used in our company	0.73
IN48	Augmented reality is integrated within our company operations	0.72
IN49	Smart manufacturing tools are widely used in our company	0.74
IN410	Our company uses 3DP for tooling or spare part prototyping	0.77
IN411	Our employees use relevant sensors on products and supplied parts in operations and processes	0.71
IN412	Our employees use Computer-Aided Design (CAD) software and metal alloys for 3DP processes	0.81
CE1	We use cloud ERP very intensively for our main functions	0.72
CE2	We use cloud ERP very frequently for our supporting functions	0.74
CE3	We use cloud ERP innovatively to aid our strategic functions	0.76
CE4	We align cloud ERP to strengthen customer services	0.77
CE5	We align cloud ERP with our business strategies	0.81
CE6	We align cloud ERP to improve process management	0.83
CE7	We align cloud ERP to enhance product/service offerings	0.84
CE8	We align cloud ERP to devise strategic plan in our industry	0.82
CE9	We align cloud ERP to consolidate business goals	0.83
CE10	We align cloud ERP with our firm objectives	0.71
CE11	We align cloud ERP for opportunity recognition	0.72
CE12	We align cloud ERP to adapt to strategic changes	0.76
IP1	These technologies resulted in improved customer relationship	0.81
IP2	These technologies resulted in improved supplier management	0.82
IP3	These technologies resulted in improved visibility in the market	0.73
IP4	These technologies resulted in improved production efficiency	0.76
IP5	These technologies resulted in overall improvement in resource management	0.72
IP6	These technologies lead to savings on IT infrastructure costs	0.75

IP7	These technologies resulted in reduced operating costs	0.77
IP8	These technologies lead to more accurate data processing	0.71

This mechanism is followed by numerous scholars and consider appropriate to explore the interrelationships among the latent constructs used (Zainudin, 2015). SEM generally have different steps to be finally stabilized. Hence, both measurement and structural model are deliberated to simplify hypotheses testing. According to Zainudin(2015) once measurement model is achieved, the next step is establishing the structural model.

4. Results

4.1 Measurement model for Industry 4.0 (In-4) technologies

The initial hypothesized Confirmatory factor analysis (CFA) for IN4 technologies contains 12 different items adapted from the literature of former scholars in the relevant field to be consistent with Palestinian industries. Initial CFA show that fitness indices are not achieved. Factor loadings for all 12 items are IN41 (0.73), IN42 (0.61), IN43 (0.77), IN44 (0.77), IN45 (0.44), IN46 (0.46), IN47 (0.68), IN48 (0.79), IN49 (0.76), IN410 (0.63), IN411 (0.42), and IN412 (0.42). It is clear that there are four IN4 items have factor loading less than 0.5 and so these have to be removed from further analysis as these are not appropriate namely IN45, IN46, IN411 and IN412. Additionally, values of normed chi-square (16.621), CFI (0.708), and RMSEA (0.225) do not reach the threshold values, so, the initial CFA is to be modified again. After removing 4 unnecessary items, and correlating error terms based on theoretical justification, the modified CFA for IN4 practices contains 8 items retained for further analysis. The modified CFA has an acceptable fit indices as RMSEA =0.044 which is less than 0.08, CFI = 0.913(greater than 0.9), normed chi-square =1.98 (less than 3). Factor loadings for the retained 8 items are: (IN41, 0.71), (IN42, 0.75), (IN43, 0.72), (IN44 ,0.75), (IN47, 0.73), (IN48, 0.79), (IN49, 0.81), (IN410, 0.82).

4.2 Measurement model for Cloud ERP (CE)

The initial hypothesized measurement model for CE contains 12 different items. These items are reflective in nature with two factors configurated. Findings show that initial CFA for CE construct has 5 items with low factor loading (less than 0.50) and authors decided to delete these as considered unnecessary in this stage. Factor loading of all 12 CE items are: (CE1, 0.77), (CE2, 0.71), (CE3, 0.70), (CE4, 0.76), (CE5 ,0.78), (CE6,0.65) , (CE7,0.67), (CE8,0.41), (CE9,0.44) , (CE10 ,0.42), (CE 11, 0.45), and (CE 12, 0.46). Since 5 items have low factor loadings, these are discarded from further analysis namely CE8, CE9, CE10, CE11, and CE12. Besides, values of fit indices are poor and unacceptable. For instance, normed chi-square = 3.75, CFI = 0.76, RMSEA= 0.095. This requires modifying CFA to have better situation to proceed. After removing the unnecessary CI items, the retained items entered again to AMOS and the modified CFA finally obtained as fitness indices were satisfied and achieved. Values of normed chi-square =1.92, CFI=0.91, RMSEA= 0.041, P=0.000. Item loadings for the modified acceptable CFA as follows: (CE1, 0.77), (CE2, 0.71), (CE3, 0.70), (CE4,0.68) , (CE5, 0.74), (CE6,0.69), and (CE7,0.76).

4.3 Measurement model for Industries Performance (IP)

The initial hypothesized CFA for IP have 8 items. These are reflective with one factor formulated. Findings from AMOS output show that CFA does not achieve the best model fit as fitness indices are not satisfied and two items have low factor loadings namely IP7(0.38) and IP8(0.34). These with very low ratings discarded from further analysis in attempt to modify the CFA for IP. Fitness indices are: normed chi square = 3.36, CFI= 0.87, RMSEA = 0.093, which are not acceptable. Factor loadings for the remaining items are: (IP1, 0.76), (IP2, 0.72), (IP3,0.69), (IP4, 0.72), (IP5, 0.73), (IP6,0.71). Conducting the CFA again with the six retained IP items show that the modified CFA is acceptable with the values of factor loadings are: (IP1, 0.75), (IP2, 0.72), (IP3,0.72), (IP4, 0.77), (IP5, 0.76), (IP6,0.74). Consequently, Model fit indices are achieved as normed chi square =1.78 which is good value, CFI= 0.91 and RMSEA= 0.043. These results support the uni-dimensional structure of the industries Performance (IP) construct.

4.4 Validity and Reliability assessment

As per the items and latent constructs, Calculations done for Cronbach alpha, Average Variance Extracted(AVE) which is should be greater than 0.5 and Composite Reliability (CO)should be greater than 0.7. Besides, convergent validity is realized since CR is greater than AVE. These are depicted in Table 2.

Table 2. Validity and reliability of main model practices

Construct	AVE	CO	Cronbach alpha
IN4	0.56	0.85	0.73
CE	0.58	0.86	0.77
IP	0.63	0.87	0.81

4.5 Full- fledged structural model and hypotheses testing

Once achieving the satisfactory measurement models for the key three practices as elaborated above, the next step is constructing the structural model which is established though AMOS program and will be used for testing the three direct postulated hypotheses (Figure 2).

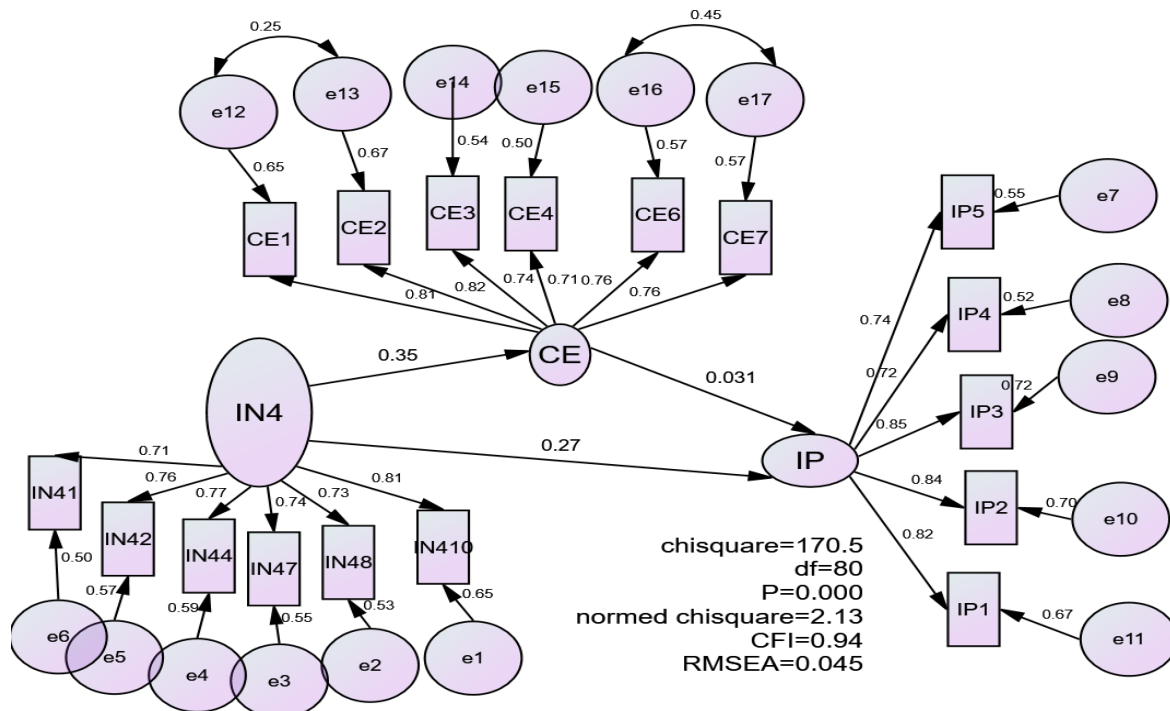


Figure 2. Final revised full-fledged structural model.

Both factor loadings and modification indices are observed for the whole structural model and correlation of errors for some items were done by authors a step to improve the fit indices and achieve the acceptable model. Consequently, the final established full-fledged structural model comprises 6 items for IN4, 6 items for CE and 5 items for IP. Some items related to these constructs were deleted to improve the structural model. It is clear that IN4 finally have IN41, IN42, IN44, IN47, IN48, IN410. Cloud EEP items are CE1, CE2, CE3, CE4, CE6, and CE7. Industries performance has IP1, IP2, IP3, IP4 and IP5. Values of factor loadings for these items collectively are portrayed in Fig. 2. The final structural model becomes acceptable as model fit indices and items factor loadings are achieved. Values of the normed chisquare = 2.13, CFI=0.94 and RMSEA=0.045 which are acceptable values as these are within the threshold values limits as per the recommendations of Zainudin(2015). His recommendations include that any hypothesis can be supported if it is both statistically and practically significant. Once the Critical Ratio value (C.R) is greater than 1.96 and standardized beta is greater than 0.2, then, it is supported. Based on the final modified structural model and the results shown in Table 2, two hypotheses (i.e., H1 and H2) are supported whereas H3 is not supported. Hypothesis 1 between both IN4 and IP have C.R of 2.64 and $\beta = 0.27$. Hypothesis 2 to examine the impact of IN4 on CE has C.R= 3.33 and $\beta = 0.35$. Hypothesis 3 between CE and IP also has C.R= 0.165 and $\beta = 0.031$. Analysis of the main hypotheses based on AMOS 25 is depicted in Table 3.

Table 3. Hypotheses testing. Authors computation

	Constructs	β	Estimate	S.E.	C.R	P-Value	Result
H1	IN4 and IP	0.27	0.29	0.11	2.64	***	Supported
H2	IN4 and CE	0.35	0.30	0.09	3.33	***	Supported
H3	CE and IP	0.031	0.015	0.091	0.165	**	Not supported
H4	IN4 and CE (a) CE and IP (b) IN4 and IP (c)	0.35 0.031 0.27	<u>Mediation test:</u> - Indirect effect: $a*b = (0.35)(0.031) = 0.011$ - Direct effect = $C=0.27$ - Since indirect effect is less than direct effect, and that the indirect effect is not significant; there is no mediation.				Not supported

S.E: Standardized Error, C.R: Critical Ratio

5. Conclusion and Implications

5.1 Summary and conclusions

This paper examined the linkages among three vital practices and technologies managers trying to adopt in their businesses namely IN4, CE and IP. The current global competition encourages manufacturers to implement these modern, smart systems and techniques to enhance their operations and processes professionally. Both direct and indirect linkages are empirically examined using techniques from Structural Equation Modelling, which is considered among the key contributions in this paper as focusing on these three performs together within the same conceptual model to explore their coexistence together is new to the Palestinian environment and not before considered by scholars. Besides, focusing on cloud ERP as a mediator construct when treating all industries in Palestine entails more resources and capacities towards realizing how this may alter the association when Industry 4.0 technologies are presented. Two hypotheses related to impact of IN4 on both IP and CE are found to be statistically and practically significant and therefore supported. This reflects the urgent matters to conceptualize these within Palestinian industries and that managers have an awareness about their possible usefulness and potential perceived benefits than can be generated on the long run. However, the other two remaining propositions concerned with the role of CE as mediator is not supported (H4), and that the direct influence of CE on IP (H3) is not statistically significant. This can be justified from different perspectives as Cloud ERP is not easy to implement within Palestinian industries as it requires an integrated system between all departments. Additionally, some necessary resources for targeted SME and large firms' respondents are not available and properly fixed and clear to some manufacturers. Adoption procedure and mechanisms could be a reason to justify why rejection of relevant hypothesis. It is advice that Palestinian manufacturers to cope with the staged ERP in their industries have an integrated skill-training program for staff members, and government collaboration on digital change, which may positively affect their businesses and enhance their operations in the long run. Considering that these modern practices are conducted in the developing economy of Palestine tries to modernise its operations and processes, it may be associated to other Southeast Asia relevant studies which would boost its global importance. This can be achieved through clear realization of the importance of these practices and appropriate implementation.

5.2 Limitations and future research

This paper has some limitations as it cross sectional study and not longitudinal which are among the agenda for future researches in this field. The developing economy of Palestine also may affect findings obtained here, and scholars have to be careful while considering generalizations of results to other sectors or nations. Other concern is about the dimensions utilized and may other mediating or moderators can be reflected to better understand the complex relationships amongst these practices.

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References

Acar, M.F., Zaim, S., Isik,M., and Calisir,F. "Relationships among ERP, supply chain orientation and

- operational performance: An analysis of structural equation modeling”, *Benchmarking: An International Journal*, Vol.24, No.5, pp.1291-1308, 2017.
- Ali,S. and Xie, Y. “The impact of Industry 4.0 on organizational performance: the case of Pakistan's retail industry”, *European Journal of Management Studies*, Vol.26, No.2/3, pp.63-86, 2021.
- AlBar, A.M., and Hoque, M. R., “Factors affecting cloud ERP adoption in Saudi Arabia: An empirical study”, *Information Development*, 35(1), 150-164, 2019.
- Al-Amin, M., Hossain,T., Islam,J., and Biwas, S.K., “History, features, challenges, and critical success factors of enterprise resource planning (ERP) in the era of Industry 4.0”, *European Scientific Journal*, ESJ, Vol.9, No.6, pp. 31-59, 2023.
- Bandara,F., Jayawickrama,U., Subasinghage,M., Olan,F., Alamoudi,H., and Alharthi,M. “Enhancing ERP Responsiveness through Big Data Technologies: An Empirical Investigation”, *Information Systems Frontiers*, Vol.26, No.1, pp.251-275, 2023
- Bazhair,A. and Sandhu,K. “Factors influencing the acceptance of Enterprise Resource Planning System (ERP) and financial performance of Saudi Arabia listed companies: Multivariate data analysis using Structural Equation Modeling (SEM)”, *International Journal of Business and Management Review*, Vol.3, No.4, pp.93-118, 2015.
- Bibby,L. and Dehe,B., “Defining and assessing Industry 4.0 maturity levels–case of the defence sector”, *Production Planning & Control*, Vol. 29 No. 12, pp. 1030-1043, 2018
- Cruz-Torres,W., Alvarez-Risco,A., and Del-Aguila-Arcenales,S. “Impact of Enterprise Resource Planning (ERP) implementation on performance of an education enterprise: a Structural Equation Modeling (SEM)”, *Studies in Business and Economics*, Vol.16, No.2, pp.37-52,2021
- Christiansen,V., Haddara,M., and Langseth, M. “ Factors affecting cloud ERP adoption decisions in organizations,” *Procedia Computer Science*, Vol.196,No.1, pp.255-262, 2022
- Frank,A.G., Dalenogare,L.S., and Ayala,N.F., “Industry 4.0 technologies: implementation patterns in manufacturing companies”, *International Journal of Production Economics*, Vol. 210, pp.15-26, 2019
- Gupta,S., Qian,X., Bhushan,B. and Luo,Z. “Role of cloud ERP and big data on firm performance: A dynamic capability view theory perspective”. *Management Decisions*, Vol.57, No.1, pp.1857–1882, 2019
- Haseeb, M., “Does Usage of ERP Systems in Biotechnology Firms Improve their Financial Performance? Role of Business Model Innovation and Top Management Support”, *Journal of Commercial Biotechnology*, Vol.27, No.4, pp.1462-8732, 2022.
- Jayeola,O., Sidek,S., Abdul-Samad, Z., Hasbullah,N.N., Anwar,S., An,N.B., and Ray,S., “ The mediating and moderating effects of top management support on the cloud ERP implementation–financial performance relationship”, *Sustainability*, Vol.14, No.9, p.5688, 2022
- Jayeola,O., Sidek,S., Rahman,A.A., Bali Mahomed, A.S., and Jimin,H., “Contextual factors and strategic consequences of cloud enterprise resource planning (ERP) adoption in Malaysian manufacturing SMEs: a Conceptual framework”, *International Journal of Economics and Business Administration*, Vol. 8, No. 3, pp.176-201, 2020.
- Kamhawi, E.M., “Enterprise Resource-Planning Systems Adoption in Bahrain: Motives, Benefits, and Barriers”, *Journal of Enterprise Information Management*, Vol.21, No.3, 2008, pp.310-334.
- Lee,S., and Kim, D., “The Effects of Industry Classification on a Successful ERP Implementation Model”, *Journal of Information Processing Systems*, Vol.12, No.1, pp.169-181, 2016.
- Majstorovic,V., Stojadinovic,S., Lalic,B., and Marjanovic,U., “ERP in Industry 4.0 context. In IFIP international conference on advances in production management systems”, (pp. 287-294). *Cham: Springer International Publishing*, 2020.
- Makathimo, M. “Cloud Based ERPs and Organizational Performance of SMEs in Nairobi, Kenya”, *Doctoral dissertation*, University of Nairobi, 2016.
- Mukred,M., Alotaibi, F.M., Yusof, Z.M., Mokhtar, U.A., Hawash, B. and Ahmed, W.A. “Enterprise resource planning adoption model for well-informed decision in higher learning institutions”, *Journal of Information Science*, Vol.49, No.3, pp.792-813, 2023.
- Ooi, L.L., Teh, S. Y. and Cheang, P. Y. S.”, The impact of lean production on sustainable organizational performance: The moderating effect of Industry 4.0 technologies adoption”, *Management Research Review*, Vol.46, No.12, pp.1802-1836, 2023
- Sun,H., Ni,W., and Lam, R. “A step-by-step performance assessment and improvement method for ERP implementation: action case studies in Chinese companies”, *Computers in Industry*, Vol. 68 No. 1, pp. 40-52, 2015.
- Zainudin,A., “SEM made simple. A gentle approach to learning structural equation modeling,” *Selangor: MPWS*

Publisher, 2015.

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