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Linking between cloud computing and productivity: The mediating role of information integration

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A B S T R A C T

The purpose of the paper is to select the mediating role of information integration between cloud computing and productivity. The research sample comprised 320 employees. Survey was utilized to gauge the cloud computing impact on productivity and information integration. 281 questionnaires returned for statistical analysis, adopting the quantitative approach. The study's findings indicated that productivity standards, applying information integration, and cloud computing usage were all highly prevalent. In addition, there was an impact for cloud computing on productivity and information integration. Recommendations for study were discussed.

1. Introduction

Businesses are continuously looking for ways to enhance their performance, boost their production, and spend less on materials, labor, and capital (Haloui & Kriouile, 2016; Bidgoli, 2011). Organizations and individuals must gain new skills and competencies because of the shift from corporate computing to cloud computing (Bayramustaa & Nasir, 2016). Consequently, with the complexity of the business environment, organizations have become aware that obtaining the proper information at the appropriate time facilitates fostering commercial relationships. Cloud suppliers like Google, Amazon, and Microsoft continually offer new services to their cloud environments to stay competitive and meet rising client demand. As a result, the use of the cloud is growing (Capachin, 2010; Alarifi et al., 2020). Computing the cloud is an excellent technical tool with resources that are easily accessible to help businesses meet their demands and accomplish their objectives. (Teh et al., 2016). Its definition of computing of cloud states that it is the provision of computing as a service rather than a product, in which shared resources, software, and information are made accessible to computers and other devices through a network as a utility such as the electrical grid or the Internet (Bitam & Mellouk, 2012). Utilizing apps without making significant capital expenditures on infrastructure is possible for both consumers and enterprises thanks to cloud computing, which also enables Internet service access (Mwesigwa, 2014; Dewan & Jena, 2014). The management of the firm needs an efficient information system to enhance services, decrease costs, and boost competitiveness (Simunovic et al., 2013).The idea of abstracting and outsourcing hardware or software resources through the sophisticated internet is known as computing of cloud (Giriraj & Muthu, 2012).The fluctuations in the business environment need cloud computing to quickly adapt to the business environment to configure applications in a flexible manner that adapts to changes in the structure of the organization and the standard of

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operations (Sarno et al., 2015). A potential approach for running high-performance or multi-task computing applications in the cloud is to exploit the performance characteristics of the cloud nodes and the network connections between them (Peterson et al., 2015). The size of the dataset, the methods used, the way memory is accessed, and the service model used all contribute to the characteristics of a cloud workload (Hwang & Shi, 2014). There have been several publications recently because of the intense interest in academics and practice. Computing the cloud offers online access to computer services such as servers, databases, networking, software, and data analytics to promote quicker deployment, flexible resource allocation, and cost savings (Dang et al., 2019). Users can access a variety of services through the computing of cloud models, including hardware, software, information access, and capacity (Barona & Anita, 2017). With the help of cloud computing, businesses can effectively scale up and down in response to changing demand while only paying for the equipment, software, and platform that they really use (Dewn & Jena, 2014). Virtually limitless computation and storage capacity are available from cloud providers on demand, enabling the elasticity and scalability of applications used in that field (Mueller et al., 2017). On-demand self-service, wide-ranging network access, resource pooling and sharing, measured and metered service, and other fundamental aspects of cloud computing are among its distinctive features (Lee & Fellow, 2017). Three models of cloud deployment can be broadly distinguished: public (where deployed cloud computing resources are made available for use by the general public); private (where the cloud computing infrastructures are solely controlled by an organization); and hybrid (which combines the public and private models) (Ajeh et al., 2014). Some of the key causes of the rapid development are the interdisciplinary character, technological and nontechnical potentials, and challenges of cloud computing. It is becoming more and more crucial to look at the state and development of computing of cloud research because of the significantly rising quantity of publications (Heilig & Voß, 2014). A model for providing universal network access to a shared pool of reconfigurable computer resources is called computing of the cloud. It possessed several qualities, including affordability, ease of maintenance, excellent performance, and productivity (Yan et al., 2015; Hasizume et al., 2013; Hassan et al., 2017).

Since users can use cloud computing resources from any location and because this trend is still very popular in the IT industry, cloud computing has recently attracted a lot of attention from the industrial society. This has raised readers' interest in cloud-related topics (Armbrust et al., 2010). To increase scientific computational productivity through automation, we think that the technologies connected to the development of cloud computing make a substantial contribution (Brezany et al., 2017). Although organizations must adopt cloud computing if they are to benefit from its potential benefits for strategic and operational advantages, this adoption has lagged expectations due to security concerns and other major issues that computing of cloud depends on (Bisong & Rahman, 2011). At the same time, companies' adoption of cloud services is hampered by concerns about reliability. Many businesses today use cloud concepts, technologies, infrastructure, and services to alter their businesses and achieve goals like automation, resilience, and optimization. By leasing computer resources and avoiding exorbitant hardware costs, cloud services give users the chance to immediately benefit from the scalability, speed, and control of the cloud (Gartner, 2011). Companies seek to improve their productivity due to growth, continuity, maintaining a good competitive position, and achieving excellence in their performance. Since the effective axis and drive for these companies is the integration of information, delving into the use of the best arts and methods to deal with and preserve information is a goal that all companies seek to achieve to enhance productivity, and to enable the company to achieve its goal and the goal it seeks. In view of the rapid changes in the requirements of customer services, the intensity of competition in the markets and the rapid growth in technology, and the attention of many companies towards globalization, the banks need for an effective system that works on managing procedures and workflow, controlling various operations, and sharing data and information between various functional activities, with the aim of its continuity and achieving advantage. Competitiveness, reducing costs, increasing efficiency in its performance, and managing customer requirements to the fullest. One of these systems that may change the nature of productivity and performance is the cloud computing system (Lal & Bharadwaj, 2015).

2. Cloud Computing, Information Integration & Productivity

2.1 Cloud Computing & Productivity

Currently accessible collaboration tools for cloud computing include computers, internet networks, tablets, and cellphones. Computing the cloud is a big potential tool to promote productivity (Rawai et al., 2013). What is typically understood by the term “productivity” is the connection between the amount of output and the amount of input used to generate that outcome (Polančič et al., 2013). Firms can outsource their whole technology of information process using cloud computing, allowing them to focus more on their core competencies and increase efficiency and creativity in the services they provide to clients (Khan et al., 2015; Khan & Yasiri, 2016). The foundation of the technology known as “cloud computing” is the transfer of the processes by a computer and storage capacity to a server device known as the “cloud” that can be accessed online. As a result, information technology programs are shifting from being products to services, and computing of cloud infrastructure is dependent on cutting-edge data centers that give customers access to enormous amounts of storage as well as some applications as services. It makes use of the functions that Web technologies make available (Akpan &Vadhanam, 2015). Computing in the cloud is a concept for ubiquitous, practical, on-demand network access to a shared pool of reconfigurable computing resources, such as networks, servers, storage, applications, and services. With this methodology, supplying and releasing these resources may be completed fast and with little intervention from service providers (Shakeabubakor et al., 2015). When using cloud computing, processing power and storage capacity are transferred from the computer to a server in the “cloud”, which may be accessed online. As a result, IT programs transition from being products to services, and the computing of cloud architecture is reliant on cutting-edge data centers that give customers a ton of storage space and supply a few programs as services. It relies on what capabilities web technologies have.

End-users and clients can profit greatly from the cloud computing environment. Some of these attributes are as follows: (1) Making use of computing resources as efficiently and effectively as possible. (2) Reduced cost of energy. (3) Access to resources and services across the internet (Mahan et al., 2021).

Computing of cloud is more than just a technology solution or server located somewhere, it is a form of computing that improves business execution and impacts business on a positive level. Regarding small and medium-sized businesses, the biggest benefits of cloud computing include lower infrastructure costs, less reliance on internal IT skills and flexibility that allows the services provided to be modified to meet their needs. When a company needs more broadband and speed than usual, the usual service on computing of cloud immediately fulfills the demand due to the large capacity of remote servers providing the service, and the ability to reach the service quickly and in a brief time. Computing the cloud is congruent with online government as a potential way to offer the people new services. An example of a green technology is cloud computing, which has the potential to increase resource utilization in data centers while consuming less energy (Ali et al., 2015). Although internet speeds are currently growing, they are still slow compared to internal networks, thus access to cloud services should be simple and simply require a regular internet connection. Also, the limited capacity of the Internet leads us to the second point of this feature, which is that customers do not download large-sized programs because doing so would take a long time, especially with a sluggish connection. There are several dangers that could impede the development of cloud computing, as there are with any technology. Technical, organizational and policy, legal, and other hazards are the four primary groups that potentially provide obstacles when it comes to the use of cloud computing (Fakieh et al., 2014).

The ratio of outputs to inputs is known as productivity, Sales, income, and market share are examples of outputs while labor hours or their cost, production costs, and equipment and machinery cost are examples of inputs. Even though the idea of productivity might vary depending on the type of activity, there is always a connection between monetary or material resources utilized in the production of those goods or services, and high productivity means achieving a greater amount of output with the same number of resources. An organization on its own and internal factors are those that fall within the organization's control (Park, 2007). Consumers and businesses alike are making greater use of cloud computing. By using the cloud, it is possible to deliver software services to a user from a central place, including processing and storage (Williams & Tang, 2013). For genuine economic growth, social advancement, and raising the standard of life in any nation, productivity improvement is a key and determining factor. Productivity has a crucial role in determining how competitive the state's products are, both locally and internationally. The same commodity means that this country produces a third of the commodity at high costs, and with the continued rise in the cost of production, we find that that country loses its sales so that customers turn to sellers at less cost, and some nations that are unable to compete at a high enough level of productivity attempt to devalue their currencies, which lowers their real income, increases the price of imported goods, worsens their inflationary conditions, and creates a balance of payments imbalance, in addition to the deterioration of growth rates and increasing the unemployment in those nations. The researcher describes productivity as the connection among the inputs into a production process and the outputs that arise from that process, where the production efficiency increases as the ratio of output to use of resources rises.

2.2 Cloud Computing & Information Integration

The public, private, hybrid, and cloud models are all represented by cloud computing, which is an inflow subset of the Internet as a global network. There are differences between public and private clouds in terms of cloud access and implementation, but they share key characteristics, such as scalability and virtual IT architecture. Organizations might use the services offered by another business since the public cloud is accessible to all users, This enables businesses to outsource their services and cut costs, but in a private cloud, services are only available to users of a specific business, with more control over data security, thus it's crucial to remember that public and special clouds may not cover all of the needs of the firm, so organizations use hybrid cloud, which, as the name implies, is a model that combines two types: the cloud and the internet (public and private) (Aljawarneh et al., 2022). Each of them has its own characteristics but they can be combined by standardizing proprietary technologies and in the community cloud it is different as some organizations with a common need share their resources and services. It is the sharing of information for the organization's infrastructure to support information exchange and coordination among business functions and business partners, and provides information combination for uniform organizations and electronic data to be exchanged and extended across the business activities of the organization to be able to compete more effectively in the markets, and to enable business partners to meet their operational needs in order to improve Combined performance (Wong et al., 2011). Achieving this degree of integration is the ideal goal for ERP systems to form ubiquitous information systems and to serve as the infrastructure for the integration of information into core commercial procedures. If the integration of all these features is simple through a common database, any effort lost in Interpretation between asymmetric information systems from within this organization, and with this level of integration, any salesperson anywhere in the world would: be able to choose the ideal delivery date, have faith that your order information will be safe, and understand that personal expenses are not a problem. They will be assigned in sales communications to the appropriate sales group so they may be handled and immediately paid. (Murthy, 2008).

Following theory, the following hypotheses were examined in this study:

H_1: *Cloud computing has a positive impact on organization outcome.*
H_2*: There is a positive effect from cloud computing on internal processes*

3. Methodology

3.1 Sample and procedure

The aimed of this paper is to identify how cloud computing affects information integration and productivity using SmartPLS software to examine the outcomes. The study sample includes Jordanian telecommunications companies, and a simple random sample has been taken from the study population, which numbered 281 questionnaires according to the Uma Sekeran (2016) table, where the researcher distributed them to the study sample participants, and 335 questionnaires were retrieved from the total number of distributed questionnaires, where 304 valid ones were subjected to analysis. A three-part questionnaire was developed, which are:

Part one: Demographic variables for the study sample members,
Part Two: Cloud computing items,
The third part: consists of phrases that cover productivity,
Fourth part: consists of statements that cover the integration of information.

3.2 Demographic elements

In the current survey, 37% of the workers are women and 36% are men. 9.6% of participants were under 25 years old; 38.1% of the participants were between 5 to 10 years and over than 40 years old; 52.3%. Lastly, 14.6% of participants have been worked by their current company for fewer than five years; 26.7% for 5 to 10 years; 58.7% for more than ten years. For five to ten years, 26.7%; for more than ten years, 58.7%. Relationship map Displaying the connection and influencing of specified variable has a multiple links with both categories as seen in Fig. 1.

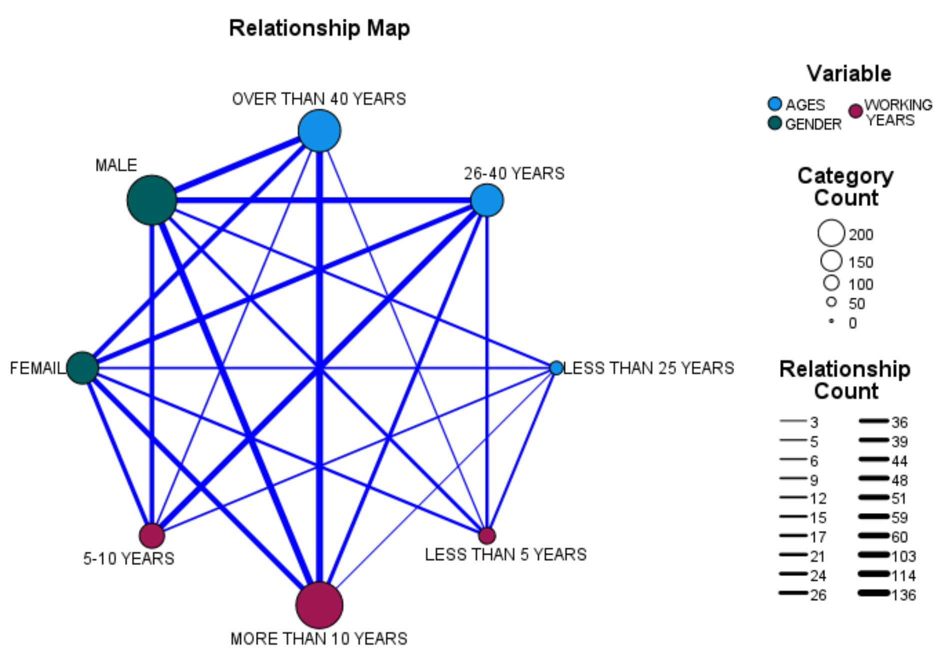

Fig. 1. Demographic of the connection and influencing of specified variable

4. Data analysis and Results

4.1 Evaluating the measuring pattern

With the aid of the SmartPLS 3 program, we used a causal predictive structural equation modeling (SEM) technique to evaluate and quantify the interactive and linear connection among the variables under inquiry. This method is also known as structural equation modeling with partial least squares (PLS-SEM). Covariance-based SEM (CB-SEM) is based on the indeterminacy of the element outcome (Rigdon et al., 2017). Contrarily, PLS-SEM, or variance-based SEM, operates with fixed latent scores and prioritizes endogenous concept prediction rather over model fit (Hair et al., 2019). PLS-SEM is capable of handling second-order models, small sample numbers, complex structural models, and is not rigid about data consistency. PLS-SEM promotes prediction-oriented attitude, ensuring that scientists may evaluate the prediction quality of the outcomes (Sarstedt et al., 2017; Burda &Teutenberg, 2015). Fig. 2 presents the scale components' outer loadings, inner model beta estimations, and R^2 inside the blue circle. Fig. 3 displays the degree of importance of the associations among the variables in the inner model as well as the significance levels of each scale components in the outer model.

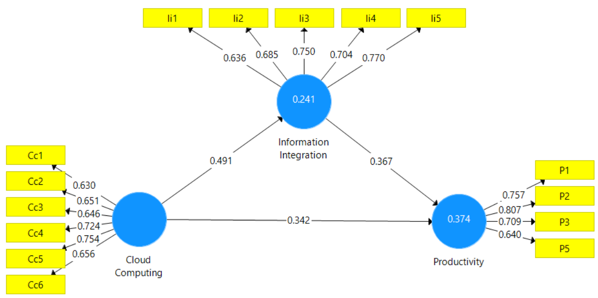

Fig. 2. Outer Loadings

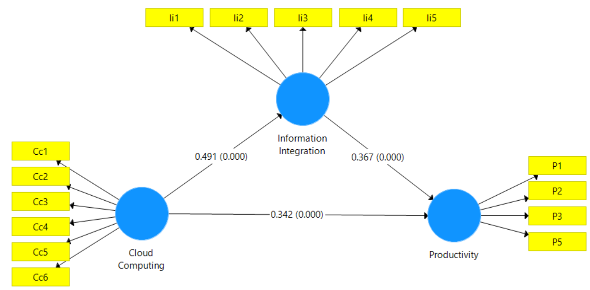

Fig. 3. Measurement model with *T, P values*

The majority of the outside model loadings shown in Fig. 2 were above the 0.7, and their corresponding t-values were important in the figure. Table 1 also includes values for Cronbach's alpha >.70, composite reliability (CR) >.70, and average variance extracted (AVE) >.50. The square of each variable's AVE is bigger than the inter-correlations, which further demonstrates that the Fornell-Larcker criterion was met. Second, as shown in Table 2, the newly added Heterotrait-monotrait (HTMT) ratios met the thresholds <.90 (Henseler et al., 2015). Therefore, we conclude that the measurement model attained internal consistency, convergent validity, and discriminant validity.

Table 1
Reliability, convergent validity

Instruments	α	CR	AVE	R^2
1. Cloud computing	0.764	0.836	0.501	-
2. Productivity	0.754	0.835	0.505	0.347
3. Information Integration	0.708	0.820	0.534	-

Table 2
Divergent validity based on Fornell–Larcker approach

Instruments	1	2	3
1. Cloud computing	**0.678**		
2. Productivity	0.491	**0.711**	
3. Information Integration	0.522	0.535	**0.731**

Table 3
Divergent validity based on Heterotrait-monotrait (HTMT) ratio

Instruments	1	2	3
1. Cloud computing	-	-	-
2. Productivity	0.461	-	-
3. Information Integration	0.691	0.718	-

The sections before this one established the validity and reliability of the models. Table 3 reports the structural model's coefficient of estimation. The direct impact of cloud computing on productivity has been observed and is both favorable and important ($\beta = .491$, $\rho = .000$). The information integration's mediating role in the among between computing of cloud and productivity was both beneficial and significant ($\beta = .180$, $\rho = .000$). For knowledge hoarding, the variation clarified by the model R^2 is 0.347, which translates to 34.7% of the variance. Falk and Miller (1992) established a standard for R^2 values and concluded that 0.10 should be the lowest number advised. Our study's R^2 indicated a sizable effect. It is reasonable to assess an important effect size f2 to determine whether it is statistically significant and practical relevant. Values above 0.35, 0.15, and 0.02 are regarded as strong, moderate, and weak, respectively, according to Cohen (1988) and Müller et al. (2018). The f2 value for the impact of electronic impoliteness on knowledge hoarding is powerful. As a result, we discover empirical evidence that supports hypothesis 1 and rejects hypothesis 2.

Table 3
Direct effects

Relationships	β-value	t-value	ρ-value
Direct effect			
Cloud Computing → Productivity	0.491	6.616	0.000
Information Integration → Productivity	0.367	5.295	0.000
Interaction effect			
Cyber Incivility × Information Integration → Productivity	0.180	3.959	0.000

Table 4
Impacts size

Connections	f square (f^2)
Direct effect	
Cloud Computing → Productivity	0.318
Information Integration → Productivity	0.163
Interaction effect	
Cyber Incivility × Information Integration → Productivity	0.141

5. Conclusion

The study reached a set of important results and conclusions, this can improve and enrich the theories and literature relating to the study topic, the most important of which is that there is an advantage impact of the computing of cloud on productivity, and there is an influence of the cloud computing on the integration of information, and there is also an impact of information integration on productivity. Information mediates the among between the computing of cloud and productivity. This study contributes to finding stable and accurate metrics and defining a standard or model for organizations to follow in the performance of their work in a way that ensures the efficiency and effectiveness of the organization based on private reality and increases the efficiency of the internal and external administrative communication process, which enhances coordination and cooperation between various administrative levels, It should be noted that cloud computing helps companies obtain the information required to perform their business in a distinctive way, and help them find new opportunities by providing accurate information for managers to make their decisions in a timely manner to give the company a competitive advantage that enables it to achieve its goals as fully as possible.

References

Ajeh, D. E., Ellman, J., & Keogh, S. (2014, June). A cost modelling system for cloud computing. In *2014 14th International Conference on Computational Science and Its Applications* (pp. 74-84). IEEE.

Akpan, H. A., &Vadhanam, B. R. (2015). A survey on Quality of service in cloud computing. *International Journal of Computer Trends and Technology, 27*(1), 58-63.

Alarifi, A., Dubey, K., Amoon, M., Altameem, T., Abd El-Samie, F. E., Altameem, A., ... & Nasr, A. A. (2020). Energy-efficient hybrid framework for green cloud computing. *IEEE Access*, *8*, 115356-115369.

Ali, O., Soar, J., Yong, J., McClymont, H., & Angus, D. (2015, May). Collaborative cloud computing adoption in Australian regional municipal government: An exploratory study. In *2015 IEEE 19th International Conference on Computer Supported Cooperative Work in Design (CSCWD)* (pp. 540-548). IEEE.

Aljawarneh, n. M., kader alomari, k. A., alomari, z. S., taha, o., & obeidat, a. M. (2022). Cloud supply chain management and customer service: the mediating role of user satisfaction. *Astra salvensis, 10(1)*.

Alzoubi, K., Aljawarneh, N. M., Alsafadi, Y., Al-Radaideh, A. T., &Altahat, S. (2020). Role of Cloud Computing in Service Quality, Information Quality & Low Costs: An Empirical Study on Jordanian Customs. *International Journal of Academic Research in Business and Social Sciences, 10*(6), 522–532.

Armbrust, M., Fox, A., Griffith, R., Joseph, A. D., Katz, R., Konwinski, A., ...&Zaharia, M. (2010). A view of cloud computing. *Communications of the ACM*, 53(4), 50-58.

Barona, R., & Anita, E. M. (2017, April). A survey on data breach challenges in cloud computing security: Issues and threats. In *2017 International conference on circuit, power and computing technologies (ICCPCT)* (pp. 1-8). IEEE.

Bauer, E., & Adams, R. (2012). *Reliability and availability of cloud computing*. John Wiley & Sons.

Bayramusta, M., & Nasir, V. A. (2016). A fad or future of IT?: A comprehensive literature review on the cloud computing research. *International Journal of Information Management*, *36*(4), 635-644.

Bidgoli, H. (2011). Successful introduction of Cloud Computing into your organization: a six-step conceptual model. *Journal of International Technology and Information Management*, 20(1), 2.

Bisong, A., &Rahman, S.M. (2011). An overview of the security concerns in enterprise cloud computing. *International Journal of Network Security & Its Applications (IJNSA)*, 3(1), 30–45.

Bitam, S., & Mellouk, A. (2012, December). Its-cloud: Cloud computing for intelligent transportation system. In *2012 IEEE global communications conference (GLOBECOM)* (pp. 2054-2059). IEEE.

Brezany, P., Ludescher, T., & Feilhauer, T. (2017, May). Cloud-dew computing support for automatic data analysis in life sciences. In *2017 40th International Convention on Information and Communication Technology, Electronics and Microelectronics (MIPRO)* (pp. 365-370). IEEE.

Burda, D., &Teutenberg, F. (2015). Understanding Service Quality and System Quality Success Factors in Cloud Archiving From an End-User Perspective. *Information Systems Management*, 32 (4), 266-284.

Capachin, J. (2010). Change on the horizon: The impact of cloud computing on treasury and transaction banking. *Journal of Payments Strategy & Systems*, 4(4), 334-344.

Dang, L. M., Piran, M. J., Han, D., Min, K., & Moon, H. (2019). A survey on internet of things and cloud computing for healthcare. *Electronics*, *8*(7), 768.

Dewan, B., & Jena, S. R. (2014, December). The state-of-the-art of Social, Mobility, Analytics and Cloud Computing an empirical analysis. In *2014 International Conference on High Performance Computing and Applications (ICHPCA)* (pp. 1-6). IEEE.

El Haloui, M., & Kriouile, A. (2017). A Decision-Support Model Enabling a Proactive Vision of Cloud Computing Adoption. In *Proc. of the 2nd International Conference of Cloud Computing Technologies and Applications–CloudTech* (Vol. 16, pp. 24-26).

Fakieh, B., Blount, Y., & Busch, P. (2014). Success in the digital economy: Cloud computing, SMEs and the impact to national productivity. ACIS.

Falk, R. F., & Miller, N. B. (1992). *A primer for soft modeling*. University of Akron Press.

Gartner (2011). Gartner identifies the top 10 strategic technologies for 2011. Retrieved 15 July 2013, from http:// www.gartner.com/it/page.jsp?id=1454221.

Giriraj, M., & Muthu, S. (2012, November). From cloud computing to cloud manufacturing excution assembly system. In *International Conference on Intelligent Robotics, Automation, and Manufacturing* (pp. 303-312). Springer, Berlin, Heidelberg.

Hasizume, K., Rosado, D. G., Fernandez-Medina, E. & Fernandez. E. B. (2013). An analysis of security issues for cloud computing. *Journal of Internet Services and Applications*, 4(1), 4–5.

Hassan, H., Nasir, M., Herry, M., Khairudin, N., &Adon, I. (2017). Factors influencing cloud computing adoption in small and medium enterprises. *Journal of Information and Communication Technology*, 16(1), 21-41.

Heilig, L., & Voß, S. (2014). A scientometric analysis of cloud computing literature. *IEEE Transactions on Cloud Computing*, *2*(3), 266-278.

Hwang, K., Shi, Y., & Bai, X. (2014, December). Scale-out vs. scale-up techniques for cloud performance and productivity. In *2014 IEEE 6th International Conference on Cloud Computing Technology and Science* (pp. 763-768). IEEE.

Khan, N., & Al-Yasiri, A. (2016). Identifying cloud security threats to strengthen cloud computing adoption framework. *Procedia Computer Science*, *94*, 485-490.

Khan, S., Al-Mogren, A. S., & AlAjmi, M. F. (2015, February). Using cloud computing to improve network operations and management. In *2015 5th National Symposium on Information Technology: Towards New Smart World (NSITNSW)* (pp. 1-6). IEEE.

Lal, P., &Bharadwaj, S. S. (2015). Assessing the performance of cloud-based customer relationship management systems. *Skyline Business Journal*, 11(1), 89-101.

Li, K. (2017). Quantitative modeling and analytical calculation of elasticity in cloud computing. *IEEE Transactions on Cloud Computing*, *8*(4), 1135-1148.

Mahan, F., Rozehkhani, S. M., & Pedrycz, W. (2021). A novel resource productivity based on granular neural network in cloud computing. *Complexity*, *2021*.

Mueller, H., Gogouvitis, S. V., Seitz, A., & Bruegge, B. (2017, July). Seamless computing for industrial systems spanning cloud and edge. In *2017 International Conference on High Performance Computing & Simulation (HPCS)* (pp. 209-216). IEEE.

Mwesigwa, C. (2014, May). Cloud computing can reshape Uganda's development. In *2014 Ist-Africa Conference Proceedings* (pp. 1-8). IEEE.

Peterson, B., Baumgartner, G., & Wang, Q. (2015, June). A hybrid cloud framework for scientific computing. In *2015 IEEE 8th International Conference on Cloud Computing* (pp. 373-380). IEEE.

Polančič, G., Jošt, G., & Heričko, M. (2015). An experimental investigation comparing individual and collaborative work productivity when using desktop and cloud modeling tools. *Empirical Software Engineering*, *20*(1), 142-175.

Rawai, N. M., Fathi, M. S., Abedi, M., & Rambat, S. (2013, January). Cloud computing for green construction management. In *2013 Third International Conference on Intelligent System Design and Engineering Applications* (pp. 432-435). IEEE.

Rigdon, E. E., Sarstedt, M., & Ringle, C. M. (2017). On comparing results from CB-SEM and PLS-SEM: Five perspectives and five recommendations. *Marketing: ZFP–Journal of Research and Management*, *39*(3), 4-16.

Shakeabubakor, A. A., Sundararajan, E., & Hamdan, A. R. (2015). Cloud computing services and applications to improve productivity of university researchers. *International Journal of Information and Electronics Engineering*, *5*(2), 153.

Teh, S. K., Ho, S. B., Chan, G. Y., & Tan, C. H. (2016, May). A framework for cloud computing use to enhance job productivity. In *2016 IEEE Symposium on Computer Applications & Industrial Electronics (ISCAIE)* (pp. 73-78). IEEE.

Williams, D. R., & Tang, Y. (2013). Impact of office productivity cloud computing on energy consumption and greenhouse gas emissions. *Environmental science & technology*, *47*(9), 4333-4340.

Yan, Y., Chen, C., & Huang, L. (2015, November). A productive cloud computing platform research for big data analytics. In *2015 IEEE 7th International Conference on Cloud Computing Technology and Science (CloudCom)* (pp. 499-502). IEEE.