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ADOPTION FACTORS OF CLOUD COPMPUTING TECHNOLOGY

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1.INTRODUCTION

Since the internet advent in the late 20th century to the ubiquitous computing facilities of present day, the internet has drastically changed the whole world of computing. It has moved from the parallel computing concept to distributed, grid and now to cloud computing (Jadeja & Modi, 2012). According to Behrend et al (2010), cloud computing is referred to the software applications and several other resources available online via internet to multiple users, rather than being installed in local computers of certain users only. Rader (2016) also defined cloud computing as an act of performing business activities on off-premises and shared computing systems. The concept has been developed due to the recent innovation in technology virtualization, hardware, service delivery and distributed computing over the internet. The metaphor 'cloud' is a clear reference of universal accessibility and availability of computing resources through internet techniques (Lin & Chen, 2012). According to Botta et al (2016), users and businesses through cloud-based solutions can have easy access to an immense computing power at relatively lower cost. It is because by moving different functions of Information Technology (IT) such as applications used by businesses, services and storage to the cloud, business firms can reduce technology implementation and its usage cost.

The traditional models of software in which organizations were tied to applications and which were supplier specific, restricted by license of users, required software upgrades or patches and incurred annual license fees are being replaced by the cloud computing solutions (Hinde & Van Belle, 2012). Also, the cloud computing system provides monetary benefits, which cannot be ignored by business organizations. However, many scholars identified

privacy and security as two biggest issues in cloud computing (Kshetri, 2013; Jadeja & Modi, 2012; Liu et al 2013). It is because, some people fear to share their important confidential data to another company. The authors inferred that customers pay to cloud service vendors when they find them reliable and trustworthy in security measures. Another factor that affects cloud computing is privacy. Data can be extracted from any place, so privacy of clients cannot be compromised (Pearson, 2013). Furthermore, reliability is also considered as an issue in cloud computing (Sanaei et al 2014).

According to National Institute of Standards and Technology (NIST), the cloud computing model is enabled on demand and convenient network access to a common pool of configured computing resources including storage facilities, various servers, data networks, services and other applications), which can be provisioned rapidly with minimum interaction of service providers and management efforts (Mell & Grance, 2011). Based on the technical definition given by the aforesaid institution, the following essentials constitute a cloud computing system:

Wide network access—Services and resources located in distinct areas of vendors in the cloud can be obtained from different places and provisioned through standard tools by thick or thin inharmonious clients. The terms 'capability of global reach' and 'standardised mechanisms' for easy access are also used to refer such characteristics (Mell & Grance, 2011).

Self-service on demand— Cloud computing allows users to request one or more services whenever they require them and use the method of 'pay-andgo' to pay without having interaction with individuals using control panel online.

Resource pooling—The single blended resource behaviour is stimulated by offering group of resources in cloud computing. It means, users are not required to know and do not have any knowledge regarding the location from where resources are provided. Such approach supports suppliers to offer several virtual or real resources in a dynamic manner in the cloud (Hamdaqa & Tahvildari, 2012).

Measured services—Different aspects of cloud computing can be automatically reported, optimised, monitored and controlled at various abstract levels for both consumers' and vendors' resources.

Rapid elasticity – Basically, it is known as scalability, which means to scale down or scale up resources as and when needed. Users through cloud computing can request as much as resources and services as they can at any point of time. Based on this exceptional characteristic, a well-known cloud service provider, i.e. Amazon has named one of its most commonly used and popular services as EC2 (Elastic Compute Cloud) (Balduzzi et al 2012).

Multi-tenacity—The Cloud Security Alliance has suggested multitenacity as an important characteristic of a cloud. The particular characteristic means that it is important to have models for segmentation, policy-driven enforcement, governance, isolation, chargeback/billing and service levels for the customers' belonging to different categories (Espadas et al 2013).

Certifiability and auditability – This last characteristic of cloud means that it is essential to prepare trails and logs for the services, in order to facilitate evaluation of an extent to which policies and regulations are observed (Hamdaqa & Tahvildari, 2012).

1.1 Actuality of the topic

New big change in information technology sector takes place nowadays in everywhere using information technology services which so-called "cloud computing ". This new paradigm shift expects to reform all information technology industry and the way of delivering information technology services to the business organizations, it's expected that the leaders in cloud computing industry will reach 160 billion dollars revenue (Behrend et al., 2010). Many advantages organizations can gain by this new technology such as on-demand-service, more mobility access, shared resource pooling, rapid elasticity, and pay measured service which eventually leads to cost reduction and more efficiency (Mell & Grance, 2011).

in near future information technology services will deliver to business organization as fifth utility to be like water, telephone, gas and electricity (Monroy, Arias, & Guerrero, 2013).

Despite its great benefits, the decision of adopting cloud computing have many concerns about this new technology. The perceived ease of use and the perceived usefulness are important factors in adopting new innovative technology (Davis, 1985). But also in cloud computing adoption there is another factors that can be classified as technology, human and organizational factors (Lian et al., 2014).

Jordan as a developing country still suffering lack of cutting edge technology and the digital divide is high compared with developed countries. So that cloud computing consider as promised with its huge possibilities to help business organizations to overcome this digital divide .but as any new technology many concerns about the adoption of this technology .

1.2. Main goals of the doctoral thesis

Cloud computing as newest paradigm shift that will reshape the way of delivering services of information technology. Decision makers in business organization still have many concerns could late or cancel the adoption of cloud computing. Just few studies that investigate the factors that affect the decision to adopt cloud computing and this factors still need deep investigation to determine the most critical factors. In developing country like Jordan, the business organizations can get the advantages of cutting-edge technology by adoption of cloud computing but many factors affect decision makers to adopt this technology and this study will be one of rare studies in Jordan to evaluate the critical factors in decision to adopt this technology. Most of previous studies focus technical factors and used well-known TAM MODEL but this study was expanded to focus on economic, human and organizational study.

The thesis is about conducting researches in Jordanian business organizations, cloud computing considers one of the hottest topic in information technology research areas. This research aims to identify the main factors that affect the decision to adopt the cloud computing technology in Jordanian business organizations and clearly evaluate the influence of this factors. this study attempts to answer the following questions:

- 1. What are the main factors influence the decision to adopt cloud computing?
- 2. How do these factors affect the decision of adoption cloud computing technology?

The model of this study used TAM variables and utilized other variables from (u, J., & Wang, S. (2005). What drives mobile commerce? Information & Management, 42(5), 719-729. doi:10.1016/j.im.2004.07.001 & Zeqiri, A., Aliu, L., Kostanica, F., & Prenaj, B. (2017). An empirical investigation of cloud computing usage in Revue Des Sciences Gestion, 285-286(3), education. La De 77. doi:10.3917/rsg.285.0077)

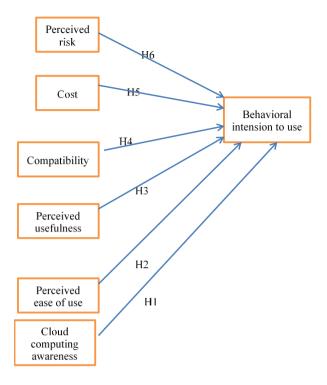


Figure 1: Research model

Based on the research model and after reviewed the other studies we identified the below hypothesis:

- **H1**. Cloud computing awareness to use has a direct effect on Behavioural intension to use
- H2. Perceived ease of use has a direct effect on behavioural intention to use.
- H3. Perceived usefulness has a direct effect on behavioural intention to use
- **H4**. Compatibility has a direct effect on behavioural intention to use
- **H5**. Cost has a negative direct effect on behavioural intention to use.
- **H6**. Perceived risk has a negative direct effect on behavioural intention to use

This research follows the following methodology in order to achieve the purpose of research:

- Collect academic literatures that report the frameworks and finding of studies determine and evaluate the most critical factors that affect the decision to adopt cloud computing in business organizations.
- 2. Design a conceptual model that represents the relationship among influential factors and decision of adoption cloud computing.
- 3. Design a survey questionnaire survey to collect data from IT employees in Jordanian business organizations.

In this research, the descriptive statics are utilized in the description of questionnaire respondent and sample characteristic. The "Statistical Package for Social Science" (SPSS) are utilized to check the research hypotheses through using structural equation modeling analysis.

2.SOURCE AND METHOD

This is a quantitative research based on correlational research design. Cause and effect relationship of variables is investigated.

The study involved sample of N=175 IT employees from different business organizations in Jordan . The data was collected using 23-item quantitative scale which assessed the factors that affect the decision making

for using cloud computing services. The questionnaire was based on seven contracts; Cloud Computing Awareness, Perceived Risk, Cost, Compatibility, Perceived usefulness, Perceived Ease of Use and Behavioral Intentions to Use. The scale reliability was 0.74 and among the constructs, Perceived Risk and Perceived Ease of Use have High reliability, Cost, Perceived Usefulness and Behavioral Intensions to Use have Above Average reliability while the subscales Cloud Computing Awareness and Compatibility have average reliability.

Data collection and analysis has done in line with research model presented herein the paper. Though it would be a systematic procedure to ensure all techniques address research problem as well as hypotheses outlined for research. Also, a criterion to answer questions in research undertaking focused at, in a simple comprehensive atmosphere to easily be understood by decision makers in Jordan Investments sector at the national level.

We therefore present the following intended methods to be used in primary data collection. They are the methods identified as the best methodology in the course of data collection by the fact that data collection should be of high accuracy, as well as address significance scope of study.

Interview sessions with IT specialists, computer systems engineers, and CIOs. Nearly 220 questionnaires were supplied to IT employees.

In accordance with the purpose of our study, we chose quantitative research methods to meet objectives of this study. In particular questionnaire, based the study model and by using previously tested and validated instruments, was used to get the IT employee's 'responses regarding the overall intension to use cloud computing technology and the same data is also used for validation of the model using statistical analysis.

After all these methods, mainstreaming of data from all primary sources was on course. Badges shall be provided to ensure right people are on the ground conducting research. (McQuarrie, 2011). Since the data that collected for this study is quantitative therefore quantitative data analysis techniques would be applied. Moreover, different statistical measures would be calculated depending on the nature of the analysis. If the analysis addresses the system evaluation, one of the research questions of this study, then descriptive statistics would be applied. For model validation, statistical measures for hypothesis testing calculated. The test of the regression analysis

Focusing at the model data research and analysis is used in, there are 6 variables.

Perceived Ease of Use

Perceived usefulness

Compatibility

Cloud computing awareness

Perceived risk, and

Cost

This can be statistically represented as:

CC_IUi=
$$\beta$$
o + β 1 PEOUi + β 2 PUi + β 3 CPi + β 4 CWi + β 5 PRi + β 6 CCi + ϵ i (1)

In the equation, CC_IUi is the intension to use cloud computing which is the dependent variable, PEOUi is the Perceived Ease of Use, PUi is Perceived usefulness, CPi is compatibility, CC is the cost, PR is perceived risk and CWi is cloud computing awareness which are independent variables. Furthermore, β_0 is constant term while β_1 to β_6 are parameters to be estimated from the independent variables used in the model and ϵ_i is error term.

Table 1: Variables of the model

Dependent Variables						
CC_IU	Behavioral intension to	Ordinal Variable				
	use	Strongly disagree=1, Disagree=2,				
		Neutral=3, Agree=4, Strongly				
		Agree=5				
Independent Variables						
Cloud Computing Adoption Model Constructs						
PEOU	The extent to which the	Ordinal Variable				
	user of cloud computing	Strongly disagree= 1, Disagree=2,				
	thinks it is easy	Neutral=3, Agree=4, Strongly				
		Agree=5				
СР	the degree to which an	Ordinal Variable				
	innovation is perceived as	Strongly disagree= 1, Disagree=2,				
	being consistent with the	Neutral=3, Agree=4, Strongly				
	existing values, needs,	Agree=5				
	and past experiences of					
	potential adopters					

PU	The level of usefulness of	Ordinal Variable
	cloud computing	Strongly disagree= 1, Disagree=2,
	perceived by the user	Neutral=3, Agree=4, Strongly
		Agree=5
PR	The level of security and	Ordinal Variable
	privacy assured by the	Strongly disagree= 1, Disagree=2,
	cloud computing as	Neutral=3, Agree=4, Strongly
	perceived by the user	Agree=5
CC	The cost of adoption of	Ordinal Variable
	cloud computing	Strongly disagree= 1, Disagree=2,
		Neutral=3, Agree=4, Strongly
		Agree=5
CW	User's level of awareness	Ordinal Variable
	of cloud computing	Strongly disagree= 1, Disagree=2,
		Neutral=3, Agree=4, Strongly
		Agree=5

These variables are more of factors affecting adoption of cloud computing technology in Jordan business organizations. Techniques and procedures set forth for data collection and analysis, are sure enough to explain, to which extend does each variable exert effect or influence on adoption of cloud computing technology. It's at this point, data collected by specific methodology shall dictate how each one of them unveils the truth of the matter in numerical values; how they influence uptake of cloud computing technology.

Researchers therefore ensured variables under this study in the model are presented in research techniques before materials are taken to respondents.

3. DATA ANALYSIS

Research methodology wouldn't be complete without methodology data analysis. It's at this point now presented forth regression analysis. It's a method, or model is used to analyse data. As it is noted from its definition as a set of statistical processes used to estimate relationships between variables, the study have factors that affect cloud computing technology intension to use as dependent variables, while Perceived Ease of Use, Perceived usefulness, Compatibility, Cloud computing awareness, Perceived risk, and Cost will remain to be independent variables. From there, we shall therefore be ready to analyse data and confirm or disapprove formulated hypotheses.

Since the data that collected for this study is quantitative therefore quantitative data analysis techniques would be applied. Moreover, different statistical measures would be calculated depending on the nature of the analysis. If the analysis addresses the system evaluation, one of the research questions of this study, then descriptive statistics would be applied. For model validation, statistical measures for hypothesis testing calculated.

The test of the structural model includes simple linear regression and multiple linear regression as well as ANOVA and MANAOVA Scheffe test for all domain is measured.

Demographic characteristics

The questionnaire included questions related to demographic characteristics such as age, gender and position in organization. Following tables show summary of those characteristics:

Table 2: Demographic Characteristics

		Frequency	Percent
Age	Less than 30	57	32.9
	30-39	66	37.7
	More than 39	52	29.7
	Total	175	100
Experience	Less than 5 years	41	23.4
	5-10 years	69	39.4
	More than 10 years	65	37.1
	Total	175	100
Gender	male	91	52
	female	84	48
	Total	175	100
Position	top level	46	52.2
	middle level	69	35.2
	non-management	60	30.6
	Total	175	100
Size of	Small	46	26.2
Organization	Medium	66	37.7

Large	63	36.1
.Total	175	100

The above table shows the age of the participants and shows that the most number of participants were from age 30-39. And the least number of participants were from the age range more than 39. There were 175 participants and no data values were missing. It shows gender of the participants and the values show that there were more male participants with the percentage 46.4% and fewer female participants with the percentage 42.9%.

The table also shows position of employees in their respective organization. The table shows that the most number of participants from middle level of management and the least of participants were from top level of management. This means that the study results can be generalized on population of Middle Level Management positions.

The size of organizations is also shown in the table in which the participants have been working. The table shows that the most number of participants were from Medium size organization. A medium size organization is the one that has 50-250 employees.

Reliability of scale

Reliability of the scale reflects the extent to which the measure of a scale is dependable or consistent. To assess the reliability of the scale used in this study, reliability analysis was used. Following are the results of reliability analysis

Table 3: Reliability of Scale

No	Domain	Alpha	Item No
1	Cloud Computing Awareness	6.73	3
2	Perceived Risk	8.46	4
3	Cost	7.54	3
4	Compatibility	6.98	3
5	Perceived usefulness	7.87	3
6	Perceived Ease of Use	8.23	3
7	Behavioural Intentions to Use	7.16	4
	Tool of study	0.74	24

The above table show that the questionnaire had reliability value of Cronbach's Alpha=0.74 which reflects Good reliability of scale.

The regression analysis

To assess the effect of factors that are likely to affect decision making in using cloud computing, Regression analysis was used. The study hypothesized effects of different factors which are stated below

H1. Cloud computing awareness to use has a direct effect on behavioral intension to use.

Independent	"t" value	"t" sig	В	R	\mathbb{R}^2	"f" value	"f" sig
variable							
Cloud	1.655	.100	.600	0.737	0.642	110.736	0.325
Computing							

The above table shows that there is no statistically significant effect at significant level ($\alpha \le 0.05$) of Cloud computing awareness on behavioral intension to use, where "f" value reached (110.736) by statistically insignificant (0.325). (R) Value reached (0.737), and (R²) value reached (0.642).

H2. Perceived ease of use has a direct effect on behavioral intention to use.

Independent	"t"	"t" sig	В	R	\mathbb{R}^2	"f" value	"f" sig
variable	value						
Perceived ease	0.761	0.001	0.021	0.684	0.743	110.823	0.000
of use							

source: own calculation

The above table shows that there is significant effect of Perceived ease of use on behavioral intension to use at significant level ($\alpha \le 0.00$), where "f" value reached (110.823) by statistically insignificant (0.00). (R) Value reached (0.684), and (R²) value reached (0.743).

H3. Perceived usefulness has a direct effect on behavioral intention to use

Independent	"t"	"t" sig	В	R	\mathbb{R}^2	"f" value	"f" sig
variable	value						
Perceived	0.987	0.000	0.029	0.579	0.637	112.464	0.001
usefulness							

The above table shows that there is statistically significant effect at significant level ($\alpha \le 0.05$) of Perceived usefulness of use on behavioral intension to use, where "f" value reached (112.8464) by statistically insignificant (0.01). (R) Value reached (0.579), and (R²) value reached (0.637).

H4. Compatibility has a direct effect on behavioral intention to use

Independent	"t"	"t" sig	В	R	\mathbb{R}^2	"f" value	"f" sig
variable	value						
Compatibility	0.001	0.975	0.034	0.639	0.742	110.346	0.253

source: own calculation

The above table shows that there is no statistically significant effect at significant level ($\alpha \le 0.05$) of Compatibility on behavioral intension to use, where "f" value reached (110.346) by statistically insignificant (0.253). (R) Value reached (0.639), and (R²) value reached (0.742).

H5. Cost has a negative direct effect on behavioral intention to use.

Independent	"t" value	"t" sig	В	R	\mathbb{R}^2	"f" value	"f" sig
variable							
Cost	-15.131	0.00	-0.540	0.755	0.570	228.953	0.00

The above table shows that there is statistically significant effect of Cost on behavioral intention to use at significant level ($\alpha \le 0.05$), where "f" value reached (228.953) by statistically significant (0.00). (R) Value reached (0.755), and (R²) value reached (0.570).

H6. Perceived risk has a negative direct effect on behavioral intention to use

Independent	"t" value	"t" sig	В	R	\mathbb{R}^2	"f" value	"f" sig
variable							
Perceived risk	-14.895	0.00	-0.492	0.749	0.561	220.799	0.00

source: own calculation

The above table shows that there is statistically significant effect at significant level ($\alpha \le 0.05$) of Perceived risk on behavioral intension to use, where "f" value reached (220.799) by statistically significant f sig (0.00). (R) Value reached (0.749), and (R²) value reached (0.561).

4.NEW AND NOVEL SCIENTIFIC RESULTS

This is one of the first studies that investigated the factors that influence the adoption of cloud computing study to determine what are the main factors that affect the decision of adoption of cloud computing and how these factors affect the decision of adoption. My study is a pioneer to determines the main factors that affect the decision of adoption of cloud computing and how these factors affect the decision of adoption. The study is the one of the first studies in the region to investigate innovative technology at the individualistic level within the organizational context in Jordan. It targets the IT employees in Jordanian business organization. With this research I am the first fellow who evaluates these factors at individual level within the organizational context. I also expanded the well-known TAM model to overcome its limitations and construct an extended model by adding other variables to make it more effective in predicting the adoption behaviour. In the present research hypothesis are approved that Perceived Usefulness, Perceived ease of use, Cost and Perceived Risk negatively affect the adoption of cloud computing meanwhile Compatibility and cloud computing Awareness is not affecting the adoption of cloud computing in Jordan

Analysis revealed that the proposed hypothesis perceived ease of use is likely to have a direct positive effect on behavioral intentions to use the cloud computing technology. It can simply be explained as the matter of awareness. The main influencing factor for the use of new technology is the information about that. If someone does not aware of cloud computing, it's not possible to use this technology for work. After the basic information, the concept build by user is important for the future use of that technology. It is also evident from

studies stated in literature review that perceived ease of use, positively affects the behavioural intention. The famous model "Technology Acceptance Model" (TAM) also supports the findings. It explained the factors that have effect on the use of cloud computing; one of those factors was perceived ease of use. Perceived ease of use is attitude in other words. Attitudes have direct effects on human behavioral intentions and decision making. Therefore, when a person perceives the use of technology easy and have information about it, there are more chances to use it. Literature review also concluded that when a person has the willingness to use certain technology, its probability of use increased. This willingness is developed through the attitude of perceived ease of use of certain technology. Abdullah and Seng (2015) also researched in this respect and presented a model in which they explain the factors effecting cloud computing usage. Perceived ease of use was also one of the factors of them. The main purpose of the technology is to provide assistance to the human beings. If it gets succeeded to formulate the attitude about the perceived ease of it there are more chances to use that technology (Abdullah & Seng, 2015).

The research result gives the service providers of cloud computing the information about the attitude of the Jordanian customers toward the cloud computing and help them to focus on the main factors that affect the customers decision to adopt cloud computing services

5. CONCLUSIONS AND RECOMMENDATIONS

This is one of the first researches that investigated adoption of cloud computing technology at individualistic level within the organizational context in Jordan. By discussing all of the above factors it can be concluded that cloud computing is an emerging and promising technology within the industrial set up. It has many advantages in terms of cost reduction, time consumption, compatibility

of staff, equal platform provision, virtualization, flexibility, security etc.1b, all these factors contribute a lot in the path of success for not only the organizations but also for the staff members. It reduces their burden as well as the organization. Hence in order to obtain the goal formulated by the companies, and to compete with the other market competitors, cloud computing adoption become inevitable factor. It supports companies as backbone by resolving their lots of issues. In this technological era most of the developed companies are using cloud computing system. Professional also get interested to work within those companies who use cloud computing because it reduces the fatigue effects, boredom effect, increase efficiency, performance, eliminating the location factor. So, the service provider of the cloud computing should pay more attention on perceived ease of use, perceived usefulness, cost and perceived risk when they develop their applications and business models for Jordanian market

Here are some limitations of the study that we suggest to be taken into consideration when doing future work.

- In the present research data was collected from one organization which
 may be weaken part. For future cross companiess comparison should
 be made for the assessment of adoption of cloud computing.
- The present research utilized form one culture. There may a comparison of cross culture, so that the phenomenon can be explored around the globe.
- Sample size was small for future sample size should be increase.
- For future research there should be evaluate different level of management who use cloud computing.

- The performance of different types of management within the organization and outside of the organizations should be explore mores.
- Equal opportunity should be given in sampling means male and female participation ration should be equal.
- The present research quantitatively assesses the phenomenon only. It is recommended for the future to use qualitative means of exploration also.
- For the future research, a comparison should be made between the professionals and beginners for the use of cloud computing and their attitude.
- A comparison should also be made between private and public sector also.
- In the present research there was time constraints. It is recommended
 for the future researches to evaluate the phenomenon in longitudinal
 means of study so that effects of cloud computing can be figure out
 with respect to time.
- More advanced data analysis techniques should be use in future researches.
- The sample categories also be explored with respect to age, gender and education so that more explanation of the phenomenon can be drawn.

 The different data collection techniques should also be used for future researches.

6. LIST OF PUBLICATIONS

Journals

Atobishi, T., & Szalay, Z. G. (2018). The Impact of Information System on Administrative Service Quality In Hospitals: The Case of Prince Hamzah Hospital, Jordan 2015. *Studia Mundi - Economica*, *5*(2), 143–152. doi: 10.18531/studia.mundi.2018.05.02.143-152

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Nosratabadi, S., Atobishi, T., & Motaghi, H. (2018). A Circular Business Model for Cloud Computing Service Providers. *International Journal of Community Development & Management Studies*, 2, 105-120, Retrieved from: http://ijcdms.org/Volume02/v2p105-120Motaghi4669.pdf

Atobishi, T, Podruzsik, S., & Gabor, S. Z.: Adoption of Mobile Banking in Jordan, *Journal of Management Studies*, accepted

Atobishi, T, Miriam, B., Fogarassy C.: Adoption of Cloud Computing The Case of Jordanian Business Organizations, ready for publication . *Acta Polytechnica Hungarica* .accepted and will be published in June 2020

Conference proceedings

Atobishi, T., Szalay, Z. G., & Bayraktar, S. (2018). Cloud Computing And Big Data In The Context Of Industry 4.0: Opportunities And Challenges. *Proceedings of the IISES Annual Conference, Sevilla, Spain*. doi: 10.20472/iac.2018.035.004

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