

Innovation Capability Improvement in Digital Creative Industries



Sulistyo Heripracoyo, Harjanto Prabowo, Raymond Kosala, Ford Lumban Gaol

Abstract: *This paper aims at examining the effect of cloud computing and big data management on innovation capabilities with particular reference to the context of digital creative industries. For that purpose, both qualitative and quantitative methods were applied in the study. Accordingly, quantitative data were gathered from an empirical survey as well as qualitative data gathered from focus group discussions. The results provide a descriptive data in the implementation of cloud computing and big data management as well as innovation capability and performance in the digital creative industry. Statistical analysis shows that cloud computing, big data management, and innovation capability simultaneously affect the company's performance significantly. However, there was no significant effect, either simultaneously or partially, of cloud computing and big data management on innovation capability. This study provide a benchmark of how the management of information technology can influence the implementation direction of cloud computing and big data management in the digital creative industries' innovation capability. The findings also provide a new knowledge in a literature on performance improvement in the digital creative industries.*

Index Terms: *Cloud computing, Big data, Innovation, Digital creative industries.*

I. INTRODUCTION

Scholars have affirmed that investment in information technology (IT) which is supported by IT resources management for achieving actual results and sustainable development bring big impact to firms [1][2]. More particularly, [2] states that digital data has grown very fast. Other scholar asserts that computing is changing with new model because of the growth of cloud computing and cloud computing [3]. In turn, cloud computing and big data management affect the investment in IT business sectors, especially for small medium enterprise.

More particularly within the creative industries, high level of innovation capability can create the robust environment

and support to creative idea which produces a product, process or new system [4]. In Indonesia, digital creative industry is growing about hundreds of new businesses with a high value, within a period of 5 years. In fact, the growth of large data has become one of the major challenges confronted by the industry sector [5]. In the year 2009, creative industry in Indonesia contribute 4,75% gross income (Gross Domestic Income), growth 7,3 per year and absorb 3,7 million workers. Increased innovation capabilities in the Creative Industries is the most important factor in increasing competition [6].

Creative industries, especially the digital creative industry, in addition to contributing substantially to state revenues, this digital creative industry also requires a strong foundation (ICT business management), actualization (new growth of local software, commercialization) and business climate (strong domestic market and part of global business) as in mapping the development of the creative industry of computer and software services [7]. However, based on some information obtained where the digital creative industry in Indonesia although growing but the results of his work is still not widely known by the public. Therefore, the digital creative industry needs to be supported in improving its performance. Especially with the ability of innovation in the digital creative industry.

In connection with the development of information technology and its utilization by the company, the development of cloud computing and big data is still a new phenomenon. In addition, the creative industries in Indonesia are well developed where the creative industries contribute to substantial state revenues and the development and support of this creative industry is indispensable. Based on several conditions and developments, this paper focuses on examining: (1) the extent to which the implementation of computing and big data management simultaneously affect the ability of innovation in the digital creative industry; (2) the extent to which the capability of information technology to moderate the implementation of cloud computing and big data management on innovation capability; and (3) the extent to which the influence of innovation ability on the performance of the digital creative industry.

II. LITERATURE REVIEW

Cloud computing is defined as a model with fast access, free to be released with minimal management effort. On-demand Self-service is the first basic characteristic of cloud computing, else characteristics are Broad network access and Resource pooling [8].

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In many terms cloud computing is the provision of information technology resources, information technology services wherever, adaptable services and scalable [9] [10]. The four types of the cloud computing service model are Software-as-a-service, Service, Platform-as-a-service and Infrastructure-as-a-service [11].

In addition, there are four types of cloud computing on the basis of privacy, including: Public Cloud, Private Cloud, Community Cloud and Hybrid Cloud. Cloud computing has emerged as a new phenomenon as a model of popular computing to support processing of volumetric data using clusters of commodity computers. The computational world is opting for pay-for-use models. The taxonomy of cloud computing have a purpose at a better understanding of the categories of applications that provide benefit from cloudification and it is for the landscape of enterprise IT, data governance, management services, and many more. It used to survey several cloud computing services such as Google, Amazon, and Force.com. The difference and similarities are not only the result of identified based on survey and the taxonomy usage, it is also for the next research [10].

To improve business performance a cloud computing technology can be a solution in the future, no huge cost of investment need with this technology companies. Companies do not have to buy their own IT infrastructure. To implement cloud computing company needs proper implementation of specific components, namely: End User, Services – Function in cloud computing, Application-backbone of services, Platform – Soft Infrastructure for application, Storage, Infrastructure – backbone of cloud computing [11].

Three V big data (volume, variety and velocity) establishes a comprehensive definition, and it reduces the myth that big data is just about the volume of data [12]. In 3 V big data, related to the size of the volume that is Terra byte, records, transactions, tables and files. Velocity related to batch, near-time, real time, stream. While Variety relate to structured, unstructured, semi-structured data and all of them.

Technology capabilities include a) the search for alternative technologies that continue to run, b) selecting the most appropriate technology, c) the dominance of technology, d) the adaptation of technology to fit specific production conditions, e) development of technologies with little innovation, f) instituted a search for the most important innovation by research and development department (R & D) and; g) conduct basic research [13].

Innovation is usually associated with the service, process, marketing and distribution, business models and supply chain [14]. The purpose of innovation includes something that companies are looking to work with a new product, process improvement, new business models or entry into new markets [15]. Innovation in the creative industries can be shown that is the cultural products, Cultural Concept, Delivery and User Interface [16].

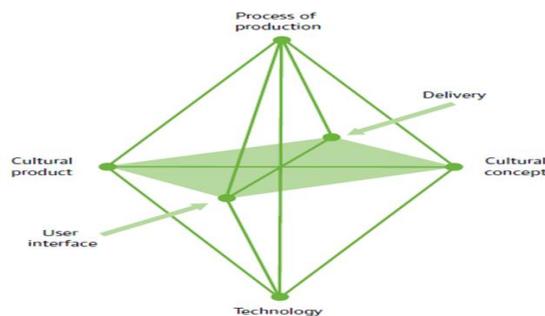


Figure 1. Innovation Diamond in Creative Industry

The ability of innovation is understood as a process of learning technology from the company that translated into the development of technology and operations capabilities, as well as managerial and transactional routines shown by the ability of management and transaction [17]. Innovation is a necessity for every organization that hopes to thrive well into the future [18].

The definition of Innovation capability is capability to change the knowledge and ideas that provide Information Technology benefits to enterprise and stakeholders through several element i.e. products, processes and new system. The ability of innovation is not just the ability to be successful in running a business new stream, or to regulate mainstream capability [19]. Innovation capability is the ability to create new and useful knowledge based on prior knowledge [20].

Creative industries are widely considered include company advertising, architecture, art and craft market, industrial design, fashion design, media services, software, performing arts, publishing, film, music, and television [4]. Performance is generally identified or equated with effectiveness and efficiency [21]. The basis of the performance of the company is to change the concept of corporate performance in a real operational divided into several dimensions of building a new business, adjust the business core, forming a portfolio and ownership structure, inspired performance and risk management, convey the company's strategy and values, and set the pace of change [22]. On the basis of the relevant literature, research models can be seen on the figure 2.

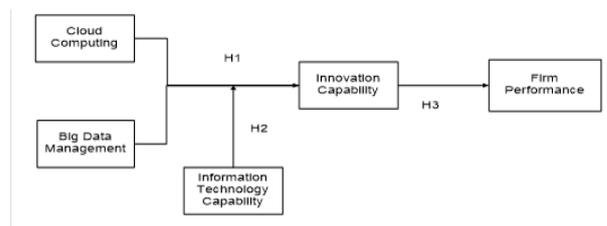


Figure 2. Conceptual framework of the research model

III. RESEARCH METHOD

The digital creative industry is the object of research. Specifically the scope of the digital creative industry that is determined as the object of research is the company in the field of animation, has implemented cloud computing and big data management,



and using information technology to produce his work (pipeline). The number of respondents is 30 animation companies. Methods of data collection conducted by conducting interviews, focus group discussions and provide questionnaires.

Data collection techniques used in this study is a questionnaire survey technique based on the research model that show in figure 2. Respondents are head of the company, executives or managers who work in animation categories. The collected information is about the company data related to the cloud computing implementation, big data management, innovation capability and product pipeline as firm performance. The data is measured with a nominal scale (1 to 4). Therefore, the data analyzed using statistical applications and Path Analysis in addition, focus group discussions (FGDs) are conducted to these companies to gain a deeper insight into the results of quantitative analysis.

IV. RESULTS AND DISCUSSIONS

The results are on the basis of data for big data management, data metrics (volume) in Terra byte is 56,67% and in Giga Byte is 43,33%. For Variety data, there are already type date from documents, database, multimedia and social media. And for velocity data, the most is real-time data type, then archive data type, and batch and streaming data types are average. Cloud computing Variable represented by cloud storage (Dropbox, One drive, Google Drive), Cloud Document (Google Docs, Youtube, Office365) and Specific Cloud (Adobe Creative, Github, Basecamp, WetTransfer, Trello and Unity).

Table 1. Model Summary Sub-structure 1

Variable	Path Coefficient (Beta)	t _{cal}	Sig
Constant	11,442	3,022	0,005
X1:Cloud computing	0,295	1,413	0,169
X2:Big data Management	0,174	0,834	0,411
F _{Cal} = 2,827 Sig = 0,07			
R ² = 0,173 Adjusted R ² = 0,112			

Results of data analysis presented in Table 1 shows that cloud computing and big data management simultaneously and partial di not significantly affect the ability of innovation (F value is equal to 2.827 with probability (sig) = 0.077). The finding reject the hypothesis formulated in the study: "Cloud computing and big data management simultaneously and partially affect the ability of innovation in the digital creative industry." Qualitative data confirm that the result is due to the fact that cloud computing implementation and big data management are not integrated and the high cost of Internet connection. Moreover, it is not effective based on time and cost. To get the effective and efficient for the pipeline product base on that factors, the collaborative cloud computing able to implement.

Results from FGDs with companies also show that the implementation of cloud computing and big data was used

only in accordance with the needs, not implemented continuously and not for main operational activities. Cloud computing and big data analysis were used separately from one activity to another. Cost factors also had a lot of effect on this implementation. Meanwhile, government regulation related to the provision of electronic systems for public services, was still inhibits the adoption or implementation of cloud computing technology. Because based on government regulation, the public cloud computing service providers operating in Indonesia must (required) have a data center in Indonesia. For this problem, the government may consider the cost of Internet access used specifically for animation.

Furthermore, statistical relationships among variables are presented in Table 2 below:

Table 2. Model Summary Sub-Structure 2-1: Relationship among variables

Influence between variables	Path Coefficient (Beta)	t Value	F Value	Test Result	Determinant Coefficient R Square	Other Variable Coefficient (Remaining)
X1 to X3	-1,612	-0,684	3,595	Significant	0,212	0,788
Z to X3	-1,290	-0,579		P=0,027	Or	or
X1*Z to X3	3,028	-0,765			21,2%	78,8%

Model Summary									
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	Sig. F Change		
1	.541 ^a	.293	.212	1.93123	.293	3.595	3	.26	.027

a. Predictors: (Constant), M_Cloud_X_ITCAP, IT_CAPB, CLOUD

For the sub-structure 2-1, the coefficient of determination is equal to .212 (Adjusted R Square): Changes to innovation capability can be explained by variable cloud and moderator variables (IT Capability) of 21.2%, while the remaining 78.80% is explained by other variables outside the model. The results of significance test (F test) shows calculated F value of 3,595 with probability 0.027 (<0.05). Thus this model is significant. The results of the partial model test (t test) shows that IT capability gives the value of the parameter coefficient (0.686) with sig 0.048. Cloud computing provides a variable coefficient value of (0.079) and sig 0.555, while the interaction of moderating variables gives a negative coefficient value of 0.002 with sig 0.870. According to the above analysis, moderating variables proved significant in affecting the cloud computing implementation on innovation capability. The negative value means that IT capability weaken the influence of cloud computing on Innovation Capability. The finding of accepted the hypothesis in this study: "The ability of IT to moderate the implementation of cloud computing and big data management to the ability of innovation." The finding reinforces previous study [23]. The qualitative data analysis with companies (FGD) affirm that the implementation of cloud computing can significantly affect the company's innovation capabilities due to the support of information technology infrastructure. Companies still rely on information technology in doing its activities. Ability in Information technology becomes the basis for the implementation of cloud computing,



the industry must have good technology skills in order to implement cloud computing. In the data obtained the ability of information technology is the ability to use the application, the ability of human resources to expertise in the field of IT and IT infrastructure, especially the Internet.

Table 3. Model Summary Sub-Structure 2-2: Influence between variables

Influence between Variables	Path Coefficient (Beta)	t Value	F Value	Test Result	Determinant Coefficient R Square	Other Variable Coefficient (Remaining)
X2 to X3	-0,867	-0,582	4,035	Significant	0,239	0,661
Z to X3	-0,513	-0,394		P= 0,018 (< 0,05)	or 23,9%	Or 66,1%
X2*Z to X3	1,621	0,744				

Model Summary									
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.564 ^a	.318	.239	1.89751	.318	4.035	3	26	.018

a. Predictors: (Constant), IT_CAPB, MN_BIGDATA, M_BigData_X_ITCAP

In sub-structure 2-2, coefficient of determination on the results of the analysis of .239 (Adjusted R Square): changes to the innovation ability is influenced by variables of big data management and moderator variables (IT Capability) by 31% while the remaining 69% influenced by variables outside the model. The results of significance test (F test) shows calculated F value of 4.35 with probability 0.018 (<0.05). Thus the model significantly. The results of the partial model test (t test) shows that IT capability gives the value of the parameter coefficient (0.939) with 0,028 sig. Variable big data management provides the coefficient value of (0.070) and 0.773 sig, while interaction moderator variable coefficient of negative value of 0.012 with a sig: 0.494. The results of discussions with companies shows that big data implementation can significantly affect the company's innovation capability due to the support of information technology infrastructure. Companies are still relying on information technology in doing its activities as well as cloud computing.

Furthermore, an effort was made to examine the effect of innovation capability on performance as presented in Table 3. The findings show that cloud computing, big data management and innovation capability are simultaneously affect significantly the company's performance (F value is equal to 10,857 with probability (sig) = 0.000), with the simultaneous contribution of 50.5%. Moreover, the results indicate a significant partial effect of innovation capability to company's performance with a probability value (sig) = 0.002.

Table 4. Model Summary Sub-Structure 3

Variable	Path Coefficient (Beta)	t _{cal}	Sig	Variable
Constant	2,895	0,637	0,530	
X1:Cloud computing	0,255	0,392	0,175	0,229
X2: Big data Management	0,159	1,078	0,291	0,169
X3:Innovation Capability	0,659	3,398	0,002	0,509
F _{cal} = 10,857		Sig < 0,005		
R ² = 0,556,		Adjusted R ² = 0,505		

The findings accepted one of the hypotheses in the study,

“The ability of innovation has an effect on the performance of the digital creative industry.” However, based on the results of interviews, the company's performance is mainly for post-production results (animation results) companies have difficulty in channeling the results. Animation (animated film) can be received at local television stations but with low cost compared to production costs, television stations prefer animation from outside Indonesia because the price is cheaper and the product can be played in long series / episodes, animated film from outside Indonesia generally has been playing in their country and has already benefited. This is in accordance with (Alam, Arumugam, Mohd Nor, Kaliappan, & Fang, 2013) with the improvement of innovation ability, company performance will also increase.

V. CONCLUSIONS

Animation companies today have implemented cloud computing for project based, task and time management, team collaboration, cloud computing Storage, cloud computing documents, file transfer services, Email Service and Social Networking.

According to the results of data analysis, animation companies have implemented big data management in their work. They have implemented big data based on 3-V big data, the first V is volume (up to size Terra byte), V second is velocity (real time data, batch, backup) and third V is variety (multimedia type).

Based on the data of the Innovation capability, it provides significant influence to the company performance. The performance of the creative digital animation industry can be achieved by increasing innovation. Based on the results of analysis known that the ability of innovation gives a significant influence of 50.9% on the performance of the company.

The implementation of Cloud computing and big data management not affect the ability of innovation. Nevertheless, simultaneously implementation of cloud computing, big data management and innovation capability affect the company's performance significantly. The direction or power of the influence of cloud computing and big data management on innovation capability is influenced by information technology.

This study provide a benchmark of how the management of information technology can influence the direction of the relationship of the effect of the implementation of cloud computing and big data management in the digital creative industries innovation capabilities, as well as provide a new knowledge in a literature on performance improvement in the digital creative industries, which can be referenced by innovation and management capabilities in data management and cloud computing implementation. Reinforce theoretically that the ability of innovation can be significantly improved by considering the effect of the variable of Information Technology Capability (aligned with [17]),



where the ability of this information technology strengthens the influence of Cloud Computing and Big Data Management to Innovation Ability [24].

This research can be refined with further research related to the rapid development of technology and who can provide new breakthroughs in supporting operations that occur in the digital creative industry, and other types of creative industries, as well as this research can be used to describe the conditions of the digital creative industry as a whole in accordance with the results of this study, however, it cannot yet describe the actual conditions in the field.

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