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DAFTAR ISI

The Contribution of Information Communication & Technology as Enabler of Knowledge Management to Bring Innovationin Mass Media Industries Sector

(Batam Case)

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ABSTRACT

Information technology (IT) plays an important role as a catalyst to enable and facilitate the implementation of the development, transfer, and utilization of knowledge, which subsequently may contribute to the improvement and innovation. This research intends to analyze how IT competency directly influences knowledge management, how knowledge management directly influences innovation, and how IT competency indirectly influences innovation through knowledge management. The research is limited to Mass Media Industries sector of the creative industries in the island of Batam, Indonesia. Those sectors are television, radio, and publishig. The data are collected via questionnaire from a sample of 150 respondents. A structural equation model is established to study the interrelationship among those variables. At the end, the research concludes that IT competency has positive effect on knowledge management, as well as on innovation via knowledge management, and knowledge management mediates the relationship between IT competency and innovation.

Keywords: *Mass Media Industries, information and communication technology, knowledge management, innovation*

Intruduction

Innovation is important to maintain company competitiveness [1]. It is not only for competitiveness but also to pursue long-term advantages [2,3]. Economists often cite innovation as a critical element for growth [4].Given the importance of innovation, researchers from a variety of disciplines have focused on the answers to the critical question: ``what can be done to improve innovation?", e.g., [4--7]. With the emergence of knowledge management and intellectual capital as new disciplines [8--10], scientific articles are starting to appear that add these constructs to the long list of possible antecedents of innovation, e.g., [11-13]. Along with the increasing study of knowledge management, information technology (IT) has closely been associated with the development of the great majority of knowledge management initiatives [17].

Previously, a number of scientific articles has discussed the importance of IT for knowledge management, and the importance of knowledge management for innovation [17--19].

However, it is remaining a question whether an indirect relationship exists between IT competency and innovation.

In work, we intend to study the indirect effect of IT competency on innovation. Firstly, we analyze the direct relationship between IT competency and knowledge management, and then, analyze the direct relationship between knowledge management and innovation. Finally, we establish the indirect relationship between IT competency and innovation.

Innovation

Innovation is generally accepted as meaning the development and implementation of new ideas [20]. Various typologies of innovation have been discussed in the literature. For example, innovation can occur at various levels within an organization: with products (what is produced), processes (how it is produced) and organizational forms (where it is produced) [21]. Alternatively, innovations can range from radical to incremental or market-pull to technology-push.

The distinction between incremental and radical innovation is important given the different effects each type of innovation is likely to have on an organization. Most innovations are incremental and will present themselves as either line extensions or modifications of existing products [22]. The ideas for these innovations are likely to come from the marketplace and so will be based on market research among current and potential customers and possibly also information about competitors and industry trends. Thus, incremental innovations are usually classified as market-pull innovations. Furthermore, they are more likely to flow from firms categorized as market-oriented since these firms are said to be more proficient in gathering, disseminating and responding to intelligence about the marketplace [23]. Since incremental innovations do not require a significant departure from existing business practices, they are likely to enhance existing internal competencies by providing the opportunity for those within the organization to build on existing know-how [24].

By contrast, a radical innovation is likely to be competence destroying, often making existing skills and knowledge redundant [24]. Additionally, radical innovations often require different management practices [25]. These innovations are more likely to originate from scientists and so are classified as technology-push innovations [22,25,26,27]. Radical innovations often put the business at risk because they are more difficult to successfully commercialize. However, they are considered important for long-term success as they involve the development and application of new technology, some of which might change existing market structures [28]. Radical innovations are also likely to open up opportunities for follow-on incremental improvements [29].

An incremental innovation, by definition, will be more closely aligned to the expressed needs of consumers. Radical innovations have tended to ignore consumers' expressed needs. This has often been cited as a possible reason as to why radical innovations fail [30]. However, an emerging view is that to be innovative, a firm needs complimentary market-pull and technology-push strategies [4]. On the one hand the firm should have gained market

knowledge from existing customers [31]. At the same time, the firm should endeavor to come up with combinations of technology that provide it with a competitive advantage - assuming of course that the firm is capable of working with the new technology [4,32]. Firms that operate with this kind of balanced focus tend to perform better than firms that focus on either market-pull or technology-push innovations [33].

Knowledge Management

Defining the concept of knowledge management is not straightforward, because this subject has been studied by several disciplines and from different approaches. For example, ref.[34]defines knowledge management as a process of collection, distribution and efficient use of the knowledge resource. O'Dell at.al [35]see knowledge management as a strategy to be developed in a firm to ensure that knowledge reaches the right people at the right time, and that those people share and use the information to improve the organization's functioning. Knowledge management is a process of knowledge creation, validation, presentation, distribution and application [36]. Peter Drucker brings us a more concise definition: ''the coordination and exploitation of organizations knowledge resources, in order to create benefit and competitive advantage'' [37]. And Bounfour defines knowledge management as a set of procedures, infrastructures, and technical and managerial tools, designed to create, share and leverage information and knowledge within and around organizations [38].

Although the above definitions vary in their description of knowledge management, there seems to be a consensus to treat knowledge management as a set of processes allowing the use of knowledge as a key factor to add and generate value [39,40].

Following the conceptual framework of Lopez et.al[17], knowledge management is composed of three main processes, which are namely: knowledge generation, knowledge transfer, and knowledge codification and storage.

Knowledge generation can be defined as the process by which the firm obtains knowledge, either from outside the company or generated internally [41,42]. The objective is to obtain new and better knowledge that helps the organizationimprove its competitiveness [43]. Thus, knowledge generation is not just about generating new contents, but also about replacing, validating and updating the firm's existing knowledge [36,44]. Firms can acquire knowledge externally from different sources, for example talking to external agents, collaborators and partners, buying patents or taking on new employees [42]. Internally, knowledge creation can involve developing new contents or replacing existing contents [44], by investing in R&D or training and development [42].

Knowledge transfer refers to the process by which an organization shares knowledge among its units and members, promoting new understanding [43,44]. It is essential for the firm to develop an adequate design of informative interaction networks that allow individuals of diverse specialties, cultures, and geographic locations, not only to access the same information but also to come together through the network to undertake a particular project.

Moreover, for the transfer of tacit knowledge, which requires more interaction between the individuals,the firm must develop mechanisms that encourage dialogue and interaction [45--50].

Finally, knowledge codification and storage is a very important aspect in the effective management of knowledge [51,52]. The existing knowledge must be captured, codified, presented and put in stores in a structured way, so it can be reused later [53]. However, it is vital to remember that organizational knowledge is dispersed and scattered throughout the organization. It is found in different locations, in people's minds, in organizational processes, and in the corporate culture,embedded in different artifacts and procedures, and stored in different mediums such as print, disk and optical media [36].

ITCompetency

This study defines IT competency as how the firm uses these technologies to manage its information effectively [17,54]. While IT is a generic term fundamentally used to refer to programs, computers and telecommunications, the term IT competency is broader and refers to the use of these technologies to satisfy the firm's information needs [55]. This study differentiates between three dimensions of this concept:IT knowledge, IT operations, and IT infrastructure. These dimensions represent specialized resources that indicate the organization's capacity to understand and use the tools necessary for managing information about markets and customers [54]. Moreover, although they are independent, all three aspects must be present for the firm to achieve IT competency. For example, many firms invest in technical tools but at the same time fail to achieve ITcompetency because they lack the knowledge required to use these tools efficiently. Brief definitions for these three dimensions follow.

IT knowledge. Knowledge is information combined with experience, context, interpretation and reflection, so knowledge has a tacit component that is difficult to quantify [34]. Taylor [56] defines technical knowledge as the set of principles and techniques that areuseful to bring about change toward desired ends. Thus, the current study defines IT knowledge as the extent to which the firm possesses a body of technical knowledge about elements such as computer systems.

IT operations. This concept refers to the IT-related methods, processes and techniques that may be needed if these technologies are to create value [58]. In the context of the current study, IT operations is defined as the extent to which the firm uses IT to improve itseffectiveness and decision making.

IT infrastructure. The IT infrastructure acts as an enabler, and to a large extent is responsible for the growing interest in the production and dissemination of information [59]. IT infrastructure refers to the artifacts, tools and resources that contribute to the acquisition, processing, storage, dissemination and use of information. According to this definition, the IT infrastructure includes elements such as hardware, software and support staff.

The Mass Media Industries

The UK DCMS Task Force 1998 defined creative industries as those industries which have their origin in individual creativity, skill and talent, and which have a potential for wealth and job creation through the generation and exploitation of intellectual property and content [60]. Indonesia Ministry of Trade grouped creative industries into 14 sectors: architecture, advertising, design, fashion, video,film and photography, music, publishing, IT software & computer services, radio and TV, art market, craft, art performing, Interactive leisure software, research & development. From the above sectors, we categorized the mass media industries, which include television, radio and publishing industries.

Hypothesis Development

This paper examines the role of ITC competency to knowledge management processes, then analyze the direct relation between knowledge management and innovation, finally the indirect relation between IT competency and innovation can be measured (**Figure 1**).Therefore:

H1. IT competency has a positive effect on the knowledge management processes

H2a. Knowledge management processes has a positive effect on innovation

H2b. Knowledge management processesmediate the correlation between IT competency and innovation

Figure 1. TheConceptual Model

Method

Sample and Data Collection

The first step in testing the above hypotheses is to choose the population object of analysis.This study focuses onmass media industries growing in Batam: TV, Radio and publishing. We used Structural Equation Modeling (SEM) to analyze the data.For the model of Structural Equation Modeling (SEM) with a variable number of construct up to five, and each construct is described by three or more indicators, the number of sample data is considered adequate 100-150 [61].The number of samples based on the opinion of Hair, et.al [62] in Ghozali [63], the multivariate data analysis using SEM, methods of estimation using maximum likelihood estimation (MLE). MLE will be effective on the number of samples

between 150-400. The number of samples can also be determined by 5-10 per parameter [64]. In this study, there are three constructs with a total of 28 parameters.Based on the above explanation, the minimum number of samples taken in this study was 5 × 28 = 140, and after the calculation of the percentage of each sub-sector, then we took 150 samples.

Measures

This section describes the scales used to measure IT competency, knowledge management and innovation. All the variables were measured on Likert 5-point scales ranging from 1 = strongly disagree to 5 = strongly agree.

IT competency. This scale was adapted from ref.[54] scale including 11 items to measure the dimensions of IT knowledge, IT operations and IT infrastructure. Items about the firm's knowledge, skills and experience in the use of IT measure the first of thesedimensions. For the second dimension, the items measure the use of collaboration technologies, as well as the tools and systems available in the firm to acquire and store information that is useful in the decision making. Finally, to evaluate the firm's infrastructure, the scale includes items considering whether the firm develops software tailored to its own needs, the allocation of funds to acquire new equipment, or the existence of a person or department in charge of IT.

Knowledge management. Respondents were asked to indicate the level of agreement on each of the 11 items measuring various aspects of knowledge management processes including knowledge generation, knowledge transfer and sharing, and knowledge codification and storage. The scale was generated using some of the items from the scales proposed by [65,66,17].

Innovation. The original [67,18] typology of innovation is used in this paper. Here, innovations are categorized as new to the world, new products to the firm, additions to existing product lines, improvements or revisions to existing product lines, cost reductions to existing products, or repositioning of existing products. New to the world innovations are typically characterized as radical innovations while the other categories are incremental innovations.

Analysis and Results

Psychometric Properties of Measurement Scales

Structural Equation Modeling (SEM) consists of two steps: measurement model and structural model.*Measurement model.*firstthe authors tested the construct validity of the measures employing confirmatory factor analysis (CFA) using AMOS 21.0.0 on each variable.

Table 1 Factor Loading Scale

Measures	Factor Loading
ICT Competency	
K3 ← ICTComp.	0.353
K2 ← ICTComp.	0.842
K1 ← ICTComp.	0.819
I4 ← ICTComp.	0.621
I3 ← ICTComp.	0.570
I2 ← ICTComp.	0.698
I1 ← ICTComp.	0.611
O4 ← ICTComp.	0.350
O3 ← ICTComp.	0.756
O2 ← ICTComp.	0.802
O1 ← ICTComp.	0.787
Knowledge Management	
KM1 ← KM	0.608
KM2 ← KM	0.291
KM3 ← KM	0.225
KM4 ← KM	0.358
KM5 ← KM	0.609
KM6 ← KM	0.794
KM7 ← KM	0.732
KM8 ← KM	0.788
KM9 ← KM	0.728
KM10 ← KM	0.670
KM11 ← KM	0.438
Innovation	
IN1 ← IN	0.575
IN2← IN	0.754
IN3← IN	0.181
IN4← IN	0.937
IN5← IN	0.559
IN6← IN	0.356

Based on construct validity using confirmatory factor analysis (CFA) on **Table 1**, there are some indicators with loading factor < 0.5 should be eliminated/dropped from construct. **Table 2** and **Figure 2**shows the final CFA of 3 constructs after all modification processes.

Table 2 Final Factor Loading Scale

Measures	Factor Loading
ICT Competency	
K2 ← ICTComp.	0.832
I4 ← ICTComp.	0.556
I3 ← ICTComp.	0.541
I1 ← ICTComp.	0.609
O2 ← ICTComp.	0.790
O1 ← ICTComp.	0.828
Knowledge Management	

KM5 ← KM	0.740
KM7 ← KM	0.776
KM8 ← KM	0.762
KM9 ← KM	0.772
KM10 ← KM	0.714
Innovation	
IN1 ← IN	0.579
IN4← IN	0.902
IN5← IN	0.590

Structural Model.Second step of SEM is Structural Model, consists of Full Model, Normality, Outliers, Construct Reliability, and Discriminant Validity.Full Model combined all of three constructs as proposed in hypothesis development (**Figure 3**).

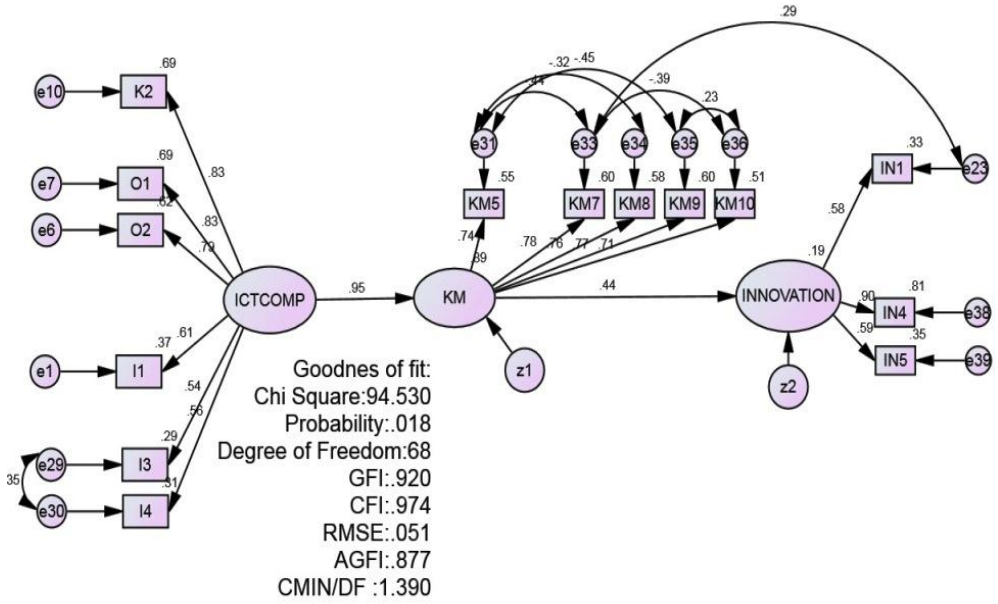

Figure 3 Full Model

Table 3 *Goodness of fit index test Full Model*

Goodness-Of-FitIndex	Cut-offValue	Model Result	Remarks
Chi-Square	<94,530	98,03	*Bad Fit*
Probability	≥ 0,05	0,015	
GFI	> 0,90	0,920	*Good Fit*
AGFI	≥ 0,90	0,877	*Marginal Fit*
TLI	≥ 0,95	0,965	*Good Fit*
CFI	≥ 0,95	0,974	*Good Fit*
RMSEA	≤ 0,08	0,051	*Good Fit*
CMIN/DF	≤ 2,0	1,390	*Good Fit*
DF	> 0	68	*Over Identified*

Based on the**Table 3**, Goodness of Fit Full Model is reasonable with the Chi-Squareof 94.530 and probability (P) <0.05 is 0.015 but the values of DF, GFI, TLI, CMIN/DF, and RMSEA has met the recommended value, only AGFI has marginal value (0.877) slightly below the recommended ≥ 0.90.

Maximum Likelihood Estimation with observed variables requires the assumption of multivariate normality meet. Therefore, it is necessary to test to see the level in multivariate normality of the data used in this study.Evaluation of multivariate normality with Amos 21.0.0 done using the criteria of the critical ratio (cr) of Multivariate on kurtosis, if they are in the range between - 2.58 and 2.58 means that the data are multivariate normal distribution (see **Table 4**).

Table 4 Assessment of normality Full Model

Variable	min	max	skew	c.r.	kurtosis	c.r.
IN5	2.000	5.000	.454	2.270	-.624	-1.559
IN4	2.000	5.000	.478	2.391	-1.053	-2.633
KM10	3.000	5.000	.861	4.303	-.654	-1.636
KM9	3.000	5.000	.218	1.091	-.809	-2.022
KM8	3.000	5.000	.202	1.010	-.973	-2.432
KM7	3.000	5.000	-.216	-1.081	-1.372	-3.431
KM5	3.000	5.000	.039	.195	-1.738	-4.344
I4	2.000	5.000	.195	.976	-1.127	-2.819
I3	2.000	5.000	.386	1.931	-1.303	-3.257
K2	3.000	5.000	.012	.061	-1.485	-3.712
O1	2.000	5.000	.036	.182	-1.093	-2.733
O2	2.000	5.000	-.310	-1.552	-1.010	-2.525
I1	3.000	5.000	.462	2.311	-1.228	-3.071
IN1	3.000	5.000	.556	2.782	-.992	-2.481
Multivariate					-6.026	**-1.743**

Outliers are observations or data that has unique characteristics, which looks very different from the observations of others and appear in the form of extreme value, either for a single variable or combination of variables [63].Detection of multivariate outliers done by looking at the value of Mahalanobis Distance.In this study shows that the data observations have mahalanobis d-squared value below 36,12 (DF 14, p.<0.001) meaning of the research has met the requirements there are no multivariate outliers.

The consistency of measuring instruments now tested. Cut-off value from Construct Reliability (CR) ≥0.70 and Cut-off Value Extracted(VE) ≥ 0.50 [67]. All measures have a composite reliability greater than the recommended level.

Hypothesis Tests

Hypothesis testing is performed using the value of the *t-value* with a significance level of 0.05, t-value in AMOS 21.0.0 is Critical Ratio (CR) on Regression Weights of fit model (Full Model). If the value C.R. > 1,967 or probability value (P) <0.05, H_0 is rejected (the research hypothesis is accepted).The results provide clear support for hypotheses H_1, H_{2a}, and H_{2b}. The findings show that IT competency has a positive effect on knowledge management processes (C.R.=7.027, P=***), Knowledge management processes has a positive effect on innovation (C.R.=3.782, P=***), and Knowledge Management mediates the relationship between ICT Competency and Innovation (indirect effect =0.416).

Table 5 Regresion Wight Full Model

			Estimate	S.E.	C.R.	P	Label
KM	<---	ICTCOMP	1.295	.184	**7.027**	***	par_4
INNOVATION	<---	KM	.291	.077	**3.782**	***	par_5

Table 6 Standarized Indirect Effects Full Model

	ICTCOMP	KM	INNOVATION
KM	.000	.000	.000
INNOVATION	**.416**	.000	.000
IN5	.245	.260	.000
IN4	.376	.397	.000
IN1	.241	.255	.000

Discussion

As mentioned above, mass media industry is the main part of creative industries. Based on the definition of creative industry, as those industries which have their origin in individual creativity, skill and talent, in the context of knowledge management, we can conclude that the creative industries are more dealing with the tacit knowledge. Knowledge and creativity have always played a relevant role in the economy [69].As pointed out by Cunningham et al. [70], the creative industriesare a high-growth sector, positively affecting jobs and economic growth.The industries of the twenty-first century will depend increasingly on the generation of knowledge through creativity and innovation [71].But few researchers who conduct research knowledge management and innovation in the field of creative industries, specially the mass media industries sector. This current work analyzes how the relation between knowledge management and innovation in mass media industries.

Innovations emerge in this study is a radical innovation in the form of product, program or service that has never existed, or in the form of incremental innovation or such conduct improvement or improvements to the products, programs or services that already exist.

This study provides information of ICT competence factors such asIT knowledge of IT technical support staff, computer-based technical expertise, the use of IT to analyze customers, the use of decision support systems,formal MIS department, and customizable software applicationswill role in supporting knowledge management in the mass media industries.

Conclusions, Limitations, and Future Lines of Research

To summarize, this study contributes empirical data to the predominantly theoretical literature on knowledge management, IT competency and innovation.It is, to a certain extent, common sense that IT has a positive impact on knowledge management and knowledge management has a positive impact on innovation.This paper takes an important step forward by analyzing how IT competency influences knowledge management directly, how knowledge managementinfluences innovation directly, and how IT competency influences innovationindirectly through knowledge management.

The findings of the research also have important implications for managers. Managers should not only focus on allocating sufficient resources for IT investments. Firms must focus their attention on intervening processes such as knowledge management in order to bring innovation in mass media industries.Managers also need to pay more attention to the factors that can drive knowledge management, such as IT competency that will makemass media industries more innovative.

The analysis described here may provide some insight into the relations between information technology competency, knowledge management, and innovation, but it suffers from some limitations.Possibly the most important limitation is the fact that the study is not providing a detailed analyze how IT affects each of the individual processes (knowledge generation, knowledge transfer, and knowledge codification and storage) in three dimensional separately.

Innovation is also closely related to the performance of the organization [18], therefore the author gives suggestions for further research to add the performance of the organization as a new variable.

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