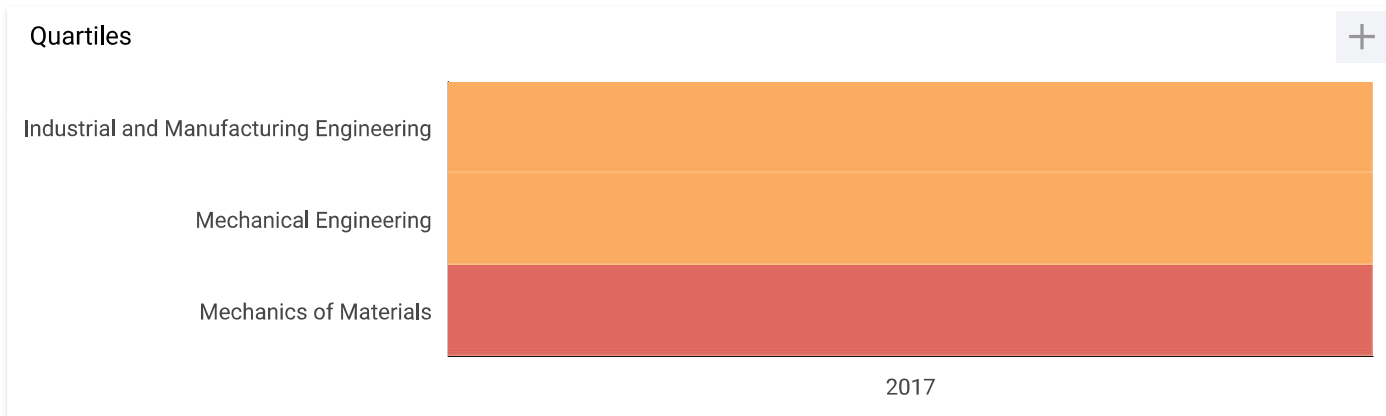




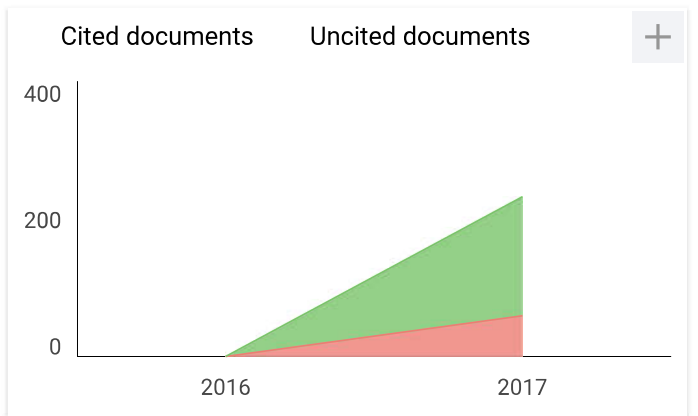
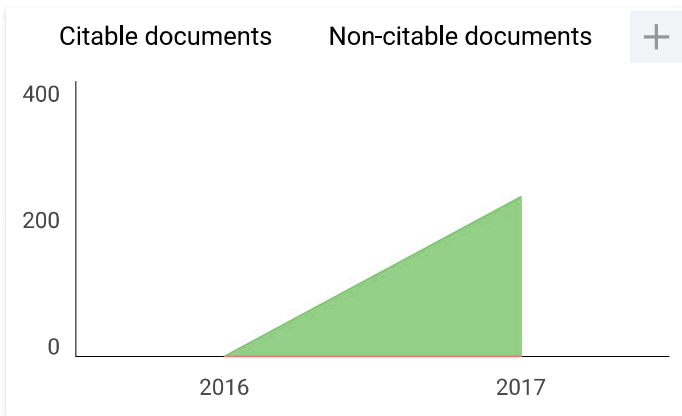
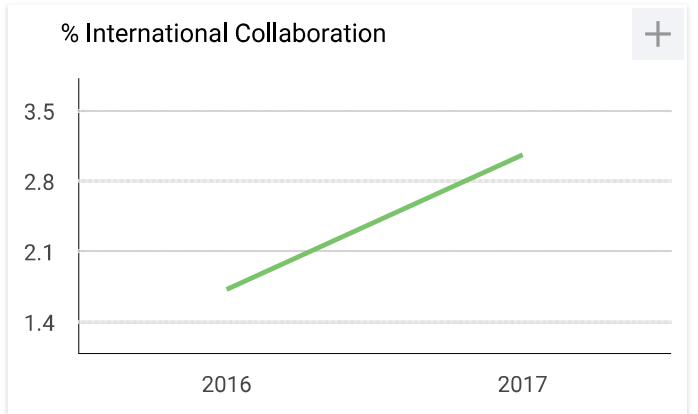
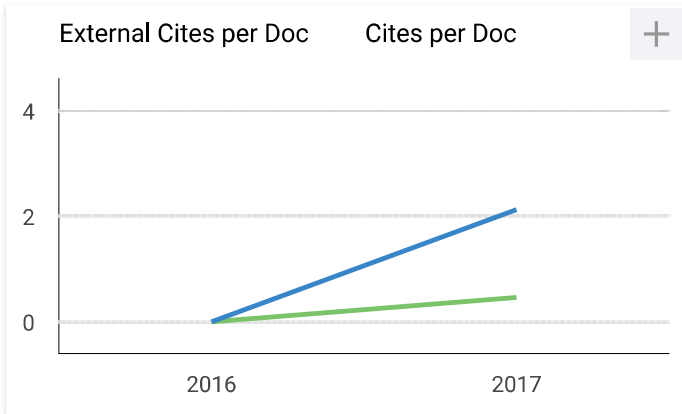
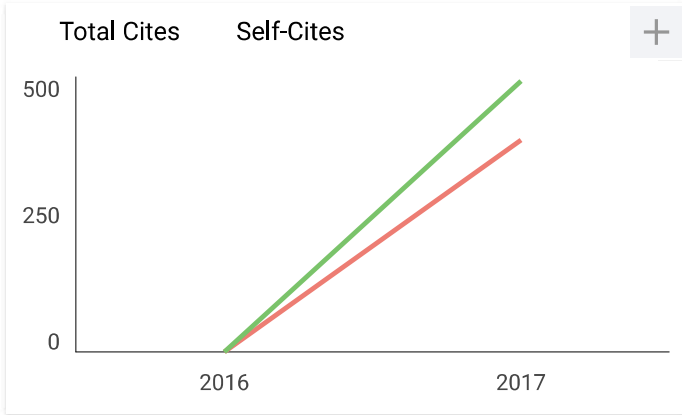
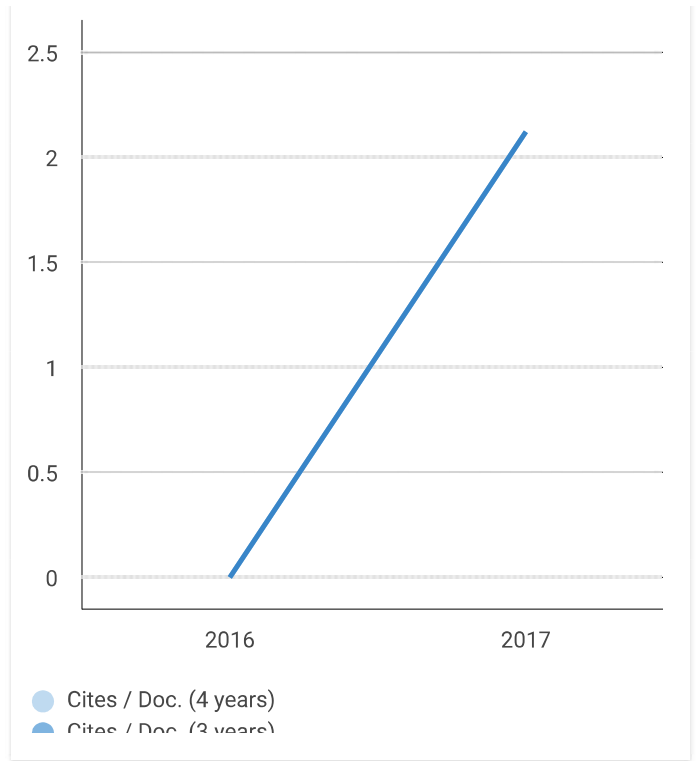
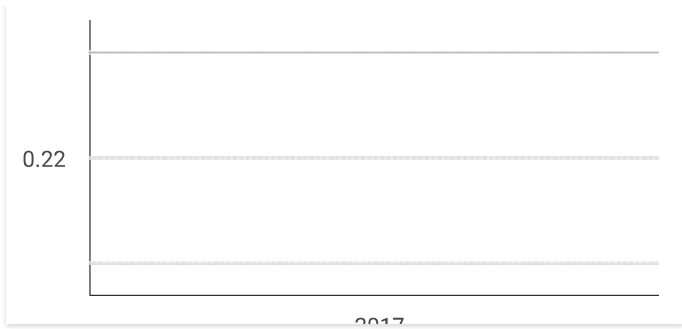
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<b>Coverage</b>	2016-ongoing	
<b>Scope</b>	International Journal of Mechanical Engineering and Applications (IJMEA) , a peer-reviewed open access journal published bimonthly in English-language, provides an international forum for the publication and dissemination of theoretical and practice oriented papers, dealing with problems of modern technology (power and process engineering, structural and machine design, production engineering mechanism and materials, etc.). The Journal covers the whole spectrum of mechanical engineering, which includes, but is not limited to, Materials and Design Engineering, Production Engineering and Fusion Technology, Dynamics, Vibration and Control, Thermal Engineering and Fluids Engineering, Environmental protection, etc.	
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**Submission ID:** 1056188027

**File name:** Artikel\_Sutoyo.pdf (350.83K)

**Word count:** 5831

**Character count:** 35654

1

**International Journal of Mechanical Engineering and Technology (IJMET)**

Volume 9, Issue 9, September 2018, pp. 149–161, Article ID: IJMET\_09\_09\_018

Available online at <http://www.iaeme.com/ijmet/issues.asp?JType=IJMET&VType=9&IType=9>

ISSN Print: 0976-6340 and ISSN Online: 0976-6359

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## THE RELATIONSHIP BETWEEN INTENSITY OF MARKET COMPETITION, ADVANCED MANUFACTURING TECHNOLOGY AND INTERACTIVE CONTROL SYSTEM ON ORGANIZATIONAL PERFORMANCE

Sutoyo\*

Doctoral Student of Faculty Economics and Business, Universitas Diponegoro  
And Lecturer Economics Faculty, Universitas UPN “Veteran” Yogyakarta

Anis Chariri

Department of Accounting, Faculty Economics and Business,  
Universitas Diponegoro, Indonesia

Fuad

Department of Accounting, Faculty Economics and Business,  
Universitas Diponegoro, Indonesia

\*Corresponding Author: [sutoyo@upnyk.ac.id](mailto:sutoyo@upnyk.ac.id)

### ABSTRACT

*The aim of this research is to investigate the relationship among intensity of market competition, advanced manufacturing technology, interactive control system and organizational performance of manufacturing companies in Central Java, Indonesia. The data were collected using a survey questionnaire distributed to financial administrators, financial controllers or accounting managers of manufacturing companies in Central Java. As many as 526 questionnaires were distributed and 145 of the potential participants refused to participate due to their tight schedule, and 384 answered the questionnaire but 19 of them did not meet the requirement; therefore, only data from respondents 365 were analyzed. The research employed SEM and used AMOS 19 Software. The findings showed that there was a positive relationship among intensity of market competition, advanced manufacturing technology and interactive control system and the relationship was significant. Besides, it was found that interactive control system and organizational performance also indicated a significant positive relation.*

**Key words:** intensity of market competition, advanced manufacturing technology, interactive control system, Organizational Performance.

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**Cite this Article:** Sutoyo, Anis Chariri, Fuad, The Relationship between Intensity of Market Competition, Advanced Manufacturing Technology and Interactive Control System on Organizational Performance, *International Journal of Mechanical Engineering and Technology* 9(8), 2018, pp. 149–161.  
<http://www.iaeme.com/IJMET/issues.asp?JType=IJMET&VType=9&IType=8>

## 1. INTRODUCTION

Globalization has changed external environmental factors in developing countries like Indonesia. Due to intensity of market competition and free trade, manufacturing companies in Indonesia are facing high competition especially in the free trade zone for ASEAN countries since the twentieth century. In such condition, companies have to rethink about anticipating the high intensity of market competition so as to be able to survive and win the competition.

Previous studies on the relationship between intensity of market competition and management control system (MCS) had attracted the researcher's attention. The findings of the previous research related to intensity of market competition and management control system described a contradiction between the two variables. A number of researchers claimed that intensity of market competition and management control system had a positive correlation (Khandwalla, 1972; Libby and Waterhouse, 1996; Mia and Clarke, 1999; Hoque et al., 2001; Williams and Seaman, 2001; Waweru et al., 2004; Hammad et al., 2013; Karaharjan et al., 2013; Fuadah, 2016). Other researchers, however, did not support the claim (Merchant, 1984; Isa, 2007; Amara and Benelifa, 2017). The contradictory findings become an interesting topic to investigate considering the difference between results of empirical studies and the reality.

Previous studies on contingency (Khandwalla, 1974; Hemmer, 1996; Libby and Waterhouse, 1996; Hoque and Hopper, 1997; Krishnan, 2005) suggest that companies nowadays have management control system which can provide timely, accurate and relevant information about production cost, productivity, quality, customer service, customer satisfaction, and profitability. Chenhall (2003) in his proposition states that there was a tendency that companies facing uncertain external environment would be more open and focused in MCS framework of Simons (2000). Simons' MCS framework states that MCS consists of belief system, boundary system and diagnostic control system. The current study focuses on the interactive control system.

External factors can promote changes in MSC, including increasing competition, customers, and market situation. Interactive control system can help companies to manage strategic uncertainties, and can be useful to adapt to competitive environment (Bobe, 2012). The higher the strategic uncertainties that the company faced is, the more intensive the company implements interactive control system. Interactive control system is effective to be implemented in companies which are facing variety of risks and uncertainties such as competition, technology risks and uncertain environment (Simons, 1991; Parwati, Zahra, Anfas, & Nurdyah, 2017; Zahra, F, 2017)

The research questions are whether intensity of market competition and advanced manufacturing technology are related with interactive control system and organizational performance. The objective of the research is to investigate the relationship among intensity of market competition, advanced manufacturing technology, interactive control system and organizational performance of the manufacturing companies in Central Java.

Previous studies on the relationship among intensity of market competition, advanced manufacturing technology (AMT), AMT and interactive control system and organizational

performance showed inconsistent findings (Fuadah et al., 2004). This research aims to provide empirical evidence from manufacturing companies in Central Java.

## 2. REVIEW OF LITERATURE

### 2.1. Contingency Theory

Contingency theory can be used to analyze design and management control to provide information which can be used by companies for various purposes (Otley, 1980) and can be used to deal with competition (Mia and Clarke, 1999). Contingency theory is based on the premise that there is no MCS which can be implemented by an organization universally in all environments (Otley, 1980). In this research, contingency approach was used to evaluate the intensity of market competition and which is assumed to bring about more effective MCS. In general, contingency theory states that organizational performance should match with other factors. These factors are external ones, such as environments, organizational factors, system control factor, technological factor that come altogether from organizational performance (Drazin and Ven, 1985).

Chenhall (2003) elaborates that researchers had attempted to explain effectiveness of MCS by examining the design which was the most suitable with the characteristics of environment, technology, structure, strategy and national culture. Contingency approach in accounting management is based on the premise that there is no accounting system which works universally and can be used by all organizations in all conditions (Otley, 1980). For this reason, accounting system depends on the condition of the company itself (Otley, 1980). Thus, it can be concluded that management control will vary in every company depending on the organizational factors and conditional factors.

General proposition of CT to evaluate organizational performance depends on contextual factors within a company (Cadez and Guilding, 2008). The basic tenet of CT says that we have to adapt ourselves with the contingency structures such as environments, organizational measures and business strategies so that the organization can perform (Gerdin and Greve, 2004). Chenhall (2003) and Chenhall (2007) conducted a meta-analysis from several previous studies and found that contextual factors affect MCS.

## 2. THE DEVELOPMENT OF HYPOTHESES

### 2.1. Intensity of Market Competition and Advanced Manufacturing Technology

One of the responses to an uncertain environment is making use of technology. It is related to the market demands and products for competitions. Increasing competitive environments can encourage companies to use of innovative products and production techniques in order to meet the customers' demands (Foster Gupta, 1994; Otley, 1994). In order to compete in competitive markets, companies need to consider their investment on advanced manufacturing technology such as computerized design, computer integrated manufacture, and just-in-time system. Previous researchers had come to the conclusion that there was a positive relationship between intensity of market competition and AMT (Mat et al., 2010b; Mat et al., 2010a; Abdel-Maksoud, 2011; Abdel-Maksoud et al., 2012; Trinandha, Ghazali, & Fuad, 2018). Henceforth, the hypothesis is formulated as follows:

H<sub>1</sub>: Intensity of market competition indicated a positive relationship with advanced Manufacturing Technology.

### 2.2. Intensity of Market Competition and Interactive Control Systems

External business environment where the company operates can be static or dynamic, certain or uncertain, simple or complex, and fluctuating or stable. (Fisher, 1995). External factors

can trigger changes in the management control system, including increasing competition, customers and market situation. Interactive control system can help manage strategic uncertainties and can be used in adapting to the competitive environments (Bobe, 2012). The higher the degree of strategic uncertainties faced by a company, is the more intensive the company uses interactive control system. The system will be more effective if it is implemented by a company which is facing various risks and uncertainties, such as competition, technological risks, and uncertain environments (Simons, 1991). Davila (2000) found that there were some dimensions of strategic uncertainties which may affect interactive control system. Mohamed (2013) stated that the intensity of market competition had a positive relationship with MCS.

H<sub>2</sub>: Intensity of market competition showed a positive relationship with interactive control system.

### 2.3. Advanced Manufacturing Technology and Interactive Control Systems

Based on the CT in accounting management, it is said that if a company states that it is implementing an accounting management system by considering the environmental and organizational factors, the company tends to have better organizational performance (Otley, 1980; Chenhall, 2003). Besides, Waterhouse and Tiessen (1978) in contingency theory propose that technology has connection with organizational performance. Companies which implement advanced manufacturing technology as part of their strategies improve their organizational performance. advanced manufacturing technology is a technology in manufacturing which focuses on the use of technology in the production processes (Askarany and Smith, 2008). In the high Global competition, the use of AMT will better meet the need for accounting management, which can be achieved by implementing a proper MCS. The more advanced manufacturing technology that is used by a company, the higher the company need to adapt to MCS. Hyvönen (2007) concludes that a link and match among technology, AMS, strategies and organizational structure will promote higher competitiveness, which results in the increase of the company performance.

H<sub>3</sub>: The implementation of advanced manufacturing technology indicated a positive relationship with interactive control system.

### 2.4. Interactive Control System and Organization Performance

Interactive control system is a formal system which is used by a top manager to regularly and personally involve himself in the act of decision making about the subordinates (Simons, 1995, 2000). Interactive control system functions to facilitate dialogue, face-to-face interaction and to bridge information gap in hierarchical relations, functional departments and profit centers. A system is categorized as an interactive one if the manager can report that the system is often used personally, regularly and it has become the priority for him as a manager and his subordinates. Every control system can be used interactively by a senior manager as long as the system match with the indicated high degree of uncertainties (Simons, 2000).

Bisbe and Otley (2004) concludes that companies are facing innovation risks and high uncertainties if they they implement control system which is interactive. Simons (2000) states that interactive control system is crucial for monitoring competition risks in culture which potentially hinder free flow of information about the coming threats and opportunities. Abernethy and Brownell (1999) find that using interactive budgeting will improve the performance of a hospital. Besides, Henri (2006) gives empirical evidence that supports the effectiveness of using measurement system of interactive performance on capability which at

the end affects the organizational performance operating in a strategic environment which undergoes on going changes (Andriyansah et al., 2017).

H<sub>4</sub>: Interactive control system indicates a positive relationship with organizational performance.

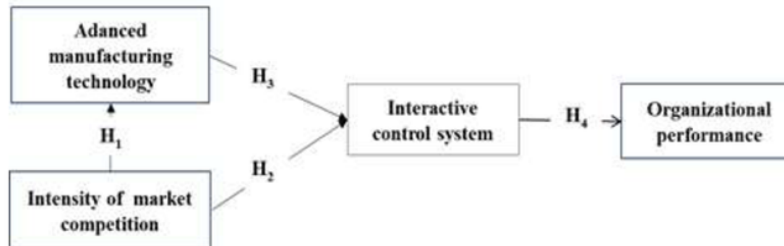


Figure 1 Research Model

### 3. METHODOLOGY

#### 3.1. Population and Sample

In total, 529 copies of the questionnaire were distributed, 145 of them failed to be collected because the respondents were difficult to find. Out of 384 responses, 19 failed to meet the requirement because the respondents were not categorized as middle or high managers of their companies as required in the research. Thus, only the questionnaire collected from 365 respondents were analyzed in this research.

There were some reasons why the researcher selected manufacture companies as samples. First, it is because manufacture companies are complex as seen from the aspect of control (Anthony and Govindarajan, 2004). Second, industrial companies experience quite high intensity of market competition, and thus they need to have sufficient control. Third, companies within the same industry were chosen in order to gain homogenous samples (Lane, 1999; Fatimah, Rosadi,& Hakim, 2018)

#### 3.2. Research Variables and Research Instrument

##### 3.2.1. Intensity of Market Competition

Intensity of market competition is defined as any factors which may affect the degree of competitiveness which is measured by the number of main competitions within the same industry, the frequency of the degree of technological changes within the same industry, frequency of new product introduction, the width of the access to the distribution channels, the frequency of regulation change and government policies (Khandwalla, 1972). The variables were measured using instruments developed by Mia and Chenhall (1994), Libby and Waterhouse (1996), Mia and Clarke (1999) and Hoque et al., (2001).

##### 3.2.2. Advanced Manufacturing Technology

Raymond (2005) defines AMT as a system of automatic production which integrates human resources, machines, designing tools, control and production process. AMT consists of new manufacturing technology, combination of machines, information technology, micro electronic and new organization management in the process of advanced manufacturing technology is technology which focuses on optimizing the use of technology in the production processes. These variables are measured using an instrument developed by Tuanmat and Smith (2011).

2  
**3.2.3. Interactive Control System (ICS)**

ICS is a formal system which is employed by a top manager of a company to involve himself regularly and personally in the decision making activity of his subordinate in order to focus the attention on the strategic uncertainties such as technology, regulations, and competitions so as to build dialogue and organizational learning, responses to development of emergent strategy (Simons, 1995, 2000). Interactive control system can be used to stimulate dialogues, face-to-face interaction and to develop information network with inter-hierarchy, functional departments and profit centers. Every control system can be implemented interactively by senior managers as long as the system is suitable for the required uncertainties (Simons, 2000). Meanwhile, the choice of the interactive control system very much depends on four factors, namely: (1) technology dependency, (2) regulations, (3) complexity of value creation, (4) the facts of the tactical responses (Simons, 2000). The variables are measured using the instrument which the researcher has developed previously (Simons, 1995; Henri, 2006; Widener, 2007; Kruis et al., 2016).

**3.2.4. Organizational Performance**

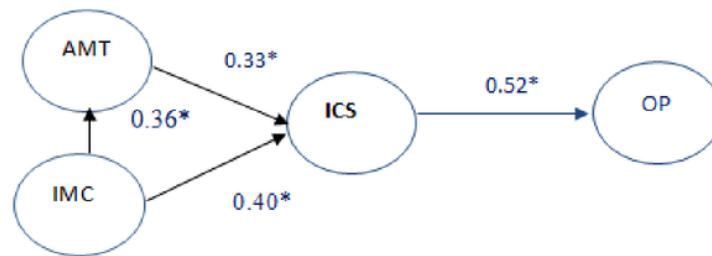
Organizational performance is a success indicator of how far a company has achieved its goals. Govindarajan (1984) states that organizational performance is not only measured from the financial but also from non-financial aspects of the company. The instrument is developed by Govindarajan (1984). The measurement consists of ten categories, namely operational profit, profit from investment, the growth rate of sales, market shares, operational cash flow, new product development, market development, research and development, cost reduction program, human resource development. These indicators have been used by previous researchers (Govindarajan and Fisher, 1990 ; Abernethy and Stoelwinder, 1991; Chenhall and Langfield-Smith, 1998; Hoque and James, 2000; Hoque, 2011).

**4. DATA ANALYSIS**

The data were analyzed using Structural Equation Model (SEM) with AMOS 19 software program. Structural Equation Model (SEM) is the combination of factor analysis and all equation models (Ghozali, 2011; Andriyansah & Aryanto, 2017). Structural equation is a figure of flowchart which represents the theory. In other words, it is a latent variable which is known for the flowchart of the theory. Furthermore, model goodness of fit will be applied. If there is an agreement, it will explain the result and the discussion (Hair et al., 2010; Ghozali, 2011).

3  
**5. RESULTS**

A total of 529 questionnaires were distributed, but 145 failed to return because the respondents were too busy to participate. Of the 394 collected questionnaires, 19 questionnaires were excluded because the respondents did not meet the requirement as they were low level managers and not middle or high managers. Therefore, only data from 365 questionnaires were valid to analyze.



**Figure 2** The Result of Research Model

Note: \* significant level of 0.005 (two-tailed test)

AMT = Advanced Manufacturing Technology

IMC = Intensity of Market Competition

ICS = Interactive Control System

OP = Organizational Performance

**Table 1** Evaluation of Goodness of Fit Model

Goodness of Fit Index	Cut of Value	Result	Model Evaluation
Chi-Square	$\geq 173.62$	64.590	Good
Probability	$\geq 0.05$	0.08	Good
RMSEA	$\leq 0.08$	0.68	Good
GFI	$\geq 0.90$	0.948	Good
AGFI	$\geq 0.90$	0.919	Good
CMIN/DF	$\leq 3$	1.292	Good
TLI	$\geq 0.95$	0.972	Good
CFI	$\geq 0.95$	0.979	Good

Based on Table 1, the results of the analysis using AMOS program show that overall criteria were good at the goodness of fit model, namely Chi-square, probability, RMSEA, CMIN/DF, TLI and CFI. From table 1, goodness of fit model can be seen based on the criteria (*cut off value*). Chi-square from the full model is smaller than chi-square table, which is 172.62. All values are within the range indicated, which means that all indicators used in the model were suitable for hypothesis testing. We can see t-value statistics to test all the proposed hypotheses. The critical value to accept or reject the proposed hypotheses is  $CR \pm 1.96$ . The result of the test indicated that intensity of market competition and AMT showed a significant relationship with interactive control system. Besides, interactive control system had a significant positive relationship with organizational performance. The result of the hypothesis testing agreed with CT (Chenhall 2003; Otley 1980).

## 6. DISCUSSION

### 6.1. The Relationship between Intensity of Market Competition and Advanced Manufacturing

The findings of this research showed empirical evidence as indicated by a positive path coefficient of 0.36. The findings supported the CT. It means that in order to respond to uncertain environment (intensity of market competition), companies need to use technology such as Just In Time, Total Quality Management, Flexibility Manufacturing (Chenhall, 2003).

Thus, it can be said that intensity of competition will make manufacture companies use AMT in order to be able to compete with other companies. With advanced manufacturing technology, companies can maintain and achieve competitive quality. The findings were consistent with the previous studies (Mat et al., 2010a; Mat et al., 2010b; Abdel-Maksoud, 2011; Abdel-Maksoud et al., 2012). The research results showed that there was a positive relationship intensity of market competition and the application of advanced manufacturing technology. In the competitive environment, manufacture companies need advanced technology because the production process is more complex (Ismail and Isa, 2011).

### **6.2. The Relationship between Intensity of Market Competition and Interactive Control Systems**

The research findings showed that there was a significant positive relationship between intensity of market competition and interactive control system. The findings are relevant with CT in accounting system management which states that if a company implement an accounting management system in accordance with environmental and organizational factors, it tends to have better performance (Otley, 1980; Chenhall, 2003). Interactive control system can help manage strategic uncertainties and can be used to adapt with competitive environment (Bobe, 2012; Fatimah, Rosadi, Hakim, & Alcantud, 2017). The higher the strategic uncertainties that the company faces are, the more intensive the company uses interactive control system. Thus, interactive control system is more effective to cope with various risks and uncertainties such as competition, technology risks, and environment uncertainties (Simons, 1991; Damarvulan, Farida, & Andriyansah, 2018). The findings were supported by Davila (2000), who found that some dimensions of strategic uncertainties affected interactive control system. Mohamed (2003) argues that intensity of market competition is positively related to management control system.

### **6.3. The Relationship between Advanced Manufacturing Technology and Interactive Control System**

The research findings were empirically proven by the path coefficient value of 0.40. It means that there was a significant positive relationship between AMT and interactive control system. The global competition is high, but with the use of AMT, companies will fulfil the need for better budget management, which can be achieved by applying appropriate MCS. Companies that make use of AMT tend to make changes on the MCS. The more advanced technology is used, hence, the more companies need to adapt with MCS. Indeed, the global competition is tight, but by using AMT, companies will be able to fulfil the need for better management, which can be achieved by choosing the most appropriate MCS.

The findings were in agreement with Mia's (2000) research, which found that the availability of management control would enhance the organizational performance within the setting of Just-in-time. Hyvönen (2007) concludes that the proper match between technology and accounting management system, strategies and organizational structure will foster competitive quality, and consequently improve organizational performance (Wijaya, Farida, & Andriyansah, 2018).

### **6.4. The Relationship between Interactive Control System and Organizational Performance**

The hypothesis that interactive control system had a significant positive relationship with company performance has been empirically proven by the positive path coefficient shown in the analysis. The finding is not surprising since interactive control system can function as

stimulating factor for dialogue, face-to-face interaction and can be a bridge for inter-hierarchical exchange of information, functional departments, and profit center. A system is said to be interactive if the manager reports that the system is frequently used personally, regularly, and becomes the priority for the manager and his subordinates. Every control system can be implemented interactively by a senior manager if the system fits with the required high degree of uncertainty (Simons, 2000; Zahra, Rohman, Chariri, & Karim, 2017).

Bisbe and Otley (2004) conclude that a company would face innovation risks and high uncertainties if it implemented the system control which was interactive. Simon (2000) argues that interactive control system is crucial to monitor competition risks in the culture which is potential to impede free flow of information about threats and opportunities which may occur. Abernethy and Brownell (1999) find that the implementation of interactive control system can improve the performance of hospitals. Besides, Henri (2006) gives empirical evidence that supports the impact of the use of measurement system for interactive performance on the capability and eventually will influence the organizational performance which operates in changing strategic environments.

## 7. CONCLUSIONS

The research has two aims: (1) to examine whether there was a relationship between intensity of market competition with advanced manufacturing technology, whether there was a relationship between intensity of market competition and interactive control system, whether there was a relationship between AMT and interactive control system, (2) to examine whether there was a relationship between interactive control system and organizational performance.

The findings showed that between intensity of market competition and AMT there was a significant positive relation. Meanwhile, the relationship between intensity of market competition, AMT and interactive control system was proven to be positive and significant. Besides, the relationship between interactive control system and organizational performance was also positive and significant.

There were some limitations in this research, which can become the considerations for future researchers. First, the samples in this research were derived only from manufacture industries, therefore the findings cannot be generalized to other kinds of industry. Second, the research employed a cross-sectional design; therefore it cannot confirm the causality between variables. Causality interpretation from the findings was merely on the theoretical basis.

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