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The Automation, Management Control System and Firm Performance – a Conceptual Framework

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Abstract

Technology evolves therefore, the organizations must keep pace with technological advancements to remain competitive and efficient by automating the system. By implementation of an automation system, work will be effectively and efficiently, reduce cost-effectively and improve the control system. Thus, automation is a formal control that provides rules and standardizations that should be complied with. Implementation of automation would reduce human participation, standardize labour and regulated behaviour in a predictable/programmatic environment. However, it does not necessarily work effectively in a dynamic and flexible environment especially in the manufacturing industry. Drawing on analysis in the field of human-machine interactions in the dynamic environment, management control systems (MCS) provide a nuanced balance between control of standardization and control of flexibility and lead to firm performance. Contingency theory confirms that the function and role of MCS vary according to the context within which firms operate including technology automation. Quantitative methods are used in the study, the data will be collected through the questionnaire. measurement of variables of the study develops from the literature. Unit analysis of the study is the manufacturing industry. The manager of the firm is the respondent of the study. Pre-test will be conducted to ensure the clarity of the questions, minimize error and increase the validity before actual questionnaires are distributed.

Keywords: Management control system, Automation, Firm Performance.

I. INTRODUCTION

Studying advanced technology in the business practices in management accounting has existed over the years. The technology is always updated therefore the organizations should align their business with advanced technology in order to survive in the business market. One of the advanced technologies is automation. Automation provides a work system effectively and efficiently, reduces the cost and improves the control system and leads to performance. Implementing automation would reduce human participation, standardizing labor and/or regulating behavior in predictable/programmatic environments. However, it does not necessarily work effectively in the dynamic and flexible environment. Additionally, high uncertainty, contingencies and breakdown of the system are the names of few turbulences that impact firm performance [1], [2]. Management accounting defines automation as an antecedent to control problem avoidance and it prevents the problems occurring as it provides the standardization of the information architecture and does act to shape organizational priorities and procedure [1], [3]. It is known as formative or coercive control [1]. In addition, it minimizes constraints, maintains stability and performance [4]. Without coercive control of the automation, the decisions could be undirected and the performance might be poorly controlled. Meanwhile, facing a dynamic business environment and uncertainty needs flexible ways to react and counter it. It requires the certain behaviors to react that matters and the automation itself does not have such capability, unless the operators who have been authorized by the managers make the automation flexible. In addition to this, the automation should work alongside labor, supporting humans to achieve better firm performance [3].

Manufacture operations are the most complex pieces of any organization. Consequently, they have impact on virtually every other function in the enterprise [5]. In addition, the organization design and implements the system to control all the operations in all circumstances therefore, maintain product quality, prevent delaying product distribution and increase organization's profits. Updating and upgrading the technology are the way manufacturing is conducted to minimize the constraints and one of that is by automating the system. The automation is a formal control that provides rules and standardization that should be compliance without room for discussion. It is hard to handle the contingency and face dynamic business operations such as, changing products development and project scopes. It needs flexibility as an alternative way to face dynamic business operations, therefore the quality of product improves and leads to financial performance.[6]. Management control systems provide nuance balance between both coercive and flexible in that environment due to being able to describe the situations in which controls are used simultaneously [1], [3], [7]. In addition, it raises general questions about how the management control system i.e.,

coercive and enabling implementation with the automation system that leads firm performance. Following this, two specific research questions arise; (1) does management control the system i.e., enabling and coercive implementation with the automation that leads to firm performance? (2) to what degree the automation could be controlled by the user that leads firm performance? Based on these research question, the study aims to investigate the relationship management control system i.e., coercive control and enabling control in the manufacturing company, specific objectives are: (1) To investigate management control systems by using enabling and coercive with the automation in the manufacturing company. (2) To determine whether enabling control and coercive control mediates the relationship between the automation and firm performance. The study contributes to the field of accounting by means of its focus implementation of a management control system with automation in the manufacturing industry. Limited empirical studies that have attempted to test the relationship between the management control system proposed by Adler and Borys (1996) with the automation have also demonstrated the complex nature of this relationship is motivated this study. In addition, the study develops the instruments to measure the management control system i.e., coercive and enabling with the automation.

2 LITERATURE REVIEW & HYPOTHESIS DEVELOPMENT

Study management control system that operates in the organization has existed over the years. It departs from using the strategies to allocate and exploit the firm's resources to achieve organization objectives. In order to ensure company strategies run on the track, it needs the system that could support and control it. Management control systems are the element that enable organizations to track how they are performing[8]. This in turn is seen as part of the feedback cycle that enables particular performance outcomes. However, lack of clarity, wide variation and inconsistencies in how MCS have been conceptualized has created a number of problems in MCS research in regards to the interpretation of research results and the design of MCS [9]. For example, technology implementation that fits with current business environments. It is required variety of control systems should be applied accordingly. Technology and control involve human and machine interaction. technology works based on users' command while design and decision of control and monitor are relied on by the management. However, to what degree human participation and control on the technology still remains unexplored especially in the manufacturing industry. The Manufacturing industry uses advanced technology due to change manufacturing strategies and emphasizes market conditions such as product assortment, quality and delivery performance [10], in addition, the production becomes more flexible. Transformations into a flexible production environment are

generally expected to have implications for management control systems especially human-machine interaction. Adler and Borys (1996) proposed the implementation of MCS framework that could structure the problem simultaneously, especially the implementation of automation systems in the organization as it is a contingent factor to achieve firm performance. Adler and Borys (1996) argue that bureaucratic structures can take both a coercive and an enabling form [11]. they developed two type bureaucratic structure in analogy to deskilling and usability approaches to technology design [7], [12].

Under coercive form of MCS, management attempts to force employee effort and compliance by providing standardized procedures to regulate their behaviour, therefore, term of coercive to force instead support compliance [7]. It is in line with the character of the automation technology which includes rules, policy and regulation set up by the system and lets the users comply with it. The coercive control system sees humans as the source of problems to be eliminated in order to improve organizational performance [3], [12]. Moreover, the automation reduces the likelihood of control problems arising in daily operations (due to lack of direction or lack of motivation). In addition, it would eliminate the errors and improve the quality of the product. Thus, the first hypotheses are:

H1a: The coercive of MCS has relationship with Deskilling of automation and firm performance

H1b: The coercive of MCS has not relationship with Usability of automation and firm performance

Enabling form of MCS on the other hand, is type formalization that is encouraged by employees as they are seen to help facilitate task performance and innovation, and enable (support) employees to deal more effectively with contingencies [3]. It is related to usability rationale design that that automation can be designed with a usability and upgrading rationale in order to enhance user capabilities and to leverage their skills and intelligence. The user is a source of skill and intelligence to be supported, and equipment is seen as inherently limited; the design goal is therefore to ensure the operator can intervene effectively to rectify problems [3]. Thus, the second hypotheses are:

H2a: The enabling of MCS has no relationship with Deskilling of automation and firm performance

H2b: The enabling of MCS has a relationship with Usability of automation and firm performance.

Under enabling, Adler & Borys (1996) demonstrates four design principles to ensure high equipment usability namely, repair, internal transparency, global transparency and flexibility. Repair means the system is not totally programmable, it seeks to integrate repair processes

with routine operations. The employees are not only to be trusted but are also actively encouraged to discuss practical problems with organizational rules and standards, thereby contributing to their development in line with usability criteria [1], [6], [7]. for example, value chain of production process which refers to the sequences of business functions in which usefulness is added to the product of an organization, it allows the users to interact with electricity useful system in each batch of the manufacturer in two different ways manually ON of OFF the electricity outside of the schedule hours The users are given the autonomy to manipulate their system to manage energy efficiency by turning off batch of production which not use it than lead cost production efficiency. By enable repair feature of automation control system in the production, it leads to cost production efficiency, therefore the hypothesis is

H3: The enabling of MCS through repair feature has mediate the relationship between automation and organization performance

Second feature of enabling MCS is internal transparency. Internal transparency is related to repair in that it is concerned with the visibility of internal processes for organizational members. [7]. The information is provided sufficiently (not overload), therefore, the users are able to leverage their skills & manage the efficiency, improve product quality and reduce costs. (Ahrens & Chapman, 2009; Brown et.al., 2019). By having internal transparency, the employee is able to understand the internal system process and conduct repair when the trouble found during the production in addition, quality product improved and energy used efficiently. Therefore, the hypothesis is

H4: The enabling of MCS through internal transparency feature has mediate the relationship between automation and organization performance

Third feature of enabling MCS is global transparency. Global transparency refers to the understanding of where and how the local processes fit into the organisation as a whole [13]. through understanding the nature of the system, the employee is able to understand the broader system that they are working in. For example, equipment technologies are programmed to provide operators with comprehensive information on the status of the broader production process. therefore, the operators are able to execute their tasks and contribute to identifying opportunities for product improvement. By having data visibility from the technology, it provides dialogue between operator, manager operational and the accountant of the possibility and implication might be fruitfully unpacked, interrogated and developed such cost allocation and budgeting for the product making. Thus, the hypothesis is

H5: The enabling of MCS through global transparency feature has mediate the relationship between automation and organization performance

Fourth feature of enabling MCS is flexibility. Flexibility provides a degree of freedom for the employee how they might use the equipment. In addition, it also provides employees with the opportunity to operate the equipment/system to suit their preference. The employee allows for the setting variance options ranging from blocking specific action though automatic reporting option. By having flexibility, the users are able to find new strategies to improve the production process that improve product development therefore the quality of the product improved. It contributes positively to supporting users in their attempts to manage and so might be expected to enhance perceived success firm performance. Thus, hypothesis is

H6: The enabling of MCS through flexibility feature has mediate the relationship between automation and organization performance

Based on the discussion above, therefore, the conceptual framework of the study is shown in figure 1 below.

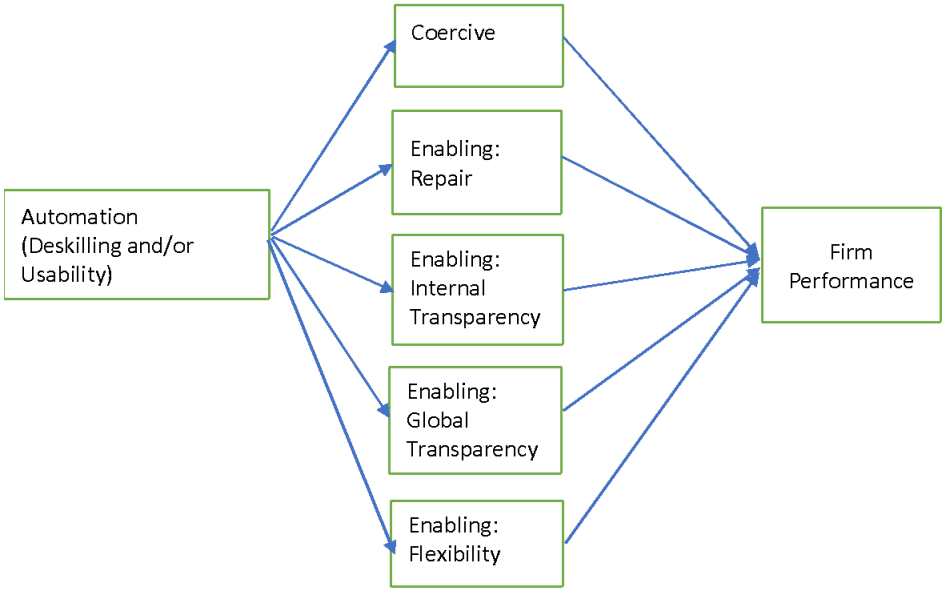

Fig. 1. Conceptual Framework

II. METHOD

A. Measurement Variable and Questionnaire Development

The study uses a quantitative method in which measurement is developed and the variables are tested empirically. Measurement of variables of the study develops from the literature. Once measurement of the variable is determined then the questionnaire is made and distributed to respective respondents. The study consists of one independent variable i.e., automation, two mediating variables i.e., coercive of the MCS and enabling of the MCS and one dependent variable i.e., organizational performance. The automation has two measurements i.e., deskilling and usability. The deskilling has five indicators with four items while usability has five indicators with four items. Coercive of the MCS has four indicators with five items while enabling of MCS consist of four principles and each principle has different measurement. Repair features have four indicators with six items, internal transparency has four indicators with four items, global transparency has two indicators with six items and flexibility has three indicators with six items. Organizational performance has four indicators with five items. Five points likert scale apply to the study

B. Sample and Data Collection

The unit analysis of the study is the manufacturing industry. The sample of study includes all sectors of manufacture industry. No specific manufacturing industry selected due to the industry uses the technology for system integration in the production process. In addition to controlling the activities. Data is collected through the questionnaire. Pre-test is conducted to enhance face validity before conducting actual data collection. Due to Covid 19 pandemic, the companies should be obligated to Indonesian healthcare protocol that prevent viruses from spreading globally, therefore the questionnaire for pre test is conducted through email and social media. The respondents of the pre test are manager operational and the academician. The manager operations considered as the practitioner who involved the production process and understood about technology implementation in the manufacturing company. Academician on the other hand to gain the inputs which related to study and to minimize measurement errors

C. Data Analysis

The study uses SPSS and PLS-SEM computer software for data analysis. Data screening, validity, reliability and factor analysis are tasted using SPSS before the hypotheses are tested using PLS-SEM. Data screening is undertaken to ensure reliability of data entering. Principal component analysis is conducted for construct validation. Reliability test of cronbach

alpha use to test consistency of the measure and further, the hypothesis is tested by using PLS-SEM. The purpose of using PLS-SEM is to examine the relationship between exogenous and indigenous and it also predicts the construct variable of the study.

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