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HOW THE IMPLEMENTATION OF THE INDUSTRIAL REVOLUTION 4.0 MANAGEMENT INFORMATION SYSTEM INFLUENCED INNOVATION: THE CASE OF SMALL AND MEDIUM ENTERPRISES IN INDONESIA

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ABSTRACT

Management Information System is a planning system in an organization that involves management of internal controls such as the use of resources, documents, technology, and management accounting as one of the strategies in business. Management information systems in the business or corporate world aim to collect, process, store and analyze information and then disseminate it for specific purposes. Management information systems function as a reference for decision making in an organization or company and management functions are applied in business. The difference in information requirements will lead to different data that must be entered and the management information system format used. Reality states that many management information systems in various government and private institutions have various problems including integration issues, ease of use, ease of access, ease of adaptation to changing conditions and the ability to produce management information as needed. The purpose of this study was to determine how much the application of the industrial revolution 4.0 management information system influenced innovation. This method is a descriptive and verification method, the analytical tool is structural equation modeling (SEM, Lisrel). The results showed that innovation affected the implementation of the industrial revolution 4.0 management information system.

Contribution/ Originality: This study contributes to the existing literature by determining how much the application of the industrial revolution 4.0 management information system influenced innovation.

1. INTRODUCTION

The system is a collection of various elements that have been formed from various parts or a collection of various properties and parts caused by the progress of the industrial revolution.

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Loudon and Jane (2004) states that the system is a collection of objects that have a relationship between each object, including the relationship of the properties it has. Susanto (2013a) classifies the system as a network rather than interrelated procedures, integrated together in order to be able to carry out an activity or achieve certain goals. Hertati (2015b) concluded that the system is a network of interrelated procedures, gathered together to be able to carry out activities or complete a certain target. Information system is part of a system consisting of a set of hardware, software, brainware, and procedures and rules that exist within the organization that are harmoniously connected integrally and integrated with each other to process data into useful information for problem solving and decision making (Hertati, 2015b). Also Susanto (2010) states that the information system is an integrated data unit that is integrated and complementary and interrelated with one another that produces output in the form of images, sounds and writing for decision making. Hertati (2015a) states that information system is a set of system-forming components that have a relationship between one component with other components that aim to produce information in an organization.

Susanto (2013a) states that information systems are collections of sub-systems that are interconnected with each other that form a component in the organization that includes input-process-output with the aim of managing data for user needs / users. Furthermore Syafarudin and Mulyana (2019) states that an information system (SI) or information system (IS) is a collection of people, data, processes, and interfaces that interact to support and improve some of the activities of daily operations in a business organization to solve problems in order to make management decisions by users who are experienced in their fields From the elucidation it can be concluded that the information system is a collection or set of components that are related and support the function of collecting, processing, storing and distributing information that is used by management as a basis in organizational decision making (Blau, 1999; Bontis, Chua Chong Keow, & Richardson, 2000; Bowen, 1998; Boyle, 1997; Caruana & Calleya, 1998).

Susanto (2013b) states that management information systems are part of information systems that aim at planning within a company that involves internal control such as the use of resources, documents, technology, and management accounting as one of the strategies in Casio (1995). Then Chase, Aquilano, and Jacobs (2001) states that the same thing revealed by Hertati (2015) states that the management information system in a company's business organization aims to collect, process, store and analyze information and then disseminated for specific purposes (Cohen, 1999). Then Hertati and Sumantri (2016) states that management information systems function for decision making in an organization or company. In fact there are many management information systems problems as stated by Swisher (2019) as the head of CE shareholders in China stated that at this time, Apple is the biggest problem, but the lack of innovation also took part. Apple cut its estimated revenue to US $ 84 billion, down from US $ 89 to US $ 93 billion previously projected. The company also cut expectations of gross margins to around 38% from between 38% and 38.5%. Furthermore, Swisher (2019) said that the problem was the economic downturn in China and fewer users upgrading to new iPhone models in other countries. He said in an interview with CNBC International that the US-China trade dispute might exacerbate economic problems.

Thus that the industrial revolution of management information systems influences innovation the statement Wade (2001) states that the industrial information management system revolution aims at its application in business with the following characteristics 1) Typical. Distinctive innovation has a characteristic that no one else has before. So that the idea or thought has never existed before. This was reinforced by Wambsganss and Kennett (1995) stating that without the hallmark of an innovation it would not be said of new innovation.2) New. Every innovation must be an idea / idea which of course must be new which has never been sparked and published before. 3) Planned innovation is planned (Wang & Chang, 2005). Wood et al. (2001) It is planned to be organized, so that it will truly be realized. 4) Has a Purpose. Wetzels, De Ruyter, and Van Birgelen (1998) Innovation must have the objectives described, innovation is a planned activity or activity and is planned to have a goal to develop and explore certain objects, these goals can develop certain objects or ideas Wood et al. (2001). The information system industrial revolution is the ability to master the technology needed, so that Indonesia is able to produce innovative products and be able to compete in global competition. Efforts to reduce the number of imported products in various sectors are carried out by increasing the capacity to use domestic technology used in industry and

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increasing the number of research products to dominate the domestic market. Innovation is not only a research product development and creativity creation, but innovation is a product or process that can provide benefits or novelty or development does not stop at the prototype stage only, innovation is demanded to produce a product or process that is able to compete and have commercial value (commercialization process), so that the resulting impact is able to drive or become an economic driver (Hannon, Patton, & Marlow, 2000). Innovation funding is one of the efforts that can be done by the Government to accelerate the growth of technological innovation in Indonesia. With the right funding, a strategy can be made to accelerate the process of revitalizing the results of the discovery and break down the constraints that are causing the failure of the innovation process. As for which is an obstacle and the cause of failure of an innovation process is an area that is often known as a critical area of the innovation process as illustrated in Figure 1.

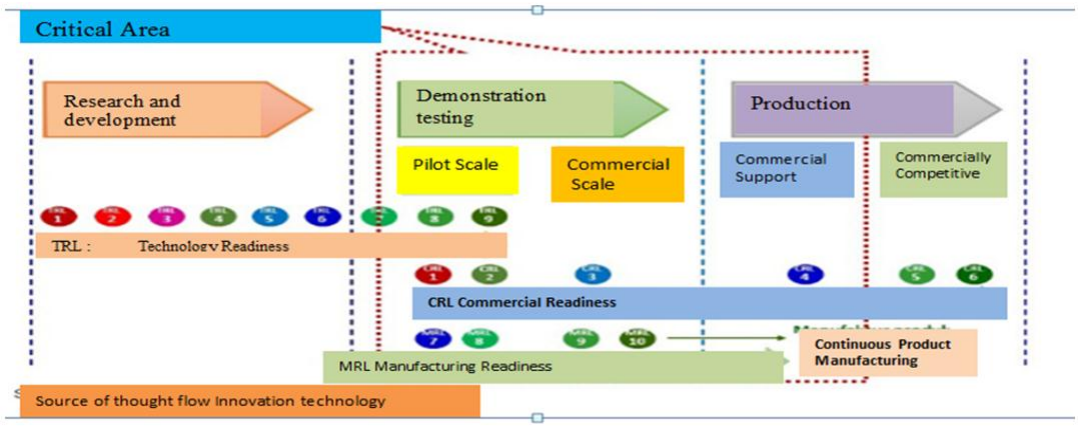

Figure-1. Technology innovation process.

Antony, Jiju Antony, and Ghosh (2004) a mature technology that is implemented into a technology product. Then Balkin and Gomez-Mejia (1987) states that to innovate means to prepare a technology product that has a competitive advantage in terms of built quality, features, cost efficiency, price, distribution network and after sales, and other benefits from similar competing products that have come first. Bailey and Bennett (1996) states that consideration of ability in controlling the market through distribution networks and after sales that are built (commercial competitive) is an inseparable part in an innovation process. The following is seen in the Figure 2 of innovation funding:

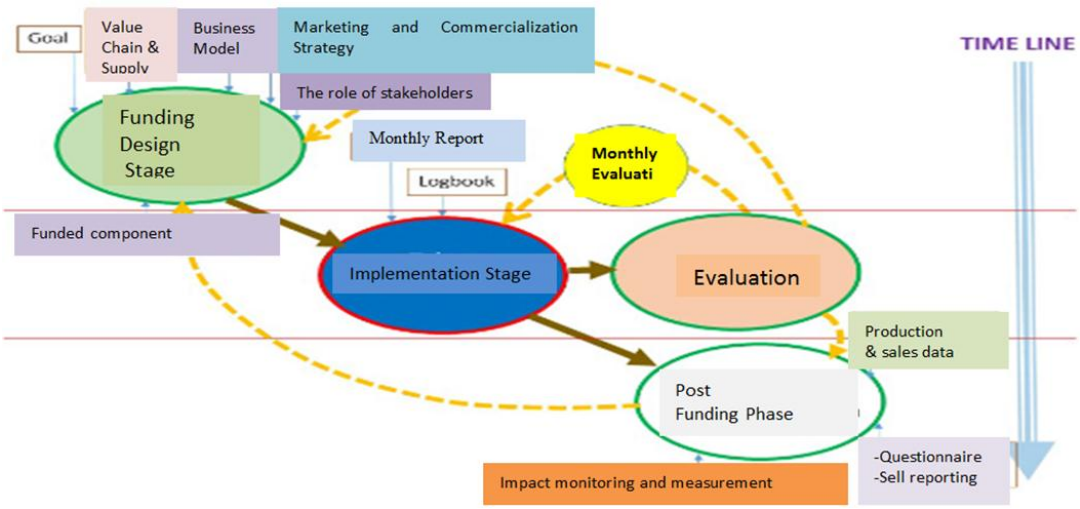

Figure-2. Stages of management of innovation funding.

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Banker, Potter, and Schroeder (1993) states that the funding design stage is the stage of identifying, exploring and designing innovation product development scenarios including the role of stakeholders so that the innovation product is successfully marketed (Banker et al., 1993). The implementation phase is the stage of implementing funding for innovation. At this stage, assistance will be conducted involving experts and practitioners to see the problems that arise and efforts to resolve them. Whereas the Post Funding Phase is the monitoring stage for the next 3 years after the completion of innovation funding is given to measure the impact of the entry of innovation products into the market. In addition, a good information system can also help in terms of analyzing and visualizing problems in the creation of new products (Blau, 1999).

Research by Hertati (2015) and Claver, Tari, and Molina (2003) which supports and in the utilization of modern proposed innovations. In addition to the existing regulations, an explanation is given of regulations, institutions and standards that do not yet exist but are needed in the utilization of the proposed innovation. E) Technology Tree Technology tree is a visual representation of the technology used to make innovation production, which is equipped with information of the technology owner so can be known precisely on which side of the technology developed and where the technology is still being adopted (Comm & Mathaisel, 2003; Daniel & Reitsperger, 1991). This mapping can be used to determine the ability / or mastery of domestic technology. f) Supply Chain Supply Chainis an innovation product describing the parties involved since the acquisition of components for the production of innovations to the delivery of products to users. Davies, Taylor, and Savery (2001) and Drucker (1997) state that the Business model developed by R&D and / or industry institutions must provide an overview of the business model that was built together. Business and industry developments in the sector related to innovation products. The potential market for innovation proposed, both directly and indirectly related Edvinsson (2000) states that competitive advantage. Market segmentation of potential buyers of manufactured innovation products. Based on the market segmentation that has been formulated, the chosen target segment is chosen. Then, an explanation of position is given from the market point of view of the proposed innovation product. Analysis of the Marketing Mix Policies and strategies that will be applied to Products and Their Development; Price; Promotion; Distribution. (Flynn, Schroeder, & Sakakibara, 1995; Forza, 1995; Gilbert, 1991).

2. INDUSTRIAL REVOLUTION MANAGEMENT INFORMATION SYSTEM

Loudon and Jane (2005) state that management information systems provide non-financial information in an organization to management for decision making that affects company performance. Then Kleiman (1997), Kotler (1997) states that all types of information are inferred by management decisions. Furthermore Hertati (2015) states that all management activities are always based on data. The same thing expressed by Susanto (2013b) states that management information systems are information that is based on existing data and is available accurately that is owned by management. Then Hertati (2015b) and Hocutt (1998) state that data and information are important and management takes decisions based on data. Gilmore and Carson (1996) states that every step taken is not misdirected and does not harm the company (Gordon & Miller, 1976). Then next Griffin, Patterson, and West (2001) the information used is the latest information. Grönroos (1984) states that the most up-to-date, outdated information of little benefit is rarely used except for special purposes. Ichniowsski and Shaw (1997) and states that management information systems help management to obtain the desired information. Management information systems will collect data and process it (Hamel & Prahalad, 1994). From the above understanding it can be concluded that the management information system will eventually become a mandatory menu that must exist in the company in order to survive, survive in tight competition, in strict rules, in bad economic conditions, even survive in changes that are not planned though. To produce the required information. The characteristics of a management information system are as follows:

1. Increasingly complex management tasks: The task of management is to ensure the company can operate normally. Generate maximum profits. And the important thing: provide prosperity to the owner of the company. Simple (Milakovich & Newman, 1996).

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2. Increasingly complex information technology: Technology that is increasingly complex, in the sense of increasingly advanced will facilitate management in carrying out their duties (Lovelock, Patterson, & Walker, 1998).
3. Effects of economic conditions: That the management information system is processing all data both from internal and external companies. Data from external companies can be influenced by the situation and economic conditions (Loudon & Jane, 2005).
4. Business competition: Business competition pressure means that management must try to excel the company over its competitors. Excel in what matters to compete. Superior in terms of product, product benefits, superior in marketing and market share, competitive prices and other things compared to competitors Balkin and Gomez-Mejia (1987) .
5. Effect of time speed: First come, first serve. A term that is often used to describe the importance of time in any case. Included in the company's operations. Management must have a fast response to whatever happens, managers must immediately make decisions about the problems that occur (Hornby, 2000).
6. Innovation findings: The discovery of new innovations allows companies to operate effectively, efficiently and quickly. While management tasks are increasingly complex, new technological innovations can ease management workloads so that management steps can be more directed (Scott, 2001).
7. Social pressure: The company's operations will always be related to the environment around the company. The social environment can affect the performance of a company. Companies can have positive and negative effects on the surrounding social environment (Sharma & Patterson, 2000).

3. INNOVATION

Scott (2001) and Sharma and Patterson (2000) state that innovation is a result of the development process of utilizing a product / resource that has been there before, so that it has more meaningful value. Jackson (2004) states that innovation is a renewal of various resources so that these resources have more benefits for humans (Jacobsen, 2000). Then (Stephen, John, & Terry, 1993) states that the innovation process is greatly influenced by technological and scientific advances because both of these can facilitate in producing something new and different (Joia, 2000). Basically the benefits of innovation are to perfect or improve the function of the use of a product or resource so that humans get more benefits (Kandampully & Butler, 2001). Innovation occurs in various fields of life, ranging from the world of business, education, communication, and so on (Kaplan & Norton, 1990). Keating and Harrington (2003) states that this innovation process occurs continuously in human life because of the desire to do something easier and faster. One example of innovation is the development of telephones that are changing and getting more sophisticated over time. When the phone used to use a cable, now the phone can be taken anywhere with very complete features. The characteristics of innovation are as follows:

1. Improve quality: In general, the aim of innovation in various fields is to improve the quality and value of something that already exists, be it a product or service. With the latest innovations, these products are expected to have advantages and benefits that are more valuable than ever (Rivers, 1999).
2. Reducing costs: Innovation also aims to help reduce costs, especially labor costs. For example, today many machines or equipment are created that can replace human labor in the production process (Sharma & Patterson, 2000). With these machines and equipment, labor costs for production will decrease. In addition, the use of machinery and equipment in the production process of certain goods / services will produce better performance (Susanto, 2013b).
3. Creating a new market: With more high-value products as a result of innovation, this will create a new market in the community (Hertati, 2015a).
4. Expanding product range: One example we can see from the e-commerce business as it is today. Entrepreneurs are expanding their product range by utilizing the internet which can be accessed by more potential customers (Gordon & Miller, 1976).

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5. Changing products / services: Innovation also aims to replace products or services that are considered less effective / efficient. One of them we can see innovations that occur in motorcycle engines that are now more fuel efficient.
6. Reducing energy consumption Hamel and Prahalad (1994): Humans always want to save energy use, which is why there are so many innovations that humans do. One of them is the existence of renewable energy sources that utilize nature, for example solar power, wind, and water, as a source of electrical energy (Hannon et al., 2000).

3.1. Influence of the Industrial Revolution Management Information System on Innovation

According to Everett M. Rogers, the notion of innovation is an idea, idea, motorcycle taxi, and practice which is based and accepted as something new by a person or certain group to be applied or adopted. According to Susanto (2010) the notion of innovation is everything that is produced through a process that reaches its implementation in the market. According to Loudon and Jane (2005) states that innovation is the development and implementation of the ideas of the new management information system industry revolution by people in a certain period of time carried out with various information technology transaction activities within a particular organizational structure. Many things can be done to improve the ability of creativity. The following are things that can help develop personal abilities in creativity improvement programs as stated by Stephen, Jermier, Koehler, and Sincich (1993).

Hendricks and Singhal (1997) research results state that many of the innovations that were born due to the industrial revolution from human power to mechanical power as a way of looking at a new and different relationship between objects, processes, materials, technology and people. Like mixing jasmine scent with water and then packing it in a unique and beautiful bottle and the bottle being uniquely fragrant and fresh. Kleiman (1997) found that to help increase creativity, we can carry out our static perspective on existing relationships of people and the environment. Here we try to see them with a new and different perspective. Researcher Kettunen (2005) explains that creative people will have certain intuitive relationships to be able to develop and recognize new and different relationships from the phenomenon. This relationship can later show new product and service ideas. For example we do the exercise by looking at the relationship between chocolate cake and vanilla ice cream, athletes and coaches and managers with workers. Milakovich and Newman (1996) states that if developed further, we can see a functional perspective of things and people. A creative person will be able to see other people as a tool to fulfill his desires and help complete a job. Miner and Heide (1992) states that often we unconsciously use kitchen knives to install bolts because the hammer we are looking for is not found. Malhotra and Mukherjee (2004) states that other ways we have to start from a non-conventional perspective and from a different perspective. For example: try to mention other functions of a chair, the book that we hold and others. Research on the use of brain function in separate parts between the left and right has been conducted since the 1950s and 1960s. Research Parasuraman (2002) right brain is used for things like analogies, imagination and others. While the left hemisphere is used for work such as analysis, making rational approaches to problem solving and others. Parker-Gore (1996) although functionally he is different, but in his work he must be interconnected. The creativity process includes logical and analytical thinking of knowledge, evaluation and implementation stages. So if we want to be more creative, we must train and develop the abilities of our two brains. Examples of exercises we can make in accordance with the functions of the cerebral hemispheres. Horton (2000) states that many mental habits limit and inhibit creative thinking. A study found that adults only use 2-10 percent of the potential creativity they have. Example: many people have a tendency to make quick judgments about something people or new ideas.

4. METHODOLOGY

The target population of this study is all small and medium enterprises in Indonesia. Keep in mind the conceptual model shown in Figure 1, the review instrument established by utilizing previous studies. The characteristics of the variable hypothesis were designed using SEM-Lisrel of five answers from 1 to 5. The measurement items of the current study consisted of seven variables including the MISQ scientific discovery emergency. MSMEs in Indonesia. After visiting MSMEs, they immediately distributed questionnaires to them for their responses. The process of selecting

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and knowledge of lecturers is very important for collecting data for researchers, when investigating creativity, emphasizing the centralization of employee knowledge relevant to the concept of management information systems can thus provide meaningful responses (Dul, Ceylan, & Jaspers, 2011). Therefore, a total of 438 questionnaires were sent to all MSMEs out of which 438 responded. Overall, the data collection process has been taken for 4 months. Finally, the current research is not funded by any association. Investigation has also followed the rules of Dillman (1978) in considering moral and ethical actions.

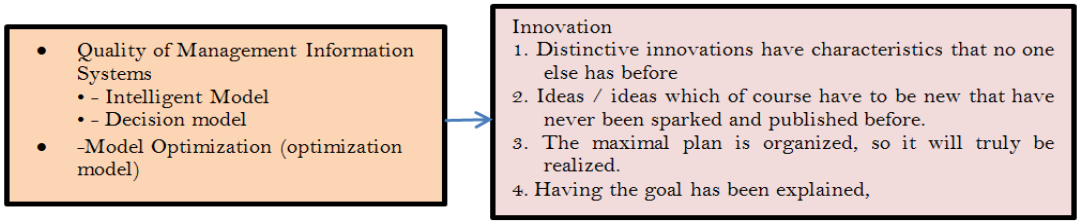

Figure-3. Research framework, 2019.

5. ANALYSIS DATA

Data analysis of this study was completed using SEM Lisrel statistical software. The final valid sample of this study was 357 after conducting food testing in which the processed data were each.

Table-1. Evaluation results of dimension relevance measurement.

Latent	Dimension	Weight	Default error	Value-z	Value- p	Sig	Relevant
Industrial revolution of management information systems	Management tasks increasingly complex	0,19	0,011	17,12	0,000	Sig	Relevant
	Information technology is increasingly complex	0,44	0,006	68,65	0,000	Sig	Relevant
	Effect of economic conditions	0,45	0,008	68,65	0,000	Sig	Relevant
	Business competition	0,43	0,004	38,65	0,000	Sig	Relevant
	Effect of time speed	0,43	0,012	68,65	0,000	Sig	Relevant
	Innovation findings	0,46	0,016	58,61	0,000	Sig	Relevant
	Social pressure	0,43	0,004	38,65	0,000	Sig	Relevant
Innovation	Improve quality	0,40	0,017	22,67	0,000	Sig	Relevant
	Reducing costs	0,45	0,015	26,32	0,000	Sig	Relevant
	Creating a new market	0,40	0,016	26,32	0,000	Sig	Relevant
	Expanding product range	0,40	0,017	26,32	0,000	Sig	Relevant
	Change products / services	0,40	0,014	26,32	0,000	Sig	Relevant
	Reducing energy consumption	0,46	0,011	39,99	0,000	Sig	Relevant

Source: Results of calculation of the score component with the R program.

Based on information obtained from Table 1, showing a P-value smaller than 0.5 then all dimensions are relevant as a measurement tool for each variable.

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Table-2. Structural model parameters for overall data processing results.

Consequence	Mediator	Cause	Standard estimate	Estimated	Default error	Value-z	Value-p	Information
MIS	-	Innovation	0,60	0,360	0,20	1,81	0,515	Significant

Source: WOutput Lisrel Calculation Result 8.5.

Based on the information obtained from Table 2, the interpretation of the results of the evaluation of the structural equation model Standard estimation after all models have been tested and the model is fit with the data, then the next step is to test the hypothesis. In this study there are hypotheses that will be tested directly affect, as follows:

Hypothesis: The better the quality of management information systems the better innovation statistical hypothesis:

H0: γ1.1 ≥ 0: There is no negative effect on the quality of the information system Management of Innovation.

H1: γ1.1 <0: There is a negative influence on the quality of management information systems. Towards Innovation.

Based on Table 1, it is known the estimated value of the parameter marked positive p-value (0.515) is smaller than 0.05 so that H0 is accepted, then there is a negative influence on the quality of management information systems on innovation.

6. DISCUSSION AND CONCLUSION

Theoretically the more the quality of management information systems the better Innovation in this study proves influential. The phenomenon of the lack of quality management information systems because innovation has not been able to design work life well flexibly and integrated accurately and timely in the face of conditions of work activities that are so complex. The better the employee innovation, the more quality the management information system is, this study states it is influential.

7. RECOMMENDATION AND POLICY IMPLICATION

The findings of this study highlight the most important role of the quality of management information systems that is influenced by Innovation. This research implies that organizations must consider Inonation as a measure of the threat of the quality of management information systems that has the potential to impede management information systems. In this case, the present study proposes a quality management information system is the main power in the progress of innovation in small and medium-sized companies to assess carefully the possibility of external risks with a diversified approach to organizational dependence on manual equipment. Furthermore, the importance of a quality management information system is also highlighted as an important driver of useful innovation. This shows that there is an error in understanding in order to improve quality, reduce costs, create new markets, expand product range, replace products / services, reduce energy consumption. Finally, this research is also for the need to maintain the quality of a good innovation design so that the management information system can be of high quality and sophisticated and a skilled workforce will encourage the production of small and medium businesses able to compete and dominate the market.

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