Competence and readiness of small and medium industries against of industrial revolution 4.0

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Abstract. Small and Medium Industry (SMI) is one of the strategic business sectors that is very influential in the industrial revolution 4.0. Industry 4.0 refers to the concept of using the internet of things, as well as smart and cloud-based manufacturing. The SMI constraints from the knowledge, skills, use of technology, so that needed the competence and readiness of Small and Medium Industries in the Industrial Revolution 4.0. This study examines the level of SMI Competence and SMI Readiness in facing the Industrial Revolution 4.0. The design and model of this study were developed using TRA. The development of this model was carried out in three stages. The purpose of the conceptual is to explain and analyze the description of the Small and Medium Industry Competency variables and the readiness of small and medium industries. The results of the conceptual about the indicators of each variable that will be used in further research.

1. Introduction
The priorities of economic development nowadays are directed at efforts to accelerate economic recovery, overcome poverty and rising unemployment, as well as efforts to increase the competitiveness of small and medium scale businesses. Small and Medium Industries are the largest economic group that can make a significant contribution to the national economy and have been proven capable of being a buffer in the economy is playing a role in increasing Gross Domestic Income (GDP). The success in developing SMEs will be able to strengthen the people's economic foundation, because so far what has been done by the SMEs is generally based on local resources, not dependent on imports, the superior products of SMEs in the regions have huge export opportunities because it has its own uniqueness that become characteristic of these products.

The role of SMEs that are strategic and proven as a driver of economic growth of the people certainly needs to be improved to develop more broadly and have competitiveness. SME competitiveness can be achieved one of them with the competence of SMEs. Competence is a basic trait of a person which is itself related to the implementation of a job effectively or very successfully (and underlying characteristic: of an individual which is causally related to effective or superior performance in jobs) [1]. The right competencies of SMEs actors in accordance with the demands of the job, then will be able to work in accordance with their abilities, knowledge, and skills.

Currently, Indonesia is entering the era of the industrial revolution 4.0. The term Industry 4.0 was the first time in Germany precisely when the Hannover Fair was held in 2011 [2]. Some other countries use different terms such as Smart Factories, Industrial Internet of Things, Smart Industry, or Advanced Manufacturing in realizing Industry 4.0. The impact on industry in Indonesia encouraged the government to implement Industry 4.0 by taking advantage of opportunities in the fourth industrial revolution era. The Industrial Revolution 4.0 is still at a visionary stage but a realistic concept, including Internet of Things, smart manufacturing, and cloud-based manufacturing. The Industrial Revolution 4.0 focuses on human integration results in continuous improvement.

The Making Indonesia 4.0 strategy launched by the ministry of industry as a road map on Indonesia's strategy in entering the Industrial Revolution 4.0 so that Indonesia can compete with other countries. One of the priority strategies for Making Indonesia in the 4.0 Industrial Revolution is the empowerment of Micro, Small and Medium Enterprises [3]. Small and Medium Industries are the drivers of economic sector development in each country, especially developing countries, [4]; [5]; [6];
Micro, small, and medium enterprises in Indonesia are growing rapidly ranging from 90-95%. The very rapid and significant development of SMEs, is also experienced in East Java Province. According to the national economic census that the number of SMEs each year has increased, in the year 2012 of 6.8 million, it increased to 9.59 million in 2017.

The development of Small and Medium Industry (SMIs) in entering the 4.0 industry, required competence and readiness of SMIs. Business competence, as defined by [10] is sufficient knowledge, expertise, and ability to meet the needs, such as the effective performance of a job. Compile many variables that explain business competence is knowledge, cognitive abilities, self-management administration, human resources, decision skills, leadership, opportunity recognition, and opportunity development [11].

Readiness is important in fostering the interest of SMIs, because with readiness means that one can be said to be able to take action even though many risks must be faced. Readiness is a concept of change that is a concept of development and movement. E-readiness is one of the tools to evaluate the readiness of a country or business in an integrated way to adopt, use and utilize information technology, so that it can be developed to rationalize actions, improve competitiveness, and manage resources efficiently [4]; [12] Therefore, the research objective is in the form of model development to identify competency factors and the readiness of SMIs towards the industrial revolution 4.0.

Competencies of Small and medium industry
Competence is knowledge, skills, and abilities possessed or achieved by a person, which is part of him/her, so he/she can carry out the appearance of cognition, affection, and certain psychomotor behavior [13]. Competence can be in the form of goals, temperament, self-concept, attitudes or values, problem mastery, or cognitive and behavioral skills. Every individual trait that can be measured or counted clearly and can be shown to clearly distinguish a superior behavior from an effective behavior from an ineffective offender [1].

The competence showed underlying behavioral characteristics that describe motives, personal characteristics, self-concept, values, knowledge or expertise that brought a person who performs a superior (superior performer) in the workplace[14].

Individual competence plays a role in innovation especially for SMEs [10]. Research conducted [1], [15] shows that competence is needed in micro, small and medium businesses.

Competencies can be divided into 2 (two) categories, is "threshold competencies" and "differentiating competencies" [14].

1. Threshold competencies are the main characteristics that must be possessed by someone to carry out their work. But not to distinguish a high-performance and average person.

2. Differentiating competencies are factors that distinguish individuals who work high and low.

Readiness of small and medium industries
The potential for rapid technological development benefits consumers, and along with that, there are also concerns about the frustration of consumers with the technology system [16]. The concept of readiness has been developed to rationalize actions, increase competitiveness, and manage resources efficiently [7]. Furthermore, research [5] shows that the readiness of MSMEs is seen from the intention of MSMEs in adopting information technology from the perception of ease of use and usefulness supported by the basis of optimism, innovation, and a sense of security in the ease of use of IT, but feel insecure and uncomfortable.

The concept of readiness is not only about physical maturity but also a combination of emotional stress and situations as a result of the learning environment and the results of new operations. Readiness to change appears to be an important maturity or measure of enthusiasm in carrying out e-business. Related to technology readiness, users are grouped into five segments is explorers, pioneers, skeptics, paranoids, and sluggish [17]. In the scenario of IT adoption by SMEs introduced by [18] most SMEs in Indonesia are still in the stage of level 1, is using IT for internal-oriented functional integration.

Industrial Revolution 4.0
Industry 4.0 refers to the latest technological advancements with the internet as supporting technology, so that needed guidance and support for the alignment of strategies and business operations. Industry Readiness 4.0 is explained in IMPULS Industrie 4.0 readiness measured in 6 dimensions (strategy and
organization, smart factories, smart operations, smart products, data-driven services, employees) to indicate a company into 5 levels of readiness. [7]. The aspect that is largely influenced is the business aspect. "Overall, four main effects are facing the Industrial Revolution 4.0 on business customer expectations, product improvement, collaborative innovation, and organizational forms" [19]. Furthermore, Industry 4.0 technologies are under rapid development and consequently the theoretical and conceptual understanding [20]. Nine technologies have been proposed to unfold the Industry 4.0 umbrella [20]: 1) big data and analytics, 2) autonomous robots, 3) simulation, 4) horizontal and vertical system integration, 5) internet of things (IoT) (including sensors), 6) cyber-security, 7) the cloud, 8) additive manufacturing and 9) augmented reality. 10) artificial intelligence, 11) mobile technologies and 12) RFID and RTLS technologies [21]; thus, the total number of technologies to be studied counts 12.

2. Methods

This model development study was carried out in four stages (Figure 1). First, a preliminary study is carried out by conducting preliminary preparations, is a literature study and preparing a model to be developed including looking at SMI Competencies and SMI Readiness. After that, formulate research to be conducted. The second produced a draft model. Third, the results of the design of the model will then result in the development of the instrument. At this stage, determine the indicators, and then develop questions from each measurement item by considering the research context. Finally, the implementation of research instrument development.

3. Results and Discussion

Theory of Reasoned Action is an individual performance of behavior that has been determined to be determined by the intent of the action to be carried out with the goal of behavior together determined by individual attitudes and subjective norms [22]. This theory connects belief, attitude, intention, and behavior. Attitudes influence behavior through a careful and reasoned decision-making process and its impact is limited to only three things; First, behavior is not much determined by general attitude but by a specific attitude towards something. Second, behavior is influenced not only by attitude but also by subjective norms, is our beliefs about what other people want us to do. Third, attitudes toward a behavior together with subjective norms form a certain intention or intention to behave [22].

The Theory of Reasoned Action model its use can be developed into the conceptual model of the competence and readiness of SMIs in the face of the industrial revolution 4.0. In the competence of SMI has the characteristics of knowledge, skills, and abilities [14]. The TRI model departs from the [17] definition of Technology Readiness, individual readiness is a significant factor influencing user adoption.
of new technologies [17]. TRI measures the readiness of SMIs to use new technology, in general, using four characteristics: optimism, innovation, inconvenience, and insecurity.

The model produced in this paper is a combination of the Small and Medium Industry competency model [10], [14], [15], [23] and the SMI readiness model [17], [20] [21], [24], [25].

![Figure 3. The Proposed Model](image)

From the above model, it can be developed again into 7 indicators and 27 items. The following items in the model:

### Table 1. List of Variables, Indicators, and items

| Variables               | Indicators                  | Item                                         | Reference                  |
|-------------------------|------------------------------|----------------------------------------------|----------------------------|
| SMI Competence          | Knowledge of SMEs actors     | 1. Level of Technology Mastery               | [10], [14], [15], [23]    |
|                         |                              | 2. Manage Business                          |                            |
|                         |                              | 3. Market share                             |                            |
|                         |                              | 4. Managing Finances                        |                            |
|                         |                              | 5. Training                                 |                            |
|                         | Skills of SMEs actors        | 1. Production process                       |                            |
|                         |                              | 2. Communication                           |                            |
|                         |                              | 3. Promotion                                |                            |
|                         |                              | 4. Information Technology                   |                            |
|                         | Ability of SMEs actors       | 1. Managing Finances                        | [17], [21], [24], [25]    |
|                         |                              | 2. Innovation                              |                            |
|                         |                              | 3. Business Associates                      |                            |
|                         |                              | 4. Technology                               |                            |
| SMI Readiness           | Optimism                    | 1. Easiness                                 | [17], [21], [24], [25]    |
|                         |                              | 2. Connectivity                             |                            |
|                         |                              | 3. Efficiency                               |                            |
|                         |                              | 4. Effectiveness                            |                            |
|                         | Innovation                  | 1. Independency                             |                            |
|                         |                              | 2. Challenges                               |                            |
|                         |                              | 3. Stimulation                              |                            |
|                         |                              | 4. Strength                                 |                            |
|                         | Inconvenience               | 1. Difficulty                               |                            |
|                         |                              | 2. Trust                                    |                            |
|                         |                              | 3. Incompatibility                          |                            |
|                         | Insecurity                  | 1. Failure                                  |                            |
|                         |                              | 2. Threats                                  |                            |
|                         |                              | 3. Incredulity                              |                            |
In terms of model development this research will give two main points is trust and validity of the problem. Readers can pay attention to how the author uses the assumption of the development of the competency model of SMI ([10], [14], [15], [23]) and the readiness of SMI [17], [21], [24], [25] by combining two models and adjusting indicators and questions at the SMI in the face of Industrial Revolution of 4.0. The above variable is defined as a condition where the competence of SMIs and the level of readiness of the SMIs developed will state their characteristics in Small and Medium Industries from the point of view of the industrial revolution 4.0 in Jawa Timur.

| Indicator of SMEs Actors | Item | Statements of questionnaire |
|--------------------------|------|----------------------------|
| Knowledge of SMEs Actors | Level of Technology Mastery | Knowledge I have about technology, pushing for entry into the Industrial Revolution of 4.0 |
|                          | Manage Business              | I have knowledge of how to manage the business of IKM in entering the Industrial Revolution 4.0 |
|                          | Market share                 | I have knowledge of market share in entering the Industrial Revolution 4.0 |
|                          | Managing Finances            | Knowledge I have related to managing financial push to get into the Industrial revolution of 4.0 |
|                          | Training                     | Training on IT that I follow, encouraged me to enter the Industrial Revolution 4.0 |

| Skills of SMEs Actors | Production process | Skills I have in the production process, pushing into the Industrial Revolution of 4.0 |
|                      | Communication      | Skills I have in using social media can be used in communicating with customers to enter the Industrial revolution of 4.0 |
|                      | Promotion          | I have skills in promoting digital based products such as e-commerce, Instagram, and Facebook to enter the Industrial revolution of 4.0 |
|                      | Information Technology | Skills I have in using technology to push financial reporting to enter the Industrial revolution of 4.0 |

| Ability of SMEs Actors | Managing Finances | I have the ability to manage finances with mobile-based accounting applications pushing to enter the Industrial revolution of 4.0 |
|                       | Innovation        | I have the ability to innovate in the production process so as to push in the Industrial Revolution 4.0 |
|                       | Business Associates | I have the ability to cooperate with business associates in entering the Industrial revolution of 4.0 |
|                       | Technology        | The ability I have in utilizing technology to support good business in entering the Industrial revolution of 4.0 |

| Optimism | Easiness | I believe that technology is easy to use and free from obstacles and difficulties |
|          | Connectivity | I can sell my business products online |
|          | Efficiency  | My efforts can run smoothly with limited resources |
|          | Effectiveness | My efforts get the maximum Output |

| Innovation | Independency | I can innovate in the production process of a product |
|            | Challenges   | Technology as a means and infrastructure can support in achieving business objectives |
|            | Stimulation  | The technology I use can drive in achieving goals |
|            | Strength     | I can support the effort of becoming more successful |
| Indicator  | Item          | Statements of questionnaire                                                                 |
|------------|---------------|---------------------------------------------------------------------------------------------|
| Inconvenience | Difficulty  | Technology that is the facility and infrastructure of SMI make comfortable in working       |
|             | Trust         | I'm sure with the technology I use in production                                             |
|             | Incompatibility | The effort I run according to what I planned                                               |
| Insecurity | Failure       | I have experienced failures in producing my business                                         |
| Threats     | Incredulity   | I use technology that doesn't harm others                                                    |
|             |               | The technology I use can improve my business                                                  |

4. Conclusions

This study will increase the understanding of how the SMI competence and the readiness of the SMI from the perspective of the 4.0 Industrial Revolution. The author proposes a combination model by integrating three indicators of the SMI competency model and four indicators of the SMI readiness model, in terms of the development of the SMI. In addition to the development process of clarity, coherent relationships among the models, variables, indicators, and questions of each indicator are also indicated by the author. With regard to the limitations of research around the understanding, assumptions, and problem of the author's perspective as a point of consideration for future work, the proposed model and its instruments can also be recommended to proceed to the development stage.

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