

# Factors Affecting the Implementation of the Teaching Factory in Vocational High Schools of Mechanical Engineering in East Java Indonesia

Dani Irawan<sup>a\*</sup>, Haris Anwar Syafrudie<sup>b</sup>, Dwi Agus Sudjimat<sup>c</sup>, Isnandar<sup>d</sup>,  
<sup>a,b,c,d</sup>Faculty of Engineering, State University of Malang, Indonesia, Email:  
<sup>a\*</sup>[the\\_boymaster2@yahoo.com](mailto:the_boymaster2@yahoo.com)

This study aims to find out the factors that significantly influence the model of the Teaching Factory (Tefa) implementation in terms of management, workshop, learning, human resources, marketing, industrial relations, and products in Vocational High Schools of Mechanical Engineering in East Java Indonesia. Data was taken from 105 teachers in 7 schools. Data analysis techniques used SEM (Structural Equation Modelling) with SPSS version 23 and AMOS 21. The results showed that the factors that significantly affected the product were management, workshop, learning and human resources. Factors that significantly influenced the implementation of Tefa were management, workshop, marketing and products. The interpretation of this relationship structure is that management, the availability of proper workshops, the availability of marketing and the presence of high products or productivity results, determines the determinants in the implementation of Tefa.

**Key words:** *Teaching Factory, Vocational High School, Product, and Industry Relations.*

## Introduction

Vocational High Schools in Indonesia will face real major challenges in the upcoming years due to the rapid change of the goods' production system; students must as soon as possible be introduced to the latest technological developments and upcoming technology. In the future, more practice-oriented teaching is required. Therefore, adaptation in the teaching and content of training and delivery mechanisms, related to the technology of the field of manufacture,

should be adjusted to the development of the current industry. Existing work situations are being taken into classrooms. This is because of the flexibility and learning changes have been identified as the production requirements of the industry to address a wide range of problems, related to the resources of one of the right learning methods by the teaching factory (Tefa) (Rentszoz, et al., 2014).

About the implementation of the Tefa, there is a problem in management that the financial administration is closed to the school citizen (internal stakeholder). The School Committee (external stakeholders) is not involved in the management of the Tefa program. It is based on the presentation that the management of the Tefa program has not adopted the principles in school-based management (SBM), especially the principles of accountability, transparency, and participation. The Vocational High School curriculum lacks support for the implementation of the Tefa program, which is evidenced by the unavailability of documents used as a reference to the implementation of the Tefa program (Widarto, 2008).

Furthermore, human resources (HR) problems, for which most teachers do not have industry experience, make them weak in the sense of quality, efficiency, and innovation. The Tefa activities are constrained by low motivation and innovation. This can be seen by the resulting product form and has not yet led to the use of a product and teamwork that is not optimal yet (Hidayat, 2012). The quality of teachers underpins the implementation of the Tefa program, which can be seen by the low academic standards for the teacher, especially productive teachers associated with the implementation of Tefa. The prolific teacher/educator of five productive teachers is only two productive teachers who once interned in the industry and have a certificate of competence, while three other productive teachers do not yet have the qualifications. This will certainly impede the achievement of the objectives of the implementation of the Tefa itself. Similarly, the education personnel who are directly related to the program Tefa has not run its task with an optimisation seen by the unavailability of the Tefa program documents (Gali, 2014).

Besides, the problems related to learning, poor teaching materials, products produced which are still unused objects (discarded), the lesson plan (Indonesian: *Rencana Pelaksanaan Pembelajaran*, RPP) serves purely educational purposes and does not implement culture industry; the scoring system has not described the function of a product (has not yet prioritised quality and efficiency). The implementation of learning used conventional models (learning class models), and did not pay attention to the ratio of teachers, participants and practice tools (GIZ, 2016).

The problem in the relationship of industry consumer distrust of the executive team, because most who are practising are students who want to learn and should be accompanied by experts from the industry. In the absence of the assessor team, there is no production plan

because it relies only on orders from consumers, so if there is no order then nothing is done/produced; the dependence of production on the number of orders from consumers causes the management team to become lazy and is reluctant to innovate to create another product (Fajaryati, 2012).

The problem of the product is that the service provided to the partner is not able to reach the desired target, there is a delay of the goods made, the price does not correspond to the agreed amount, and even the goods made do not work by original and impressed trial and error. Of course, this cannot reach the goal of the implementation of the Tefa, which helps students in the Vocational High School prepare for the workforce, as well as helping to establish cooperation with the actual workplace. This is due to teachers who are less able to give lessons and training, and lack the concept of design and manufacturing of products and services required by the partners (Fathurrohman, 2016).

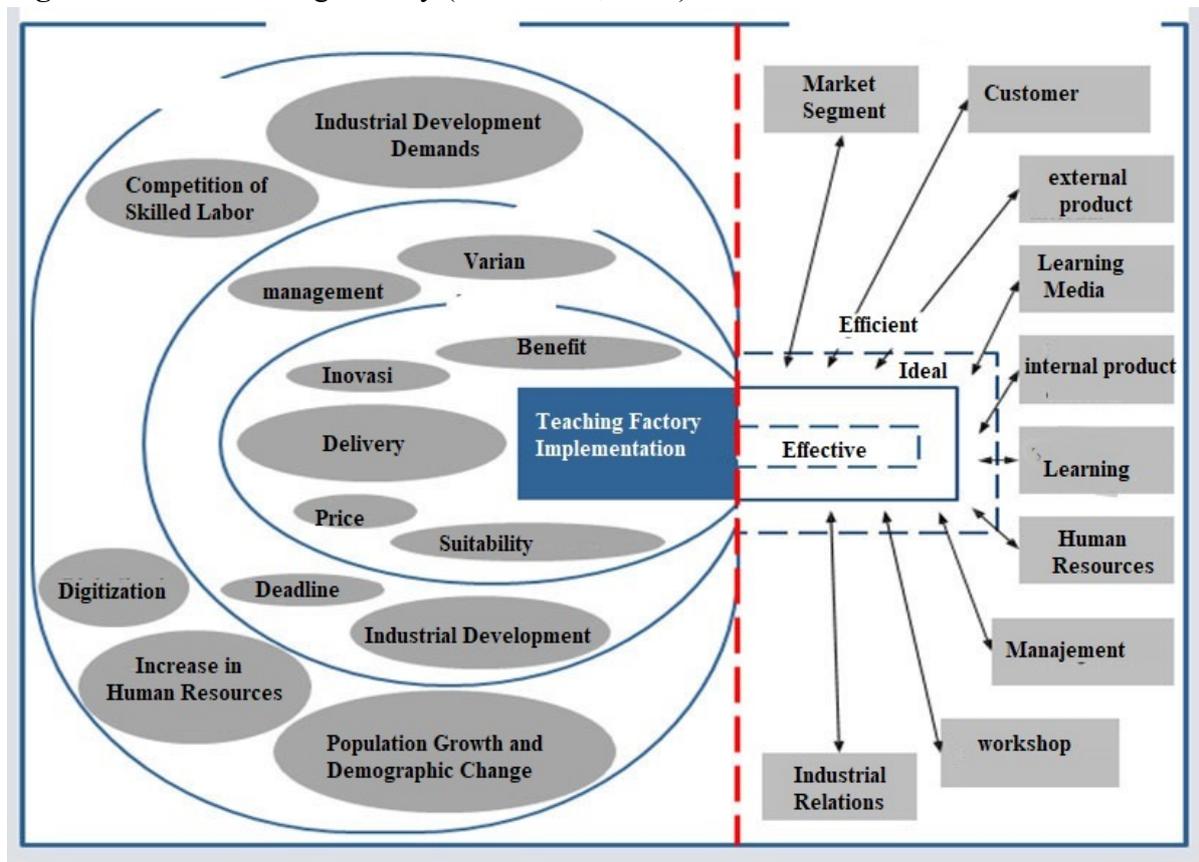
Based on issues relating to the implementation of Tefa, this research aims to find factors affecting the teaching factory as reviewed from the management, workshop, learning, human resources, and marketing industry relations, mediated by the quality of products in the Vocational High School.

## **Literature Review**

### ***Teaching Factory Concept***

The simple concept of Tefa is the development of dual system education, known as Competence-Based Training (CBT), and Production Based Education and Training (PBET) which is implemented by the school. Schools are still struggling to implement production-based education. Therefore, the term Tefa requires the school to have a place for students to perform practical learning that is designed in such a way that it resembles a working environment. The implementation of the Tefa model combines fully between study and work, no longer separating between the place of delivery of theoretical material and the place of production material (practice) (Triatmoko, 2009).

**Figure 1.** Ideal Teaching Factory (Dinkelman, 2016)



Based on Figure 1, Tefa presents actual industry in the school environment so that it can prepare the graduates to be ready for work. To realise Tefa in the Vocational High School, it is necessary to have the synergy in the implementation of Tefa through the process of learning with the production and technology in the management of the utilisation of human resources and facilities. The implementation of Tefa in Vocational High School in Indonesia, especially mechanical engineering, only implements 7 components that are: (1) management, (2) workshops, (3) learning; (4) human resources, (5) marketing, (6) industry relations, (7) products. Why is that? It is because to produce the products with internal and external needs requires high costs and time. In a factory, someone works for 8 hours a day and only handles one area of work to produce a product, while students have limited time for the production of goods and the learning process. Furthermore, in the aspect of teaching materials, there is no distinction between training learning patterns and teaching materials; the implementation of Tefa only uses training learning patterns, while teaching materials are included. The learning materials and patterns of training according to Dinkelman, are separate because of the variety of products produced. Then in the aspect of customer and market segment they are also not used because the implementation of Tefa in the Vocational High School has been in cooperation with the industry.

## ***Factor Affecting of Teaching Factory***

### ***Management***

Management is a process of planning, organising and coordinating, as well as the supervision of resources to achieve goals effectively and efficiently (Tandjung, 2004). Effective means that objectives can be achieved by the contemplation, organisation, coordination, and control. Efficiently means tasks that are executed correctly, organised, and by the schedule. The opinion has 3 (three) forms of management which are: a process, as a collective of the actors, and as knowledge.

### ***Workshop***

The engineering practice space is divided into several spaces: bench work area, measurement, and metal testing space, lathe working area, Frais machine work area, grinding machine, drilling machine, fitting workspace, storage space, and space Instructor. Each practice room has a means by the functions of each consisting of furniture, equipment, learning media, and other supplies (Adelman & Taylor, 2015).

### ***Learning***

The training is learning that aims to help students gain skills and knowledge to perform the task by the predefined standards (Bertram, 1990). The training learning pattern is a pattern of Tefa Learning in activities aimed at the students to follow the learning by the real activities in the industry, in which case schools are required to bring the industry which wants to give education in school and follow-up, usually on the recruitment of labour. An industry-class curriculum is organised by schools and industries; the role of the industry here is required to scenario the learning process that produces graduates who are in line with the demands of the workplace.

### ***Human Resources***

Human Resources (HR) in the Tefa is the people who give their energy, talents, creativity, and efforts in carrying out the objectives of the Tefa. The implementation of the Tefa must have experienced human resources production in Tefa, as well as human resources who can innovate and cooperate well in the team. Tefa Human Resource is the number of human resources capable of implementing Tefa and directly involved in the implementation of the distribution of work and the authority that has been running smoothly and by SOP (Dharmessta & T Hani, 2013).

### ***Marketing***

Marketing is an activity that facilitates and expedites a mutually satisfying exchange relationship through the creation, distribution, promotion, and price determination of goods, services, and ideas (Philip, Koler, 2002). The other sense of marketing is a whole system of business activities aimed at planning, determining a price, promoting, and distributing goods and services that satisfy good needs to existing buyers or potential buyers (Arifin, 2013).

### ***Industry Relation***

Industry relations is an effort to improve cooperation with the business and the industrial world and is essentially quite positive for large-scale industries in both moral and material support. Relationships with external members are conducted through partnerships in internship program activities (Indonesian: *Praktek Kerja Industri*; English: Field Industrial Practice), information mechanisms and through tasks, current proposals, audiences, and promotions with local government and UNICEF involvement (Enke & Matternic, 2016; Budiwati, 2004)

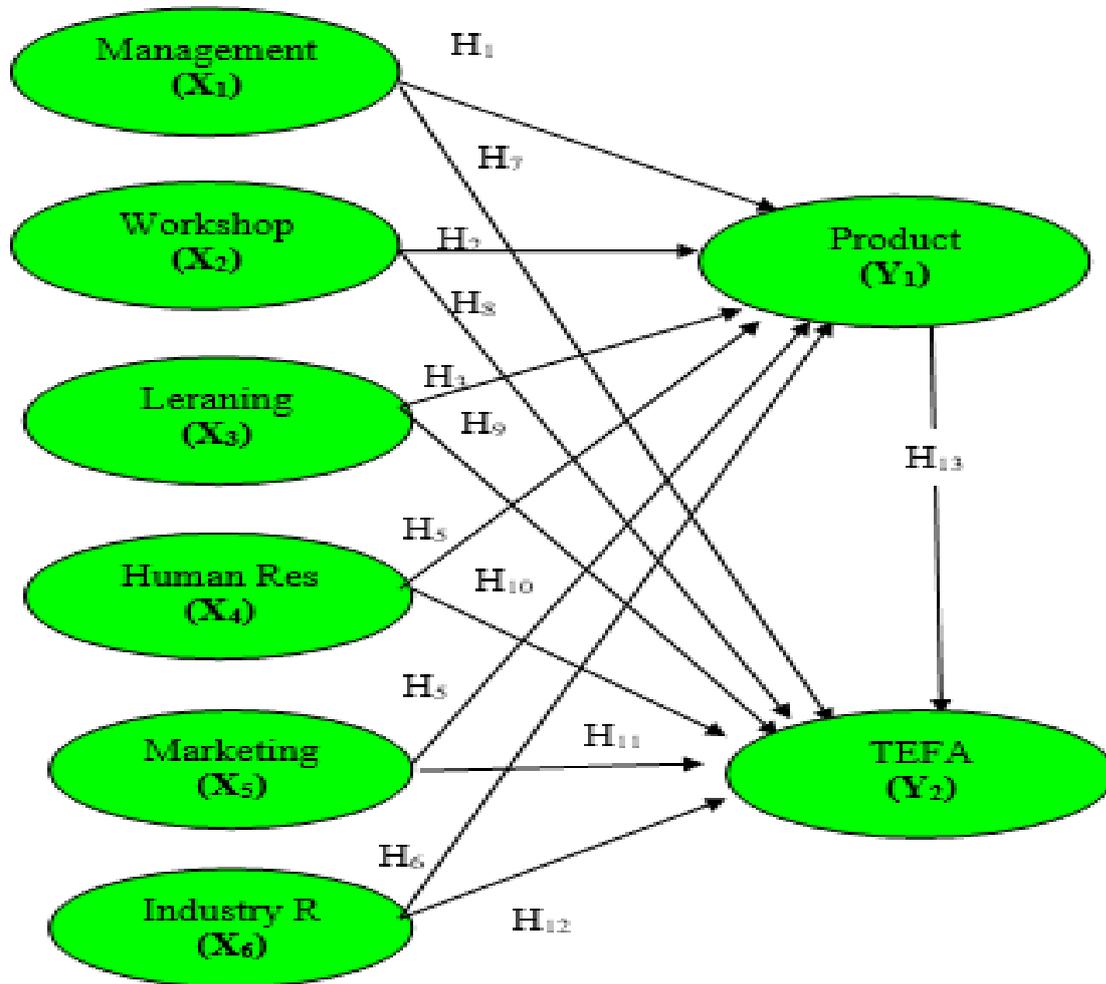
### ***Product***

The type of industry in the production system are: Make to stock, make to order, assemble to order, and engineer to order. About the Tefa study in the Vocational High School, the industry types in the production system are often applied both in whole and in part. The production system draws a learning atmosphere with industry (Damiri, 2012). With regards to the next product, this is after-sales; after-sale is a service given by the company to a consumer after the occurrence of the transaction. Service Parts is that component or subassembly that may be needed at some time to keep the appliance or device operable for the user. The component or Assembly will be required to satisfy the original warranty to repair the appliance or device beyond the basic warranty period, and be available at all the times to ensure and protect the goodwill of purchases that will maintain his brand Loyalty. The product is the result of learning the teaching Factory. The products have been standardised, have good quality and are appropriate, with orders or industry needs (Rentzos, et al., 2014)

### **Research Model**

The conceptual framework that shows patterns and relationships between research variables, the conceptual framework of this research is as follows:

**Figure 2.** Conceptual Framework



Based on Figure 2, the hypothesis model in this study can be formulated as follows

- H<sub>1</sub> : Management has a significant effect on the product.
- H<sub>2</sub> : Workshop has a significant effect on the product.
- H<sub>3</sub> : Learning has a significant effect on the product.
- H<sub>4</sub> : Human resources have a significant effect on the product.
- H<sub>5</sub> : Marketing has a significant effect on the product.
- H<sub>6</sub> : Industry relations have a significant effect on the product.
- H<sub>7</sub> : Management has a significant effect on Tefa.
- H<sub>8</sub> : The workshop has a significant effect on Tefa.
- H<sub>9</sub> : Learning has a significant effect on Tefa
- H<sub>10</sub> : Human resources have a significant effect on Tefa
- H<sub>11</sub> : Marketing has a significant effect on Tefa.
- H<sub>12</sub> : Industry relations have a significant effect on Tefa.
- H<sub>13</sub> : The product has a significant effect on Tefa.

## Methodology

### *Population and Sample Size*

The population of this study is all accredited "A"; the public and private vocational high school of mechanical engineering have implemented Tefa learning and completed the basic SMK data on the website <http://datapokok.ditpsmk.net> in East Java. SMKs that meet these requirements are SMK 1 Blitar, SMK N 2 Pasuruan, SMKN 5 Surabaya, SMK Semen Gresik, SMK PGRI 1 Gresik, SMKN 1 Pungging Mojokerto, and SMK Raden Patah Mojokerto. The study population is presented in Table 3.1 as follows:

**Table 1:** Population and Sample

No	Name of School	Total of Population	Total of Sample
1	SMK Islam 1 Blitar	25	17
2	SMKN 2 Pasuruan	21	15
3	SMK N 5 Surabaya	27	18
4	SMK Semen Gresik	23	15
5	SMK PGRI 2 Gresik	17	12
6	SMKN 1 Pungging Mojokerto	23	16
7	SMK Raden Patah Mojokerto	18	12
	Total	154	105

Based on Table 1 the sampling technique used to determine the research sample is proportionate stratified random sampling because path analysis has the assumption of random sampling or probability sampling. To determine the number of study samples I used a random number table with an error level  $\alpha = 5\%$ , from the Isaac and Michael Tables (Cohen, et al., 2007). With a population of 154, the sample used was 105 teachers. To get a balance of the number of samples in each school, carried out proportionally we used the formula (Winarsunu, 2006: 12).

$$JSB = \frac{JST}{JPT} \times JPB$$

(Winarsunu, 2006: 12).

Note: JSB = number of sample parts,  
ANN = total sample size,  
JPB = number of section population,  
JPT = total population.

From the calculation of the number of samples using the formula above was obtained by the number of samples for each school as presented in Table 1

### **Data Analysis Technique**

Data analysis techniques were based on the conceptual framework and the research design; this study used the SEM analysis techniques (Structural Equation Modelling) with the program SPSS version 23 and AMOS 21. Structural Equation Modelling is statistical techniques, allowing us to test a series of relatively complicated relationships simultaneously.

### **Findings**

#### ***The Results of the Tests of Goodness of Fit***

A model is said to be good if the hypothetical development is conceptually and theoretically supported by empirical data; structural equation model test results are shown on the following picture:

**Figure 3.** Path Analysis

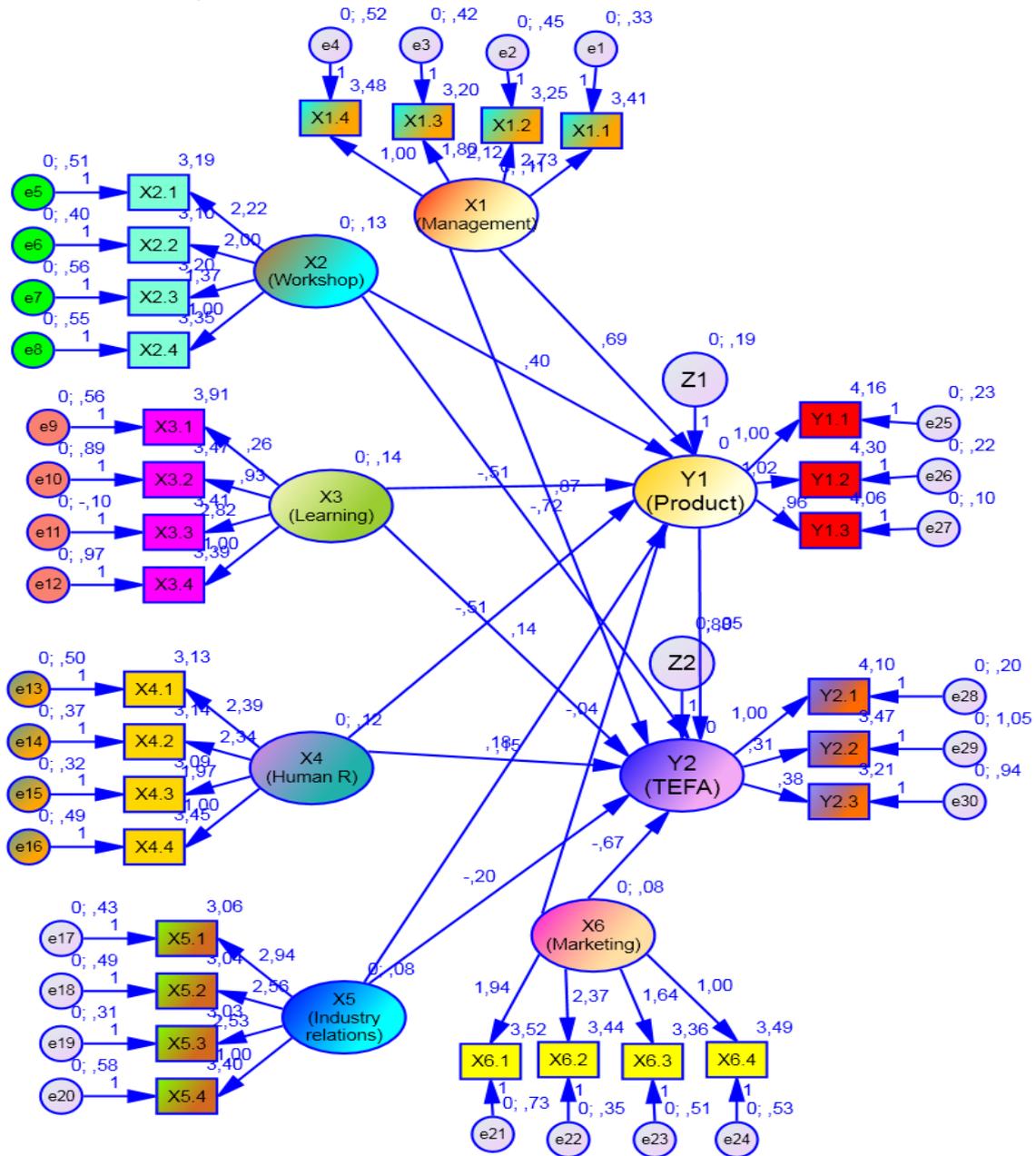


Table 2 below represents the final model *Goodness of Fit Structural Index* values showing  $\chi^2$  / Chi-Square 1119,7, probability 0.057, GFI 0.971, AGFI 0.905, TLI 0.424, CFI 0.481, RMSEA 0.134 and CMIN/DF 2.857. Referring to the opinion of Solimun (2002) which states based on parsimony rules, if there is one or two Criteria fit model that has been fulfilled then the model has been declared fit. These results indicate the expected range of values so that the model can be accepted.

**Table 2:** Final Model Goodness of Fit Structural Index Value

The goodness of fit index	Cut-off Value	Model Test Results	Remarks
$\chi^2$ /Chi-Square		1119,7	
Probability	$\geq 0,05$	0,000	Not Fit
GFI	$\geq 0,90$	0,971	Fit
AGFI	$\geq 0,90$	0,905	Fit
TLI	$\geq 0,90$	0,424	Not Fit
CFI	$\geq 0,90$	0,481	Not Fit
RMSEA	$\leq 0,08$	0,134	Not Fit
Relative $\chi^2$ (CMIN/DF)	$\leq 2,00$	2,857	Not Fit

### *Hypothesis Testing*

If models are already ascertained fit, then, the next step is to test the hypothesis that tests the causal relationship, i.e. testing whether endogenous or exogenous variables between the effect on endogenous variables has appropriate reference in the hypothesis. At the stage of testing, this hypothesis can also note the value of the coefficient of the respective relationships between variables. The value of the coefficient of relationship is to know the direction of the relationship, whether positive or negative and if there are big changes in endogenous variables and exogenous variables or if they changed at all. Table 4 below is the result of testing the research hypotheses showing the following results.

**Table 3:** Coefficient of Path Between Variables

Relationship Structure	Path Coefficient	P	Remarks	Hypothesis
Product <-- Management	0.689	0.003	Significant	Accepted
Product <-- Workshop	0.402	0.031	Significant	Accepted
Product <-- Learning	-0.506	0.006	Significant	Accepted
Product <-- Human Resources	-0.508	0.010	Significant	Accepted
Product <-- Marketing	-0.037	0.864	Not significant	Denied
Product <-- Industry relations	0.178	0.401	Not significant	Denied
Tefa <-- Management	0.867	0.003	Significant	Accepted
Tefa <-- Workshops	-0.723	0.004	Significant	Accepted
Tefa <-- Learning	0.135	0.411	Not significant	Denied
Tefa <-- Human Resources	0.153	0.448	Not significant	Denied
Tefa <-- Marketing	-0.670	0.033	Significant	Accepted
Tefa <-- Industry relations	-0.204	0.391	Not significant	Denied
Tefa <-- Product	0.881	0.000	Significant	Accepted

**Hypothesis 1.** Management has a significant effect on the product

Regression (standardised estimation) is generated at 0.689 and  $p = 0.003$ . This means that management has a significant positive effect on the product. Because the main action in the management of a product is planning. Planning must be made according to the purpose of making the product. Operational management is the relationship with how it should be related to one's needs and priorities. Good-quality products are produced from good planning. Quality is the ability of a product or service to meet the needs of its customers. There are three approaches to this: the first is user-based quality in which the quality depends on the audience. This approach is usually used by marketing people and customers. The second, manufacturing-based quality is typically applied by production managers. In this approach, the quality of goods means the fulfillment of standards, where products are made properly from the beginning. The third is a quality based product that looks at that quality as a variable whose position can be calculated. This is in line with the theory and results of the research Hidayat (2012), McIntyre, et al (2007), Ogorodnyk, et al (2016).

**Hypothesis 2.** Workshop has a significant effect on product

Regression (standardised estimation) is generated at 0.181 and  $p = 0.049$ . This means that the workshop has a significant positive effect on the product of learning teaching Factory, because the workshop governance is one of the operational strategic decisions that also determine the operational efficiency in the long term. Proper workshop governance demonstrates the characteristics of the layout of the operational facilities that are made with the product or type of service produced and the conversion process. Good governance will contribute to increased productivity. This is due to the smooth flow of production factors that will be processed, starting from being prepared and delivered into processing until the final product. Besides, students and teachers who are directly involved in processing can move more freely without worrying about the possibility of accidents. Thus, a good layout will also cause students to work safely and away from pressure. This is in line with the theory and results of the research of Ori, Eyal. (2007), Müller-Frommeyer, et al (2017).

**Hypothesis 3.** Learning has a significant effect on product

Regression (standardised estimation) is generated at 0,127 and  $p = 0.080$ . This means that learning has no significant positive effect on the product. Learning is assumed by production-based learning, which means students are involved in the production process. Furthermore, the steps that must be taken to manage the learning by the objectives that are to be achieved, are through the management of learning to improve the competencies that are appropriate to the industry world including:(1) learning skill process design based on actual procedures and standards. (2) the learning settings are made according to the reality in the industry. (3)

Learning is centred on student active learning and learning by doing. (4) Designing Learning for learning objectives that enhance the ability of soft skills (independent, cooperation, unyielding, responsibility and so on). (5) Socialise learning activities to all the school's stakeholders to become a goal understanding. (6) Evaluate. This is in line with the research theory and results of Baena, et al (2017), Björklund, et al (2013). Dobson, (2003), Hidayat. D, (2012), Müller-Frommeyer (2017), Tisch, et al (2016).

**Hypothesis 4.** Human resources have a significant effect on the product

Regression (standardised estimation) is generated at 0.016 and  $p = 0.820$ . This means that human resources do not have a significant positive effect on the product. Because human resources in producing products are employees, teachers/instructors, and students involved in the activities of Tefa. Tefa aims to improve competence. Therefore, Tefa must involve every student in the conduct/process of the production undertaken. This agrees with the statement from Lamancusa (2008) that students prefer a real-life experience rather than listening to lectures from professors in a book or presentation. These live and real experiences will always be remembered by the students for a long time after the learning process is passed. Besides the involvement of students in the implementation of Tefa, the school also needs the availability of teachers who serve specifically to run the production process. The existence of this teacher is necessary for the reason that the availability of products is one of the key successes in doing business. This is in line with the theory and results of the research of Krúckhans, et al (2015), Murwaningsi (2017), Leung & Simon (2010), Shieh, Chich-Jen, et al (2009).

**Hypothesis 5.** Marketing has a significant effect on product

Regression (standardised estimation) is generated at 0.178 and  $p = 0.401$ . This means that marketing does not have a significant positive effect on the product. Because marketing/promotion with the system and its activities can familiarise consumers with the product and name, the company brand name offered. One important marketing decision in a product strategy is a decision about the brand. This is because at this time the marketing aspect not only leads to the function of the product only, but will focus more on the battle of the brand. If a brand is capable of meeting consumer expectations or even exceeding consumer expectations and providing quality assurance on every occasion of its use, the brand is produced by a reputable company; therefore, the consumer will be more confident with the choice and consumers will have confidence in the brand, like the brand, and consider the brand as a part of them. Thus, brand loyalty will be easier to set up and the company will have a brand name that has strong consumer loyalty as brand Trust will determine consumer loyalty to the brand and trust will potentially create relationships of high value. This is in line

with theory and research results Fajaryati. N (2012), Hamidi, et al (2008), Küsters & Gloy (2017), Tvenge, et al (2016).

**Hypothesis 6.** Industry relationships have a significant effect on product

Regression (standardised estimation) is generated at 0.256 and  $p = 0.00$ . This means that industrial relations have a significant positive effect on the product, because industrial relations are related to inputs, processes, outputs, and utilisation of graduates. Industrial relations can be done with government and non-governmental institutions such as universities, equivalent schools, as well as business and industry in its environment. The school must develop cooperation and partnerships with the community, industrial world, business world, alumni and other units of education in the country and abroad. Furthermore, the partnership relates to human relationships with the interests of stakeholders, which is based on the balance of power. Partnerships are complex subjects that are difficult to describe and analyse, because partnerships do not merely forage old values or nostalgia back to the past. Partnerships require moral and fair responsibility as an essential foundation of every partnership. This is in line with the theory and results of the research of Ekawati, (2012) Enke & Metternich (2016), Lamancusa, et al (2008), Ori, Eyal (2007), Rentzos, et al (2016), Widarto (2008). Ozsagir, et al (2010).

**Hypothesis 7.** Management has a significant effect on Tefa

Regression (standardised estimation) is generated at 0.046 and  $p = 0.582$ . This means that management has a significant positive effect on Tefa, because the relationship between operational management on the implementation of Tefa management affects the implementation of Tefa Sampurno, et al (2013) The implementation of management of good quality is done through planning, with the creation of long-term, medium and short-term plans; the implementation is done by integrating into the curriculum to involve all students, as well as supervision with conducting routine coordination. This is in line with the theory and results of the research of Dadang, H (2012), McIntyre, et al (2007), Ogorodnyk & Holtskog (2016).

**Hypothesis 8.** The workshop has a significant effect on Tefa

Regression (standardised estimation) is generated at 0.210 and  $p = 0.030$ . This means that the workshop has a significant positive effect on Tefa. The significant relationship between the workshop governance to the implementation of the Tefa workshop affects the implementation of Tefa. The development of the workshop is done by empowering or optimising the utilisation of workshop equipment facilities and cooperation with the repair workshops in the industry. Development of the Model learning practice as Tefa in the machining field is in the

form of project-based learning or work-based learning. The project is presented to customers who need services from students while the work is done in the school practice workshop. The implementation of Tefa in the Vocational High School of mechanical engineering can be realised in the form of the development of the Tefa facility in the school environment and outside the school environment. The Tefa facility was developed as a result of cooperation with the outside parties from the industry or with related agencies such as the Directorate of Vocational High School. The successful implementation of Tefa: several examples of implementation are strongly influenced by the existence of a person who has a commitment, strong willingness, and competence to develop the Tefa. A very important second factor is the support of the industry or related agencies, especially in investment facilities and infrastructure for the implementation of Tefa. This is in line with the theory and results of the research of Kemény, et al (2016), Ori, Eyal. (2007).

**Hypothesis 9.** Learning has a significant effect on Tefa

Regression (standardised estimation) is generated at 0.007 and  $p = 0.928$ . This means that learning does not have a significant positive effect on Tefa. Implementation Model of learning implementation planning based on laboratory expertise competency can be flexible to follow the development of industry/business and can be implemented in school. Implementation models of the implementation stage of learning in the laboratory can follow the development of technology and engineering; the implementation Model of the Minimum Guidelines for Learning Evaluation in schools should be upgraded from a vocational level to become a complex vocational level. The development of the resulting industry learning model is learning that provides a direct experience with the industry atmosphere in the school and can improve the skills demanded by the industry. The implications of the results of this study are through this study, students can portray themselves as workers/operators and gain a direct experience of the working atmosphere at school, and can foster the entrepreneurial spirit. Tefa can improve student skills in the technical field and have conformity with skills needed in the workforce. This is because the industry provides projects to students with a wide range of activities, involving people, time, resources, skills and technology, which they will face in their work life. Students expand their knowledge and skills as they work. This is in line with the theory and results in Hidayat, D (2012), Müller-Frommeyer, et al (2017), Tisch, et al (2016).

**Hypothesis 10.** Human resources have a significant effect on Tefa

Regression (standardised estimation) is generated at 0.243 and  $p = 0.01$ . This means that human resources have a significant positive effect on Tefa. A significant human resource related to the implementation of the empirical fact indicates that there is an influence on the role of education, especially the industry Group Vocational School, in supporting the

development of the manufacturing sector. The potential of Vocational High School in creating Tefa belongs to the good category. This means that Tefa can be developed in Vocational High School. Aspects that are factors in supporting Tefa fulfillment of human resources in the production unit, motivation to make Tefa, parent support to the production unit, availability on land or building, production quality production unit, quality of production unit, Support of policies, integration of production units in learning, and the availability of raw materials of production units. This is in line with the theory and results of the research of Krúckhans, et al (2015), Murwaningsih (2017), Leung & Simon (2010), Shieh, et al (2009).

**Hypothesis 11.** Marketing has a significant effect on Tefa

Regression (standardized estimation) is generated at 0,123 and  $p = 0,391$ . This means that marketing has not a significant positive effect on Tefa. The relationship between marketing/promotion to the implementation of Tefa. Tefa aims to improve the professional and social competence of students, conducting an innovative platform to create a shared understanding between educational institutions and the world of business/industry. The teaching method allows experts/professional workers in the industry to practice and teach skills and knowledge before students enter the workforce. Tefa is an innovation for education as well as a place of production of goods/services that have a selling value, besides it can also be used as a research and testing facility formula to develop services suitable for industrial enterprises, process optimization in the laboratory. It is in line with the theory and results of Research Krúckhans, et al (2015), Murwaningsih (2017), Leung & Simon (2010). Shieh, et al (2009).

**Hypothesis 12.** Industry relations have a significant effect on Tefa

Regression (standardized estimation) is generated at 0,063 and  $p = 0.499$ . This means that Industry relations have no significant positive effect on Tefa. The collaboration between academics and industry would be very strategic to support the manufacturing industry. The focus should be on generating knowledge through research, spreading knowledge through education as well as using and applying knowledge through manufacturing. The industry must be involved in all stages of the educational process (curriculum design, Advisory Board, project sponsorship, working experience, financial support) in addition to the right environment will motivate students to study for themselves, the facility that places to Stimulating learning, therefore, facilities must be well equipped. All students, can use the available equipment and must have open access. This means that in the production process all students can use the equipment provided by the school in the course of the department/expertise it is intended to save costs and improve work productivity for that required supervision and maintenance of well-equipped equipment/maintenance and repair

(MRC). This is in line with the theories and results of the research of Enke & Metternich (2016), Lamancusa, et al (2008), Ori Eyal (2007), Rentzos, et al (2014).

### **Hypothesis 13.** Product has a significant effect on Tefa

Regression (standardized estimation) is generated at 0.343 and  $p = 0,001$ . This means that management significant effect on Tefa. The collaboration between academics and industry would be very strategic to support the manufacturing industry. The focus should be on generating knowledge through research, spreading knowledge through education as well as using and applying knowledge through manufacturing. The industry must be involved in all stages of the educational process (curriculum design, Advisory Board, project sponsorship, work experience, financial support) in addition to the right environment will motivate students to study for themselves, the facility that places to Stimulating learning, therefore, facilities must be well equipped. All students, can use the available equipment and must have open access. This means that in the production process all students can use the equipment provided by the school in the course of the department/expertise it is intended to save costs and improve work productivity for that required supervision and maintenance of well-equipped equipment/maintenance and repair (MRC). This is in line with the theories and results of the research of Enke & Metternich (2016), Lamancusa, et al (2008), Ori, Eyal (2007), Rentzos, L., et al (2014).

### **Conclusions**

Based on the results of data processing and analysis in the previous chapter, it can be concluded as follows: factors that significantly affected the product (Y1) management (X1) ( $b = 0.689$ ;  $p = 0.003$ ); workshop (X2) ( $b = 0.402$ ;  $p = 0.031$ ), learning (X3) ( $b = -0.506$ ;  $p = 0.006$ ), Human Resources (X4) ( $b = -0.508$ ;  $p = 0.01$ ) relationship structure this is that product improvement or progress is determined by the availability of good workshop management, schools can develop good workshops, carry out good learning and can build human resources, while the other two variables are not significant, namely marketing (X5), industrial relations (X6). The direction of the path coefficient being tested, which is in significant, cannot be used as an explanation of the effect on the product. Products (Y1) can be improved in both schools with good and bad marketing (X5), and industrial relations, because there are other determinants of stronger contribution. Factors that significantly influence the implementation of Tefa (Y2) are management (X1) ( $b = 0.867$ ;  $p = 0.003$ ), workshop (X2) ( $b = -0.723$ ;  $p = 0.004$ ); marketing (X5) ( $b = -0.670$ ;  $p = 0.033$ ), product (Y1) ( $b = 0.881$ ;  $p = 0.000$ ). The interpretation of this relationship structure is that the determinants in the implementation of Tefa are determined by management, the availability of well-conducted workshops, the availability of marketing and the presence of high products or productivity results.

## REFERENCES

- Arifin, Zainal Nur. 2014. Model Teaching Industry Politeknik Negeri Jakarta (Industry Based Vocational Education System/IVE-PNJ System). <http://dikti.go.id/blog/2014/02/10/model-teaching-industri-politeknik-negeri-jakartaindustry-based-vocational-education-system-ive-pnj-system>
- Adelman, H. S. & Taylor, L. 2015. Classroom climate. In S. W. Lee, P. A. Lowe, & E. Robinson (Eds.).
- Baena, F., Guarin, A., Mora, J., Sauza, J., & Retat, S. 2017. Learning Factory: The Path to Industry 4.0. *Procedia Manufacturing*, 9, 73–80. <https://doi.org/10.1016/j.promfg.2017.04.022>.
- Bertram, J.W.M., Wortmann, L.C. & Wijngaard, J. 1990. Production Control: A Structural and Design Oriented Approach. Amsterdam: Elsevier.
- Björklund, T. A., Nordström, K. M., & Clavert, M. 2013. A Sino-Finnish Initiative for Experimental Teaching Practices Using the Design Factory Pedagogical Platform. *European Journal of Engineering Education*, 38(5), 567–577. <https://doi.org/10.1080/03043797.2013.824412>.
- Chryssolouris, G., Mavrikios, D., & Rentzos, L. 2016. The Teaching Factory: A Manufacturing Education Paradigm. *Procedia CIRP*, 57, 44–48. <https://doi.org/10.1016/j.procedia.2016.11.009>
- Cohen, Louis Lawrence Manion & Keith Morrison. 2007. Research Methods in Education Sixth edition. New York. Taylor & Francis e-Library.
- Dharmmesta, Basu Swastha., & T Hani Handoko. 2013. Manajemen Pemasaran Analisis Perilaku Konsumen. Yogyakarta.
- Dinkelman, Max. 2016. Methode Zur Unterstützung Der Mitarbeiterpartizipationim Change Management Der Varien Tenreichen Serien Production Durch Lernfabriken. Stuttgarter Beiträge Zur Produktions forschung: Universität Stuttgart
- Dobson, Graeme, 2003. A Guide to Writing Competency Based Training Materials Commonwealth of Australia *Published by National Volunteer Skills Centrem* <http://www.volunteeringaustralia.org/files/R3Q9Y0OQY0/Revised%20Writers%20Guid%202.pdf>



- Ekawati, Anik Dhian. 2012. Employment Relations School by DU / DI (Study Site SMK Donorojo Pacitan). [http://eprints.ums.ac.id/18975/11/NASKAH\\_PUBLIKASI.pdf](http://eprints.ums.ac.id/18975/11/NASKAH_PUBLIKASI.pdf)  
*Encyclopedia of School Psychology*. Thousand Oaks, CA: Sage.
- Enke, J., Tisch, M., & Metternich, J. 2016. Learning Factory Requirements Analysis- Requirements of Learning Factory Stakeholders on Learning Factories. *Procedia CIRP*, 55, 224–229. <https://doi.org/10.1016/j.procir.2016.07.026>
- Fajaryati, N. 2012. Evaluation of Vocational High School Teaching Factory. *Jurnal Pendidikan Vokasi*, Vol 2 No. (3), <https://journal.uny.ac.id/index.php/jpv/article/download/1040/842>
- Fathurrohman, Wawan. 2016. Pelaksanaan Teaching Factory (Tefa) Pada Program keahlian Teknologi dan Rekayasa di Sekolah Menengah Kejuruan Negeri 4 Semarang. [https://www.academia.edu/27385010/Pelaksanaan\\_Teaching\\_Fact](https://www.academia.edu/27385010/Pelaksanaan_Teaching_Fact)
- Gali, I Nyoman Darmawan. 2014. Evaluasi Manajemen Teaching Factory Pada Unit Produksi Training Hotel Sekolah Menengah Kejuruan Kridawisata Bandar Lampung. *Jurnal FKIP Unila*
- GIZ. 2016. *Teaching Factory Coaching Program*. Jakarta: Kemenperin
- GraBler I., Taplick P, Yang X. 2016. Educational Learning Factory of a Holistic product Creation process. 54, 141-146. *Procedia CIRP*. <https://www.sciencedirect.com/science/article/pii/S2212827116308782>
- Hamidi, Yar Daniel, Wennberk Karl, & Berglund Henrik. 2008. Creativity in Entrepreneurship Education. *Journal of small business and enterprise development*, Vol 15 No. 2. <https://www.emeraldinsight.com/doi/abs/10.1108/14626000810871691>
- Hendarman, Suharti, Nizam, Fahturahman, Kurniawan, A.W., Bakrun, Lestari, S.P., Ambarukmi, S., Panca, LG, .Masitoh, S., Kurniawan, Ibrahim, & G.A., Purwadi, A. 2016. Revitalisasi Pendidikan Vokasi. Jakarta: Kemendikbud
- Hidayat. D. 2012. Developing a Teaching Factory-Learning Model to Improve Production Competences among Mechanical Engineering Students in a Vocational Senior High School. *Journal of Technical Education and Training (JTET)* Vol 4, No. 2 Desember 2012. No ISSN 2229-8932.
- Krúckhans, B., Wienbruch, T., Freith, S., Oberc, H., Kreimeier, D., & Kuhlenkötter, B. 2015. Learning Factories and Their Enhancements - A Comprehensive Training Concept to Increase Resource Efficiency. *Procedia CIRP*, 32(C1f), 47–52. <https://doi.org/10.1016/j.procir.2015.02.224>



- Küstters, D., Prab, N., & Gloy, Y. S. 2017. Textile Learning Factory 4.0 – Preparing Germany’s Textile Industry for the Digital Future. *Procedia Manufacturing*, 9, 214–221. <https://doi.org/10.1016/j.promfg.2017.04.035>
- Lamancusa, John S, Jose L. Zayas, Allen L. Soyster, Luenymorell, J. J. 2008. The Learning Factory : Industry-Partnered Active Learning. *Journal of Engineering Education*, 5(1), 1–7. Retrieved from [https://www.researchgate.net/publication/264218086\\_2006\\_Bernard\\_M\\_Gor](https://www.researchgate.net/publication/264218086_2006_Bernard_M_Gor)
- Leung, Anita Sui Man & Simon McGrath. 2010. The Effective Learning Model to Support People Development: *The Emarging Approach of the Hong Kong Institute for Vocational Education*. Volume 3, Iss.4: pg. 94, 13pgs.
- McIntyre, Nan; Schoening, Fred dan Weathers, Fatima.2007. A Public/ Private Partnership Model for Education. *Frontiers in education Journal*. <http://archive.fie-conference.org/fie97/papers/1246.pdf>
- Müller-Frommeyer, L. C., Aymans, S. C., Bargmann, C., Kauffeld, S., & Herrmann, C. 2017. Introducing Competency Models as a Tool for Holistic Competency Development in Learning Factories: Challenges, Example and Future Application. *Procedia Manufacturing*, 9, 307–314. <https://doi.org/10.1016/j.promfg.2017.04.015>
- Murwaningsih Tri, Subroto Rapih. 2017. Need Analysis in Development of Teaching Factory In Higher Education Tri 1 1, 158(ICTEE), 675–684. Retrieved from <https://download.atlantis-pess.com/article/25885724.pdf>
- Ogorodnyk, O., Granheim, M. V., & Holtskog, H.2016. Preconditions for Learning Factory A Case Study. *Procedia CIRP*, 54, 35–40. <https://doi.org/10.1016/j.procir.2016.05.076>.
- Ori,Eyal. 2007. Governmental Sponsorship as a Mechanism Restricting School Entrepreneurship.[http://isep.info/wp-content/uploads/2015/03/16\\_1\\_1GovernmentalSponsorship.pdf](http://isep.info/wp-content/uploads/2015/03/16_1_1GovernmentalSponsorship.pdf).
- Ozsagir,Arif dkk. 2010. The Relationship between Vocational Education and Industrial Production in Turkey. *International Economic Society*. Volume 4 Edisi 2 pg. 439, 10 pgs.
- Philip Kotler. 2002. *ManajemenPemasaran 1*. Milenium ed. Jakarta: PT.Prenhallindo
- Rentzos, L., Doukas, M., Mavrikios, D., Mourtzis, D., & Chryssolouris, G. 2014. Integrating manufacturing education with industrial practice using teaching factory paradigm: A construction equipment application. *Procedia CIRP*, 17, 189–194. <https://doi.org/10.1016/j.procir.2014.01.126>.



- Sampurno, Yoga Guntur & Sudyanto Siswanto, Ibnu.2012. Teaching Factory di SMK St. Mikael Surakarta. *Jurnal Taman Vokasi*.  
<http://jurnal.ustjogja.ac.id/index.php/tamanvokasi/article/view/134/74>.
- Shieh, Chich-Jen, Wang, Fu-Jin & Wang, I-Ming & Chou, Jyh-Rong. 2009. The Impact of Vocational Education on Human Resource Development in China. *International Journal of Organizational Innovation*. 2. 289-319.
- Tandjung, W. 2004. Marketing Management Pendekatan pada Nilai-nilai Pelanggan. Malang : Banyumedia.
- Triatmoko, SJ. 2009. The ATMI Story, Rainbow of Excellence. Surakarta: Atmipress.
- Tisch, M., Hertle, C., Abele, E., Metternich, J., & Tenberg, R. 2016. Learning Factory Design: A Competency-Oriented Approach Integrating Three Design Levels. *International Journal of Computer Integrated Manufacturing*, 29(12), 1355–1375.  
<https://doi.org/10.1080/0951192X.2015.1033017>.
- Tvenge, Nina, Kristian Martinsen, Kolla, Sri Sudha, & Vijay Keshav Kolla.2016. Combining Learning Factories and ICT- based Situated Learning .*Procedia*. Available at [www.sciencedirect.com](http://www.sciencedirect.com) Volume 1, No. 1.  
<http://staffnew.uny.ac.id/upload/198105072008121002/penelitian/Pelaksanaan+teaching+factory+di+VOCHATIONAL+HIGH+SCHOOL+St+Mikael+Surakarta.pdf>.
- Widarto.2008. Contribution of Industrial Technology Vocational High School to the Growth of the manufacturing industry. *Journal VTE Research and networking* [www.ojs.vocotech.org/index.php/volume1](http://www.ojs.vocotech.org/index.php/volume1).
- Winarsunu, Tulus.2006. Statistika Dalam Penelitian Psikologi dan Pendelikon. Malang: UMM.Press.