

# The Effect of Digitalization for Employees in Manufacturing Companies in the Era of Industrial Revolution 4.0 Using the CFA (Confirmatory Factor Analysis) Calculation Method

Angga Pradana<sup>1</sup>, Fajriyah Amanatus<sup>2</sup>, Muhamad Rifaldi<sup>3</sup>, Yudi Prastyo<sup>4</sup>, Tri Ngudi Wiyatno<sup>5</sup>

<sup>1,2,3,4,5</sup> Industrial Engineering, Pelita Bangsa University, Bekasi, West Java (17530)

**ABSTRACT:** Industrial digitalization 4.0 is a change in communication, function and interaction in industry to digital. So, this is an industrial transformation from a conventional concept to a virtual one. The purpose of this research is to examine the benefits of digitalization for employees in various manufacturing companies. This aim provides quite effective benefits in optimizing many things so that we don't need to spend a lot of time and effort to achieve the targets of our work. This research uses the Validity Test and Reliability Test method with a purposive sampling approach technique of 75 respondents from various employees in manufacturing companies. In this study, researchers used the JASP program version 0.17 with CFA (Confirmatory Factor Analysis) calculations. Of the 40 items that describe 3 components including the company's digitalization system, work productivity, job satisfaction. In the trial of the measuring instrument, it was reliable because the results were above 0.07, but the quality of the items was not good because there were still items whose benchmark was below 0.05. This measuring instrument was tested on 75 respondents. Based on the measuring instrument test, in the first stage 14 items were obtained that could be used and 26 items that could not be used with a validity value of 0 out of the 40 items that had been tested.

**KEYWORDS:** Digitalization, manufacturing, industry 4.0, JASP, CFA

## 1. INTRODUCTION

The period of the Industrial Revolution 4.0 is characterized by the merging of the physical, digital and biological worlds, which has fundamentally changed the way people live and work. The rapid development of technology has led to the emergence of new innovations that create demand for advanced skills in various sectors. The four skills needed in the Industry 4.0 era include advanced computing, artificial intelligence, cyber systems and collaboration in the production process.

The emergence of information technology in the digital age has enabled businesses to become more efficient and make successful decisions, giving them an edge over competitors. The use of technology, communication and information has become increasingly sophisticated and continues to evolve in the Fourth Industrial Revolution. First introduced in 2011 at the Hannover Messe in Germany, the term was coined to refer to a range of changes, including the use of artificial intelligence (AI), digital commerce (e-commerce), big data, financial technology and robotics. Hence, the process of digitalization emerged in this era.

Worker performance in a company can be influenced by many factors, including individual factors, organizational This section explains the steps of the research methodology using the validity test and reliability test methods. According to Sugihart and Sitinyak (2006), validity refers to the fact that

factors and psychological factors (Grainger and Gibson, 1999). Individual factors include skills and competencies, where skills are the abilities workers have to do a job and competencies are the knowledge workers have about a job. The use of technology in the workplace requires the skills and experience of existing human resources. In addition to knowledge, skills and attitudes, factors that affect employees' ability to work include equipment, physical work environment, meaningful work, performance standards, reward systems, performance expectations, feedback (Sedarmayanti and Safer, 2016). Digitalization not only affects companies, but of course also employees who work in various manufacturing sector companies.

The purpose of this study is to analyze employee data regarding digitalization in manufacturing companies. This objective provides several effective benefits to optimize digitalization through questionnaire data conducted and processed with the JASP 0.18.1 application. Thus, this research is expected to contribute theoretically and practically to employee digitalization in manufacturing companies in the era of the Industrial Revolution 4.0.

## 2. RESEARCH METHODS

a variable measures what it is intended to measure. Validity in research indicates the level of accuracy of the research measurement instrument in relation to the actual content it is

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intended to measure. Reliability, on the other hand, is a test that indicates whether the instrument used to collect information can be trusted to reveal information about the field as a data collection instrument. In this study, a series of steps had to be followed before the test could be conducted:

- **Making Research Variables**
- a. **Independent Variable**

The independent variable in this study is the company's digitalization system.

**b. Dependent Variable**

In this study, the dependent variable is labor productivity.

**c. Variable Intervening**

The intervening variable in this study is job satisfaction.

**Table 1 Operational Definition of Variables**

Dimensions	Definition	Indicator	Item
Company Digitalization System	Digitalization is the transition from analog to digital technology.	1. Machine system and work equipment (CDS 1) 2. Data collection system (CDS 2) 3. Information system (CDS 3)	1-5 6-10 11-15
Work productivity	Labor productivity is the ability to produce goods and services from various sources and production factors used to improve the quality and quantity of work produced in a company.	1. Work Quantity (WP 1) 2. Quality of Work (WP 2) 3. Timeliness (WP 3)	16-20 21-25 26-30
Job satisfaction	Job satisfaction is an employee's attitude towards work, which is related to the work situation, cooperation between employees, rewards received at work, and physical and psychological factors.	1. Satisfaction with the job itself (JS 1) 2. Satisfaction with work leaders (JS 2)	31-35 36-40

- **Determining Data Collection Targets Population and Sample**

Population is a generalizable domain consisting of objects and/or entities with certain characteristics and attributes used by researchers to make studies and conclusions (Sugiyono, 2013). In this study, a purposive sampling method was used, where the sample consisted of certain respondents who provided the information needed, so that a sample of 75 respondents was obtained from employees of different manufacturing companies.

- **Data Types, Data Sources & Analysis Techniques**

The type of data used is quantitative and based on primary data sources, data collection is done through a closed questionnaire sent to respondents via google form. The data obtained was processed using the path analysis method with the JASP 0.18.1 program.

**3. RESEARCH RESULT**

Below is a tabulation of the survey results, with a total of 40 statements obtained from multiple sources, divided into 15 statements regarding the company's digitalization system (CDS), 15 statements regarding job productivity (WP), and 10 statements regarding job satisfaction (JS).

**Table 2 Questionnaire Results**

Statement	Code
The introduction of digitalization in the manufacturing industry may have a negative impact on employment, as some jobs could be automated.	CDS 1
Enterprise means that machines, sensors, devices and people can work together seamlessly.	CDS 2
The digital transformation of machines can help companies to remain competitive and adapt to changing market conditions.	CDS 3
Digital archiving can save resources and space and increase efficiency in document management.	CDS 4
The use of information systems in businesses strikes a balance between technical information and its application.	CDS 5
The company still uses older machinery and equipment.	CDS 6
Digitalization and digital transformation can help save resources and reduce storage space.	CDS 7

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Digitalization makes it easy to record all transactions and update data and information quickly according to business needs.	CDS 8
Digitization has improved the creation, transmission, storage and analysis of digital data and increased its accessibility.	CDS 9
Information systems are often entered verbally, so the information received appears inaccurate.	CDS 10
Technological advancements have also changed the business environment, making organizations that used to operate their systems manually obsolete.	CDS 11
Information technology is a key factor in the development of society.	CDS 12
Data is still recorded manually.	CDS 13
The use of information systems in companies should focus on input-output and activity management.	CDS 14
Digitalization can pose security risks to businesses, such as data breaches and cyberattacks.	CDS 15
The company uses human-machine technology to reduce the possibility of production stoppages due to quality defects.	WP 1
Digitalization shows that the number of customer complaints received by the company has decreased.	WP 2
I am not used to using digitalization systems in my work.	WP 3
With digitalization, the quality of employee performance has declined.	WP 4
With a digital system, I can work smartly, accurately and precisely.	WP 5
The company is in the process of implementing a digital system so that I can use my time efficiently and carry out my tasks.	WP 6
AI technology can reduce reliance on manual labor and improve overall operational efficiency.	WP 7
Digitalization allows us to be constantly connected, which has a positive impact on material supply.	WP 8
Digitalization has made my desk bigger, so I feel overloaded.	WP 9
Digitalization increases security and privacy risks in transactions.	WP 10
The company uses screens to display daily goals/plans so that employees can easily read them.	WP 11
Digitalization has a very positive impact on business performance.	WP 12
Thanks to the existing digitalization system, my workload is in line with the company's needs.	WP 13
An inadequate digitization system can affect employee performance.	WP 14
Digital systems provide more efficient control over the inputs and outputs of the production process.	WP 15
Digital information systems provide accurate information to managers.	JS 1
My work plays an important role in the development of digitalization.	JS 2
My job gives me the opportunity to learn about the digitization process.	JS 3
Digital data collection systems are very effective in management.	JS 4
With the help of digital infrastructure, I can attend training and education courses to improve my skills and knowledge.	JS 5
My work does not play an important role in the development of digitalization.	JS 6
Digitalization has made it easier for me to communicate with management.	JS 7
My manager still seems to ignore the digital side of the company.	JS 8

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Automated systems and digital equipment make it easier for supervisors to monitor employee work.	JS 9
I am very happy with the digital services provided by the company.	JS 10

Point	Information	
5	SS	Strongly agree
4	S	Agree
3	N	Neutral
2	TS	Don't agree
1	STS	Strongly Disagree

**Table 3**  
**Frequentist Scale Reliability Statistics**

Estimate	Cronbach's $\alpha$
Point estimate	0.898
95% CI lower bound	0.862
95% CI upper bound	0.927

For measuring reliability, use Cronbach Alpha. Overall the data has a value of 0.898, which means the value is above 0.7 and it can be said that overall the data is quite reliable or suitable for use.

**Table 4**  
**Chi-square test**

Model	X <sup>2</sup>	Df	P
Baseline model	2229.713	780	
Factor model	1427.931	737	< 0.01

For the Model Fit tool using Phi Value. Overall the data has a value of more than 0.01, which means the value is less than the measured value, namely 0.5 and it can be said that overall the data does not include the first criterion.

**Table 5**  
**Fit indices**

Index	Value
Comparative Fit Index (CFI)	0.523
Tucker-Lewis Index (TLI)	0.496
Bentler-Bonett Non-normed Fit Index (NNFI)	0.496
Bentler-Bonett Normed Fit Index (NFI)	0.360
Parsimony Normed Fit Index (PNFI)	0.340
Bollen's Relative Fit Index (RFI)	0.322

**Table 5**  
**Fit indices**

Index	Value
Bollen's Incremental Fit Index (IFI)	0.537
Relative Noncentrality Index (RNI)	0.523

**Table 6**  
**Other fit measures**

Metric	Value
Root mean square error of approximation (RMSEA)	0.112
RMSEA 90% CI lower bound	0.103
RMSEA 90% CI upper bound	0.120
RMSEA p-value	1.074×10 <sup>-13</sup>
Standardized root mean square residual (SRMR)	0.107
Hoelter's critical N ( $\alpha = .05$ )	43.085
Hoelter's critical N ( $\alpha = .01$ )	44.555
Goodness of fit index (GFI)	0.893
McDonald fit index (MFI)	0.010
Expected cross validation index (ECVI)	22.319

For the Additional Fit Measures measuring tool using the Metric Comparative Fit Index (CFI), the data has a value of 0.523, which means the value is less than 0.695 and it can be said that overall the data does not include the second criterion. Metric Root Mean Square Error of Approximation (RMSEA) data has a value of 0.112, which means the value is above 0.08 and it can be said that overall the data includes the third criterion. Metric Goodness Of Fit Index (GFI) data has a value of 0.893, which means the value is above 0.08 and it can be said that overall the data includes the fourth criterion. So, this questionnaire can be declared fit or good fit index because it is included in the 2 Confirmatory Factor Analysis (CFA) criteria.

**Table 7 Factor loadings**

Factor	Indicator	Estimate	Std. Error	z-value	p	95% Confidence Interval		Std. Est. (all)
						Lower	Upper	
CDS	CDS 1	0.313	0.148	2.110	0.035	0.022	0.603	0.247
	CDS 2	0.547	0.147	3.710	< .001	0.258	0.835	0.427
	CDS 3	0.792	0.113	7.030	< .001	0.571	1.013	0.717
	CDS 4	0.714	0.129	5.515	< .001	0.460	0.968	0.602
	CDS 5	0.204	0.142	1.438	0.150	-0.074	0.482	0.172
	CDS 6	0.132	0.164	0.802	0.422	-0.190	0.453	0.095
	CDS 7	0.812	0.124	6.542	< .001	0.569	1.056	0.684
	CDS 8	0.417	0.143	2.923	0.003	0.137	0.697	0.344
	CDS 9	0.737	0.118	6.269	< .001	0.507	0.968	0.661
	CDS 10	0.685	0.124	5.548	< .001	0.443	0.928	0.599
	CDS 11	0.446	0.144	3.102	0.002	0.164	0.728	0.359
	CDS 12	0.442	0.154	2.871	0.004	0.140	0.743	0.335
	CDS 13	0.646	0.121	5.356	< .001	0.410	0.883	0.580
	CDS 14	0.717	0.105	6.835	< .001	0.512	0.923	0.708
	CDS 15	0.581	0.120	4.847	< .001	0.346	0.817	0.533
WP	WP 1	0.164	0.138	1.190	0.234	-0.106	0.433	0.141
	WP 2	-0.160	0.124	-1.296	0.195	-0.402	0.082	-0.154
	WP 3	-0.099	0.150	-0.659	0.510	-0.392	0.195	-0.078
	WP 4	-0.132	0.162	-0.813	0.416	-0.449	0.186	-0.097
	WP 5	-0.613	0.126	-4.852	< .001	-0.861	-0.365	-0.533
	WP 6	-0.100	0.149	-0.671	0.502	-0.393	0.193	-0.080
	WP 7	-0.631	0.107	-5.880	< .001	-0.842	-0.421	-0.625
	WP 8	-0.022	0.150	-0.148	0.883	-0.316	0.272	-0.018
	WP 9	-0.469	0.135	-3.477	< .001	-0.734	-0.205	-0.397
	WP 10	-0.812	0.102	-7.953	< .001	-1.012	-0.612	-0.783
	WP 11	-0.862	0.105	-8.196	< .001	-1.068	-0.656	-0.802
	WP 12	-0.809	0.089	-9.066	< .001	-0.983	-0.634	-0.852
	WP 13	-0.779	0.104	-7.477	< .001	-0.983	-0.575	-0.749
	WP 14	-0.651	0.119	-5.465	< .001	-0.884	-0.417	-0.590
	WP 15	-0.733	0.102	-7.186	< .001	-0.933	-0.533	-0.732
JS	JS 1	0.602	0.140	4.283	< .001	0.326	0.877	0.513
	JS 2	0.593	0.127	4.684	< .001	0.345	0.841	0.543
	JS 3	0.533	0.109	4.892	< .001	0.319	0.746	0.571
	JS 4	0.666	0.106	6.287	< .001	0.458	0.873	0.689
	JS 5	0.482	0.112	4.318	< .001	0.263	0.700	0.507
	JS 6	0.240	0.141	1.703	0.089	-0.036	0.517	0.212
	JS 7	0.560	0.138	4.073	< .001	0.291	0.830	0.479
	JS 8	0.673	0.114	5.888	< .001	0.449	0.897	0.666
	JS 9	0.023	0.140	0.163	0.870	-0.251	0.297	0.021
	JS 10	0.406	0.110	3.688	< .001	0.190	0.621	0.444

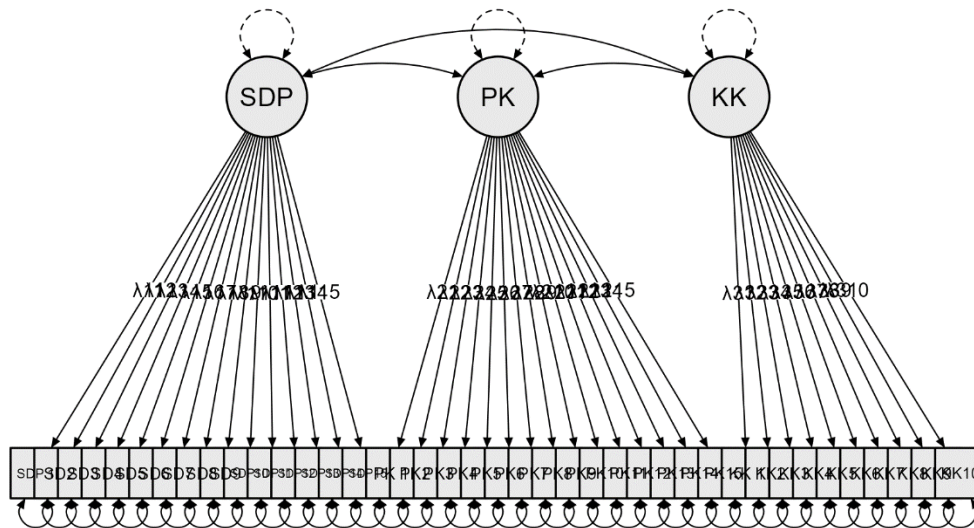


Figure 1 Model plot

For measuring Factor Loadings, use Standard Estimate (all). Overall, the data under many items is below 0.5. It can be said that overall the data has many items that fall because it is below the 0.5 benchmark due to several respondents choosing the same items from 1 to 5.

**4. CONCLUSION**

Of the 40 items that describe 3 components including the company's digitalization system, work productivity, job satisfaction. In the trial of the measuring instrument, it was reliable because the results were above 0.07, but the quality of the items was not good because there were still items whose benchmark was below 0.05. Based on the measuring instrument test, in the first stage 14 items were obtained that could be used and 26 items that could not be used with a validity value of 0 out of the 40 items that had been tested. This can be interpreted as meaning that what researchers have done can provide an important role that benefits each other in digitalization and the performance of the organization, where digitalization is able to have an increasing effect on operational performance. to be effective and efficient.

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Because these 3 variables have mutually beneficial power and also provide mutual progress for the company.

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