Research Article

Factor Analysis of SME Owner Intention to Join Collaborative Manufacturing Networks Using Structural Equation Modeling

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Abstract

Small and Medium enterprises in Indonesia lack on initiative and knowledge in the field of Collaborative Manufacturing Networks (CMN). SME owner has an important role to establish strong Collaborative Manufacturing Networks. To the author's knowledge, there are rare studies regarding SME owner intention to join CMN. Therefore, this study investigates the factors influencing SME owner intention to join CMN of Batik SME in Indonesia. The data for this study, including three factors: Resource, Trust, and Design, was gathered from 140 Batik SME owners. The method used in this study is Structural Equation Modeling. This study finds that Trust and Design have a positive influence on the intention to join Collaborative Manufacturing Networks. The main contribution is to assist the policy-maker on establishing Collaborative Manufacturing Networks of Batik SMEs in Indonesia. The final model found that Resource has a negative influence on willingness to collaborate with an estimated value -0.091; Trust has a positive influence on willingness to collaborate with an estimated value 0.54; Design has a positive influence on willingness to collaborate with an estimated value 0.34, but not significance. The results showed that Trust and Design are the driving factors of SME owners' Intention to Join the Collaborative Manufacturing Networks.

Keywords: Structural equation modeling; Collaborative manufacturing networks; Small and medium enterprise; Owner intention to join

1. Introduction

Manufacturing companies are currently facing the phenomenon of increasingly fierce competition, shorter product life cycles, and increasingly diverse customer demands. To deal with this phenomenon, companies must have a competitive advantage to be able to compete, including product quality, delivery time, price, and flexibility. Competitive advantage can be achieved by utilizing another resource outside the company that can be utilized by establishing collaboration (Man and Luvison, 2019). Collaborative manufacturing is based on the idea that participating companies work together to improve things for everyone. To accomplish this, the two side's relationship evolved from a traditional one to one based on mutual trust, and it grew as a result of their achievement in performance and contribution (Sachsenmeier and Scottenloher (2003). Collaboration allows businesses to produce superior results by combining the resource and routines of their many members (Firmansyah and Amer, 2013). Collaboration can speed up new product development, improve product quality, reduce production costs, and reduce delivery time to market (Fawcett et al., 2012).

In this era of globalization, SMEs must compete on a global scale with limited government assistance and resources. As a result, to strengthen their competitive edge, SMEs must

band together and develop their long-term viability. Creating a culture of collaboration is one method that might be implemented (de Fretes, 2010), (Fachrunnisa, Mutamimah, and Gunawan, 2013). Several types of collaboration can be carried out between companies, including Collaborative Manufacturing (Firmansyah and Amer, 2013), (de Fretes, 2010), , Collaborative New Product and Development (Kim and Lee, 2016), Collaborative Production Planning (Pan, Zhang, and Cao, 2014), Collaborative Supply Chain Management (CSCM) (Cao and Zhang, 2010; Barnes and Liao, 2012; Ogulin, Selen, and Ashayeri, 2012; Fu and Fu, 2015; Ding et al., 2019; Kusmantini et al., 2020), Collaborative Project Planning (Liu et al., 2021); and Collaborative Commerce to Support Marketing Activities (Fachrunnisa et al., 2013). SME Owner has an important role in their company decision-making. There are several studies regarding the SME owner's role including willingness to share knowledge in decision-making to take commercial bank loans (Tolba, Seoudi, and Fahmy, 2014), work ethic, religion, ad moral energy management (Uygur et al., 2017), entrepreneurial competencies (Bagheri and Vagnoni, 2020), innovation and culture (Muskat et al., 2021), and intention to adopt private finance (Kijkasiwat, 2021) (Kijkasiwat, 2021). (Brunetto and Farr-Wharton, 2007). Brunetto and Farr-Wharton (2007) studied the role of trust in SME decision-making about collaboration while Ghauri,

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Mazzarol, and Soutar, (2021) explained the reason SMEs join co-operatives from SME owner's and executives' perspectives. From those studies above, there is deficient studies that discuss the SME owner's role in intention to join Collaborative Manufacturing Networks.

In Indonesia, most Batik's Small and Medium Enterprises are still unaware of collaborative manufacturing and have not applied it yet. In general, they just become competitors to each other. Moreover, collaborations have not been carried out systematically and are still in incidental cooperation. Due to the delayed time-to-market and the weakness of being rivals to each other, their global competitiveness is low. There is a risk of revenue loss owing to sharing orders with collaboration partners and unknown product quality. SME owners also face difficulty in balancing the company's goals with the objectives of the collaboration (Man and Luvison, 2019). The special region of Yogyakarta (DIY) is one of the Indonesian provinces where various types of SMEs focusing on creative business, such as those in the culinary, fashion, craft, and photography subsectors, grow and thrive. It contributed the most to the creative economy's GDP in 2018, while having the fewest creative business units.

Batik is a traditional Indonesian textile with international commercial potential (Kusmantini et al., 2020). Batik is a Javanese art form, particularly in the shape of batik cloth. Distinct from conventional textile production using machines, a wax-resist coloring technique is used to create batik cloths. Producing Batik is a time-consuming process that requires an excellent level of precision and worker's ability. Hot wax is inscribed all over the cotton fabric according to the existing pattern using a *canting* or a stamp. Wax block color from existing fabric. During the dyeing process, the section of the body covered in wax becomes the part that is colored. Batik fabric can be dyed multiple times to create an artistic batik cloth.

The Batik sector requires efforts to build effective and efficient performance because the market is both dynamic and unpredictable. Batik's Small and Medium Enterprises need to be open to utilizing existing resources outside the company to deal with this dynamic and unpredictable demand situation. One approach that might be employed is collaboration with other company. Faster product creation, higher product quality, lower costs, shorter cycle times, and better customer management are all advantages of collaboration.

Collaboration with other SMEs is usually not a priority for Batik's Small and Medium Enterprise. A strong motivation or reason is required of an SME that willing to collaborate. There hasn't been much research on the factors that influence SME owner intention to join collaborative manufacturing networks in Indonesia. If the elements that influence SME's owner desire to collaborate can be discovered, policy makers in the government can use them to boost the SME sector's economic growth. There are not many academic studies on SME's owner intention to join Collaborative Manufacturing Networks. Therefore, to fill the lack of literature, this study aims to identify the factors influencing SME owners' intention to join Collaborative

Manufacturing Networks on Batik's Small and Medium Enterprises in Indonesia in order to improve the Batik SMEs's competitive advantage.

2. Literature Review
2.1. Collaborative manufacturing networks

Collaboration is a significant issue in a manufacturing organization to respond to market demands by combining expertise and resources swiftly. In collaborating, a company needs partners and a system in the form of a network between companies. A collaborative network (CN) is a group of people or companies with different organizational cultures and goals but agree to collaborate to achieve mutually beneficial objectives (Camarinha-matos, 2005). One of the usable tools in collaborating with companies is information and communication technology (ICT). It can be used to simplify communication and develop joint programs to attain the intended mutual objectives (Camarinha-Matos et al., 2009).

One application of the concept of collaborative networks is in manufacturing which is often referred to as Collaborative Manufacturing. Collaborative Manufacturing Network (CMN) is a type of collaboration developed to benefit participating organizations by covering a portion of the entire manufacturing process. Integrating these existing collaborative methods into a collaborative manufacturing model could minimize production cost while also providing a significant competitive advantage (Firmansyah and Amer, 2013). Collaboration would be a very productive and profitable business strategy but requires trust, innovative thinking, and transparency. Trust is the most important factor between partners. Still, there are some consideration such as 1) the member needs to have willing to provide confidential information, such as company performance, production cost, and the design of the particular product; 2) The member of the collaborative networks need to formulate mutually agreed goals (McClellan, 2003). Collaborative Manufacturing is also fascinating to be applied in Small and Medium Enterprises. In contrast to large companies that can adapt to market changes quickly using the resources they have, SMEs must adapt by utilizing existing resources outside the company (Irianto, 2016). SMEs go up against several challenges, including limitation in resource capacity, company leadership, creativity in new product innovation, and unestablished collaborative manufacturing role model. Small and Medium Enterprises (SMEs) gain benefits from collaborating in a variety of ways, including increasing company skills, capacities, and capabilities through resource sharing, becoming system suppliers, developing more complex products, increasing global market share, and lowering production costs (Firmansyah and Amer, 2013)

2.2. Structural Equation Modeling

SEM is famous statistic-based technique which many researchers used for modeling variable relationships. SEM is called latent variable modeling because the model in

SEM including both observed and unobserved or latent variables (Hoyle, 2012). SEM is a multivariate analysis technique to examine complex variable relationships. By using SEM, it able to test the structural model and measurement model. In addition, SEM able to test measurement errors and factor analysis along with hypothesis testing. Considering from how it works, SEM is a combination of factor analysis and regression analysis, structural and measurement models (Byrne, 2016).

Some researchers used SEM on their research, both inside and outside the field of collaboration. Those studies could be used as a reference for this research. Barness & Liao (Barnes and Liao, 2012) have studied Collaborative Supply Chain Management. The factors being considered are individual role, network role, and competencies using structural equation modeling (SEM). Barnes & Liao (2012) examines the link between supply chain management and human resource management. This study tested whether individual factors, network, and collaborating competencies affect the company's performance. Both organizational awareness (individual competency) and supply network competency (organizational competency) are significant factors and have promising influences on collaborative competencies. The significant positive impact of the collaborative competencies supports the need for inter-organizational capabilities. Sari et al., (2021) studied E-Waste Management and examined the factors that make consumer willing to join the e-waste collection program. Intention of consumers to participate in e-waste collection initiatives is explained using the Theory of Planned Behavior framework, which is enhanced by employing reverse logistics factors, access to e-waste facility, and value belief theory. According to the study's findings high level of government drivers, access on e-waste facility, and high personal attitudes have a high impact to consumer willingness in joining e-waste collection program. Zhong & Moon, (2020) conducted an online survey study on customer happiness and loyalty at Chinese food restaurants, and looked into the moderating influence of gender. There are some factors that are being considered including perceived price, food, service, and physical environment quality. Structural Equation Modeling is used to analyze the factors that influence customer satisfaction and loyalty. Customer satisfaction is influenced significantly by all the mentioned factors above. The perceived price of a restaurant substantially impacts customers' views of its quality dimensions.

Cao & Zhang, (2010) used Structural Equation Modeling in Collaborative Supply Chain Management and examined the factors influencing the company performance. Process efficiency, adaptability, business synergy, quality, and innovation are all elements to consider. The findings showed that all factors have a positive impact on supply chain collaborative advantage. The supply chain collaborative advantage also has a significant influence on the company performance. Kusmantini et al. (2020) looked at Collaborative Supply Chain Management and the impact of information and communication technology (ICT) and trust on the performance of screenprinting SMEs in Yogyakarta. From the study's findings, a high trust and

high ICT quality have a strong influence on the collaboration and operational performance. The impact of the correlation between ICT and trust on operational performance is also considerable. Widyastuti et al. (2020) revisited Online Shopping Behavior in Indonesia by examining two factors, including Trust and Perceived Benefit. This study is in the scope of behavioral marketing studies. The goal of this study is to get an effective marketing strategy by considering different levels of customer trust. The findings showed that high perceived benefits and high trust are influencing high consumer attitudes toward online shopping.

Ding et al. (2019) conducted a study on dairy cow culture using structural equation modeling (SEM). From the study's result, government regulation and corporate social responsibility significantly influence dairy product quality assurance. Dairy production behavior has significantly facilitated the effects on dairy product quality assurance and has a significant influence on the dairy supply chain. The impact of collaborative supply chain management was investigated by looking at four factors: capability connection, relationship alignment, the inability to integrate resources across supply chain partners, and the inability to integrate resources across supply chain partners (Ogulin et al., 2012). The study indicates that informal supply chain coordination has various impacts on operational efficiency, with informal supply-oriented networking having the most favorable impact on operational efficiency. Kiraz et al. (2020) use structural equation modeling to examine factors that influence the Industry 4.0 tendency.

3. Hypothesis Development

3.1. Resource

Ardito and Angelo (2021) examined the influence of intellectual resources on SMEs' international market expansion performance. The findings elucidate the significance of intellectual capital in small business leadership. The decision-maker has a key role in promoting ethnic minorities' participation in SME ownership, such as by preferential treatment in enterprises. An intellectual is also important in achieving company goals (Marzo and Scarpino, 2016). As an intrinsic source, human resources can play a vital role in achieving the enterprise's goals. HRM studies meet a businessperson's desire to comprehend the economy, market, organization, or any other connected topic (Virk, 2017). Internal competencies and capabilities are essential in creating value for clients' relationships and achieving excellent financial performance (Etemad, 2009). In addition to human resources, machine resources are also crucial for a company. The influence of technological adaptation and innovative activity on SMEs is significant (Meng, Qamruzzaman, and Adow, 2021). Human resources and machine resources are taken as independent variables that make up resource variables. Therefore the first hypothesis is:

H1: Resource positively and significantly influences Batik SMEs owner intention to join Collaborative Manufacturing Networks

3.2. Trust

Trust is defined as one's willingness to believe in the actions of others, take risks, and confidence to hand over a job to someone else (Kusmantini et al., 2020), (Widyastuti et al., 2020). Trust has become a fascinating issue that some scholars have investigated in a variety of fields, including the importance of trust in e-commerce (Widyastuti et al., 2020), Business advice by accountants to SMEs (Blackburn, Carey, and Tanewski, 2018), a collaboration between SMEs and universities (Darabi, Saunders, and Clark, 2020), and Supply Chain Collaboration (Kusmantini et al., 2020). Collaboration and inter-organizational cooperation are thought to be impossible without trust. (Darabi et al., 2020). Supply chain collaboration and operational performance are strongly related to trust and technological capabilities (Salam, 2017). The main job of the collaborative supply chain is about building trust (Fawcett et al., 2012). Therefore, the second hypothesis states:

H2: Trust positively and significantly influences Batik SMEs owner intention to join Collaborative Manufacturing Networks

3.3. Design

Innovation and design factors are widely discussed in research on collaborative networks, especially in the field of collaborative product design such as (Liu et al., 2021), (Kim and Lee, 2016), (Bai et al., 2005), (Morris, 2011), (Chen, Ko, and Yeh, 2017)], and (Silva, Mathrani, and Jayamaha, 2014). Innovation becomes the dependent variable in the research conducted by Feranita, Nugraha, and Sukoco (2019) with government support as an independent variable, Abbas, (2019) with knowledge management as the independent variable, and Silva et al., (2014) with Information and Communication Technology as the independent variable. Innovation and design factor becomes the independent variable in research conducted by Mir, Casadesús, and Honore (2016) with business performance as the dependent variable, Liu et al. (2021) with project performance as the dependent variable, and Kurniawati (2020) with economic growth as the dependent variable. In this study design/innovation factor is taken as the independent variable with a willingness to collaborate is taken as the dependent variable. Therefore, the third hypothesis is:

H3: Design positively and significantly influences Batik SMEs owner intention to join Collaborative Manufacturing Networks

4. Research Methodology

4.1. Data collecting

Data were collected from Indonesian Batik SMEs, especially in Yogyakarta special region using questionnaire as a survey instrument to the Batik SMEs owner. the standard error of the mean (SEM) sample size is 100–200 samples (Astriani et al., 2023). The collected sample was 140 respondents. Before a full-scale study, there was a pre-test study to analyze the validity and reliability of the constructed scale. Structural Equation Modeling was chosen to analyze statistically and supported by AMOS in computing and validating the proposed structural equation model. The questionnaire was prepared based on a literature study related to the factors considered both from papers on the topic of collaborative SCM, and in other topics as explained in the hypothesis formulation session. There are three latent variables (constructs) considered in this study: Resource, Trust, and Design. Resource based on five statements, Trust based on seven statements, and Design is based on four statements. Intention To Join (ITJ) was divided to be five items describing what particular intention the Batik SME owner in collaborating with other SMEs. The questionnaire is divided into two sections: 1) demographic and SMEs information from respondents, and 2) items that measure the components. Respondents were asked to indicate the most appropriate level to which each statement was true for them on a five-point Likert-type scale ranging from 1 to 5 ("1=strongly disagree", 2= disagree, 3= neutral, 4= agree, and 5="strongly agree"). This survey was given to them in three distinct ways, including a paper-based questionnaire, structured interview, and google form.

Hypothetical model in this study is determined followed the basic concept of Structural Equation model (Byrne, 2016). The hypothetical model is displayed as follows:

$$ITJ = \alpha*RES + \beta*DES + \gamma*TR + resid1$$
$$RES1 = \alpha_1*RES + err1$$
$$RES2 = \alpha_2*RES + err2$$
$$RES3 = \alpha_3*RES + err3$$
$$RES4 = \alpha_4*RES + err4$$
$$RES5 = \alpha_5*RES + err5$$
$$DES1 = \beta_6*DES + err6$$
$$DES2 = \beta_7*DES + err7$$
$$DES3 = \beta_8*DES + err8$$
$$DES4 = \beta_9*DES + err9$$
$$TR1 = \gamma_1*TR + err10$$
$$TR2 = \gamma_2*TR + err11$$
$$TR3 = \gamma_3*TR + err12$$
$$TR4 = \gamma_4*TR + err13$$
$$TR5 = \gamma_5*TR + err14$$
$$TR6 = \gamma_6*TR + err15$$
$$TR7 = \gamma_7*TR + err16$$
$$ITJ1 = \delta_1 ITJ + err17$$
$$ITJ2 = \delta_1 ITJ + err18$$
$$ITJ3 = \delta_1 ITJ + err19$$
$$ITJ4 = \delta_1 ITJ + err20$$
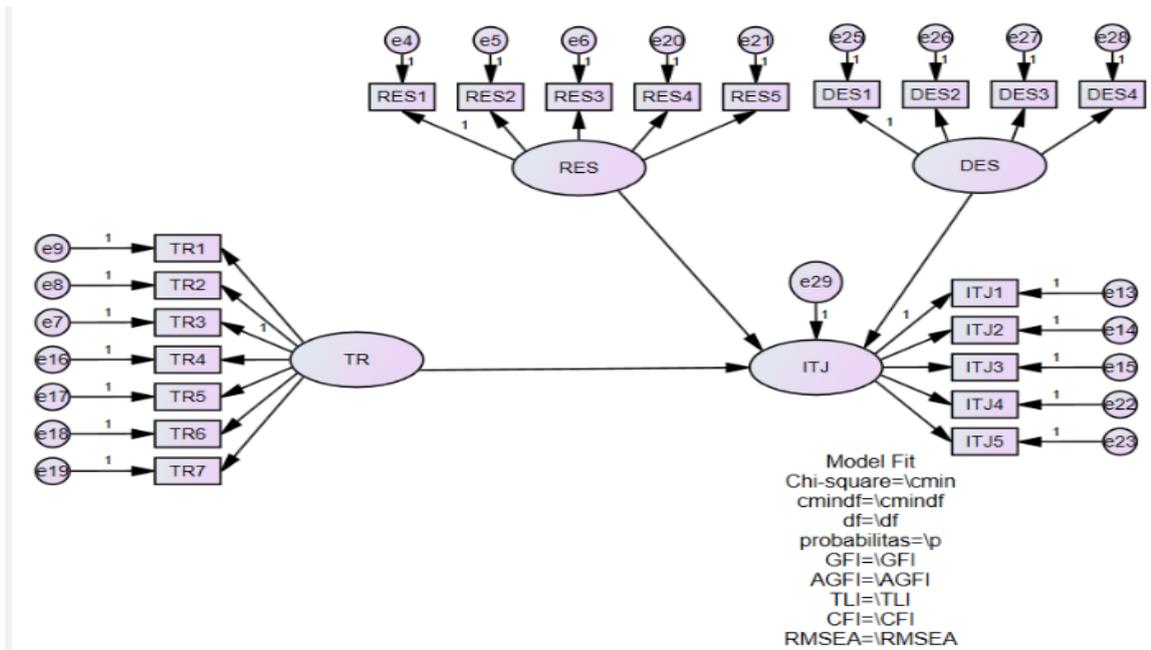$$ITJ5 = \delta_1 ITJ + err21$$

Fig. 1. The conceptual model

Figure 1 shows The Conceptual Model from this study.

4.2. Data analysis

This study used IBM SPSS AMOS* version 22 for structural analysis the model. According to (Astriani et al., 2023), Data analyses step using IBM SPSS AMOS are:

a. Extension of the hypothetical model
b. Draw a flow diagram
c. Adjust flowcharts to reflect structural equation
d. Select the estimation technique model and enter matrix.
e. Assessing the possibilities based on the problem's identification
f. Assessing the requirements for that superior form fit

5. Results and Findings

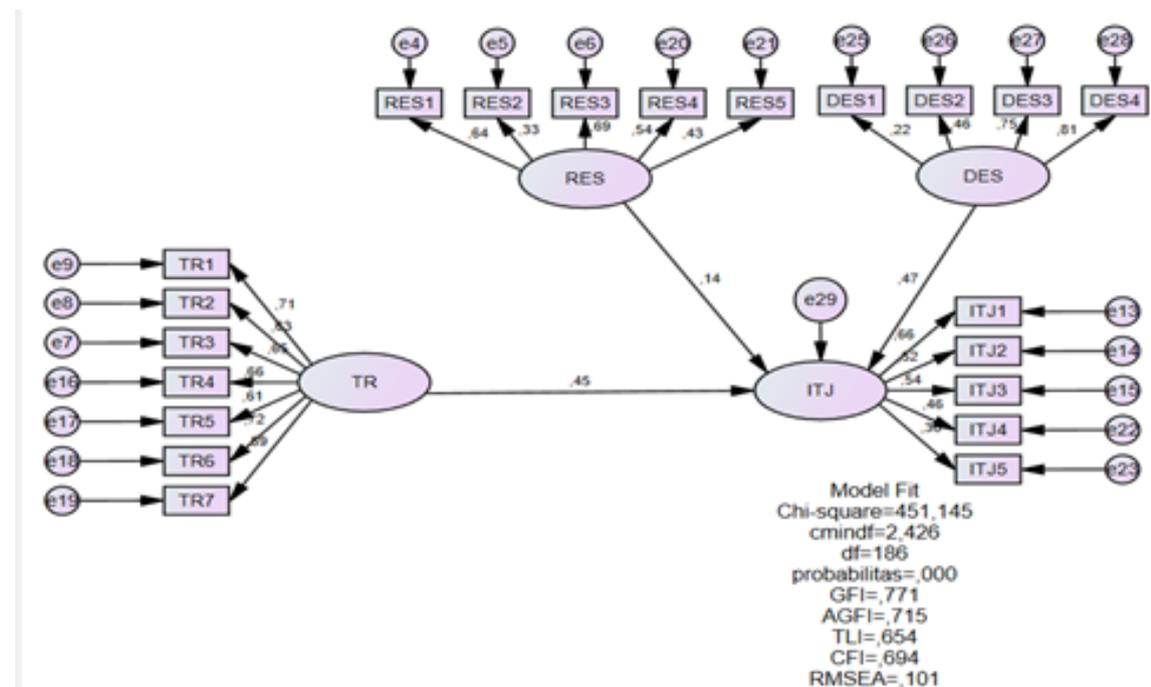The result can be illustrated in Figure 2 and Table 1 below,

Fig. 2. The research original model

Table 1

Estimation of the variable

No	Construct	Standard Loading	Construct Reliability	Variance Extracted
1	Resource (RES)			
	RES 1	0.64	0.665	0.297
	RES 2	0.33		
	RES 3	0,69		
	RES 4	0.54		
	RES 5	0.43		
2	Trust (TR)			
	TR 1	0.71	0.844	0.438
	TR 2	0.63		
	TR 3	0.65		
	TR 4	0.66		
	TR 5	0.61		
	TR 6	0.72		
	TR 7	0.59		
3	Design (DES)			
	DES 1	0.22	0.663	0.367
	DES 2	0.46		
	DES 3	0.75		
	DES 4	0.81		

Table 2
Standard Regression Weight:(Primary group: Default model)

			Estimate
INTENTION	<---	RESOURCE	,140
INTENTION	<---	DESIGN	,469
INTENTION	<---	TRUST	,449
RES1	<---	RESOURCE	,641
RES2	<---	RESOURCE	,328
RES3	<---	RESOURCE	,694
TR3	<---	TRUST	,650
TR2	<---	TRUST	,632
TR1	<---	TRUST	,705
ITJ1	<---	INTENTION	,661
ITJ2	<---	INTENTION	,518
ITJ3	<---	INTENTION	,535
TR4	<---	TRUST	,656
TR5	<---	TRUST	,614
TR6	<---	TRUST	,723
TR7	<---	TRUST	,593
RES4	<---	RESOURCE	,544
RES5	<---	RESOURCE	,432
ITJ4	<---	INTENTION	,461
ITJ5	<---	INTENTION	,364
DES1	<---	DESIGN	,222
DES2	<---	DESIGN	,457
DES3	<---	DESIGN	,752
DES4	<---	DESIGN	,805

Based on Table 5 Among all variables to be researched, the highest value achieved is ,805 of the design4-Intention to

Join variable, while the lowest achieved is ,22 of the Design1- Intention to Join.

Table 3
Variance

	Estimate	S.E.	C.R.	P	Label
RESOURCE	,235	,070	3,353	***	
TRUST	,138	,035	3,993	***	
DESIGN	,024	,021	1,173	,241	

The highest score in SE based on the AMOS Output is noted in 0.024 with the lowest noted in ,241. The highest value of CR is noted at 0,844 and the highest noted in P is 0.663. Resource and Trust have value P *** means that Resource and Trust significant influence on Intention to Join Collaborative Manufacturing Networks. While Design p value is 0,241 mean that design does not significantly influence to Intention to Join CMN. Observing from the original model's suitability in Figure 1 and Reliability Scores in Table 3, then the original model used in this study is not appropriate because the results of the model's suitability (GFI=0.771, AGFI=0.715, CFI=0.694, RMSEA=0.101) have a value lower than the specified limit value (Byrne, 2016). Therefore, the original model needs to be modified. According to Figure 2 and Table above, Trust is a significant factor in the original model, while the design is significant for the 0.05 level of significance. Modification of the original model is done by:

1) Eliminate R2, R5, DES1 from the model based on CFA analysis, 2) Use suggestion of modification indices from AMOS to increase the GFI value.

2) Add the Correlation arrows between DES-TRUST, TRUST-RES, and DES-RES, and Correlation between errors. The modification results get the final model as in Figure 3.
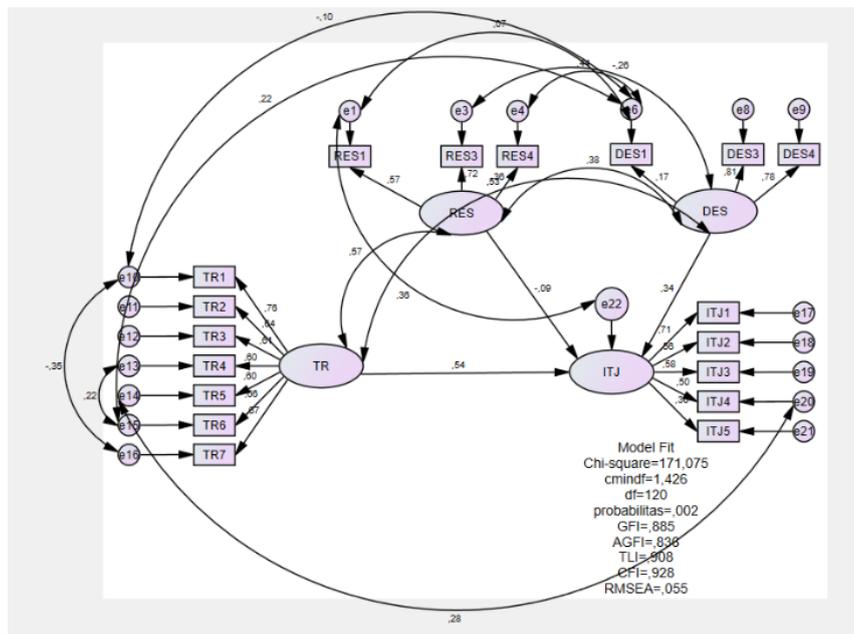
Fig. 3. The result of the final model

5. Discussion

A Batik SMEs requires to be upright at seeing opportunities that can be used to increase the company's competitiveness in the market. In order to maximize the potential of each SME, they need to utilize resources that can be used outside the company by collaborating with other SMEs. The development of Batik production and efforts to preserve batik culture make SMEs realize that collaboration is essential. When they have a high level of trust, they will tend to collaborate, whereas if the level of trust is less, they will not collaborate. If the Government wants to develop a collaboration system between Batik SMEs, the first step that the decision-maker must do is to increase the level of trust. These findings are in line with the previous studies that state trust is an important influencing factor in Supply Chain Collaboration [9], in e-commerce [25], in business advice by accountants to SMEs [41], and in a collaboration between SMEs and universities [42].

According to [22] and Fit Values in Table 4, the Final model used in this study is good because the results of the suitability of the model (GFI, TLI, CFI) have a value higher than the specified limit value. The value of RMSEA = 0.028 is smaller than the highest limit value. This criteria value shows that the final model is appropriate.

Table 4
Fit Values for Owner's Intention to Join CMN

Fit Index	Final Model	Acceptance Fit
Cmin	171.075	
Cmin/df	1.426	<3
GFI	0.885	0.85 <GFI<1
AGFI	0.836	0.8<GFI<1
RMSEA	0.05	0.0<RMSEA<0.08
CFI	0.928	0.9<CFI<1
TLI	0.908	0.9<GFI<1

From the final model in Figure 3 and Table 4 above we can see that the value estimate of regression weight of Resource is -0.091 is the second factor that significantly influence Intention to Join CMN on Batik SMEs in Indonesia, with an estimated value 0.34 (p=0.04). Therefore, we can conclude that H1 is rejected, and Resource is negatively influencing the Batik SMEs owner's Intention to Join the Collaborative Manufacturing Networks. Trust to Intention to Join CMN is 0.54 (p=0.004). Therefore, it can be concluded that H2 is accepted and Trust, positively and significantly influence the Batik SMEs owner's intention to join the Collaborative Manufacturing Networks. Design is the third factor that significantly influence intention to join CMN on Batik SMEs in Indonesia, with an estimated value 0.34 (p=0.337). Therefore, we can conclude that H3 is accepted, and Design is positively influencing the Batik SMEs owner's intention to join the Collaborative Manufacturing Networks.

From Figure 3, the final model shows DES1 (= Batik SMEs requires innovation in batik motif design) has an estimate score 0.17, DES3 (= other SMEs have the well ability to design batik) has an estimate score of 0.81, DES4 (= willing to purchase batik design royalty) has an estimate score = 0.78. While DES2 (=Batik owner wants to buy royalties) has been deleted from the original model, it is no longer used in the final model. The score above shows that batik design has an essential role so Batik SME owners are willing to join the Collaborative Manufacturing Networks. They admit that apart from their SMEs, many other SMEs have better motif designs. They are willing, if other SMEs want to buy royalties for their batik designs, but they refuse to buy royalties for batik designs from other SMEs. In the Batik industry, every SME is required to have an innovative Batik motif so that it can be accepted by consumers. Therefore, the opportunity to collaborate with other SMEs, especially related to attractive designs, is to be studied further. Resource, based on the results of this study, have a negative

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influence of -0.26 and does not significant influence willingness to collaborate. Therefore, H2 is rejected. Resources have a negative contribution, meaning that if a Batik SME has complete resources from the beginning to the end of the Batik production process, they will tend not to be interested in collaborating. Meanwhile, if their resources are limited, they will tend to have high motivation to collaborate. The use of technology of CNC Batik (RES2) machines is still a pro and contra among Batik SME business owners. Some tend to refuse because they prefer to empower local workers to make batik instead of getting saving time by using a CNC Batik machine. On the other hand, there are Batik SME owners who are open to technological advances in the form of CNC Batik machines because they get benefits in the form of savings in manufacturing lead times being shorter. Due to these pros and cons, the reliability of RES2 becomes small, and in the final model, RES2 is omitted. RES5 is also removed from the original model so that in the final model, RES5 is no longer available. RES5 is a statement that at some stages of production, there is a shortage of Human resources. The reliability value of RES5 is low because advanced Batik SMEs they have complete human resources. In contrast, Batik SMEs, which are still not advanced, they have limited resources in certain processes in batik. RES1, RES3, and RES4 are not deleted, indicating that in general human resources in Batik SME are limited, staff in the innovation department are limited, and most workers in Batik SME are elderly.

Table 5

Factors and Correlation Between Factors Owner's Intention to Join CMN

Factor and Correlation	Standardized regression coefficient	p-value	Result
Trust	0.54	***	Positive and significant
Design	0.34	0.337	Positive and not significant
Resource	-0.091	0.04	Negatives and significant
Trust and Design	0.53	0.080	Positive and not significant
Trust and Resource	0.57	***	Positive and significant
Resource and Design	0.38	0.169	Positive and not significant

Table 6

Standardized Regression Weights: (Group number 1 - Default model) _Final Model

INTENTION	<---	RESOURCE	-,091
INTENTION	<---	DESIGN	,338
INTENTION	<---	TRUST	,542
RES1	<---	RESOURCE	,573
RES3	<---	RESOURCE	,719
TR3	<---	TRUST	,611
TR2	<---	TRUST	,644
TR1	<---	TRUST	,758
ITJ1	<---	INTENTION	,710
ITJ2	<---	INTENTION	,558
ITJ3	<---	INTENTION	,585
TR4	<---	TRUST	,603
TR5	<---	TRUST	,597
TR6	<---	TRUST	,661
TR7	<---	TRUST	,670
RES4	<---	RESOURCE	,360
ITJ4	<---	INTENTION	,498
ITJ5	<---	INTENTION	,361
DES1	<---	DESIGN	,168
DES3	<---	DESIGN	,806
DES4	<---	DESIGN	,777

Among all variables to be researched, the highest value achieved is ,806 of the design3-Design variable, while the lowest achieved is - ,091 of the Resource- Intention to Join.

Table 7

Variance Owner Intention to Join CMN

	Estimate	S.E.	C.R.	P	Label
RESOURCE	,183	,064	2,843	,004	
TRUST	,122	,033	3,764	***	
DESIGN	,014	,015	,960	,337	
e22	,122	,037	3,268	,001	
e1	,375	,061	6,155	***	
e3	,247	,064	3,880	***	
e12	,205	,027	7,623	***	
e11	,256	,034	7,483	***	
e10	,167	,027	6,136	***	
e17	,254	,044	5,822	***	
e18	,253	,035	7,241	***	
e19	,269	,038	7,076	***	
e13	,288	,038	7,595	***	
e14	,251	,033	7,677	***	
e15	,244	,033	7,384	***	
e16	,333	,048	6,877	***	
e4	,878	,113	7,797	***	
e20	,293	,039	7,547	***	
e21	,532	,067	7,979	***	
e6	,485	,058	8,375	***	
e8	,187	,053	3,531	***	
e9	,263	,064	4,130	***	

Table 8
Covariance

			Estimate	S.E.	C.R.	P
RESOURCE	<-->	TRUST	,086	,025	3,408	***
RESOURCE	<-->	DESIGN	,019	,014	1,377	,169
TRUST	<-->	DESIGN	,022	,013	1,753	,080
e13	<-->	e15	,058	,026	2,279	,023
e10	<-->	e16	-,083	,026	-3,244	,001
e14	<-->	e20	,077	,026	2,996	,003
e15	<-->	e6	,074	,028	2,661	,008
e1	<-->	e6	,030	,035	,861	,389
e1	<-->	e22	,077	,031	2,484	,013
e3	<-->	DESIGN	-,016	,013	-1,224	,221
e4	<-->	e6	,285	,060	4,722	***
e10	<-->	e6	-,029	,025	-1,151	,250

From the Table 6, Table 7, and Table 8 it can be concluded some statistical analysis from the factors influencing the Intention to Join Collaborative Manufacturing Network (CMN). It can be seen that the influence of Resource variables on Intention to Join variables is statistically significant. The CR value is 2.843> 2.00, and the Probability is ***< 0.05. The standard estimate (regression weight) of the effect of variable Resource on variable Intention to Join is - 0.091, implied that Resource has negative influence to the variable Intention to Join CMN and statistically significant. Batik owners that have a good resource tend to not collaborate with other Batik SMEs.

The standard estimate (regression weight) of the effect of variable Design on variable Intention to Join is 0.338, Probability = 0.337, CR value 0.096 ≤ 2.00, Probability = 0.37 > 0.05 shows the influence of Design variables on Intention to Join variables is positive but not significant. Usually Batik owner has their own Batik cloths designer and do not employ other Batik SME's designer. Trust has positive influence to Intention to Join when the standard estimates (regression weights) of the impact of Trust variables on Intention to Join variables are: 0.542. Values of CR= 3.764>2.00 and Probability=0.008<0.05 suggest a positive impact of Trust on Intention to Join CMN.

6. Conclusion

This study examines the impact of Trust, Resource, and Design on SME Owners Intention to Join Collaborative Manufacturing Networks. A structured questionnaire is used to collect data from 140 Batik SMEs owner. The final model found that Resource has a negative influence on willingness to collaborate with an estimated value -0.091; Trust has a positive influence on willingness to collaborate with an estimated value 0.54; Design has a positive influence on willingness to collaborate with an estimated value 0.34, but not significance. The Resource is correlated with Trust by 0.56, Trust is correlated with Design by 0.53, and Trust is correlated with Resource by 0.57. The results showed that Trust and Design are the driving factors of SME owners' Intention to Join the Collaborative Manufacturing Networks. Design is the second factor positively influence Intention to Join Collaborative Manufacturing Network but not significant. Resources have a negative effect, implies that if an SME already has Resources, both human resources and complete equipment, they tend not to collaborate. Indeed, by collaborating they get good benefits for the company. Therefore, as a practical contribution, this study can be a reference for decision-makers in Government to build SME trust and a system for Batik Design collaboration before the CMN system is successfully implemented.

References

Abbas, J., 2019, Impact of knowledge management practices on green innovation and corporate sustainable development : A structural analysis. *Journal of Cleaner Production*, Vol.229, .

Ardito, L., and Angelo, V. D., 2021, The role of human capital in the foreign market performance of US SMEs : does owner ethnicity matter ? *Journal of Intellectual Capital*, Vol.22, No.7, pp.24–42.

Astriani, F., Noviyanti, Wibisono, C., and Kenedi, J., 2023, Determination of Motivation, Work Environment, and Work Communication on Performance Through Competence at the Public Health Centers In Batam City. *Journal of Optimization in Industrial Engineering*, Vol.16, No.2, pp.41–47.

Bagheri, A., and Vagnoni, E., 2020, Correction to: Entrepreneurial Competencies of SME Owners: A Comparative Exploratory Analysis Between Iran and Italy, pp.C7–C7.

Bai, Y. W., Chen, Z. N., Bin, H. Z., and Hu, J., 2005, Collaborative design in product development based on product layout model. *Robotics and Computer-Integrated Manufacturing*, Vol.21, pp.55–65.

Barnes, J., and Liao, Y., 2012, The effect of individual, network, and collaborative competencies on the supply chain management system. *International Journal of Production Economics*, Vol.140, No.2, pp.888–899.

Blackburn, R., Carey, P., and Tanewski, G., 2018, Business advice by accountants to SMEs: relationships and trust. *Qualitative Research in Accounting and Management*, Vol.15, No.3, pp.358–384.

Brunetto, Y., and Farr-Wharton, R., 2007, The moderating role of trust in SME owner/managers' decision-making about collaboration. *Journal of Small Business Management*, Vol.45, No.3, pp.362–387.

Byrne, B. M., 2016, *Structural Equation Modeling With AMOS. Structural Equation Modeling With AMOS*. Routledge.

Camarinha-matos, L., 2005, Collaborative Networks : A New Scientific Discipline Collaborative networks : a new scientific discipline. *Journal of Intelligent Manufacturing*, Vol.16, No.June 2005, pp.439–452.

Camarinha-Matos, L. M., Afsarmanesh, H., Galeano, N., and Molina, A., 2009, Collaborative networked

organizations - Concepts and practice in manufacturing enterprises. *Computers and Industrial Engineering*, Vol.57, No.1, pp.46–60.

Cao, M., and Zhang, Q., 2010, Supply chain collaborative advantage: A firm's perspective. *International Journal of Production Economics*, Vol.128, No.1, pp.358–367.

Chen, L., Ko, W., and Yeh, F., 2017, Approach based on fuzzy goal programming and quality function deployment for new product planning. *European Journal of Operational Research*, Vol.259, No.2, pp.654–663.

Darabi, F., Saunders, M. N. K., and Clark, M., 2020, Trust initiation and development in SME-university collaborations: implications for enabling engaged scholarship. *European Journal of Training and Development*, Vol.45, No.4–5, pp.320–345.

de Fretes, O. M., 2010, Collaborative Manufacturing Network for Small and Manufacturing Medium Manufacturing Enterprise. *ARIKA*, Vol.04, No.1, pp.1–10.

Ding, H., Fu, Y., Zheng, L., and Yan, Z., 2019, Determinants of the competitive advantage of dairy supply chains: Evidence from the Chinese dairy industry. *International Journal of Production Economics*, Vol.209, No.October 2016, pp.360–373.

Etemad, H., 2009, Internationalization of Small and Medium-sized Enterprises: A Grounded Theoretical Framework and an Overview. *Canadian Journal of Administrative Sciences / Revue Canadienne des Sciences de l'Administration*, Vol.21, No.1, pp.1–21.

Fachrunnisa, O., Mutamimah, and Gunawan, 2013, A Framework of Digital Collaboration Networks for SME's Sustainability. *International Proceedings of Economics Development and Research* (Vol. 63, pp. 73–77).

Fawcett, S. E., Fawcett, A. M., Watson, B. J., and Magnan, G. M., 2012, Peeking inside the black box: Toward an understanding of supply chain collaboration dynamics. *Journal of Supply Chain Management*, Vol.48, No.1, pp.44–72.

Feranita, N. V., Nugraha, A., and Sukoco, S. A., 2019, The Role of Government Support For Innovation and Performance of SMEs. *Politico*, Vol.19, No.2, pp.124–136.

Firmansyah, M. R., and Amer, Y., 2013, A Review of Collaborative Manufacturing Network Models. *International Journal of Materials, Mechanics and Manufacturing*, Vol.No.January, pp.6–12.

Fu, J., and Fu, Y., 2015, An adaptive multi-agent system for cost collaborative management in supply chains. *Engineering Applications of Artificial Intelligence*, Vol.44, pp.91–100.

Ghauri, S., Mazzarol, T., and Soutar, G. N., 2021, Why do SMEs join Co-operatives? A comparison of SME owner-managers and Co-operative executives views. *Journal of Co-operative Organization and Management*, Vol.9, No.1, pp.100128.

Hoyle, R. H. (Ed.), 2012, *Handbook of Structural Equation Modeling*. The Guilford Press.

Irianto, D., 2016, Collaborative Manufacturing for Small-Medium Enterprises. *IOP Conference Series: Materials Science and Engineering*, Vol.114, No.1,.

Kijkasiwat, P., 2021, The influence of behavioral factors on SMES' owners intention to adopt private finance. *Journal of Behavioral and Experimental Finance*, Vol.30, pp.100476.

Kim, K. M., and Lee, K. pyo, 2016, Collaborative product design processes of industrial design and engineering design in consumer product companies. *Design Studies*, Vol.46, No.July 2016, pp.226–260.

Kiraz, A., Canpolat, O., Özkurt, C., and Taşkın, H., 2020, Analysis of the factors affecting the Industry 4.0 tendency with the structural equation model and an application. *Computers and Industrial Engineering*, Vol.150, No.October,.

Kurniawati, M. A., 2020, The role of ICT infrastructure , innovation and globalization on economic growth in OECD countries , 1996-2017. *Journal of Science and Technology Management*, Vol.11, No.2, pp.193–215.

Kusmantini, T., Satmoko, A., Pratiwi, K. W., and Kurniawati, A., 2020, Building supply chain collaboration on SMEs: The role of ICT and trust. *Jurnal Siasat Bisnis*, Vol.24, No.2, pp.127–137.

Liu, H., Liu, Z., Lai, Y., and Li, L., 2021, Factors influencing collaborative innovation project performance: the case of china. *Sustainability (Switzerland)*, Vol.13, No.13, pp.1–19.

Man, A. De, and Luvison, D., 2019, Collaborative business models : Aligning and operationalizing alliances. *Business Horizons*.

Marzo, G., and Scarpino, E., 2016, Exploring intellectual capital management in SMEs : an in-depth Italian case study. *Journal of Intellectual Capital*, Vol.17, No.1, pp.27–51.

McClellan, M., 2003, *Collaborative Manufacturing Using Real-Time Information to Support the Supply Chain*. New York: CRC Press Company.

Meng, L., Qamruzzaman, M., and Adow, A. H. E. A., 2021, Technological Adaption and Open Innovation in SMEs : An Strategic Assessment for Women-Owned SMEs Sustainability in Bangladesh. *Sustainability*, Vol.13, No.2942, pp.1–22.

Mir, M., Casadesús, M., and Honore, L., 2016, The impact of standardized innovation management systems on innovation capability and business performance : An empirical study. *Journal of Engineering and Technology Management*, Vol.41, pp.26–44.

Morris, K. D., 2011, *Collaborative Product Development*. Colorado State University.

Muskat, B., Hörtnagl, T., Peters, M., and Zehrer, A., 2021, Journal of hospitality and tourism management innovation capability and culture: How time-orientation shapes owner-managers' perceptions. *Journal of Hospitality and Tourism Management*, Vol.47, No.March, pp.217–227.

Ogulin, R., Selen, W., and Ashayeri, J., 2012, Determinants of informal coordination in networked supply chains.

Journal of Enterprise Information Management, Vol.25, No.4, pp.328–348.

Pan, T., Zhang, Z., and Cao, H., 2014, Collaborative production planning with production time windows and order splitting in make-to-order manufacturing q. *COMPUTERS & INDUSTRIAL ENGINEERING*, Vol.67, pp.1–9.

Sachsenmeier, P., and Scottenloher, M. (Eds.), 2003, *Challenges Between Competition and Collaboration*. Springer-Verlag Berlin Heidelberg 2003.

Salam, M. A., 2017, The mediating role of supply chain collaboration on the relationship between technology, trust and operational performance: An empirical investigation. *Benchmarking*, Vol.24, No.2, pp.298–317.

Sari, D. P., Masruroh, N. A., and Asih, A. M. S., 2021, Consumer intention to participate in e- waste collection programs: A study of smartphone waste in Indonesia. *Sustainability (Switzerland)*, Vol.13, No.5, pp.1–28.

Silva, C., Mathrani, S., and Jayamaha, N., 2014, The role of ICT in collaborative product development: A conceptual model based on information processing theory. *International Journal of Innovation and Technology Management*, Vol.5, No.1, pp.43–49.

Tolba, A., Seoudi, I., and Fahmy, K., 2014, Factors influencing intentions of Egyptian MSME owners in taking commercial bank loans. *Journal of Small Business and Entrepreneurship*, Vol.27, No.6, pp.497–518.

Uygur, S., Spence, L. J., Simpson, R., and Karakas, F., 2017, Work ethic, religion and moral energy: the case of Turkish SME owner-managers. *International Journal of Human Resource Management*, Vol.28, No.8, pp.1212–1235.

Virk, S., 2017, Role of Human Resource Manage ment in Micro , Small and Medium Enterprises (MSME) in India. *International Journal of Busniess Administration and Management*, Vol.7, No.1, pp.26–34.

Widyastuti, W., Hartini, S., and Artanti, Y., 2020, Revisiting the online shopper's behaviour in Indonesia: The role of trust and perceived benefit. *International Journal of Industrial Engineering and Management*, Vol.11, No.4, pp.226–236.

Zhong, Y., and Moon, H. C., 2020, What drives customer satisfaction, loyalty, and happiness in fast-food restaurants in china? Perceived price, service quality, food quality, physical environment quality, and the moderating role of gender. *Foods*, Vol.9, No.4,.