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Understanding Learning Intention Complexities in Lean Manufacturing Training for Innovation on the Production Floor

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Abstract: The Theory of Planned Behavior (TPB) is a useful framework that helps explain people's behavior across a wide range of settings. The present study adopted the TPB to investigate factors that affect the complexity of the learning intention of workers involved with a lean manufacturing training initiative. Even though workers' training has been consistently listed as a critical success factor for innovative improvement initiatives, very few studies explore direct workers' learning intentions. This is particularly true within the area of lean manufacturing training. Hence, direct workers in an automotive parts manufacturing organization were invited to participate in this study, to which 204 workers voluntarily responded. The survey data was compiled and analyzed through stepwise regression to establish the effects of the different factors on learning intention in lean manufacturing training. It was determined from the empirical results that the participants' attitude toward learning from lean manufacturing training and the perceived behavioral control factors positively affected the workers' learning intention. Organization management could look into different measures and policies to stimulate better learning effects from training programs among the participants. Actions that could foster positive attitudes and confidence of workers towards lean training initiatives will be most helpful in enabling effective and innovative lean practices on the organization's shop floors. The key theoretical and managerial implications, as well as the limitations of the study, are also discussed.

Keywords: learning intention; training; lean manufacturing; continuous improvement

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1. Introduction

Lean manufacturing is one of the most successful continuous improvement methods to increase a manufacturing organization's productivity and efficiency. It has been considered a practical methodology to help manufacturing organizations improve production quality and cost. The roots of lean manufacturing can be traced back to the Toyota Production System (TPS), which Taichi Ohno developed to improve the manufacturing competitiveness of Toyota factories in Japan at the end of the Second World War [1,2]. There has not been a standardized definition for lean manufacturing used in the field. However, some of the lean concept's key characteristics can be traced back to the book *The Machine that Changed the World* [3]. Lean production is "an integrated socio-technical system whose main objective is to eliminate waste by concurrently reducing or minimizing supplier, customer, and internal variability" [4]. Lean manufacturing is also seen as a customer-value-focused approach to production which can bring remarkable productivity increases [5]. Therefore, implementing lean manufacturing, including addressing the human aspects of lean manufacturing, has become a priority for many manufacturing organizations [6,7].

1.1. Workers' Impact on Lean Manufacturing Innovations

Workers have a significant impact on lean manufacturing implementation, especially in labor-dependent manufacturing industries. Direct workers fundamentally are an essential part of the manufacturing process in such industries, and the performance of operations relies heavily on their involvement and abilities. Womack, widely acknowledged as a key authority on the lean concept, had even considered that workers' work teams are at the very heart of the lean factory [3]. This is also in line with other researchers' views that lean manufacturing implementation success depends on workers' cooperation and full participation [6,8–10]. Without workers' contribution, not only will the continuous improvement effort fail, but operations and production may even come to a halt. Past studies have also highlighted the importance of workers' commitment to successful lean manufacturing implementation in organizations [11–13]. Others have highlighted the risk of worker resistance as a threat to be considered for any lean manufacturing implementation effort [14]. Addressing workers' fear of new methods or procedures taking over their jobs will be an issue when planning for improvement and innovation in a manufacturing environment [15,16]. There have been indications that workers may fear that lean manufacturing implementation may lead to job losses, and therefore they may resist any changes required [17]. Consequently, it is hard to assume that workers will openly accept any continuous improvement effort, even if it is for the good of the organization.

Conversely, a continuous improvement effort pursued through the lean manufacturing methodology will allow workers the opportunity to harness their creativity and experience [18,19]. These improvement initiatives and opportunities will lead to a better sense of pride and a sense of job security among workers [20,21]. It has been suggested that workers should be empowered to provide ideas and suggestions to improve the processes that they are working on [5]. Employees who are skilled and experienced in their tasks could effectively contribute to their organization's innovation development [22]. More organizations are also integrating the drive for efficiency through lean approaches with the need to be more innovative by adopting open innovation [23,24]. Lean practices could potentially effectively contribute to open innovation in organizations [25]. It is evident that workers could play an essential and positive role, but organizations must prepare them well for the requirements and challenges through training initiatives.

1.2. Lean Manufacturing Training Complexities

The training of staff is an integral part of a lean manufacturing implementation effort. Without proper training, lean and other innovative change implementations could never be successfully implemented [26]. The training and education of workers have been noted as a critical success factor for lean manufacturing and other related improvement initiatives implementation in various industrial settings [27–31]. Proper resources must be allocated for workers' training, and management should encourage workers to attend the training by providing the appropriate rewards and outcomes for those engaging in training activities [10,32]. Experiences during training may also alter a learner's intention to complete the training [33]. Failure to provide proper and adequate training could even lead to low morale in the workplace [34,35]. For better quality and effectiveness, the training of skilled workers should be accomplished through a formalized process [36]. The right approach to the on-the-job training will have a positive impact on the level of innovation of the organization [37]. However, determining the types of training and how much training is necessary is a complex and complicated process [38]. The participants' learning intentions are an even more critical consideration for organizations seeking to train their workers.

Past research has identified that participation in training is a rational decision on the part of the participant. These studies enabled an understanding of the relationships between different factors and the impact on participants in training sessions [39–43]. Studies have also highlighted that participants could be encouraged to learn better from training activities through motivational initiatives [44–46]. Accordingly, the TPB has considered that a person's intention is affected by the different motivational factors that influence their behavior [47]. Therefore, the TPB is a suitable framework to be considered for better understanding participants' learning intention regarding training activities.

A limited number of past studies have applied the TPB to cover training participants' motivation, engagement, and learning. Wiethoff 2004 [48] adapted the TPB for a study on diversity training, while Renkema and van der Kamp 2006 [49] conducted a quasi-experimental study examining the individual learning accounts of learning intention and perceived learning cultures of different sectors. More recently, Ho et al., 2011 [43] conducted an empirical study testing the TPB to predict public sector employees' training participation and examine the factors that influence the participants' intentions and behaviors regarding participating in training. Alok et al., 2018 [50] tested the efficacy of the TPB in the prediction of lean adoption practices among workers of cement companies. Liu et al., 2020 [51], on the other hand, used the TPB to investigate workers' safety behavior and discussed the important role of safety training in an off-plant manufacturing environment. Other studies have also built upon the TPB framework to better understand the factors affecting participants' learning from training initiatives. Sanders et al., 2011 [41] considered the different factors that could stimulate low-education workers' learning intention in workplace learning activities. Kyndt et al., 2011 [42] completed a detailed study on the effects of past participation on the learning intentions of low-qualified workers. Similarly, Sanders et al. 2015 [52] investigated the impact of low-educated workers' training participation and learning experience on their self-efficacy. These past studies indicate the TPB framework's potential suitability for considering workers' learning intentions in lean manufacturing training.

1.3. The Aims of This Study

From the above literature, the important impact of workers' training on the successful implementation of lean manufacturing initiatives on the shop floor is evident. It has also been noted that there has been limited research into the learning intentions of workers in training programs. Therefore, this study seeks to adopt the Theory of Planned Behavior (TPB) to study production workers' learning intentions. Workers being well trained in lean practices will enable better implementation of lean manufacturing on the production shop floor.

2. Theoretical Framework: Theory of Planned Behavior (TPB) and Hypothesis

Learning intention has been defined as "a readiness or willingness to undertake a concrete action in order to neutralize an experienced discrepancy and to reach a desired situation by means of training and education" [42]. Past research by Maurer et al., 2003 [39] has shown that participants' learning intention is a strong predictor of their actual participation in learning activities. However, learning intention is a complex human behavior to be described clearly and comprehended. The Theory of Planned Behavior (TPB) is one of the leading theories that explain human behavior and intention. It is a promising social cognitive model of the different influences on an individual's decision to perform a particular behavior [53]. The TPB, as its name suggests, is suited for predicting planned behavior. Planned behavior refers to actions that are intentional and deliberate. Past research has indicated that a person's behavior is a direct positive function of their behavior intention [54,55]. Therefore, the training participants' learning intention is an excellent predictor of their willingness to engage with and learn from lean education programs.

The TPB proposes that behavior is significantly regulated by behavioral intention (BI). Additionally, BI is jointly affected by three combined predictors, attitude towards behavior (AT); subjective norm (SN); and perceived behavioral control (PBC). The TPB posits that when a person makes a decision, it will be based on the potential benefits of the decision or related actions, the impact of social pressure from their surroundings, and the ease of performing the behavior. The determinant of BI, AT, SN, and PBC can be further decomposed into underlying belief structures.

However, the significance of AT, SN, and PBC in the forecasting of intention will differ across behaviors and conditions. Thus, this paper aimed to investigate the contribution of each of the above predictors to the learning intention of direct workers involved in lean manufacturing training programs. This study adopts the TPB model, as shown in Figure 1, to examine factors influencing workers' learning intention in a lean manufacturing training initiative.

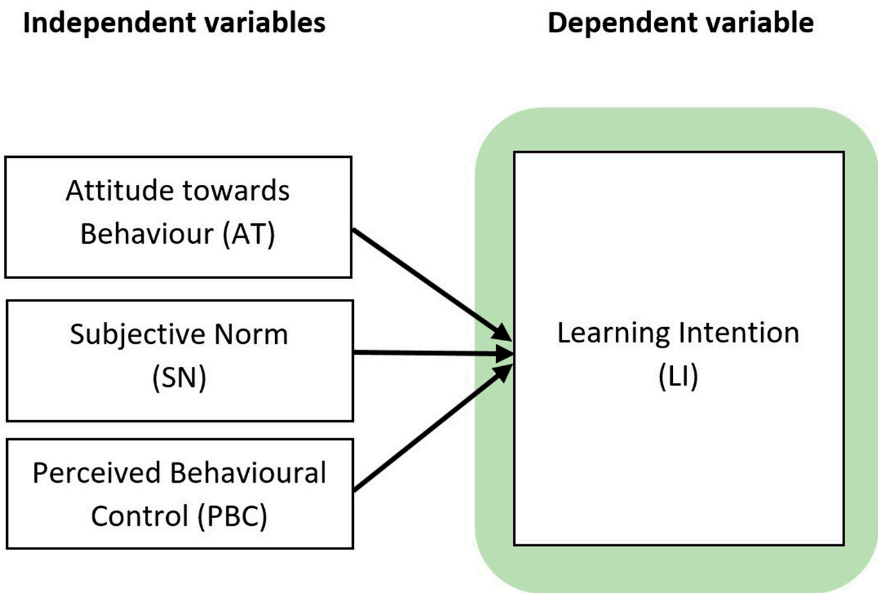

Figure 1. TPB model for this study.

Attitude is defined by Fishbein and Ajzen 1977 [56] as a positive or negative feeling in relation to the achievement of an objective by a person. Attitude is pertinent to assumptions about the outcomes of a behavior and the appraisal of the proportion between the positive and negative degree of contributing to a learning action [57]. It has also been emphasized that a supportive organizational attitude is a precursor for the implementation of any lean improvement program [58]. Prior studies based on the TPB have confirmed the significant relationship between attitude toward behavior and behavioral intention [59,60]. Ries et al., 2012 [61] believe that a person is much more likely to act out a behavior if they perceive that the actions have more value for them. It has been emphasized that the importance of workers' attitudes towards lean culture and engagement cannot be underestimated [62]. There is a tremendous challenge in changing the attitudes of employees when developing a lean enterprise [63]. In many organizations, continuous learning and work-related learning are essential for workers to improve their competitiveness [64]. A positive attitude within an organization towards lean manufacturing is important to ensure successful implementation [65]. As the manufacturing competitive landscape increases, there will be a massive demand for workers to reskill and upskill [66]. As Garrison 1997 [67] proposed, learning interest and opportunities will promote continuous learning. Workers would thus be expected to have a more positive feeling about the opportunity and the ability to learn from training activities if they feel they can benefit from and be rewarded for doing so. Therefore, the following hypothesis is proposed:

H1. *There is a significant positive relationship between attitude and learning intention in lean manufacturing training programs.*

Subjective norm (SN) is defined as the perceived social pressure on a person for performing or not performing a behavior [47]. A person's behavior is considered to be affected by beliefs about what is appreciated or degraded by others deemed important by the person [53,68]. In this sense, when individuals conduct certain actions, their behaviors are impacted by what others think about the particular behaviors. If the perceived social pressure is that an individual should exhibit the behavior in question, then the individual will be inclined to perform this behavior; otherwise, if the perceived social pressure is opposing the behavior, then the individual will be disinclined to do so [47]. Many studies have investigated perceived organizational support and its effects on learning intentions among employees [42,69,70]. From the literature, management's support [41,52,71], co-workers' and supervisors' support [41], as well as subordinates' support [39] can have positive influences on learning intention. It has also been established that supervisors' support and recognition could be beneficial for an intense lean production environment [72,73]. Workers are likelier to learn the content of the lean manufacturing training program if they believe that learning from the training is a desirable behavior to the people who are important to them. Therefore, the following hypothesis is proposed:

H2. *There is a significant positive relationship between the subjective norm and learning intention in lean manufacturing training programs.*

PBC is "the perceived ease or difficulty of exhibiting behavior" [47]. PBC deals with situations in which "people lack complete volitional control over the behavior of interest" [74]. In Ajzen's TPB model [47], PBC positively affects behavioral intentions and, therefore, the actual behavior [75–77]. The level of confidence someone has in performing a behavior and how much the person can control the behavior are two aspects of PBC [47,78]. In other words, PBC is ultimately the individual's beliefs about the situational and internal factors that assist or hinder their ability to perform the behavior. Understanding of the challenge of lean manufacturing processes and self-confidence in handling the changes have a direct impact on the acceptance of lean manufacturing by workers [16]. The complexities and challenges could encourage deeper learning for the participants [79]. However, workers who lack confidence in the improvement and lean initiatives will have a higher resistance to accepting change [80]. The more control an individual feels over their ability to learn from the training program, the more likely he or she will learn the contents of the training programs. In this study, PBC is the workers' ability to learn from the lean manufacturing training program. The hypothesis is as follows:

H3. *There is a significant positive relationship between perceived behavioral control and learning intention in the context of lean manufacturing training programs.*

A summary of all of the hypotheses used in this study is presented in Table 1 below.

Table 1. A summary of the hypotheses for the study.

	Hypothesis
H1	There is a significant positive relationship between attitude (AT) and learning intention (LI) in the context of lean manufacturing training programs.
H2	There is a significant positive relationship between subjective norm (SN) and learning intention (LI) in the context of lean manufacturing training programs.
H3	There is a significant positive relationship between perceived behavior control (PBC) and learning intention (LI) in the context of lean manufacturing training programs.

3. Methodology

3.1. Background of the Industry and Participants of This Study

The industry covered by this study is the automotive parts manufacturing industry. A key manufacturer of automotive parts located in the southern part of Malaysia participated in this study. The organization manufactures products for the automotive sector and employs a large pool of direct workers. The organization had also successfully implemented lean production in the manufacturing lines, an essential focus for this study.

With the organization's support, all of the direct workers from the organization were invited to participate in this study. The organization had a total of 584 direct workers during the study period. These workers are mainly involved with the factory's production processes and have been involved with the lean manufacturing methodology deployed in the organization. Lean manufacturing training is compulsory for all new direct workers in the organization, and further training is required when there are improvements or process changes related to the worker. The related details of this study, including the goals, scope, and voluntary basis of participation, were shared with all of the direct workers in the organization. Table 2 illustrates the selected demographic information of the participants in this study. After confirming with industry experts and the organization's management executives, it was agreed that the demographic data presented here are representative of the profile of a direct worker employed in the manufacturing sector.

Table 2. Demographic characteristic variables of the study participants.

		Quantity	Percentage (%)
Gender	Male	52	25.5
	Female	152	74.5
Age Group	19–23	89	44
	24–28	51	25
	29–33	19	9
	34–38	25	12
	39–43	13	6
	44–48	7	3
Education level	Graduates and above	19	9.3
	Secondary school	158	77.5
	Primary School	27	13.2
Nationality	Malaysian	64	31
	Indonesian	100	49
	Myanmar	20	10
	Nepal	12	6
	Vietnam	8	4
Language preference	Malay	178	87.3
	Other	26	12.7

3.2. Data Collection and Survey

This study collected data from a convenience sample of 204 manufacturing factory direct workers. This sampling method is frequently used in quantitative studies, as it relies on participants who are easily accessible [81–83]. In collaboration with the organization's human resources department, online questionnaires were distributed directly to the 204 participants who had signed up. The use of online questionnaires led to a good completion rate for the survey, encompassing 204 respondents without any missing data.

Before the actual data collection, an elicitation and pilot study were first conducted. In the elicitation study, 20 workers from the production floor participated in the exercise. An elicitation study is a formative guideline to develop questionnaire items to explain particular beliefs that should be measured in TPB constructs based on the target population [53,84–87].

A pilot study, which could help to identify potential practical problems in the research instrument [88], was also initiated. The pilot test consisted of three steps. First, eight experts were invited to attempt to draft the questionnaire. All of them were professionals with academic or manufacturing industry backgrounds. After scrutinizing the questionnaire, they provided their feedback, which enhanced the validity and clarity of the questionnaire. Two academic experts were invited to translate the questionnaire from English to the Malay language and then back-translate it to ensure that the meaning of the questions did not change. Third, the pilot survey instrument was validated through an initial, small-scale survey conducted with 30 workers from the organization personally contacted by the project team [89–91]. Pilot survey results showed that the Cronbach's alpha values of each construct were above 0.7, demonstrating the instrument's internal consistency and satisfactory reliability [92–94].

3.3. Measurements of Model Variables

The survey deployed in this study consisted of a self-reporting questionnaire designed to collect information about the participants and their views about the study's topic. This study adopted the following guidelines to develop the questionnaire items. The TPB questionnaire development guideline, which was recommended by previous studies on work-related training, was used as a key reference [47,95,96]. Secondly, this study used the semantic differential scale to capture the respondents' intensity of agreement or disagreement with various statements [97]. All items used the 7-point rating scale except the demographic questions. Thirdly, this study adapted measurement items with high reliability values from past research applicable to learning-intention-related studies. Learning intention was measured with five-item subscales derived from a previous study focusing on learning intention in the workplace [77]. Attitude was measured with five-item subscales with adjectives reflecting learning from training [86,98]. The subjective norm was measured with six-item subscales that were derived from those proposed by two past studies [77,99]. A further five items adapted from Kyndt et al. 2013 [77] were used to measure workers' perceived behavioral control. Response options available to the respondents included a 7-point scale anchored by (1) 'Not at all true' to (7) 'Very true' for perceived organizational support and (1) 'strongly disagree' to (7) 'strongly agree' for attitude, learning motivation, self-efficacy, and learning intention.

3.4. Data Analysis

There were four steps taken to analyze the data collected in this study. Firstly, the descriptive statistics of the study participants were reviewed, as covered in Section 3.1. Next, an explorative factor analysis (EFA) was performed to reduce the number of variables and to look for underlying constructs in the data. The EFA results could help confirm the unidimensionality of the constructs in our model and the underlying factor structure. Next, Spearman correlation was utilized to assess the relationships between independent variables and independent variables to determine the predictive validity of the data [86]. Collinearity diagnostic statistics were calculated to evaluate the multicollinearity effects. Next, a series of regression analyses was performed to examine the predictive effect of demographic variables. Finally, a stepwise regression analysis was performed to analyze the predictive impact of the independent variables on learning intention.

4. Results

4.1. Descriptive Statistics

Of the total respondents, 74.5 percent were females. Most respondents were between 19–23 years old (44 percent), and 25 percent were between 24–28 years old. Regarding the respondents' highest formal education levels, 77.5 percent were at the secondary school level, 13.2 percent were at the primary school level, and the remaining were graduates and above. In terms of the respondent nationalities, 49 percent were Indonesian, 31.4 were Malaysian, and the rest comprised respondents from Myanmar, Nepal, and Vietnam. The majority of the respondents (87.3 percent) preferred Bahasa Melayu (Malay) as the first language in the training activity, as shown in Table 2.

4.2. Reliability and Discriminant Validity

The reliability and discriminant validity were tested through exploratory factor analysis (EFA). Based on the EFA output shown in Table 3, the Kaiser–Meyer–Olkin (KMO) value is 0.913, which is above the minimum requirement of 0.5. Bartlett's test shows a significance of 0.000, which is less than 0.05 [100,101]. The cumulated explained variance accounts for 74.25% of the total variance. Based on the factor-loading criteria, a total of three items measured with factors of less than 0.5 were removed from the model [100]. Francis et al. [96] suggested a minimum of three items for each construct's measurement. After removing the low factor items, each construct consists of at least three measurement items; the cumulated explained variance has been improved, as it accounts for 76% of the total variance, and no additional items were indicated for deletion.

Table 3. Factor loadings for variables.

Components	No. of Items	No. of Items Retained	Item	1	2	3	4
Attitude (AT)	5	5	at8	0.979	-	-	-
			at9	0.911	-	-	-
			at10	0.872	-	-	-
			at12	0.818	-	-	-
			at11	0.763	-	-	-
Subjective Norm (SN)	6	5	sn8	-	0.919	-	-
			sn9	-	0.916	-	-
			sn6	-	0.900	-	-
			sn7	-	0.803	-	-
			sn10	-	0.735	-	-
Learning Intention (LI)	5	5	li4	-	-	0.922	-
			li5	-	-	0.840	-
			li2	-	-	0.717	-
			li3	-	-	0.709	-
			li1	-	-	0.658	-
Perceived Behavioral Control (PBC)	5	3	pbc6	-	-	-	0.917
			pbc7	-	-	-	0.816
			pbc5	-	-	-	0.795

The Cronbach's alpha value presented in Table 4 explains the reliability of the measurement items in the model. The Cronbach's alpha values for the LI, AT, SN, and PBC are 0.873, 0.930, 0.913, and 0.910, respectively. On the other hand, the composite reliabilities (CR) and the average variance extract (AVE) were calculated to test the constructs' discriminant validity based on the model. The cut-off value of CR is above 0.7, and the AVE for each construct is above 0.5 [102]. All CR values are higher than 0.8, and the AVE of each construct is greater than 0.6. In summary, all four constructs satisfy the assumption of reliability, convergent validity, and discriminant validity in the measurement model.

Table 4. Reliability and correlation between constructs of the model.

	Cronbach's Alpha	LI	AT	SN	PBC
Learning Intention (LI)	0.873	1.0	0.498 **	0.509 **	0.534 **
Attitude (AT)	0.930	0.498 **	1.0	0.457 **	0.431 **
Subjective Norm (SN)	0.913	0.509 **	0.457 **	1.0	0.484 **
Perceived Behavioral Control (PBC)	0.910	0.534 **	0.431 **	0.484 **	1.0

All correlations significant ** at $p < 0.01$.

Prior to the multiple regression analyses, there was a need to check for possible violations of normality and multicollinearity [103,104]. All variables were found to be normally distributed, which was confirmed through the level of skewness. The Spearman correlations indicated that all constructs revealed a positive correlation with learning intention (AT = 0.498, SN = 0.509, and PBC = 0.537) at a significance level of $p < 0.01$. In addition, collinearity diagnostic statistics were calculated to assess the multicollinearity effects. Collinearity diagnostic statistics for all constructs provided tolerance values that were greater than 0.10, and the variance inflation factor (VIF) was less than 10. Thus, the measures selected in the model do not have multicollinearity issues between the constructs. These results suggest that respondents could clearly distinguish the different constructs that influence their learning intention. Based on Tables 3–5, we conclude that the measurement model met the discriminant validity criterion.

Table 5. Multicollinearity and discriminant validity.

	VIF	Tolerance	CR	AVE
Attitude (AT)	1.78	0.56	0.94	0.76
Subjective Norm (SN)	1.72	0.58	0.93	0.73
Perceived Behavioral Control (PBC)	1.61	0.62	0.88	0.71
Learning Intention (LI)	-	-	0.88	0.60

4.3. Hypotheses Testing

The multiple regression analytic method was applied in this study using the SPSS software to assess learning intention prediction [100,105,106]. Specifically, stepwise regression was selected, as it has been recommended for use in predictive research with a simple model [75,107].

A series of regression analyses on the relationship between demographic variables (age, gender, education, position, and years of experience) and learning intention for training found that none of the demographic variables have a statistically significant effect. Therefore, no control variables were used in further analyses.

The stepwise regression analysis of this study was examined with regression analysis output, excluded variables output, and model summary output. The initial regression analysis is shown in Table 6. Based on the coefficients output, AT and PBC were significant predictors of learning intention (β = 0.247 and 0.454, respectively, $p < 0.05$) while SN (β = 0.075, $p = 0.274$) was not a significant predictor of learning intention. Based on this result, a regression analysis was tested by checking the excluded variable of the suggested model. After the variable's exclusion from the initial model, the model summary shown in Table 7 explains the final model of this study. The combination of two variables (AT and PBC) contributes to a larger R-squared (0.454) in Model 2 as compared to there being only one variable (PBC) in Model 1 (0.401). The results revealed that AT and PBC were the predictors of the prediction model of learning intention.

Table 6. Coefficients for Regression Analysis.

Model		Unstandardized Coefficients		Standardized Coefficients	*t*-Value	*p*-Value
		β	**Std. Error**	**B**		
1	(Constant)	5.984×10^{-17}	0.052	5.984×10^{-17}	0.000	1.000
	Attitude (AT)	0.247	0.069	0.247	3.557	0.000
	Subjective Norm (SN)	0.075	0.068	0.075	1.097	0.274
	Perceived Behavioral Control (PBC)	0.454	0.066	0.454	6.861	0.000

Dependent Variable: Learning Intention (LI).

Table 7. Model Summary.

Model	R	R^2	Adjusted R^2	Std. Error of the Estimate
1	0.633 [a]	0.401	0.398	0.77599614
2	0.674 [b]	0.454	0.449	0.74247293

[a]. Predictors: (Constant), Perceived Behavioral Control (PBC); [b]. Predictors: (Constant), Attitude (AT), Perceived Behavioral Control (PBC); Dependent Variable: Learning Intention (LI).

5. Discussion

This study's fundamental goal is to explore the complex factors affecting workers' learning intention in a lean manufacturing training program. Learning intention is a good indicator of actual learning in training activities. It also serves as an important initial step towards understanding workers' true learning from training initiatives. This study's findings indicate that the TPB model was able to describe up to 44.9% of the variance in the workers' learning intention involved with lean manufacturing training. The factors AT and PBC considerably determined the learning intention of workers in lean training programs. The third factor, SN, was determined by the analysis to be insignificant in this study. Figure 2 provides an overview of the significant factors based on the results of this study.

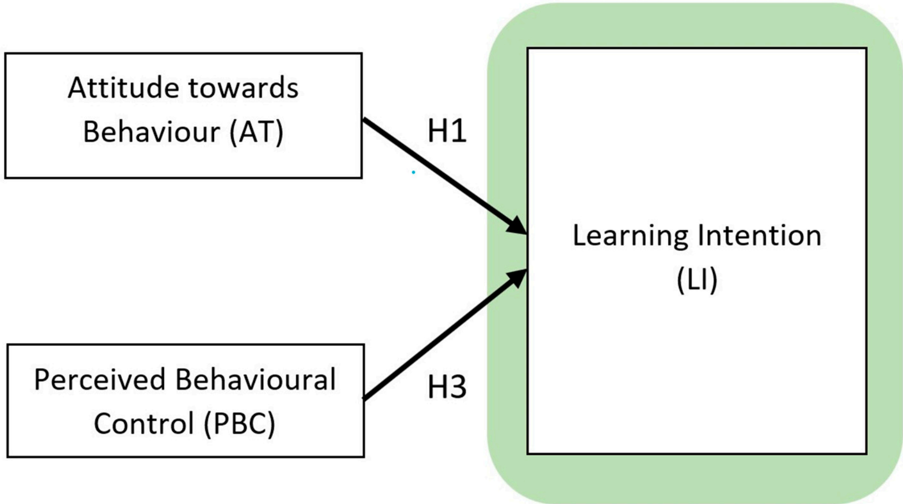

Figure 2. Significant factors in this study.

Hypothesis 1, that there is a significant positive relationship between attitude and learning intention in the context of lean manufacturing training programs, was supported by the results of this study. This is consistent with past findings in other related TPB studies [51,59,61,67]. The organization will need to do more to shape and encourage the workers' positive attitude towards learning in training programs. Some measures to be considered include providing the required resources and incentives to engage in lean manufacturing training initiatives. When trainees are well-informed about the training program content and expectations from training, it motivates them to put more effort into learning during training. Workers are also likely to be interested in the positive impact or reward of learning in a lean manufacturing training program [32]. Training could be a good and meaningful activity for workers, as they could capture the potential returns. Therefore, workers must clearly understand the benefit of learning from participating in these lean training programs. The organization's management can play a more proactive role in influencing workers regarding the potential benefits for workers when they engage in and learn from training initiatives.

Regarding Hypothesis 2, SN is not a predictor of learning intention in lean training programs. This finding differs from previous studies that determined that SN is a strong predictor of intentions [42,69,70]. However, the result is in line with the past study by Sanders et al. [41] on the training intention of lowly educated workers, which determined that SN is a weaker predictor of training intention when compared to AT and PBC. Alok et al., 2018 [50], a study in the Indian cement manufacturing context, also noted that SN is not a significant predictor of lean training intentions. Additionally, Gijbels et al., 2012 [108] found that social support was not significantly correlated with work-related learning. Raemdonck et al., 2014 [109] also recommended that work-related learning rely more on personal characteristics instead. As this study covered direct workers working specifically in a large manufacturing environment, it is possible that SN's effect on individual learning intention for training programs may be weaker. The workers in the company environment may be more rational and have their individual preferences. Some possible remedies to this would include a greater commitment and contribution from the organization's higher management toward lean manufacturing training [110,111]. As such, the message from the organization's management and their line managers should be consistent and reflective of the above. In many cases, the higher management support may not always be clear to direct workers' superiors (production line supervisors), who have direct responsibilities in managing direct production workers. Therefore, this leads to a significant impact on direct workers' understanding of the key priorities and strategy of an organization. Better communication and engagement with direct workers will be an important priority to ensure the success of lean manufacturing and other important change initiatives.

Hypothesis 3 was supported by the results. In this study, the PBC significantly affected the participants' learning intention in lean training programs. Therefore, the workers' feelings on how well they could learn from the training programs in their immediate and relevant situations are vital. This finding is in line with past research in training and human capital development which indicated that constraints from the workplace environment might affect employee attitudes and participation in training programs [112–114]. From a training perspective, it is in line with the TPB proposition that the more capable the participants are, the more likely they are to want to master the training content. Organizational management should seek to help their workers gather better determination and self-belief in their capabilities [115]. Line managers and lean leaders in the organization could also consider interventions that could help stimulate workers to be more determined to learn from the training sessions. These could include measures to help workers have better self-confidence in their abilities to learn about lean manufacturing and creating a supportive working environment that emphasizes continuous learning and improvement through training programs [116,117]. Workers should feel at ease and confident in engaging in the training activities.

6. Conclusions

Using the TPB framework, this study examined the different factors that affect a participant's learning intention. Staff training is an essential element in the success of lean manufacturing implementation, but the importance of participants' learning intention has not received much attention in the literature. To the best of the authors' knowledge, this study is the only one investigating workers' learning intention in lean manufacturing training programs.

The results of this study are consistent with the proposed sequence of relationships in the TPB model. The linkages between the different factors and learning intention in the lean training program were successfully determined. The results indicate that lean training program participants will want to learn from the training if they have an excellent positive attitude and perceived behavioral control. The study's empirical results indicate that the PBC and AT significantly affect the learning intention of lean manufacturing training program participants. It is clear that workers in a lean manufacturing training program are more likely to gain knowledge from such sessions if they perceive that they have adequate behavioral control of the situation, have a positive attitude towards their participation in the training, and have clear intentions to participate.

6.1. Theoretical and Managerial Implications

The present study has contributed to the paucity of literature investigating the learning intention of workers in lean manufacturing training programs. The importance of training for the success of lean manufacturing and innovative improvement programs is clearly evident from past research outcomes. This study advances the knowledge and understanding in the field by adopting the TPB as a framework to investigate the behavioral intentions of direct workers involved with lean manufacturing training initiatives in an automotive parts manufacturing environment. The study provides some needed understanding with regard to the complexity surrounding worker learning intentions. The study could also encourage academics in the future to further research workers' learning intentions, including further considering other constructs which may have significant influences.

From a practical perspective, managers looking to encourage better learning from lean manufacturing training could benefit from this study's findings. Organizations should emphasize the personal benefits of participating in lean manufacturing training programs to encourage workers to learn from such programs. The organization's management should also better facilitate employee learning. They must convince employees that they can participate effectively and learn essential knowledge and skills from lean training programs. For such training to be more effective, the management of organizations should pay attention to the importance of preparation for the training much in advance.

6.2. Limitation and Future Work

As with all research, there are some limitations to this study. First, the research data is limited to a manufacturing organization in the automotive parts production sector. Therefore, the research findings may not necessarily apply directly to other organizations in other sectors seeking to implement lean manufacturing. Future research could consider investigating workers' learning intentions across various industries.

This research is also based solely upon the TPB. It is a well-established framework for predicting attitudinal variables across different domains, but it could not exhaustively capture all the possible factors that could impact the workers' learning intention in a lean training program. Future research could examine and test factors beyond the TPB.

The present study relied on self-reporting from the workers. Future studies could depend on other, more objective types of measurement. The present study was also performed in a particular snapshot in time and trusted the workers' past behavior to predict their future learning intention in a lean manufacturing training program. The study did not involve a longitudinal behavioral follow-up, which could be considered in future research efforts.

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