

Factors affecting human resources development of SMEs: Evidence from the fourth Industrial revolution in Vietnam

Nguyen Van Song^a, Phung Tran My Hanh^{b*}, Mai Thanh Cuc^a and Nguyen Cong Tiep^a

^aVietnam National University of Agriculture (VNUA), Hanoi, Vietnam

^bThai Nguyen University of Economics & Business Administration (TUEBA), Thai Nguyen, Vietnam

CHRONICLE

Article history:

Received: January 20, 2020

Received in revised format:

March 25 2020

Accepted: April 26, 2020

Available online:

April 30, 2020

Keywords:

Human resources development

Small and Medium-sized

enterprises

Fourth Industrial Revolution

ABSTRACT

This paper examines the factors affecting human resource for small and medium-sized enterprises (SMEs) in the Fourth Industrial Revolution in Vietnam by using survey data from labors who worked in SMEs in Thai Nguyen, Vietnam. It then empirically examines the relationship between human resource development and a range of factors, using Exploratory Factor analysis and Multivariate regression analysis. The results indicate that six factors were more strongly affected SMEs human resource development in Industry 4.0 such as SMEs human resource development policy, System of training and vocational institutions, The development of science and technology, State and provincial policies for human resource development for SMEs, Business manager and Individual employee. In Vietnam, State and provincial policies for SMEs human resource development is the most influential factor on human resource development in Industry 4.0.

© 2020 by the authors; licensee Growing Science, Canada

1. Introduction

Industry 4.0 is a term given to refer to the current trend of automation and developmental process in manufacturing and chain production. Industry 4.0 is commonly referred to as “*The Fourth Industrial Revolution*” (Bernard, 2016). The term was first used in 2011 at the Hannover Fair in Germany. There is a widespread, and unsurprising, consensus that The Fourth Industrial Revolution can change economic development so that robot and machinery can play a more important role in reducing physical labor and enhancing labor productivity. There is always an interaction between technology, human resource and economic - social structures. “*Some jobs will be transformed; some will disappear; some will be created. Companies that do not adapt may go out of business or be forced to merge with others. New companies will arise*” (IndustriALL Global Union, 2017). The wave technology of the Fourth Industrial Revolution is requiring changes human resources because of the extremely important role for the existence and development of each country, every enterprise in general and small and medium-sized enterprises (SMEs). In particular, SMEs account for 99.43% of Vietnam's total enterprises. Vietnam's human resources are in a period of “*Golden Population Structure*”- this is a great opportunity for every SMEs to effectively utilize this abundant human resource, while also creating pressure strong in ensuring jobs, meeting the needs of learning, training and improving human resources quality. Following the estimating by the International Labor Organization (Aradhana, 2016), the automation in the Fourth Industrial Revolution can be replaced 64% of Indonesian textile, clothing and footwear, 86% in Vietnam, 88% of Cambodia in the next decade. Industrial revolution 4.0 also poses many challenges especially that will dramatically change the structure of labors and the labors market. Automation systems will gradually replace manual labors in the economy as a whole. This will affect the income of simple workers and increase unemployment.

* Corresponding author.

E-mail address: phungtranmyhanh.tueba@gmail.com (P. T. M. Hanh)

Vietnam's human resources index ranks the 62nd in the world and the 14th in the Asia Pacific region; only 5% of the laborers are proficient in English and only 10.4% are skilled workers (ManpowerGroup Solutions, 2018). After the effects of the Industrial Revolution 4.0, Vietnam has faced with many challenges, especially the ability to compete to maintain and seek job of low-qualified laborers. In the “Readiness for the Future of Production Report 2018” was released by the World Economic Forum (2018), in a total of 100 countries, Vietnam fell in the group of countries where are not ready for the 4th industrial revolution; the quality of human resources ranked No.70 and the indicators related to innovation and the quality of human resources at a very low level. Thai Nguyen is a Northern midland and mountainous province with 97.07% of SMEs playing an extremely important role in the socio-economic development of the province, creating jobs for the province's human resources as well as other Northern midland and mountainous provinces. Thai Nguyen is the 3rd ranked province in the country in terms of the number of professional and vocational training institutions, so training of human resources and human resources have the opportunity to access changes in technology, create favorable for learning activities, improving human resources quality in the Fourth Industrial Revolution. However, Thai Nguyen with 61.26% of the population in working age - is the “Golden population structure” period but the human resources quality for SMEs is a big challenge because human resources are trained at university only accounted for 7.9% and the post graduate only accounted for 0.3% are very low compared to other regions across the country; unprofessional working attitude; lack of foreign language skills, information technology, soft skills do not meet the requirements of workers in Industry 4.0. Besides, the working style is not high and mainly concerned with short-term benefits and goals, not focused on improving qualifications and skills in the long run even with the support of training costs from State policies. As a result, labor productivity, average income, labor efficiency and labor productivity of SMEs are much lower than in Asia-Pacific countries as well as in the world. The economy is mainly dependent on the use of cheap labor in many occupations such as apparel, footwear, mining natural resources,... with the level of workers is not high, labor income compared with many countries in Southeast Asia, has a long gap (Fig 1).

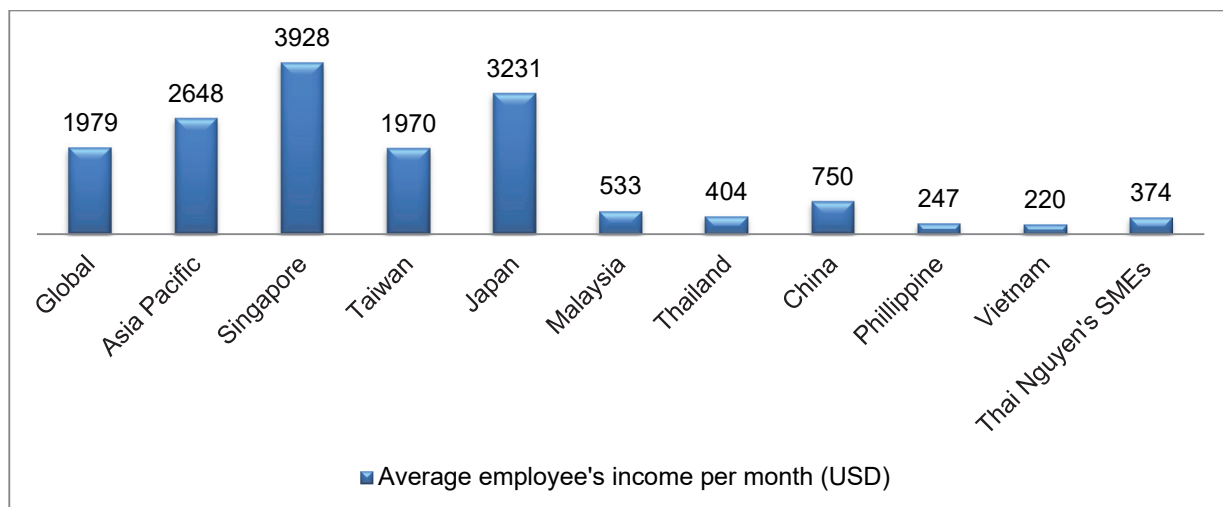


Fig. 1. Average employee's income per month in Vietnam and some Asia Pacific countries

Source: Manpower Group Solutions (2018)

This paper aims to clarify the background of Thai Nguyen's human resource development for SMEs in the long term perspective. The present analysis provides practically useful implications. Based on this motivation, the paper summarizes recent discussion on human resources development and investigates factors affecting SMEs human resource development in the Industrial Revolution 4.0 by Exploratory factor analysis and Multivariate regression analysis. There are, however, other factors that would change in the future. For example, there would be major changes in population sizes, technologies development, new policies, new education approach and other economic - socio conditions. Nevertheless, at this stage, these changes would be beyond the author's ability. In addition, the primary purpose of this research is only to investigate the factors affecting SMEs human resources development in Industrial Revolution 4.0 in Thai Nguyen province, Vietnam. Hence, such changes are not accounted.

2. Literature review

With that backdrop, human resource development in SMEs plays an important role in the Fourth Industrial Revolution. Many previous studies have empirically investigated the human resources development in enterprises. Existing studies on the human resource management models focus mostly on the measuring components that enhance the effectiveness of human resource management. A human resource management model is particularly useful, as it includes most elements and interaction among all factors in human resource management (Craciun, 2015; Skledar et al., 2015; Katarzyna, 2016; Keltouma & Rahima, 2016, 2016; Wibawa & Dian; Ilyas et al., 2016; Prihardini, 2018; Pravdiuk et al., 2019). Talent management issues have received increasing attention; however, the traditional approaches of human resource management cannot cope with the shortage of talent in a competitive environment (Chang & Yeh, 2018). A study by Scavarda et al. (2019) aims to present a sustainable

human resource management framework, focusing on the youth generation and two proposals were presented: “*the role of the institution in promoting education programs for youth generation*” and “*the role of the institution in improving the presence of the youth generations within the job market.*”

There are extensive researches on the factors affecting SMEs human resource development. In general, these studies point to a small but positive effect on SMEs human resource development (Alan, 2006; Ale et al., 2008; Roberto & Eleonora, 2014; Drábek et al., 2017; Soto-Acosta et al., 2017; Alžbeta et al., 2018; Miloloža, 2018; Silvia et al., 2018; Rozsa et al., 2019). Holátová et al. (2013) show that development in relation to human resources and innovations, with a focus on developing students' knowledge, future managers and potential founder's family companies and enterprises, finding new ways and innovative approaches to the development of human potential human capital. Demyen (2015) proposes education does not stop in college, as well as it does not stop at the University. Knowledge around world evolves and it is vital for companies to keep pace with new trend. Thus, training becomes vital especially for the new employees. Also investing in workers' health, “*including flexible leave policies, can easily save more money than these new policies cost to implement*”, workers that are not only healthy but also satisfied with their jobs becoming the essential element in generating greater productivity, as well as lower absenteeism and turnover rates. Many current studies have empirically investigated necessary skills, education and training activities for human resources in enterprises, organizations and countries in the Industrial Revolution 4.0. For example, Ditrach (2016) shows that the Fourth Industrial Revolution constitutes both a risk and an opportunity for the European economies. Reskilling is now a central element in the introduction of connected production. However, not all companies and regions are equally well prepared to deal with the challenges of connected production processes, whereas Christian (2017) presented the state of implementation of Industry 4.0; presents typical obstacles and challenges for the others demonstrate the importance of involving employees to improve the success of innovation processes in the company; and derives political recommendations to improve the overall framework. In addition, as IndustriALL Global Union (2017) note, both companies and government in Europe have engaged in strategic skills planning and taken measures to make industrial jobs more appealing. Some remarks on skills and the regional divide (Fig. 3), product complexity and skill level are important indicators for the economic development of Industry 4.0. These were followed by a number of further studies such that of Demyen (2015), KPMG (2016), International Labor Organization (2016), Benešová and Tupa (2017), Wisskirchen et al. (2017), Silvio et al (2017), Oscar Lazaro (2017), Stentoft et al. (2017) and Buhr (2017). The estimated results of economic efficiency indices showed that the mean value of technical efficiency was 82 percent, allocative efficiency was 87 percent and economic efficiency was 75 percent for three years of which the highest densities were from 51 percent to 90 percent. The findings of the study support the idea that human capital positively affects rice productivity and economic efficiency (Nguyen Van Song, 1997).

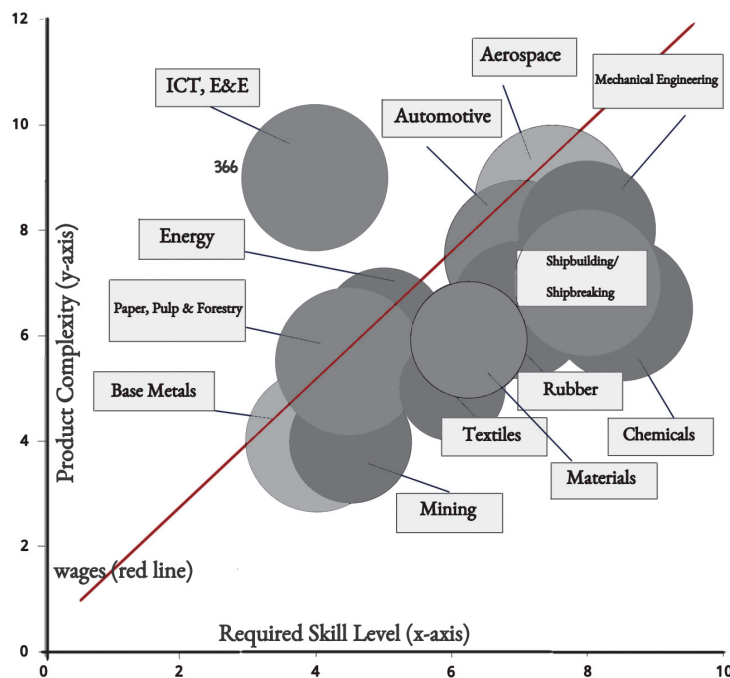


Fig. 2. Qualitative model of IndustriALL's industrial sectors on a plot of product complexity and required skill level (Source: IndustriALL Global Union, 2017)

The background shading corresponds to the regional divide (light grey = developing world, dark grey = developed world; size of bubble indicates relative number of workers affected). Adapted from Hilpert, Y: 2017.

The finding of Katarína et al. (2019) are that the paper focuses on comparing highly innovative countries and less innovative countries in Central Europe, analyzing businesses by looking at differences in attitude towards employee education and individual forms of employee education. The main statistically significant difference is in the strategic approach to employee education and development and the set-up between innovative countries and moderate innovators.

3. Methodologies

3.1. Questionnaire

A 510 - item questionnaire was constructed for this research. In order for the items to be relevant to the factors affecting on SMEs human resource development, two focus groups were held as managements group and labors group. 255 Managements and 255 labors in SMEs in Thai Nguyen province were invited to participate in the interview. The interview schedules cover in these areas: SMEs human resource development policy, System of training and vocational institutions, Developing of science and technology, State and provincial policies for human resource development for SMEs, Business manager and Individual employee.

3.2. Sample and model

The sampling frame includes managements and labors worked in SMEs in three economic sectors: Agriculture, forestry and fishing enterprises; Manufacturing, construction enterprises and Service enterprises. As a general rule, the minimum is to have at least five times as many observations as the number of variables to be analyzed (Hair et al., 2014). In this study, there were 50 observations, so the number of samples should be 250 variables. Two focus groups were held, so the authors decided to investigate 510 samples. The number of valid responses was 465. In the survey, managements and labors were asked to describe the cognitive abilities they believed the factors were affected to SMEs human resource development in Industry 4.0. They responded to each item on a 5-point Likert scale in relation to each of assessment questions. Likert scales provide a range of responses to a statement or series of statements. Usually, there are 5 categories of response ranging from 5 = strongly agree to 1 = strongly disagree with a 3 = neutral type of response (Jamieson, 2004). When using Likert-type scales, it is essential that the researcher calculates and reports Cronbach's alpha coefficient for internal consistency reliability. Internal consistency reliability refers to the extent to which items in an instrument are consistent among themselves and with the overall instrument; Cronbach's alpha estimates the internal consistency reliability of an instrument by determining how all items in the instrument relate to all other items and to the total instrument (Gay et al., 2006). Exploratory factor analysis was performed using Principal Axis method of extraction and Varimax rotation. Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and Bartlett's test of sphericity were computed to test the validity of the factor analysis of the data set. Factor scores were considered as independent variables for estimating SMEs human resources development in Industry 4.0, using Multivariate regression model. Based on Unver and Gamgam (1999), in Multivariate regression analysis, there are n explanatory variables, and the relationship between the dependent variable and the explanatory variables is represented by the following function:

$$y_i = \beta_0 + \beta_1 x_{i1} + \beta_2 x_{i2} + \dots + \beta_n x_{in} + \varepsilon$$

where: y = dependent variable
 x_i = independent variable
 β_i = parameter
 ε = error

The Multivariate regression model is useful to analyze factors affecting SMEs human resources development so that the authors assume the following Multivariate regression function considering six factors affecting SMEs human resource development in Industry 4.0 in Thai Nguyen province, Vietnam.

$$PTNL = \beta_0 + \beta_1 CSNN + \beta_2 CSDT + \beta_3 KHCN + \beta_4 CSDN + \beta_5 NQL + \beta_6 CNLD + \varepsilon$$

where:

CSNN = State and provincial policies for human resource development for SMEs
 CSDT = System of training and vocational institutions
 KHCN = Developing of Science and technology
 CSDN = SMEs human resource development policy
 NQL = Business manager
 CNLD = Individual employee

4. Results and discussions

4.1. Exploratory factor analysis

The scale was evaluated through Cronbach's Alpha reliability coefficient. There are some observations concerning Corrected Item-Total Correlation, Corrected Item-Total Correlation must be greater than 0.3 (Nunnally, 1978). The items *CSDN4*, *CSDN7* and *CSDN8* do not have loading greater than 0.3; Factor Loading at 0.3 is the minimum condition for observed variables to be retained (Hair et al., 2014). There is thus empirical ground to discard these items from the scale. The internal consistency of the construct (Cronbach's alpha) for all assessments improves substantially when the items are deleted; all

alpha values are above 0.7. The data were factor analyses for each Independent variable and Dependent variable, using Principal Axis method of extraction and Varimax rotation with Kaiser Normalization to achieve items. The item *CNLD6* has factor loading less than 0.5 and the variable is not uploaded factor, and the item is deleted and we continue to carry out the second EFA test. The Kaiser-Meyer-Olkin (KMO) indices of the instrument in the Independent variable, Dependent variable of 0.905 and 0.728, respectively; indicate the data suitable to very suitable for factor analysis (Hair et al., 2014). A statistically significant Bartlett's test of sphericity Sig. = 0.000 (sig <0.05), indicates that sufficient correlations exist among the variables to proceed (Hair et al., 2014). Independent's Cronbach alpha values from 0.785 to 0.890 are above 0.6 and Dependent's Cronbach alpha values of 0.684 to 0.752, which show the instrument has sufficient internal consistency in human resources development in Industry 4.0 contexts.

Independent's Eigenvalue values are greater than 1, only those elements with Eigenvalue ≥ 1 are retained in the analysis model (Hair et al., 2014). Dependent's Eigenvalue values is 2.136 >1, which presented that 4 observed variables were grouped into 1 factor. The Independent cumulative by 52.705% >50%, indicating that 6 factors of Independent values explained 52.705% of the variation of research data. The Dependent cumulative by 53.391%, which shows that the dependent variable factor explained 53.391% variation of research data. All factor loading values are above 0.5 and these observed variables only upload a single factor so the observed variables are important in the factors are significant. The scales of independent variables and dependent variables warrant convergence values and discriminate values. Table 1 reports the summary research variables and hypotheses. In the final model, the items *CSDN4*, *CSDN7*, *CSDN8* (State and provincial policies for human resource development for SMEs) and the item *CNLD6* (Individual employees) were deleted for empirical and substantive reasons. The final model was subsequently tested on the validation samples for each assessment.

Table 1
Summary research variables and hypotheses

No.	Factor	Encode	Expectations affecting human resource development	Cronbach's Alpha
Independent variables				
1	State and provincial policies for human resource development for SMEs	CSNN	+	.890
2	System of training and vocational institutions	CSDT	+	.871
3	Developing of science and technology	KHCN	+	.837
4	SMEs human resource development policy	CSDN	+	.882
5	Business manager	NQL	+	.785
6	Individual employee	CNLD	+	.821
Dependent variable				
7	SMEs human resource development	PTNL		.705

Source: Compilation from survey data (2019)

4.2. Multivariate regression analysis

Multivariate regression analysis is a statistical technique that can be used to analyze the relationship between a single dependent (criterion) variable and several independent (predictor) variables in the foundation (Hair et al., 2014) for forecasting model the affecting SMEs human resource development in Thai Nguyen province in Industry 4.0. The analysis was carried out by Enter method; the variables were taken at the same time to select based on the criteria for selecting variables with significance are less than 0.05. The results of regression analysis are presented in Table 2. The standardized regression coefficients are all different from 0 with positive beta coefficients and Sig t tests of the regression coefficients are less than 0.05. All 6 independent variables are involved in SMEs' human resource development and no variables are excluded from the model.

Table 2
Multiple regression analysis

	Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
	B	Std. Error	Beta	t	Sig.	Tolerance	VIF
(Constant)	1.281	.126		10.176	.000		
CSNN	.072	.020	.132	3.520	.000	.769	1.301
CSDT	.074	.022	.119	3.299	.001	.830	1.205
KHCN	.085	.023	.142	3.732	.000	.742	1.348
CSDN	.254	.033	.287	7.746	.000	.785	1.274
NQL	.159	.023	.253	6.826	.000	.785	1.274
CNLD	.120	.028	.157	4.298	.000	.802	1.247

Source: Compilation from survey data (2019)

According to Hair et al. (2014), Variance Inflation Factor (VIF) is used to measure of multicollinearity, which is calculated simply as the inverse of the tolerance value. Generally accepted levels of multicollinearity (corresponding to a VIF of 10) almost always indicate problems with multicollinearity, but these problems may also be seen at much lower levels of collinearity and multicollinearity. However, in fact, Values much lower than the suggested thresholds (VIF values of even 3 to 5) may result in interpretation or estimation problems, particularly when the relationships with the dependent measure are weaker. Refer to Table 2, VIF values of 1.205 to 1.348 are lower than 3, showing that the regression model does not violate hypothetically the phenomenon of multicollinearity. The coefficient $R = 0.712$ shows that the relationship between the variables in the model has a close correlation. The regression results of the model show that R^2 (R Square) value is 0.507. This

refers to the model's appropriateness of 50.7% or in other words, 50.7% of the variation of factors affecting SMEs human resource development in the Industrial revolution 4.0 is explained by 6 factors. The value of Adjusted R² reflects more accurately the fit of the model than the whole, Adjusted R² value of 0.501 (or 50.1%) and 49.9% is due to variables outside the model and random errors; explained by 6 factors. Durbin-Watson is less than 1 and greater than 3, the probability of autocorrelation of residual is very high (Field, 2009). The Durbin – Watson value is in the range of 1.5 – 2.5, there will be no autocorrelation phenomenon, this is the standard value of current use (Yahua Qiao, 2011) with observation number n = 465, parameter number $\beta - 1 = 6$ ($k^2 = 6$), significance level 0.01 (99%) in Durbin – Watson, dL statistics (lower statistic value) = 1,613 and dU (Statistical value above) = 1.735, Durbin-Watson (d) = 1.781 coefficient is in the range (1,735; 2,265); so there is no autocorrelation between the remainder in the model, the research model is statistically significant. To further test the appropriateness of the model, the research is use F test (relevance of the overall linear regression model). This indicates whether the dependent variable is linearly correlated with the entire independent variable. If value Sig. <0.05 which means that the Multivariate linear regression model is suitable for the data set. The value Sig. of F test is 0.00 <0.05. This means that the independent variables in the model have a linear correlation with the dependent variable, or show that the linear regression model is suitable for the data set and the variables meet the acceptance criteria. The study used the Spearman test to examine each statistically independent variable with the absolute value of the standardized residuals (ABSRES), the evaluation criteria are correlation coefficients. Spearman has meaning Sig.>0.05, it can be concluded that the variance of the remainder remains unchanged. Spearman correlation coefficients between independent variables and absolute variables of standardized residuals have a significance of greater than 0.05, so it can be concluded that the variables ensure no variance of constant error. In order to compare human resource development for SMEs enterprises in Industry 4.0 by kind of economic activity, One – way analysis of variance (ANOVA) was conducted. The significance level Sig. = 0.299 > 0.05 can be shown that the variance of factors affecting human resource development for SMEs by economic sector is not significantly different. Thus, the results of analysis in ANOVA table can be used well to test hypotheses. It is evident from Table 10 that significance Sig. = 0.535 > 0.05, it can be concluded that there is no statistically significant difference in the factors affecting SMEs human resource development by economic sectors. To further examine factors affecting SMEs human resource development, a correlation analysis is made between independent variables and dependent variables. All independent variables are correlated with the dependent variable at the 1% significance level with 99% confidence. The correlation coefficients between independent and dependent variables are significant (sig. <0.05), so the factors included in the regression analysis are reasonable. The dependent variable affecting human resource development (PTNL) is most strongly correlated with the independent variable SME's human resource development policy (CSDN) (Pearson coefficient = 0.533) and the weakest correlation with the Independent variable training and vocational training system (CSDT) (Pearson coefficient = 0.356). This close correlation is expected because the close and linear relationships among variables explain the influence on model results. Therefore, these independent variables can be included in the regression analysis to explain the impact on the results of the research model.

The non - standardized regression equation:

$$PTNL = 1.281 + 0.072 * CSNN + 0.074 * CSDT + 0.085 * KHCN + 0.254 * CSDN + 0.159 * NQL + 0.120 * CNLD + \epsilon$$

4.3. Factors affecting Thai Nguyen's SMEs human resources development in the Fourth Industrial Revolution

In order to analyze the factors affecting SMEs human resources development in Thai Nguyen province, the research results raise a number of issues and policy implications that need to be paid attention as follows:

The factor State and local policies has a positive relationship with human resource development, with beta coefficient is 0.072. In recent years, the Government has developed, adjusted and completed many policies to support human resources development in general and SMEs human resource development in particular in Industry 4.0. The most recent is Decree 39/2018/ND-CP detailing a number of articles of the Law on Supporting SMEs to replace Decree No. 56/2009/ND-CP and Thai Nguyen Provincial People's Council issued Resolution 04/2012/NQ - HDND on Human Resource Development Planning Thai Nguyen province, period of 2012-2020 but mainly developing general human resources of the province and there is no specific policy on developing human resources for SMEs in Industry 4.0. The State Policies are the basis for SMEs to carry out training and human resource development activities for enterprises. The process of finalizing, amending and supplementing has shown the spirit of innovation in human resource development activities for SMEs in Industrial Revolution 4.0. The regression results show that the System of training and vocational institutions has a positive relationship with human resource development. This result is similar to the research of Cunningham and Rowley (2008). The education and training institutions provide the number of human resources great force for businesses in general and for SMEs in particular. In 2018, the number of high school graduates was 13,828, intermediate school graduates were 8,652 students, college graduates were 4,892 students and university graduates were 12,670 students (Thai Nguyen Statistical Office, 2019). Therefore, the system of education and training institutions need to renovate training and education methods in order to enhance the role of training institutions to develop human resources with multidisciplinary knowledge and skills in the digital revolution. There has been breakthroughs in teaching methods; the training program is still heavy in theory, there has been no change in Industry 4.0, workers still lack a lot of foreign language skills, information technology, teamwork skills, etc. The above is the basis for research to provide more appropriate solutions for human resource development for SMEs of Thai Nguyen province in the context of Industry 4.0. Regression results the development of science and technology has a positive relationship with human resource development. Meanwhile, according to the research of Ale et al. (2008), Roberto and Eleonora (2014) science and technology is one of the factors affecting on human resource development when there is a change in science. Technologies will positively affect

the development of human resources for businesses. The factor developing of science and technology has a positive relationship with human resource development, with beta coefficient is 0.085. The main reasons why SMEs in Thai Nguyen are not fully aware of the role of technology innovation are: Firstly, most of SMEs think that funding for technology innovation is a big problem for businesses. Because investing in a technology line is quite expensive. Secondly, the majority of enterprises said that at this time, there was no problem or did not see the need for technological innovation as in the food processing or textile industry, SMEs thought that this was the main production sector. Weak with the traditional method, the demand for technology application is not high; in addition, some other small-scale enterprises have just started, so there is no orientation for technological innovation. Thirdly, due to the size of SMEs' resources, human resources have not really met the changes of new technologies. SMEs human resource development policy includes attracting and recruiting, arranging and using, training and developing, evaluating work performance, salaries and remuneration. The regression results show that the human resource development policy of SMEs has the same direction and the most influence on human resource development with beta coefficient is 0.333. This is consistent with the hypothesis with the research of Jameson (2000) and Demyen (2015). In SMEs, workers with professional qualifications have a difference in the development of human resources, those with high qualifications have the desire, awareness and conditions for raising qualifications, more professional skills, and workers with low professional qualifications face many difficulties in human resource development, especially their own capabilities. Therefore, SMEs need to support and improve policies for workers who have many opportunities to learn and participate in training to develop their own capacity better.

Business managers have a positive influence on the development of human resources for SMEs, with beta coefficient is 0.310. This result is in the same opinion as several studies conducted by Beaver and Jennings (2001), Coetzer (2006). Managers play an important role in encouraging, motivating and learning opportunities for employees to improve their skills and qualifications. In addition, the manager helps find and organize training programs for employees in the enterprise to develop human resources in the digital revolution. Therefore, it is essential to improve the capacity of managers with the changes of Industry 4.0, contributing to the development of human resources for SMEs in Thai Nguyen province. Most of the managers in Thai Nguyen SMEs have low professional qualifications and the management is mainly based on experience but has not been through intensive training programs on human resources management, so the management capacity before the change of Industry 4.0 is still limited. Restrictions from managers are the basis for researching and proposing solutions to develop managers for SMEs in order to develop common human resources for SMEs in the Fourth Industrial Revolution. The regression results show that individual employees positively affect the development of human resources for SMEs with beta coefficient is 0.236. In the digital revolution, in addition to well-qualified workers, suitable for the job, there is a need for multi-disciplinary knowledge, many skills in information technology, foreign languages, teamwork skills, problem solving, professional ethics, adapting quickly, and good at creative thinking with technological innovation in Industrial Revolution 4.0. The labors in Thai Nguyen province working for SMEs are mainly low-skilled workers, easily replaced by robot workers, intelligent technology equipment... Therefore, the individual worker is the self-employed person decided to develop their own capacity to adapt to the change when automation replaces people in the entire economy. This result is in the same opinion several studies conducted by Craciun (2015) and Rozsa et al. (2019); besides financial or tangible resources that allows and generate long term benefits for an enterprise, there is also another source that consists in an intangible form: the human capital.

5. Conclusions

Due to the characteristics of natural conditions, socio-economic conditions in countries and in Thai Nguyen province are different, the factors and the degree of influence of these factors on SMEs human resources for businesses development are also different. Based on the findings of previous studies, the author will focus on solving issues that have not been clarified to have a comprehensive overview of the factors affecting human development. The capacity of SMEs in Thai Nguyen province through using Exploratory Factor analysis and Multivariate regression analysis, together with the addition of the new factor of individual employee into the analysis to complete the research goals of the thesis has set and solved a shortcoming of previous studies.

Table 3
The importance of independent variables

No.	Factor	Standard. Beta	%	Influencing order
1	CSNN	0,072	9,42	6
2	CSDT	0,074	9,69	5
3	KHCN	0,085	11,13	4
4	CSDN	0,254	33,25	1
5	NQL	0,159	20,81	2
6	CNLD	0,120	15,71	3
Total			100,00	

The standardized regression coefficients shows that SMEs human resources development in Industry 4.0 is influenced by 6 factors arranged in order of importance from high to low level: (1) State and provincial policies for SMEs human resource development (CSNN), (2) System of training and vocational institutions (CSDT), (3) Developing of science and technology, (4) SMEs human resource development policy (CSDT), (5) Business manager (NQL) and (6) Individual employee (CNLD).

All factors have positive β coefficients, so they have a positive impact on human resource development. In the Fourth Industrial Revolution, Vietnam's human resources in general and Thai Nguyen's employees in SMEs in particular have not only lacking in professional knowledge, but also weakness in problem solving, leadership and communication skills. The Industrial Revolution 4.0 is an indispensable trend, so human resource development in SMEs is happening and nothing can be resisted. This paper investigates the factors influencing human resource development for SMEs enterprises in Industry 4.0 in Thai Nguyen province, Vietnam and analyses the current situation using relevant statistic data. Further, this model offers a blueprint for the successful policy implementation to solve the human resource development issues in the SMEs in Vietnam in Industry 4.0. Due to the characteristics of natural conditions, socio-economic conditions as well as the context in different countries and provinces of Vietnam, the factors and the level of influence on human resource development for SMEs in the province Thai Nguyen in the digital revolution is also different. The research has achieved basic objectives, content and methodology, which is appropriate and scientific, but there are some limitations such as the number of SMEs that have not been fully surveyed focus on only one group of SMEs in Thai Nguyen province. All factors affecting the SMEs human resources development have not been analyzed and synthesized. This study is based on the data collected the form the literature and focus only SMEs human resource development in Thai Nguyen province, Vietnam. The study could be included other countries and other sectors also. Further researchers can conduct survey research to test the proposed model to determine which factors directly affect to policy implementation.

Acknowledgment

The authors would like to thank the anonymous referees for constructive comments on earlier version of this paper.

References

- Ale Ebrahim, N. & Ahmed, S. & Zahari, T. (2008). R&D Network and value Creation in SMEs. MPRA Paper 27218, University Library of Munich, Germany, revised Apr 2008.
- Aradhana, A. (2016). Millions of SE Asian jobs may be lost to automation in next two decades: ILO. Reuters, Technology news. <https://www.reuters.com/article/us-southeast-asia-jobs/millions-of-se-asian-jobs-may-be-lost-to-automation-in-next-two-decades-ilo-idUSKCN0ZN0HP> (accessed March 03, 2019).
- Beaver, G., & Jennings, P. (2001). Human resource development in small firms: the role of managerial competence. *The International Journal of Entrepreneurship and Innovation*, 2(2), 93-101.
- Benešová, A., & Tupa, J. (2017). Requirements for education and qualification of people in Industry 4.0. *Procedia Manufacturing*, 11, 2195-2202.
- Bernard, M., (2016). Why Everyone Must Get Ready For The 4th Industrial Revolution. Forbes. <https://www.forbes.com/sites/bernardmarr/2016/04/05/why-everyone-must-get-ready-for-4th-industrial-revolution/#5188819b3f90> (accessed March 03, 2019).
- Chang, Y. H., & Yeh, Y. J. Y. (2018). Industry 4.0 and the need for talent: a multiple case study of Taiwan's companies. *International Journal of Product Development*, 22(4), 314-332.
- Coetzer, A. (2006). Managers as learning facilitators in small manufacturing firms. *Journal of Small Business and Enterprise Development*, 13(3), 351-362.
- Craciun, E. (2015). Human capital-A quality factor for the competitiveness of IT companies. *Manager*, 21, 44-51.
- Cunningham, L. X., & Rowley, C. (2008). The development of Chinese small and medium enterprises and human resource management: A review. *Asia Pacific Journal of Human Resources*, 46(3), 353-379.
- Demyen, S. (2015). Effects of the educational level of employees upon human resource management in Romanian small and medium sized enterprises. In *GUT FME Conference Publications* (pp. 54-66). Faculty of Management and Economics, Gdansk University of Technology.
- Dittrich, P. J. (2016). Re-Skilling for the Fourth Industrial Revolution. Formulating a European Strategy. *Jacques Delors Institut-Berlin, Policy Paper*, (175).
- Drábek, J., Lorincová, S., & Javorčíková, J. (2017). Investing in Human Capital as a Key Factor for the Development of Enterprises. *Issues of Human Resource Management*, 113-136.
- Buhr, D. (2015). *Social innovation policy for Industry 4.0*. Friedrich-Ebert-Stiftung, Division for Social and Economic Policies.
- Holátová, D., Řehoř, P., & Doležalová, V. (2013). Knowledge Management and Development of Managers and Students, Active Citizenship by Knowledge Management & Innovation: Proceedings of the Management, Knowledge and Learning International Conference 2013, To Know Press.
- Gay, L. R., Mills, G. E., & Airasian, P. W. (1976). *Educational research: Competencies for analysis and application*. Columbus, OH: Merrill.
- Hair, J., F., Black, W., C., Babin, B., J., Anderson, Rolph, E., 2014. *Multivariate Data Analysis*. Pearson Education Limited.
- Ilyas, W., Farooqi, Y. A., & Ahmad, M. (2016). Effect of Human Resource Management Practices on Employee Performance: A Study of Telecom Sector. *Journal of Resources Development and Management*, 20, 61-71.
- IndustriALL Global Union (2017). The challenge of Industry 4.0 and the Demand for New Answer. IndustriALL Global Union

- International Labor Organization (2016). ASEAN in transformation, perspectives of enterprises and students on future work. Geneva: International Labor Office.
- Miloloža, I. (2018). Impact of leadership styles on enterprise success in the area of knowledge and human resource management. *Managing Global Transitions*, 16(2), 103-122.
- Jameson, S. M. (2000). Recruitment and training in small firms. *Journal of European Industrial Training*, 24, 43-49.
- Jamieson, S. (2004). Likert scales: how to (ab) use them. *Medical education*, 38(12), 1217-1218.
- Katarzyna NiedŹwiecka, 2016. "Talent Management as a Key Aspect of Human Resources Management Strategy in Contemporary Enterprise," Managing Innovation and Diversity in Knowledge Society Through Turbulent Time: Proceedings of the MakeLearn and TIIM Joint International Conference 2016, ToKnowPress.
- Keltouma, B., & Rahima, H. (2016). The impact of globalization on the management of human resources in the Algerian economic enterprise. *Journal of Business & Management (COES&RJ-JBM)*, 4(2), 60-71.
- Klaus, S. (2016). The fourth industrial revolution. In *World Economic Forum* (p. 11).
- KPMG, 2016. "The factory of the future, Industry 4.0 – The challenges of tomorrow" KPMG
- ManpowerGroup Solutions (2018). Total Workforce Index™ 2017 Global Analysis. ManpowerGroup.
- Nunnally, J. (1978). *Psychometric Theory*, 2nd ed., New York: McGraw - Hill.
- Oscar, L. (2017). Analysis of National Initiatives for Digitizing Industry. Portugal Industrial 4.0. European Commission.
- Pravdiuk, N., Pokynchereda, V., & Pravdiuk, M. (2019). The human capital of an enterprise: theory and assessment methodology. *Baltic Journal of Economic Studies*, 5(2), 176-183.
- Roberto Ganau, Eleonora Di Maria, 2014. "Determinants of technological innovation in SMEs. Firm-level factors, agglomeration economies and the role of KIBS providers," ERSA conference papers ersa14p820, European Regional Science Association.
- Rozsa, Z., Formánek, I., & Maňák, R. (2019). Determining the Factors of the Employees' Intention to Stay or Leave in the Slovak's SMEs. *International Journal of Entrepreneurial Knowledge*, 7(2), 63-72.
- Scavarda, A., DaŹ, G., Scavarda, L. F., & Goyannes Gusmão Caiado, R. (2019). An Analysis of the Corporate Social Responsibility and the Industry 4.0 with Focus on the Youth Generation: A Sustainable Human Resource Management Framework. *Sustainability*, 11(18), 5130.
- Schröder, C. (2016). The challenges of industry 4.0 for small and medium-sized enterprises. *Friedrich-Ebert-Stiftung: Bonn, Germany*.
- Skledar, A., Stimac, H., & Zunic, J. (2015). Development Of Human Resources Through Managing Teams And Decision Groups. *Economy of eastern Croatia yesterday, today, tomorrow*, 4, 632-640.
- Silvio, A., Marco, P., Francesco, Q., Marco, Z., Silvia, F., Francesca, N., Stefania, S., 2017. "Unito and the challenges of Industry 4.0," University of Toronto, Canada.
- Song, Ng, Van (1997) Human capital and economic efficiency of rice farmers in the province of Hanoi in Red River Delta North Vietnam. [University Library, University of the Philippines at Los Baños . http://agris.fao.org/agris-search/search.do?recordID=PH1998010218](http://agris.fao.org/agris-search/search.do?recordID=PH1998010218)
- Soto-Acosta, P., Popa, S., & Palacios-Marqués, D. (2017). Social web knowledge sharing and innovation performance in knowledge-intensive manufacturing SMEs. *The Journal of Technology Transfer*, 42(2), 425-440.
- Stentoft, J., Rajkumar, C., & Madsen, E. S. (2017). Industry 4.0 in Danish Industry. *Department of Entrepreneurship and Relationship Management, University of Southern Denmark*.
- Thai Nguyen statistics office (2019). Thai Nguyen Statistical Yearbook 2018. Thai Nguyen statistics office
- Unver, O., & Gamgam, H. (1999). Uygulamalı İstatistik Yöntemleri. Application Statistics Siyasal Kitabevi, Ankara, Applied Statistics Methods. Political Bookstore, Ankara.
- Wibawa, Dian Prihardini, 2018. "Analysis of Human Resource Competency as Effort to Increase SMEs Economic Sector Productivity with Gender as Differentiating Variable," MPRA Paper 88105, University Library of Munich, Germany.
- Wisskirchen, G., Biacabe, B. T., Bormann, U., Muntz, A., Niehaus, G., Soler, G. J., & von Brauchitsch, B. (2017). Artificial intelligence and robotics and their impact on the workplace. *IBA Global Employment Institute*, 2012-2017.
- World Economic Forum (2018). Readiness for the Future of Production Report 2018. Geneva, Turkey.



© 2020 by the authors; licensee Growing Science, Canada. This is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC-BY) license (<http://creativecommons.org/licenses/by/4.0/>).