

The Role of the Digital Economy in the Development of Human Capital in the Labor Market Measures Through the Resources and Environmental Resources Graduates

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Abstract:

The aim of clarifying the influence of the digital economy on the development of human capital in the labor market measured through graduates in the environmental industry. The author of the article deploys a survey questionnaire for 165 new graduates of environmental majors in Hanoi. By quantitative linear regression research method on SPSS 20 software, the study has identified 5 factors of the digital economy that have an impact on the development of human capital of environmental graduates, including: (i) Operation of equipment and software (OES), (ii) Creation of information and data (CID), (iii) Communication and cooperation (CC), (iv) Creation of digital content (CDC), (v) Problem solving (PS), in which, the variables of OES, CID, CC, CDC have a positive relationship with the development of human capital, while the variable value of knowledge has a positive relationship with the development of human capital, while the variable CC has a negative relationship. Implications for managers, it's necessary to develop and set up a digital system in universities and businesses in order to improve human capital, contributing to stable and sustainable development.

Keywords: Digital economy, human capital market, human capital, innovation economy, innovation economic index, new technology.

1. Introduction

The history of world economic science shows that physical capital – means of production, material resources, etc an important role in the production process. Just having a natural workforce is enough, which at that time will be used as one of the additional resources for technology that is to train and replace employees. Human development is influenced by changes in society. Workers began to participate in the distribution of the results of their labor, in the management of enterprises through the system of property and profits, the number of cooperatives and their efficiency increased.

As a result, the category of human capital in economic science began to take shape. Its birth has met economic and living requirements. Statistical data on economic growth in developed countries show much higher growth rates than calculations based on classical growth factors. Analysis of the process of economic development and growth shows that human capital has become the main social production factor for the development of the modern economy and society.

Currently, Vietnam is entering a new stage of development, special attention to human capital issues according to the most advanced standards, widely recognized in all fields, ensuring competitiveness and commensurate with developed countries. The economy cannot develop without a highly qualified and skilled workforce.

The key features of the future are digital technologies. This is not only due to advances in information technology and telecommunications, but also due to the high level of human resources. It's also determined by a higher level of professional education.

The more people with university degrees in a society, the faster and more effective the development. These are the foundations for the growth of the digital economy – new and improved computer software cannot master or create high technology, both at the industry, micro and macro levels, as a number of

companies did.

Today, the world is entering a new technological revolution. New technologies have been introduced in all sectors of the economy, including banking, commerce and services. Our educational model, business and economy are lagging behind these changes, which threaten our national economy. On that basis, it's necessary to solve the problem of human capital and its level at the level of the national economy so that our economy can intergrate effectively into the new reality and create a basis for the development of the country.

2. Literature Review and Previous Research Studies

According to Lewis and associates (2004), in the context of today's competitive digital economy, the key to the existence and sustainable development of businesses or even employees is human resources that must be suitable for the environment (Lewis, Wright & Geroy, 2004). Extensive changes in technology, old methods of human resource management are no longer suitable for the digital economy. Traditional organizations will need to evolve and fully transition to an e – business. Through qualitative research methods, researchers have discovered groups of workers that will adapt quickly, complete tasks, on time with quality work thanks to digital. This process is systematically examined, to examine the main research question: “What changes are needed to support the transition of a new venture – based group as it moves from the traditional to the digital economy?” Using the in – depth interview method, the researchers draw conclusions that can have far – reaching ramifications for both practice and theory in human resource management.

According to Law et al (2018), the important role of the digital economy is demonstrated on many countries and regions, through to the development and implementation of digital frameworks, strategic planning to increase the technical knowledge of workers (Law, Woo, de la Torre & Wong, 2018). However, countries always have different reasons for application and development. The team of researchers combines computer and information technology insights to reflect hardware and software knowledge and skills incorporated into the trading framework, digital media literacy and computer engineering. Digital is actually the ability to safely and appropriately access, manage, understand, intergrate, communicate, evaluate and create information through digital technologies for work. It includes competencies referred to in various ways as computer literacy, digital literacy, information literacy and media literacy.

According to Kelchevskaya et al (2019), the main trends in the management of processes related to the use of human capital are operating production through digitization. With the goal of developing a multi – factor model of human efficiency in the digital economy, the study uses SPSS 25 software to process data from the survey (Kelchevskaya & Shirinkina, 2019). On the basis of empirical literature, the study suggests that the determinants of efficiency in using human capital in the digital economy, namely, production experience for wages as an indicator of profitability per capita human capital. Digitalized technologies, replacing old working methods, previous organizational methods are no longer relevant. Through the experimental results, the research team believes that expanding the range of the parameters increases the coefficient of determination and the statistical significance of the parameters. Factors caused by the process of automation and digitization of the environment change activities from job responsibility to design, especially the development of skills in applying digital knowledge is essential to use effective use of human resources in the digital economy. These skills are adapted by human resources to the changing work processes as well as the different requirements of businesses as well as the labor market. Experimental results have shown that the correct interpretation of the determinants affecting the effectiveness of human capital allows the selection of appropriate targeting tools to manage human capital as a factor economic growth.

According to Azarenko et al (2020), in the current digital transformation economy, the proportion of human capital and tools, means of production, human capital is changing significantly. The foundation of the human resource management system in the current context is that human resources must be really high quality and qualified. Researchers have proposed a systematic model called human capital structure which characterizes human capital management in the digital economy. To identify ways to improve the quality of human capital structure and to evaluate the effectiveness of human capital development is presented. The model includes both qualitative and quantitative indicators.

According to Korneeva et al (2020), the relevance of knowledge as a factor of human capital to ensure it works effectively. Through observation, it's shown that there is a widespread impact of digitization in the whole socio – economic process on the development of human capital (Ashmarina, Mesquita & Vochozka, 2020). The importance of knowledge leads to emphasis in research that focuses on identifying

problems of the modern education system through the lens of the difficulties faced by employees of training institutions. The assessment of human capital represents the level of workers in the economy as a whole. The researchers conducted a survey of businesses in the Samara region to identify the problems that shape human capital in the digital economy, thereby determining the level of financial literacy of employees. To form a comprehensive view of the human capital development prospects, the outcome scoring method was applied to these surveys. The result is said to be that knowledge capital has a reciprocal effect on the digital economy.

According to Grigorescu et al (2021), in the twenty – first century is a hub for technological innovation, engineering and both productivity and satisfaction (Grigorescu, Pelinescu, Ion & Dutcas, 2021). Businesses are actively looking for people with the knowledge and skills to make a difference for the organization to enhance competitive advantage. Human capital naturally becomes an effective vehicle for growth. On the basis of determining the relationship between the welfare of the people of 11 Central and Eastern European countries that are members of the European Union, the countries tend to digitize through the cloud industry, information and communication technology, communication, the ability to connect to the internet of things. Through multiple regression, test panel models with fixed effects, both spatially and in multidimensional time. The results show that there is a positive relationship between independent and dependent variables, the digitalization of the economy and human capital together lead to the growth of the whole economy. findings were deemed relevant for each country included in the study, digitization and differentiated human capital and their overall impact. Even so, the study is still a bit limited in terms of time frame and the countries in the sample are not large enough.

3. Methodology And Proposed Model

The study used mainly quantitative research methods.

Quantitative research goals. Testing the model of factors affecting the digital economy on the development of human capital of graduates in the natural resources and environment industry, performed on SPSS 20 software.

The research and testing includes: Evaluation of the reliability of the scale by the reliability coefficient (Cronbach Alpha); exploratory factor analysis (EFA); multivariate regression analysis; ANOVA analysis of the influence of the digital economy on the development of human capital of graduates in the natural resources and environment industry. Finally present the conclusions, managerial implications, limitations of the topic and suggest further research directions for the authors to study in the future.

The model has the form: $HC = \beta_0 + \beta_1 * OES + \beta_2 * CID + \beta_3 * CC + \beta_4 * CDC + \beta_5 * PS$

In there:

Human capital: HC

Operating equipment and software: OES

Creation of information and data: CID

Communication and cooperation: CC

Creating digital content: CDC

Problem solving: PS

Research data: The study carried out a survey of 165 votes for students preparing to graduate in the field of environment of 3 times to distribute questionnaires (5 level linker scale), the obtained data is suitable to run the econometric model.

Structure of survey subjects: The survey results of 110 votes were male employees, accounting for 66,67%. There are 55 votes for female employees, accounting for 33,33%.

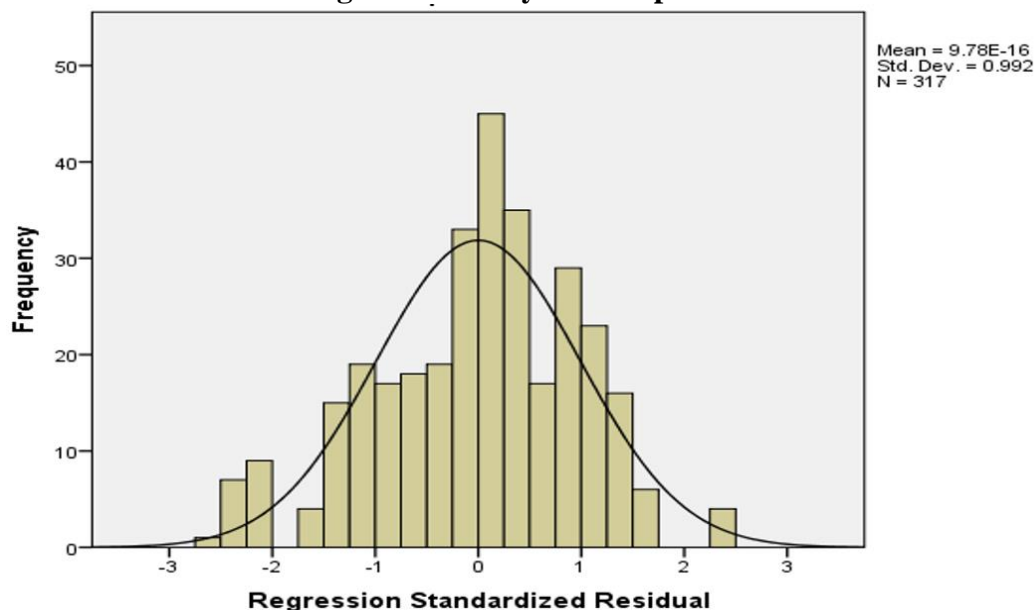
Table 1. Structure of survey subjects

| Respondents | Votes | Percentage |
|-------------|--------------------|------------|
| Female | 110 | 66,67% |
| Male | 55 | 33,33% |
| Age | Under 21 years old | 81,82% |
| | From 21 | 18,18% |
| Level | 4th year student | 93,94% |
| | Other students | 6,06% |

Source: Compiled from the investigation process

Table 1 shows that the number of survey is relatively uniform and reflects the reality.

Figure 1: Survey data dispersion



Source: Compiled from the investigation process

The collected survey data has been cleaned so it's relatively homogeneous, the data set is of relatively good quality for testing the regression model.

Table 2. Scale of variables in multivariable regression model

| Numerical order | Encode | Contents of the list of survey questions | Quote |
|-----------------|--|--|--|
| I | Human capital: HC | | |
| 1 | HC1 | Intermediate level | Recommended by the author |
| 2 | HC2 | Advanced level | |
| 3 | HC3 | Specialized level | |
| II | Operating equipment and software: OES | | |
| 1 | OES1 | Overall operation of training aids | Pham Do Nhat Tien (2022), Lewis et al (2004), Law et al (2018), Korneeva et al (2020), Azarenko et al (2020), Grigorrescu et al (2021) |
| 2 | OES2 | Software operation of training support equipment | |
| 3 | OES3 | Hard operation of training aids | |
| III | Creation of information and data: CID | | |
| 1 | CID1 | Skimming, searching, filtering information about digital content | Pham Do Nhat Tien (2022), Lewis et al (2004), Azarenko et al (2020), Grigorescu et al (2021) |
| 2 | CID2 | Evaluation of data, information about digital content | |
| 3 | CID3 | Data management, information about digital content | |
| IV | Communication and cooperation: CC | | |
| 1 | CC1 | Interaction through digital technology | Pham Do Nhat Tien (2022); Lewis et al (2004); Grigorescu et al (2021) |
| 2 | CC2 | Realizing the role of learners through digital technology | |
| 3 | CC3 | Collaboration through digital technology | |
| V | Creating digital content: CDC | | |
| 1 | CDC1 | Digital content development | Pham Do Nhat Tien (2022); |

| | | | |
|-------------------------------|------|---|--|
| 2 | CDC2 | Digital content integration and reintegration | Lewis et al (2004); Law et al (2018) |
| 3 | CDC3 | Copyrights and licenses | |
| VI Problem solving: PS | | | |
| 1 | PS1 | Solve technical problems | Pham Do Nhat Tien (2022); Lewis et al (2004); Law et al (2018); Azarenko et al (2020); Grigorescu et al (2021) |
| 2 | PS2 | Creative use of digital technology | |
| 3 | PS3 | Thinking like a computer | |

Source: Synthesized from the theoretical basis

4. Research Results

To test the reliability of each scale, the standart Cronbach alpha coefficient of the scale greater than 0.7 will be a good scale.

Table 3: Results of the model's scale analysis results

| Item-Total Statistics | | | | |
|----------------------------------|----------------------------|--------------------------------|----------------------------------|----------------------------------|
| Var | Scale Mean if Item Deleted | Scale Variance if Item Deleted | Corrected Item-Total Correlation | Cronbach's Alpha if Item Deleted |
| HC1 | 7.67 | 3.122 | .628 | .738 |
| HC2 | 7.50 | 3.346 | .541 | .830 |
| HC3 | 7.49 | 2.934 | .770 | .789 |
| Cronbach's Alpha = 0.798 | | | | |
| OES1 | 7.17 | 1.880 | .724 | .796 |
| OES2 | 6.79 | 2.680 | .650 | .847 |
| OES3 | 6.95 | 2.197 | .804 | .700 |
| Cronbach's Alpha = 0.845 | | | | |
| CID1 | 5.08 | 2.006 | .727 | .724 |
| CID2 | 4.76 | 2.286 | .742 | .712 |
| CID3 | 4.97 | 2.499 | .603 | .841 |
| Cronbach's Alpha = 0.829 | | | | |
| CID1 | 4.97 | 2.499 | .603 | .841 |
| CID2 | 5.08 | 2.006 | .727 | .724 |
| CID3 | 4.76 | 2.286 | .742 | .712 |
| Cronbach's Alpha = 0.825 | | | | |
| CC1 | 5.43 | 3.252 | .606 | .777 |
| CC2 | 5.55 | 3.388 | .610 | .771 |
| CC3 | 5.67 | 3.748 | .582 | .704 |
| Cronbach's Alpha = 0.8765 | | | | |
| CDC1 | 7.12 | 2.707 | .660 | .756 |
| CDC2 | 7.25 | 3.015 | .724 | .677 |
| CDC3 | 6.89 | 3.542 | .621 | .785 |
| Cronbach's Alpha = 0.811 | | | | |
| PS1 | 5.7098 | 2.517 | .817 | .789 |
| PS2 | 5.6120 | 2.479 | .821 | .784 |
| PS3 | 5.9022 | 3.595 | .548 | .933 |
| Cronbach's Alpha = 0.849 | | | | |

Source: Report extracted from SPSS 20 software

Correlation coefficient matrix: The paper considers the peason correlation coefficient with significance less than 5% (Sig < 5%). Table 4 shows that all variables including the dependent variable meet the regression condition.

Table 4: Matrix of peason correlation coefficient between variables in the model

| Correlations | | | | | | | |
|--------------|---------------------|--------|--------|---------|--------|--------|---------|
| | | HC | OES | CID | CC | CC | PS |
| HC | Pearson Correlation | 1 | .108 | .443** | .080 | -.034 | -.031 |
| | Sig. (2-tailed) | | .000 | .000 | .000 | .000 | .000 |
| | N | 165 | 165 | 165 | 165 | 165 | 165 |
| OES | Pearson Correlation | .108 | 1 | -.024 | .154** | .281** | .037 |
| | Sig. (2-tailed) | .054 | | .675 | .006 | .000 | .512 |
| | N | 165 | 165 | 165 | 165 | 165 | 165 |
| CID | Pearson Correlation | .443** | -.024 | 1 | .052 | -.039 | -.165** |
| | Sig. (2-tailed) | .000 | .675 | | .356 | .494 | .003 |
| | N | 165 | 165 | 165 | 165 | 165 | 165 |
| CDC | Pearson Correlation | .080 | .154** | .052 | 1 | .253** | .103 |
| | Sig. (2-tailed) | .157 | .006 | .356 | | .000 | .068 |
| | N | 165 | 165 | 165 | 165 | 165 | 165 |
| CC | Pearson Correlation | -.034 | .281** | -.039 | .253** | 1 | .081 |
| | Sig. (2-tailed) | .544 | .000 | .494 | .000 | | .148 |
| | N | 165 | 165 | 165 | 165 | 165 | 165 |
| PS | Pearson Correlation | -.031 | .037 | -.165** | .103 | .081 | 1 |
| | Sig. (2-tailed) | .588 | .512 | .003 | .068 | .148 | |
| | N | 165 | 165 | 165 | 165 | 165 | 165 |

** . Correlation is significant at the 0.01 level (2-tailed).

Source: Report extracted from SPSS 20 software

With the sample data collected from surveying the parameters of the regression model, the results of testing the suitability of the model (Table 5)

Table 5: Model test results of influencing factors of the digital economy on the development of human capital of graduates in the environmental industry

| Model Summary ^b | | | | | | |
|----------------------------|---|---|----------|------|-------------------|---------|
| Mo | R | R | Adjusted | Std. | Change Statistics | Durbin- |
| | | | | | | |

| del | | Squar e | R Square | Error of the Estimate | R Square Change | F Chang e | df1 | df2 | Sig. F Change | Watson |
|--|--|-------------------|----------|-----------------------------|--------------------|-----------------|-----|-----|---------------------|--------|
| 1 | | .566 ^a | .517 | .75225 | .517 | 17.26 5 | 5 | 311 | .000 | 1.978 |
| a. Predictors: (Constant), OES, CID, CC, CDC, PS | | | | | | | | | | |
| b. Dependent Variable: HC | | | | | | | | | | |

Source: Data taken from SPSS 20 software

Through table 5, we see that the two values of R square (R2) and Adjusted R square (adjusted R2) are 0,566 and 0,517 respectively, both > 0,5. The F – statistic is calculated from the R2 value of the full model with the significance level (Sig value = 0, 000) less than 5%, showing that the multiple linear regression model fits the database.

Table 6: results of model analysis of influencing factors of the digital economy on the development of human capital of graduates on the environmental industry

| Coefficients ^a | | | | | | |
|---------------------------|------------|-----------------------------|------------|---------------------------|--------|------|
| Model | | Unstandardized Coefficients | | Standardized Coefficients | T | Sig. |
| | | B | Std. Error | Beta | | |
| 1 | (Constant) | .820 | .411 | | 1.996 | .000 |
| | OES | .155 | .063 | .129 | 2.460 | .000 |
| | CID | .552 | .063 | .447 | 8.761 | .000 |
| | CC | .050 | .053 | .050 | .953 | .000 |
| | CDC | -.069 | .054 | -.069 | -1.285 | .000 |
| | PS | .043 | .056 | .039 | .763 | .000 |
| a. Dependent Variable: HC | | | | | | |

Source: Author statistics on SPSS 20 software

Correlation coefficient matrix. The paper considers the Pearson correlation coefficient with significance less than 5% (Sig < 5%). Table 4 shows that all variables including the dependent variable meet the regression condition

Table 4: Matrix of Pearson correlation coefficient between variables in the model

| Correlations | | | | | | | |
|--------------|---------------------|-----|------|--------|------|-------|-------|
| | | HC | OES | CID | CDC | CC | PS |
| HC | Pearson Correlation | 1 | .108 | .443** | .080 | -.034 | -.031 |
| | Sig. (2-tailed) | | .000 | .000 | .000 | .000 | .000 |
| | N | 165 | 165 | 165 | 165 | 165 | 165 |

| | | | | | | | |
|--|---------------------|-------|--------|---------|--------|--------|---------|
| OES | Pearson Correlation | .108 | 1 | -.024 | .154** | .281** | .037 |
| | Sig. (2-tailed) | .054 | | .675 | .006 | .000 | .512 |
| | N | 165 | 165 | 165 | 165 | 165 | 165 |
| CID | Pearson Correlation | .443* | -.024 | 1 | .052 | -.039 | -.165** |
| | Sig. (2-tailed) | .000 | .675 | | .356 | .494 | .003 |
| | N | 165 | 165 | 165 | 165 | 165 | 165 |
| CDC | Pearson Correlation | .080 | .154** | .052 | 1 | .253** | .103 |
| | Sig. (2-tailed) | .157 | .006 | .356 | | .000 | .068 |
| | N | 165 | 165 | 165 | 165 | 165 | 165 |
| CC | Pearson Correlation | -.034 | .281** | -.039 | .253** | 1 | .081 |
| | Sig. (2-tailed) | .544 | .000 | .494 | .000 | | .148 |
| | N | 165 | 165 | 165 | 165 | 165 | 165 |
| PS | Pearson Correlation | -.031 | .037 | -.165** | .103 | .081 | 1 |
| | Sig. (2-tailed) | .588 | .512 | .003 | .068 | .148 | |
| | N | 165 | 165 | 165 | 165 | 165 | 165 |
| **. Correlation is significant at the 0.01 level (2-tailed). | | | | | | | |

Source: Report extracted from SPSS 20 software

With the sample data collected from surveying the parameters of the regression model, the results of testing the suitability of the model (Table 5)

Table 5: Model test results of influencing factors of the digital economy on the development of human capital of graduates in the environmental industry

| Model Summary ^b | | | | | | | | | | |
|--|-------------------|----------|-------------------|----------------------------|-------------------|----------|-----|-----|---------------|---------------|
| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate | Change Statistics | | | | | Durbin-Watson |
| | | | | | R Square Change | F Change | df1 | df2 | Sig. F Change | |
| 1 | .566 ^a | .517 | .505 | .75225 | .517 | 17.265 | 5 | 311 | .000 | 1.978 |
| a. Predictors: (Constant), PS, OES, CID, CDC, CC | | | | | | | | | | |
| b. Dependent Variable: HC | | | | | | | | | | |

Source: Data taken from SPSS 20 software

Through table 5, we see that the two values of R square (R^2) adjusted R square (adjusted R^2) are 0,566 and 0,517 respectively, both $> 0,5$. The F – statistic is calculated from the R^2 value of the full model with the significance level (Sig value = 0, 000) less than 5%, showing that the multiple linear regression model fits the database.

Table 6: Results of model analysis of influencing factors of the digital economy on the development of human capital of graduates in the environmental industry

Coefficients^a

| Model | Unstandardized Coefficients | | Standardized Coefficients | T | Sig. |
|---------------------------|-----------------------------|------------|---------------------------|--------|------|
| | B | Std. Error | Beta | | |
| (Constant) | .820 | .411 | | 1.996 | .000 |
| OES | .155 | .063 | .129 | 2.460 | .000 |
| CID | .552 | .063 | .447 | 8.761 | .000 |
| CDC | .050 | .053 | .050 | .953 | .000 |
| CC | -.069 | .054 | -.069 | -1.285 | .000 |
| PS | .043 | .056 | .039 | .763 | .000 |
| a. Dependent Variable: HC | | | | | |

Source: Author statistics on SPSS 20 software

As table 6 shows, the regression results can be written as:

$$HC = 0.155*OES + 0.552*CID - 0.069*CC + 0.050*CDC + 0.043* PS$$

Besides, statistical data shows that the remaining independent variables all satisfy the sig value is less than or equal to 0,05 showing that the variables have statistical significance.

5. Discussion And Conclusion

Based on the results of regression testing of the model, the author proposes for the development of human capital in the labor market to be measured through graduates in the environmental industry as managers building and establishing a digital training system in universities and enterprises in order to improve human capital, contributing to stable and sustainable development.

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