

# Does Human Capital Improve Health Care Agility through Health Care Supply Chain Performance? Moderating Role of Technical Orientation

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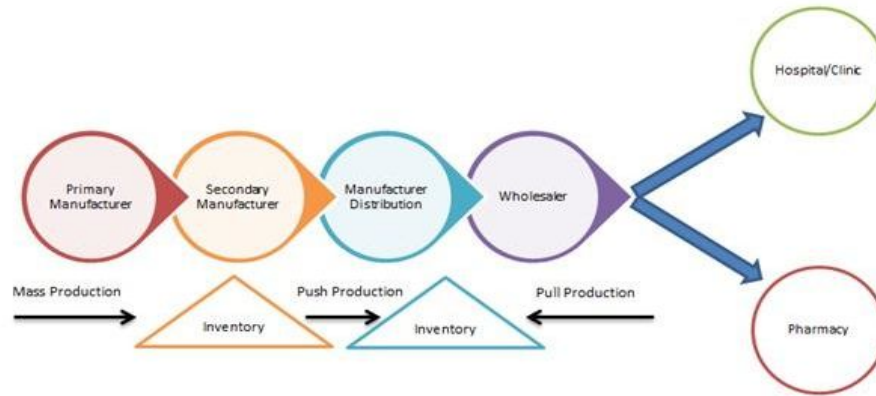
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**Abstract**— Supply chain is not just confined to manufacturing or production-oriented industries but its implications are also there in healthcare sector. Such healthcare supply chain can work even better with proper care on human capital side. With an increase or betterment in human capital, agility of the sector also gets affected. In this study, author has checked the impact of human capital on health care agility in Thailand's health care sector along with analyzing the mediating role of healthcare supply chain performance in given relationship. Moreover, moderating role of technological orientation was also assessed in relationship between human capital and healthcare supply chain performance. Data has been collected from various hospitals of Thailand and questionnaires were distributed among administrative staff of those hospitals. Responses were then analyzed on SPSS and AMOS through applying various screening and structural equation modeling test. Results have indicated that human capital significantly enhances agility in healthcare sector and healthcare supply chain performance also significantly mediates in this relationship. Implications of this study are mostly focusing on service sector that it can improve its agility through better human capital and with increases supply chain performance.

*Key Words:* Human Capital, Technological Orientation, Healthcare Supply Chain Performance and Healthcare Agility

## Introduction

Health care agility proved through progressive human capital. Remarkable changes have seen in health care agility through health care supply chain performance. Human capital contains workforce, efficient labor, skilled employees and efficient managerial staff. Human capital is a big need of today's era for different companies because it also provides a competitive advantage to the company [1, 40]. Health care agility provides an organization to quickly change for the changing needs of its customers [41]. Technological advances must need the thing for any organization [42-43]. Technology helped a lot in improvements in health care agility. The organizations who adapted the advanced technology never became a pessimist. Technological changes always help the organization to improve the healthcare supply chain performance. Figure no. 1 is elaborating the human capital activities involved in the improvement of healthcare supply chain. In the past few years, the organizations who did not pay attention to improve their human capital got declined from its progressive race. Only those fewer got benefits who knew that they will win the race with the improved human capital [2].



**Figure 1:** Healthcare supply chain and the human capital activities

Many researchers stated that specialist labor forces always go for optimistic tasks and they fulfilled the tasks on time, and they accept challenges. Our study took place in Thailand and the information is gathered through different hospitals and their administrative staff. This study will focus on the relationship between human capital and healthcare agility. This study will also provide knowledge about the mediating role of healthcare supply chain performance between human capital and healthcare agility. The study will also discuss the moderating impact of technical orientation between human capital and healthcare agility [3]. Past researchers suggested the positive impact between these different variables. This study will also study the variables and state different suggestions regarding the relationship between these variables. The problem of knowing the relationship between human capital and healthcare agility through the supply chain performance of health care is not only the issue of Thailand. This problem is so common around the world [4]. Almost seventy percent of Asian companies are suffering from the disease of lack of human capital. Lack of human capital is the main reason for their bad healthcare agility. With the role of technical orientation and healthcare supply chain performance, these problems must be solved. This study will provide suitable data to the people who want to establish a system which will provide them impressive human capital, and which will automatically cause the improved healthcare agility [5]. The objectives of the study are very clear. First objective will be to know about the impact of human capital on healthcare agility. Another aim will know

the impact of the mediating role of healthcare supply chain performance and the moderating role of technical orientation between human capital and healthcare agility. From different hospitals and their different administrative staff, the data will be gathered and the country will be Thailand in which this research will conduct. The person having the same issue regarding the same problem can have a deep insight into this study and can have a suitable and reliable suggestion about their concerns [6]. This study will significantly contribute to the literature. This study will enlarge the literature material. This study will also contribute practically and at the governmental level as well. Researchers from different countries can have more knowledge about the problem which will discuss in this paper. People can apply the suggestion in practical life, and they may get a positive result through this study. The government should establish the cell which study the different research regarding the manufacturing and services sectors and find the solutions and implement the suggestions proposed in different researchers in order to do better for the healthcare organization. A researcher not observed data about this topic keenly in the past. They did not properly propose reasons for the relationships between human capital and healthcare agility, they did not search for more reliable data. They did not use the mediating and moderating role of IT and supplicating performance of healthcare to improve the healthcare agility this study will also keenly observe the mediating and moderating effects on human capital and healthcare agility [7].

## 2. Literature review

### 2.1. Human Capital Theory

Human capital theory (HCT) defines the perspectives [8] of human capital resources (HCR) that serves individuals at one unit-level or societal level. One-unit capacities are based on the reliability of and accessibility of unit-relevant purposes. However, studies by [9] suggest that human capital resource is associated with economic parity or best practice outcomes. Within the streams of literature [10] that distinguishes between human capital resources and strategic human capital resources. Both of which relates itself to firm-level outcomes. Another study by [11] that briefly defines the definition of human capital (HC) that is, considered as the knowledge, skills and abilities of individuals. These definitions further connect HC with employee motivation, development and well being. Theorists like Arena and Uhl-Bien [12], defines the human capital theory, in such a way that produces positive outcomes for the individuals who works at the firm-level to gain more competitive advantages. Therefore, strategic HC focuses more on the organizational outcomes. Human capital theory enable an individual to perform with full dedication, trust and concerns in an organization while, utilizing all its potential, hard work, reservoir of knowledge [13] and skills along with developing experiences through individual learning. Framework of measurement theory and HC development theory develops a contemporary tool for HC management undergoing the phenomenon of theoretical aspects of HC. Human capital is further divided into two main components [14] that include: Social capital and Structural capital. Therefore, these are also known as the human aspects of the organizations, but there concepts can be fundamentally different, but however they might complement each other by increasing the organizational value. Theoretical aspects [15] related to social, structural and human capital believes that it implements its knowledge advantage on different firms and organization. Human capital theory concepts are based upon organizational assets; HC is required by the companies as well as organizations to meet different goals and aims for the transferability of responsibilities and work force general skills that further combines with social capital to create new knowledge [16, 44].

### 2.2. Human Capital and its Relationship with Health Care Agility

According to past studies by [17], human capital HC develops widely by acknowledging agility which act as a promising weapon for different manufacturing firms and organization to deal with enhanced performance and competitive capabilities. However, health care related studies [18] believe that human capital is an essential requirement that correspond effectively with health care and agility performance . Patients need a lot of health care through service sector which can be responsive enough to deal with multiple patients. Human capital can enable the growth of many health care centers because of its agility and integration of new facilities, new perspectives and knowledge. Hence, literature study [7] tries to prove the importance of agility that increases in many dimensions with sustaining coordination and collaborative efforts for resulting in essential human capabilities. Human capital basically guarantees enormous information exchange with the help of advanced IT capabilities to develop a sound relationship with health care agility. Human capital enhances the performance of agility within health care centers because it fulfills firm customer requirements with great speed. [19], elaborates the evidences regarding human capital theory that plays an important role in stabilizing human capital under the parameters of health care agility that ensures the well being of the patients and for instance gain subsequent satisfaction. [19], analyzes that human capital is required by various health care centers to improve their supply chain management that will deal effectively with the customers as well as with patents. However, manufacturing sector supply chain management differs with the health sector supply chain management due to its various requirements, rules and policies and other development criteria. The [20] on human capital and IT capabilities advances the performance of supply chain agility to bring vast complexity and diversity in medical requirement and medical treatment. Therefore, there is less literature present that properly investigates about health care environment and management along with the importance of human capital and agility in sustaining efficient health care depending upon the supply chain. Thus, the following hypothesis is proposed:

**H1:** Human capital has a significant impact on health care agility.

### 2.3. Mediating Role of Health Supply Chain performance between Human Capital and Health Care Agility

[21], briefly elaborates the idea of a mediator that influences the role of two variables such as human capital and health care agility. There are different studies by that define the performance and involvement of human supply chain performance (HSCP) within the capabilities of human capital and health care agility. Many health care centers require the availability of massive amount of human capital to fulfill the demands of the patients which can be fulfilled by SCP. However, researchers [23] also explain the importance of IT capabilities that act as an essential attribute that determines the effectiveness of human capital into health care centers along with the integration of HSCP. Extant literature, focuses on IT based business associations to expand the criteria of human capital and health care agility with the mediating role of HSCP. Efficient use of IT resources and human capital resources, process its architecture for spanning IT capabilities that can easily unify the performance of human capital and health care center agility with the capabilities and high performance of HSCP that ensures the advancement of IT capabilities in making health care center more reliable, accessible and long lasting. Moreover, [24] analyze the positive correlation between firm capabilities or firm agility performance to increase the value of business performance and competitive capabilities of human capital [25] with the intervention of HSCP. HSCP can benefit the relationship between human capital advancement and health care center agility performance, by enhancing the business performance, by positively implementing the implications of market orientation and furthermore, by increasing the dynamicity in the environment for SC orientation on SC agility [26]. Supply chain agility witnesses the role of dominant supply chain management that would be further explored by HSCP with the services setting and enhancing the strength of human capital that would rather support the health care centers while, providing facilities and different successful opportunities. Thus, the following hypothesis is proposed:

**H2:** Health supply chain performance has a significant mediating role between the relationship of human capital and health care agility.

### 2.4. Moderating Role of Technical Orientation between Human capital and Health Care Supply Chain Performance

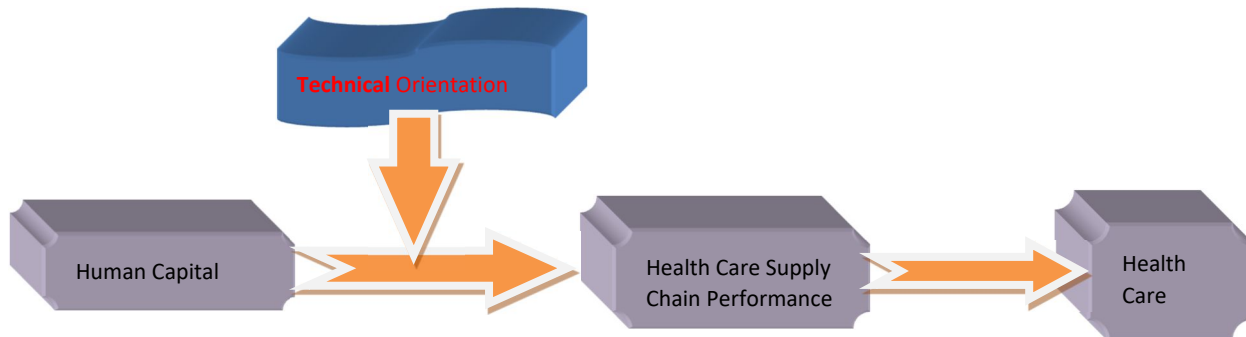
Recent literature by [27], explains the dominance of the moderating role of technical orientation between two variables like human capital and HCSCP. Technical orientation depends upon the function and practices of IT capabilities that somehow manages the contribution of human capital in promoting the facilities required by health care centers, whose basic potential is to generate the supply chain management along with [28] supply chain performance. Technical orientation collaborates with market orientation and further empowers resources orientation that is being utilized by human capital and health care. [29], examines the internal and external spanning and abilities of human capital that obtains recognition as an active enabler of firm performance mainly in strategic human resource management that highlights the impact of technical orientation on health care supply chain performance. The linkages of IT capabilities with technical orientation generates the idea of gaining knowledge [30] and capabilities residing within an organization and which are particularly used by the individuals associated with firm's human capital insurance. Authors [31] elaborate the firm's performance while involving technical orientation that would develops a link between human capital improvement and HCSCP advancement. Technical orientations can facilitate patients need and requirements with specialized knowledge and employee expertise, knowledge and expertise can only be gained through use of human capital that can benefits the health care performance. [32], demonstrates the effect of health services with effective functioning of SC, hence health care units may provide better responses to patients along with their requirements that further aims to response affectively to supply chain performance and health care capabilities. Further explains the extent of operationalize supply chain in various way of suggested selection of technical orientation perspective that possess casual complexity and ambiguity that will result in complete advantages relatable to human capital and supply chain performance. Hence, [34] elaborate the literature in a sense when technical orientation and health-care units are more effective in executing their SC processes with the help of health care facility.

Authors like Ralston, et al. [35], often describes the theoretical approach regarding human capital theory implementations between the relationship of human capital and HCSCP. Research article [36], deliberately explain the performance of IT capabilities highly depending upon technical orientations about firm's ability to acquire, deploy,

combine and reconfigure IT resources in support and enhancement of business strategies and firm related work processing. Thus, the following hypothesis is proposed:

**H3:** Technical orientation has a significant moderating role between human capital and health care supply chain performance.

#### Model:



### 3. Methodology

#### 3.1. Population and Sample

In this research study, role of human capital and health care supply chain performance in health care agility has been examined, in moderating role of technical orientation. Health care supply chain are different in their composition, as it includes totally different units such as hospitals, accommodation provider, medical equipment manufacturer, food and beverages and insurance. In this research study, researcher has been selected the hospitals of Thailand for collecting the data about the health care agility under the impact of human capital and health care SCs performance. Researcher has been selected bumrungrad international hospital, BNH hospital and Vejthani hospital as a sample of this research study. Researcher used purposive sampling techniques for the selection of administrative employees as respondents because they have clear picture of the hospitals supply chain and operational performance. Sample size is 300 for this research study, it has been calculated on the bases of idea. Questionnaires have been distributed among 300 respondents, out of which only 620 responses have been collected. After the deletion of invalid responses, only 290 responses considered valid.

#### 3.2. Data collection procedure

Data collection method has been used in this research study is questionnaire. As the data collected from this method is numeric which researcher can easily be analyzed statistically. Before finalizing the questionnaire, researcher has to ensure that questionnaire must be in Thai language in order to collect the data from respondents. After data collection researcher again translated the questionnaire into English by back translation method, because evaluation of data can easily be happened if data is in English language. Moreover, content validity of scale has been checked by researcher before implementing it to whole sample. The finalized questionnaire has been sent to whole sample with online software, respondents can easily solve it according to his or her own perspective.

#### 3.3. Analysis of Validity, Reliability and Common Bias

In the measurement model, reliability has been analyzed by SPSS and criterion used by research entails that Cronbach's  $\alpha$  has to be greater than 0.70 in order to ensured the desirable level of items reliability [25]. Both elements of validity have been assessed by AMOS but criteria to examined the assessment are different form each other. For convergent validity, three criteria have been followed such as (1) items loading  $\lambda$ , as per [33] its threshold

range is greater than 0.70, (2) composite constructs reliability has to be greater than 0.80 because its values were stronger above that specific value and (3) average variance extracted, according to Fornell and Larcker, (1981) it has to exceed the specific limit such as 0.50. For discriminant validity, researcher used criterion to examined the assessment which states that square root of AVE has to be greater than all other correlated constructs.

Coming towards analysis of common bias, Harman's single factor test has been administered. According to [25], common bias has been generated when single measure used for accounting of most of the variance of constructs. All the variances of this research study have been under taken in evaluation of common bias such as health care agility, human capital, health care supply chain performance and technical orientation. Now, it has been checked that whether most of the constructs accounted for by single factor or not accounted for by single factor. Results narrates that most of variance such as 91% of variance accounted for by factor solution and only 16% of variance accounted for by one factor. As the 50% of variance not accounted for by single factor that's why inexistence of common bias has been ensured.

### 3.4. Hypothesis Testing

Hypothesis testing has been accompanied in order to respond which hypotheses are positively related or which hypotheses are negatively related. It has been performed by structure equation modeling and SEM has been runs on AMOS. Covariance based approach has been used by AMOS for running the diagnostics of SEM. In this research study, hypotheses which have been tested under CV-SEM approach are impact of human capital on health care agility, in mediating role of health care supply chain performance and in moderating role of technical orientation. Acceptance or rejection status of all these hypotheses have been analyzed by examining direct, indirect and total

effect and by examining the relative significance and t-statistic values.

### 3.5. Measures

HC was measured by taking five items on a five-point Likert scale with the help of the scale developed by [25], HCSCP was assessed with the scale developed by [23] with the help of four items on a five-point Likert scale, TO and HCA were measured with the scale developed by [22] on a five point Likert scale five items were taken.

## 4. Empirical results

### 4.1. Demographical results

The study was conducted in Thailand and data was from 300 participants and the number of respondents was 290. The associations with the help of a self-organizational questionnaire were analyzed by using SPSS and Amos. It is very important to conduct the prerequisite analysis in order to check the reliability, normality, and validity of the data. The researcher applied the frequency distribution test in order to check the respondent profile. The findings showed that 111 males and 179 females participated in this study. 23 of the participants had graduation degree, 134 respondents had done post-graduation. Whereas, 123 respondents had master's degree and 10 had another degree. The participants included 220 people in age range 21 to 30 years, 49 people in age range 31 to 40 years, 19 people in age range of 41 to 50 years and only 2 participants were of age more than 50.

### 4.2. Descriptive Statistics

Table no. 1 is showing that there is no outlier in the given data as the maximum values lie in the threshold range of 5-point Likert scale, as the skewness value is somewhere between -1 and +1 which is the threshold range of normality assumption and so the data is normal and is valid to go for further testing.

**Table 1.** Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation	Skewness	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error
HumCap	290	1.00	5.00	3.5986	1.07594	-.876	.143
HealCareAgi	290	1.00	5.00	3.6083	1.05197	-.901	.143
TecOrian	290	1.00	5.00	3.4655	1.12400	-.565	.143
HCSCP	290	1.00	5.00	3.5948	1.11127	-.816	.143
Valid N (listwise)	290						

**Table 2.** KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.927
	Approx. Chi-Square	5383.911
Bartlett's Test of Sphericity	df	171
	Sig.	.000

**4.3. Suitability of the data**

More than .60 the value of KMO is considered a good fit for data suitability of data for major analysis, now the current value is .927 is more reliable and good fit.

Suitability is tested by the KMO test by using SPSS:

**4.4. Convergent and discriminant validity**

Discriminant validation of the data is required to judge the multicollinearity of the data, while convergent validity is required to analyze the internal consistency of the constructs.

**Table 3.** Convergent and Discriminant Validity

	CR	AVE	MSV	MaxR(H)	TEO	HC	HCA	SCP
TEO	0.950	0.792	0.251	0.969	<b>0.890</b>			
HC	0.935	0.743	0.391	0.979	0.501	<b>0.862</b>		
HCA	0.930	0.727	0.383	0.984	0.497	0.590	<b>0.853</b>	
SCP	0.936	0.784	0.391	0.987	0.392	0.625	0.619	<b>0.885</b>

**4.3. Suitability of the data**

Discriminant validity is checked by seeing the CR and AVE value. If the CR is greater than .70 and AVE is more than .50 then, the validation is confirmed. The current findings show that all variables have CR more than, 0.70 and value of AVE

Suitability is tested by the KMO test by using SPSS:

is also greater than .50 for all constructs. Other remaining parts of the table prove the convergent validity of each construct because all variables have more value for themselves as compared to others.

**Table 4.** CFA

Indicators	Threshold range	Current values
CMIN/DF	Less or equal 3	2.200
GFI	Equal or greater .80	.899
CFI	Equal or greater .90	.967
IFI	Equal or greater .90	.967
RMSEA	Less or equal .08	.064

**4.5. Confirmatory Factor Analysis**

Here, CMIN is less than 3, GFI is greater than .924, CFI is greater than .90, IFI is greater than .981 and

RMSEA is less than .80. So, the table 4 is showing that the indicators lie in the valid range so the data is good to go. Screenshot of CFA is given below:

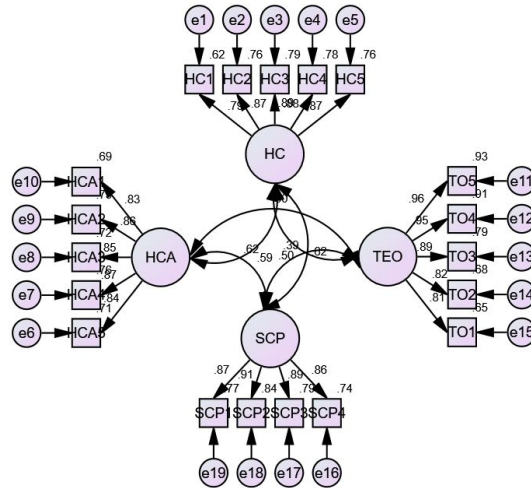


Figure 2: CFA

4.6. Structural Equation Modeling

Table 5. SEM

Total effect	HumCap	HCSCPer
HCSCPer	.598***	.000
HealCareAgi	.551***	.391***
Direct effect	HumCap	HCSCPer
HCSCPer	.598***	.000
HealCareAgi	.317***	.391***
Indirect effect	HumCap	HCSCPer
HCSCPer	.000	.000
HealCareAgi	.234***	.000

HumCap has a 60% and 55.1% impact on HCSCPer and HealCareAgi respectively, impact is positive and significant. Directly, HumCap has a 60% and 31.7% impact on HCSCPer and HealCareAgi. Indirectly,

HumCap has a 23% impact on HealCareAgi. HCSCPer has a 39% impact on HealCareAgi. Directly, HCSCPer has a 39% impact on HealCareAgi.

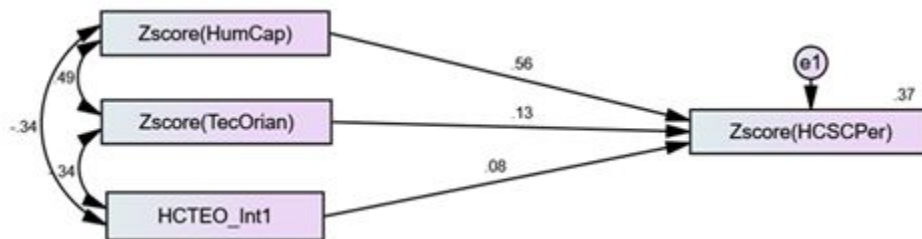


Figure 3: SEM

4.7. Moderation Analysis

With the help of structural equation modeling, two-way interaction was obtained to check out the moderating effect of IT capability on the relation of

BDA planning, BDA investment, BDA coordination and BDA control with Sustainable tourism supply chain performance. Results are showing that IT capability significantly moderates the relationship



between BDA planning, BDA investment, BDA coordination and BDA control and Sustainable tourism supply chain performance which can be seen in the following figure:

### Moderation

ZHumCap has an impact of 56% on ZHCSCPer, ZTecOrian has an impact of 13% on ZHCSCPer, HCTEO\_Intl has 8% impact on ZHCSCPer according to the figure below:

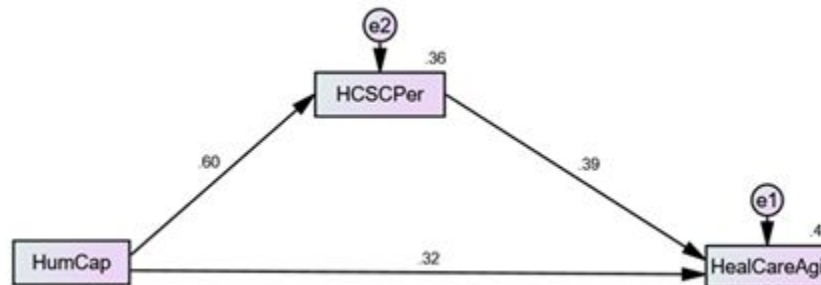


Figure 2: Moderation

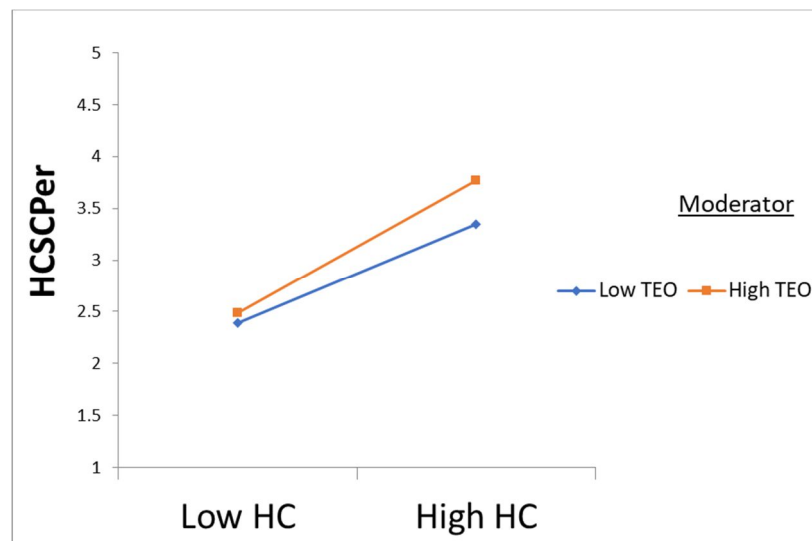


Figure 3: Moderation 1

## 5. Discussion and Conclusion

### 5.1. Discussion

The aim of this study was to know about the affiliation between Human Capital (HC) and healthcare agility (HCA) [37]. The aim was also to know about the mediating role of Health Care Supply Chain Performance (HCSCP) between HC and HCA and also to know about the moderating role of Technical Orientation (TO) between HC and HCSCP. The study conducted a hypothesis test which suggested the following hypothesis. The hypothesis number one suggested that there is a significant impact of HC on HCA. This hypothesis was accepted. “Santanu Mandal” who is a researcher,

suggested in that research (Published in September 2018) utilization of efficient human resources for the better supply chain performance in the health sector proved beneficial [38]. The second hypothesis suggested the positive and significant mediating role of HCSCP between HC and HCA. This hypothesis was accepted as well. “Osman Demirdogen” (pharmaceutical and healthcare marketing) stated that the role of HCSCP directly related to the endurance of the patient welfare automatically. Due to this reason, the mediating role if significant and positive. Third and last hypothesis suggested and recommended the significant and positive moderating role of TO between HC and HCSCP. This hypothesis

is accepted. “Zhao Chu” a Chinese researcher suggested that technological factors enhanced the performance and provided the efficient human resources to the organizations in order to do best in this regard[39].

## 5.2. Conclusion

This study was conducted in Thailand. The main objective of this study was to know about the impact of HC on HCA. The aim was to know about the mediating part of HCSCP between HC and HCA. The aim was also to know about the moderating impact and role of TO between HC and HCSCP. The data was collected from managers and administrative staff of different hospitals located in Thailand. The sample size was 300, 290 responds were valid. The tool which is used for the data collection was questionnaire. At the last, this study concluded the results about the suggested hypothesis, that the impact of HC on HCA was positive and significant and HCSCP positively mediates between HC and HCA, and TO significantly moderates between HC and HCSCP.

## 5.3. Implications of this Study

This study has significantly contributed to literature material. It enhanced the material on internal. The required knowledge and data can be collected easily from this research. The related students of this research can teach and give suggestions to other students. This paper provided significant data on the topic of hospital human healthcare and healthcare agility, and also provide data to the concerned researchers about the mediating role of HCSCP and moderating role of TO between HC and HCA, and between HC and HCSCP. This study also contributed to practical life. The concerned hospitals can get awareness about their supply chain performance and insider to enhance the performance through this study. The government can find the flaws and drawbacks from this research and they can take significant steps in order to improve the systems in different hospitals.

## 5.4. Limitations and future research indications of the study

This study took place in Thailand. This can be conducted outside Thailand. This study can be completed in any other country in the world to

improve the health care facilities and services provided by the hospitals in accordance with internationally and globally adopted standards. In research, the sample size was very small. The future researchers can enlarge the sample size. In order to get more reliable data from the hospitals. The study only included the top and middle management in their sample. The future researchers can involve lower management as well, as a reliable data source for the problem discussed in the paper. The questionnaire was the data collection tool. The other researchers can use different types of tools like interviews, and one to one meeting.

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