

A MODEL OF FACTORS STRUCTURALLY RELATED TO RAJAMANGALA UNIVERSITY OF TECHNOLOGY ADMINISTRATORS' CRITICAL THINKING

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ABSTRACT

The purpose of this study was to develop a model of factors structurally related to Rajamangala University of Technology (RMUT) administrators' critical thinking. The sample in the research included 291 RMUT administrators selected by Stratified Random Sampling (using Krejcie and Morgan's table). The researcher, based on Watson and Glasser's concept, constructed a questionnaire for data collection. The data were described by using Mean and Standard Deviation. The consistency of empirical evidence, with the factors structurally related to Rajamangala University of Technology administrators' critical thinking, was tested by using Chi-square (χ^2), Goodness of Fit Index (GFI), Adjusted Goodness of Fit Index (AGFI), and Root Mean Squared Residual (RMR).

It was found that a model of linear factors structurally related to Rajamangala University of Technology administrators' critical thinking as developed by the researcher was supported by empirical evidence. The statistical values were as following: Chi-square (χ^2) = 318.15, degree of freedom (df) = 280, $p = 0.058$, Goodness of Fit Index (AGFI) = 0.92, Adjusted Goodness of Fit Index (AGFI) = 0.87, and Root Mean Squared Residual (RMR) > 0.05 = 0.039 at the 0.05 level.

This model can reveal the factors influencing RMUT administrators' critical thinking, as it is significantly supported by empirical evidence. Four factors significantly and directly affect on their critical thinking are leadership, character, internal motivation, and self-power belief. The model can be applicable to RMUT administrators and possibly to other Rajamangala University of Technology administrators as well.

Keywords: Model, factors, administrator, critical thinking.

INTRODUCTION

Thailand has been a member of the "world village" during the last decade. It has been swiftly affected by globalization like many other countries in the world. While many countries in the world

have been progressing speedily in terms of economy, society, politics, science and technology, they have been variedly affected by the first, the second and the third waves. Society has changed into knowledge-

based society. To retrain the nation's competitive capability, stability and dignity in the world village, it is necessary for Thailand to put into its 9th National Economic and Social Development Plan of B.E. 2502–2506. The emphasis on human resources, especially through long life educational development, as education is the most important foundation for national development, progress, and problem solving. People must be the center of development, with the main focus on their critical thinking, i.e., their ability to logically analyze and synthesize information, and on urging them to pursue knowledge by themselves.

Critical thinking is useful, especially in those situations in which human beings need to solve problems, make decisions in a reasonable way on what to believe or what to do. Critical thinking is important wherever the quality of human thinking significantly impacts upon the quality of life. In other words, critical thinking is “a way of taking up the problems of life” (Sumner, 1906).

Critical thinking is important for learning (Hudgins, 1997); it is a skill used for analysis and for a better understanding of what is studied. People must be trained to develop the ability of “self-thinking and self-doing” for effective learning. They should be able to analyze information systematically for better decision-making based on logical thinking, as critical thinking is a useful skill for both learning and living in the present time and in the future. Critical thinking education in the faculty is the only education, which can be truly said to make good citizens (Nekamanurak, 1993).

Critical thinking is very important, especially for professional administrators, as a key to success of the organization. It can be said that critical thinking is the most important characteristic of administrators. Administrators' critical thinking is their ability to apply logical thinking, knowledge and experience to handle situations, scrutinizing evidences thoroughly in order to draw a correct conclusion or to make a right decision. There are five steps in critical thinking according to Watson and Glaser (1964) to follow, i.e., inference, recognition of assumption, deduction, interpretation, and evaluation.

Rajamangla University of Technology has recently been restructured. It needs leaders who understand its nature and has a network of international cooperation (Songthanapitak, 2005). The new RMUT structure requires professional administrators who can act as change agents. The administrators must play a key role in the development of learning and teaching processes, motivating and guiding students and faculty members to act properly, to solve problems effectively, to have good values, and to develop themselves in several aspects, particularly their high-level conceptual skills, i.e., critical thinking. This, in turn, will enable RMUT under autonomous management to become a leading educational institution in developing human resources that are professional in different careers and possess international standard know-how, and reach academic excellence, which will benefit the society as a whole.

It has been shown that administrators play an important role for the success in every level of works of the organization. It is, therefore, interesting to build the model of factors structurally relating to RMUT administrators' critical thinking in any situation. But what factors are related to their critical thinking? And how should the model look like? These questions need answers.

This study was aimed to formulate a model of factors structurally related to RMUT administrators' critical thinking, so that the administrators can further develop themselves and their critical thinking.

RESEARCH FRAMEWORK

This research aimed to develop a model of factors structurally related to RMUT administrators' critical thinking. The constructed model is consistent with empirical evidence. The hypothesis was based on the basis of Watson and Glaser's theory of critical thinking. The components of critical thinking that were consisted of several factors, i.e., inference, recognition of assumption, deduction, interpretation, and evaluation.

Six factors or variables were selected to include in the first model after all available documents were reviewed. These factors were character (personality, cleverness, professional knowledge, skill, and morale), learning habits (aptitude, eagerness, and learning environment), self-power belief (action learning, learning acknowledgement, and general learning), stress (anxiety, moodiness, and physical symptom), leadership (acceptance, control, participation, management, and development), and internal motivation (challenge need, attention, self-confidence, skillfulness and intention).

The following figure illustrated the first model.

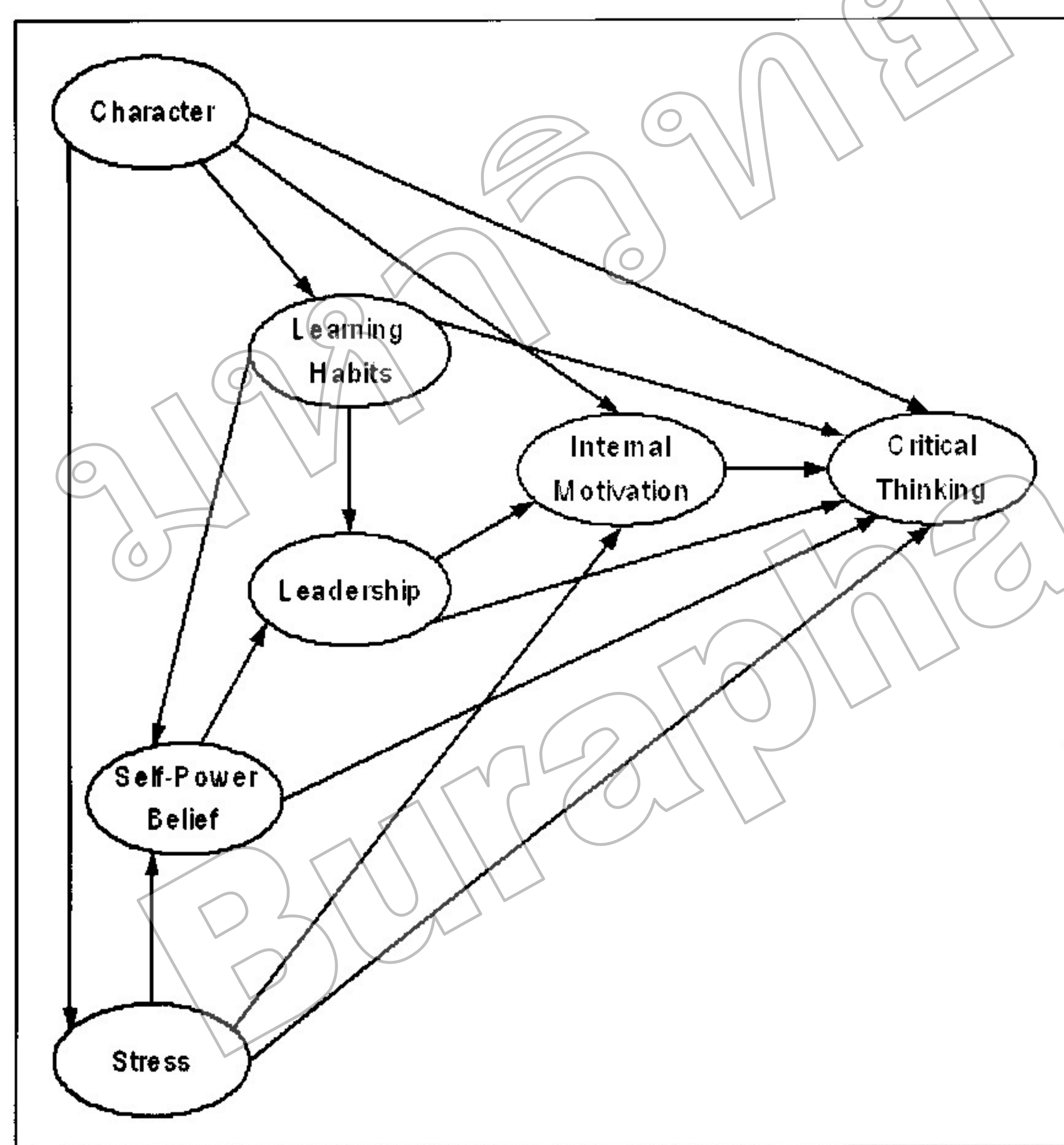


Figure 1. Schematic diagram shows variables influencing critical thinking.

Once the model was constructed, quantitative data were collected from RMUT administrators to test the model against empirical evidence in order to find out how much of each variable in the model influenced RMUT administrators' critical thinking.

RESEARCH METHODOLOGY

Sample

A total of 291 participants from the population of 1,138 RMUT administrators in 2007 were selected by Stratified Random Sampling method using Krejcie and Morgan's table (Krejcie and Morgan, 1970).

Instrument

The questionnaire was constructed, using the five-point Likert scale. Attempts had been made in a series of development, i.e., studying the concepts, theories, and existing documents related to factors affecting an individual's critical thinking. The questions were synthesized based on the operational definitions of the factors affecting RMUT administrators' critical thinking. The thesis advisor committee reviewed the constructed questionnaire for the face validity of the questions. The modification of questionnaire was done according to the suggestions of the thesis advisor and co-advisors. The five professional experts to verify the content validity against the Index of Items-Variable Congruence (IVC), subsequently reviewed the modified questionnaire. The questionnaire was finalized according

to the suggestions of five experts in the field. The request for the application of the questionnaire was approved by the Dean of Industrial Education, Faculty of Industrial Education, King Mongkut's Institute of Technology at Ladkrabang. The preliminary try out was carried out with a group of administrators with similar characteristics to the population. An analysis of the data was done to determine the Internal Consistency Reliability using Cronbach's Alpha method (Cronbach, 1990).

The permission to collect data during September 4 - 10, 2007 was granted by nine RMUT's presidents. The questionnaires were sent out with stamped return-envelope to all of the selected participants. All returned questionnaires were checked for the completeness of information. The data were analyzed to test the consistency of empirical evidence with the model of factors

structurally related to RMUT administrators' critical thinking, descriptive statistics, i.e., Mean and Standard Deviation, were determined. The constructed model of factors structurally related to RMUT administrators' critical thinking was

RESULTS

A total of 245 copies (84 %) of the questionnaires were returned. Therefore, the sample was consisted of 7 vice rectors, 5 rector assistants, 18 deans, 52

subsequently tested for its consistency with empirical evidence by using Chi-square (χ^2), Goodness of Fit Index (GFI), Adjusted Goodness of Fit Index (AGFI), and Root Mean Squared Residual (RMR).

deputy deans, 13 assistant deans, 9 academic section heads, 87 academic subsection heads, and 54 heads of clerical sections.

Table 1. Population and sampling.

Name of University	Population	Sample	Questionnaire returned
Rajamangala University of Technology Krungthep (RMUTK)	127	32	32
Rajamangala University of Technology Phra Nakhon (RMUTP)	136	35	30
Rajamangala University of Technology Suvanabhumi (RMUTSB)	128	33	22
Rajamangala University of Technology Lanna (RMUTL)	122	31	23
Rajamangala University of Technology Thanyaburi (RMUTT)	138	35	35
Rajamangala University of Technology Srivijaya (RMUTSV)	132	34	33
Rajamangala University of Technology Tawanok (RMUTTO)	115	29	24
Rajamangala University of Technology Isan (RMUTI)	116	30	18
Rajamangala University of Technology Ratanakosin (RMUTR)	124	32	28
Total	1,138	291	245

The majority of 245 participants were male administrators, which was equivalent to 53.5 %, while only 46.5 % were female. About 73.9% received a Master's degree, 16.3 % received a Bachelor's degree, and 9.8 % received a doctoral degree. The majority of them were head of

academic section (35.5%), followed by head of clerical section (22.1%), deputy dean (21.2%) and others. Their age ranged from 31–40 years. Most of them had been working at RMUT for 21–30 years. They were in the administrative position for 1–10 years.

Regarding the factors concerning to latent variables, the results are summarized in Table 2.

Table 2. Mean and standard deviation scores of latent variables of participants.

Latent variables	Mean	S.D.
<u>Character</u>		
X1: personality	4.06	0.45
X2: professional knowledge	3.69	0.56
X3: cleverness	3.88	0.51
X4: skill	3.92	0.50
X5: morale	4.52	0.51
<u>Learning habits</u>		
Y1: aptitude	4.13	0.46
Y2: eagerness	3.97	0.53
Y3: learning environment	4.02	0.54
<u>Self-power belief</u>		
Y4: action learning	4.12	0.54
Y5: learning acknowledgement	4.15	0.52
Y6: general learning	3.19	0.60
<u>Stress</u>		
Y7: anxiety	3.67	0.81
Y8: moodiness	3.66	0.86
Y9: physical symptom	4.01	0.88
<u>Leadership</u>		
Y10: acceptance	3.78	0.53
Y11: control	3.86	0.54
Y12: participation	4.01	0.56
Y13: management	3.86	0.58
Y14: development	3.86	0.60
<u>Internal motivation</u>		
Y15: challenge need	3.77	0.59
Y16: attention	4.07	0.54
Y17: self-confidence	3.92	0.59
Y18: skillfulness	4.05	0.56
Y19: intention	4.05	0.60

It was found that among five components of the administrators' character, morale was found to have the highest mean (mean = 4.52). Aptitude was found to have the highest mean (mean = 4.13) among the three components of learning habits.

However, learning acknowledgement was found to have the highest mean (mean = 4.15) among the three components of administrators' self-power belief, while physical symptom was found to have the highest mean (mean = 4.01) among the three

components of administrators' stress. Participation was found to have the highest mean (mean = 4.01) among the five components of administrators' leadership, whereas attention was found to have the highest mean (mean = 4.07) among the five components of the administrators' internal motivation.

The factors structurally related to RMUT administrators' critical thinking were identified from the review of existing literatures. It was found that six variables were likely to influence their critical thinking, namely, character, learning habits,

self-power belief, stress, leadership, and internal motivation.

The following symbols were used in the model:

- refers to cause and effect relationship
- refers to latent variable
- refers to an observed latent variable

The following model was formulated.

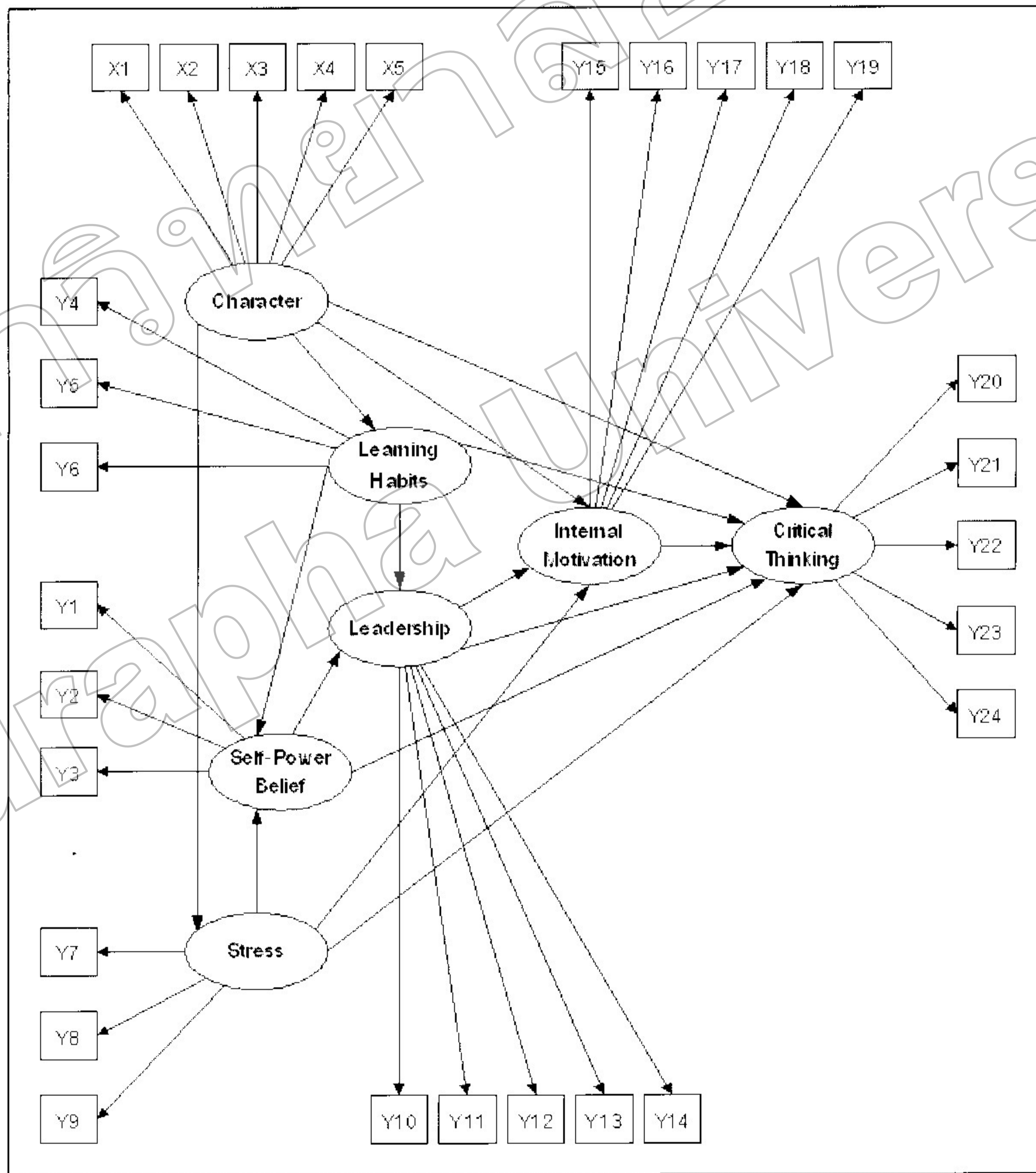


Figure 2. Latent variables influencing critical thinking.

Results of the determination of the validity of the factors structurally related to RMUT administrators' critical thinking used in the model

by using Multiple Correlation coefficients are summarized in Table 3.

Table 3. Matrix of correlation between variables.

Variables	Character	Self-power belief	Learning habits	Stress	Leadership motivation	Internal thinking	Critical thinking
Character	1.00						
Self-power belief	0.78**	1.00					
Learning habits	0.68**	0.79**	1.00				
Stress	0.34**	0.38**	0.29**	1.00			
Leadership motivation	0.65**	0.68**	0.68**	0.19**	1.00		
Internal thinking	0.62**	0.62**	0.68**	0.28**	0.76**	1.00	
Critical thinking	0.53**	0.67**	0.62**	0.47**	0.65**	0.55**	1.00

It was found that all variables were correlated with RMUT administrators' critical thinking, with the correlation between self-power belief was the highest value ($r = 0.67$), followed by leadership, learning habits, internal motivation, character, and stress ($r = 0.65, 0.62, 0.55, 0.53,$ and 0.47 , respectively). The variables were negatively and significantly related to critical thinking ($p < 0.01$).

In order to have the consistency of empirical evidence with the factors structurally related to Rajamangala University of Technology administrators' critical thinking, the model had been modified three times before the practical model was finally derived. The Model Modification Index was applied for this purpose.

The model that was first constructed, based on Watson and Glaser's theory of thinking, was tested. There was no significant relationship among the variables in the model, where the value of Chi-square (χ^2) = 1044.81, degree of freedom (df) = 362, $p = 0.00$, Goodness of Fit Index (GFI) = 0.77,

Adjusted Goodness of Fit Index (AGFI) = 0.73, and Root Mean Squared Residual (RMR) = 0.054, respectively. The value of Chi-square test was very high, which suggested that there was no significant consistency between the model and the empirical evidence.

The model was re-modified based on the model modification indices and EPC (Expected Parameter Change) in order to reduce the values of the parameters. Still, there was no consistency among variables due to the obtained values, i.e., $\chi^2 = 409.86$, df = 261, $p = 0.062$, GFI = 0.92, AGFI = 0.87, and RMR = 0.064.

The model was finally re-adjusted for the third time. This time it was found that the model of factors structurally related to RMUT administrators' critical thinking was significantly correlated with the empirical evidence as seen from the following statistical values, i.e., $\chi^2 = 318.15$, df = 280, $p = 0.058$, GFI = 0.92, AGFI = 0.87, and RMR > 0.05 = 0.039 at the 0.05 level, as shown in Figure 3.

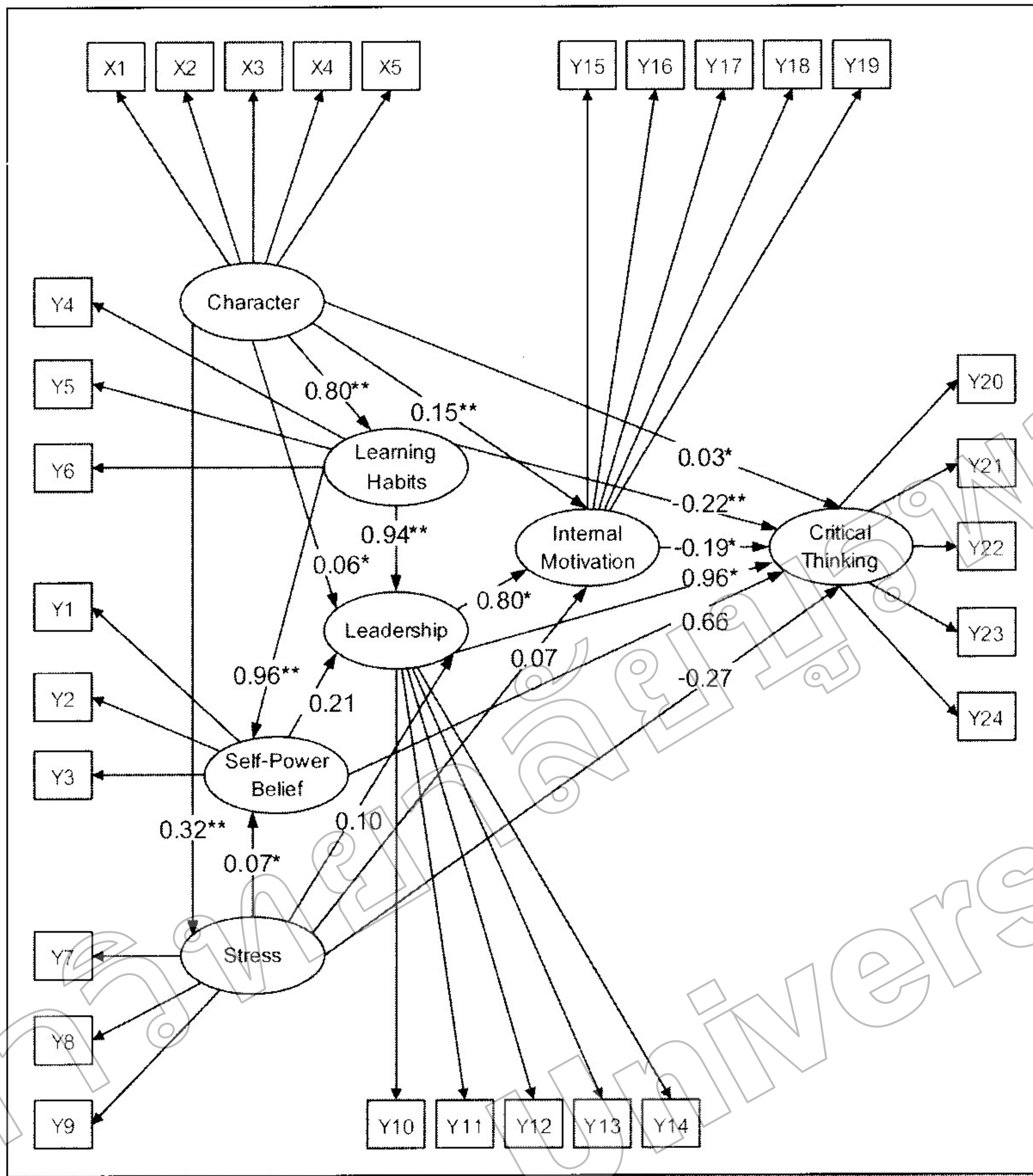


Figure 3. The final model of factors structurally related to Rajamangala University of Technology administrators’ critical thinking.

It was found that nearly all of the studied factors had a high predictive power in predicting RMUT administrators’ critical thinking as seen from R-square (R^2) in Table 4.

Table 4. R²-square of factors structurally related to Rajamangala University of Technology administrators’ critical thinking.

Variables	R ²
Learning habits	0.70
Self-power belief	0.95
Stress	0.10
Leadership	0.79
Internal motivation	0.78
Critical thinking	0.24
Total	0.59

It was found that all factors, i.e., character, learning habits, self-power belief, leadership, and internal motivation could predict RMUT administrators’ critical thinking at 80%, 70%, 95%, 79%, and 78% correct, respectively, whereas stress could do so at only 10% correct. One of interest was shown that critical thinking could predict itself at 24% correct. Most factors were related to each other at a high level (see Table 4).

Overall, it was found that learning habits were significantly correlated with character, self-power belief, and leadership at a high level ($r = 0.80, 0.96, \text{ and } 0.78$, respectively) at the 0.01 levels.

Character itself was found to highly correlate with leadership and internal motivation ($r = 0.69$ and 0.73 , respectively) at the 0.01 levels, while leadership was highly correlated with internal motivation and critical thinking ($r = 0.80$ and 0.80) at the 0.01 levels.

It should be noted that an internal motivation was negatively correlated with critical thinking, even though the correlation coefficient was not high ($r = -0.19$). Other variables had no relationship with critical thinking (see Table 5).

Table 5. Linear structural relationship among factors affecting Rajamangala University of Technology administrators' critical thinking.

Variables	Effect	Variables					
		Character	Learning habits	Self-power belief	Stress	Leadership	Internal motivation
Learning habits	DE	0.80**	-	-	-	-	-
	IE	-	-	-	-	-	-
	TE	0.80**	-	-	-	-	-
Self-power belief	DE	-	0.96**	-	0.07*	-	-
	IE	-	-	-	-	-	-
	TE	-	0.96**	-	0.07*	-	-
Stress	DE	0.32**	-	-	-	-	-
	IE	-	-	-	-	-	-
	TE	0.33**	-	-	-	-	-
Leadership	DE	0.06*	0.94**	0.21	0.10	-	-
	IE	0.63**	-0.16	-	-0.09	-	-
	TE	0.69**	0.78**	0.21	0.01	-	-
Internal motivation	DE	0.15**	-	-	0.07	0.80*	-
	IE	0.57**	-	-	0.01	-	-
	TE	0.73**	-	-	0.08	0.80*	-
Critical thinking	DE	0.03*	-0.22**	0.66	-0.27	0.96*	-0.19*
	IE	-0.03	0.18	-0.97	0.19	-0.16	-
	TE	0.01	-0.04	0.69	0.08	0.80*	-0.19*

DE = Direct effect, IE = Indirect effect, TE = Total effect, * $p < 0.05$; ** $p < 0.01$

DISCUSSION

The researcher developed a model of factors structurally related to RMUT administrators' critical thinking, which was consistent with empirical data. The research hypothesis of this study was accepted.

The model had been adjusted three times before the practical model was derived. The Model Modification Index was applied for this purpose.

First, the model based on Watson and Glaser's theory of thinking was tested. No significant relationship was found among the variables in the model (Chi-square (χ^2) = 1044.81, Degree of Freedom (df) = 362, $p = 0.00$, Goodness of Fit Index (GFI) = 0.77, Adjusted Goodness of Fit Index (AGFI) = 0.73, Root Mean Squared Residual

(RMR) = 0.054. Such high Chi-square value showed no significant consistency between the model and the empirical evidence.

Again, the researcher had to adjust the model, which, this time, was based on the model modification indices and EPC (Expected Parameter Change) in order to reduce the values of the parameters. Still, no consistency was found (χ^2) = 409.86, Degree of Freedom (df) = 261, p = 0.062, Goodness of Fit Index (GFI) = 0.92, Adjusted Goodness of Fit Index (AGFI) = 0.87, Root Mean Squared Residual (RMR) = 0.064.

The model had to be re-adjusted for the third time. This time it was found that the model of factors structurally related to RMUT administrators' critical thinking. It was found to be linear and significantly correlated with the empirical evidence as seen from the following statistical values: Chi-square (χ^2) = 318.15, Degree of Freedom (df) = 280, p = 0.058, Goodness of Fit Index (AGFI) = 0.92, Adjusted Goodness of Fit Index (AGFI) = 0.87, and Root Mean Squared Residual (RMR) > 0.05 = 0.039 at the 0.05 level. The final model was similar to that of Paiungkool (2004) in that they are both linear.

In conclusion, the model of factors structurally related to RMUT administrators' critical thinking supports the research hypothesis formulated by the researcher. When individual variables were considered separately to find out the direct and indirect effects on RMUT administrators' critical thinking, the points, which were worth discussing, are as follows:

Character. Character was an external variable that had both direct and indirect effects (0.03, -0.03 respectively, or the total of 0.01) on RMUT administrators' critical thinking. This is because character is an essential component of the other variables. Character was found to directly influence five variables, i.e., leadership, internal motivation, stress, critical thinking, and learning habits, but indirectly influence self-power belief through learning habits. Good character is necessary for those in administrative position. Character and leadership are closely related.

If an administrator has proper characteristics, possessing managerial skills and continuously improving them, their leadership ability will be enhanced. Katz (1955) stated that three leadership skills were conceptual skill, human relations skill, and technical skill.

Administrators must possess good personality, intelligence, knowledge in their fields coupled with administrative skills, and morality. The findings supported the study by Sairirat et al. (2006) who found that not all the leader traits were put to use at the same time. The situation will determine which to use.

Good leaders must have good human relationship. This is perhaps more necessary for administrators than for other staff. Administrators must contact or interact with different people. On campus, RMUT administrators must oversee the university affairs; therefore, they must have other factors to help them in making decisions.

Campbell et al. (1983) stated that administrators must coordinate with and seek cooperation from other administrators to brainstorm ideas for problem-solving efficiently and effectively. According to Inthusamith (2004), administrators must understand, be responsible, and must have vision. They must be trained on managerial skills, how to develop teamwork, how to gain respect from people, how to evaluate options, how to build learning networks, how to motivate people to work, etc.

Variables related to critical thinking and similar to those in the earlier studies by Jittaputthi (1996), Damkong (1998), Boonwig (2000) were studied and similar results were found. That is belief in self-power, internal motivation stress and character were all found to be related to critical thinking.

Learning habits. Learning habits were an external variable that had both direct and indirect effects (0.22, -0.18 respectively, or the total of -0.04) on RMUT administrators' critical thinking. Learning habits directly influence self-power belief because those with good education will have more confidence

or believe in their own power (self-power belief) than those with poor education. The more knowledge or a higher education one has, the more they are confident in their own ability or self-power. They also influence leadership because those with good learning habits usually have more opportunities to move to an administrative position. Jex (1998) and Kwanchuen (2000) found that learning habits that received social support from people in the organization had a strong influence over self-power belief and leadership. Good learning habits will increase one's intelligence, which in turn will enable a person to adjust oneself to the environment well (Boonyaphat, 2000).

However, they indirectly have a negative relationship with critical thinking (i.e., critical thinking influence learning habits) because to use critical thinking efficiently, one needs to acquire more knowledge and information.

According to Maddox (1963), learning achievement does not depend on only a person's intelligence but also on attitude and learning habits. Like students, administrators must use their learning habits to search for information and to upgrade their knowledge and skills in order to manage an organization efficiently.

Self-power belief. Self-power belief was an external variable that had both direct and indirect effects (0.66, -0.97 respectively, or the total of 0.69) on RMUT administrators' critical thinking. It directly influences leadership and critical thinking because if one has a strong self-power belief, one tends to have a desire to be a leader and to be eager to express one's opinions. Those with self-power belief usually have a good sense of responsibility. Fischer and Spiker (2004) found that self-power belief went hand in hand with a good mental health. Those with good mental health would have low stress. Those with low stress would possess critical thinking. The finding that self-power belief was positively related to critical reading supported the findings in the studies by Marra (1990; cited in Damkong, 1998), Boonwig (2000).

Stress. Stress was an external variable that had both direct and indirect effects (-0.27, 0.19 respectively, or the total of 0.08) on RMUT administrators' critical thinking. It directly influences self-power belief, leadership, internal motivation, and critical thinking because stress is a mental condition that cannot be easily controlled, and always affect a human mind to a certain extent. High stress would hinder self-power belief and critical thinking; thus it unfavorably affects physical health, leadership, and management (Katz and Kahn, 1966; Hancock and Meshkati, 1988).

Leadership. Leadership was an external variable that had both direct and indirect effects (0.96, -0.16 respectively, or the total of 0.80) on RMUT administrators' critical thinking. It directly influences internal motivation and critical thinking because leaders are normally proud of themselves and this feeling can motivate them to work hard and to use reasons to achieve the goals.

Under the education reform by the Ministry of Education, RMUT administrators have to work under a stressful condition to meet the key performance indicators (KPI) and have to use their leadership to drive the newly restructured organization to succeed in a high competition among public and private universities. Besides stress, it is unavoidable that their leadership is influenced by all other internal factors studied, such as internal motivation, character, and others.

Internal motivation. Internal motivation was an external variable that had both direct and indirect effects (-0.19, -0.19 respectively) on RMUT administrators' critical thinking. It directly has a negative impact on critical thinking, although not to a high degree. This means that critical thinking can cause change in people's internal motivation because reasoning can help them make right judgments, draw correct conclusions, or make right decisions.

This research found that internal motivation has a highly positive relationship with critical thinking.

This finding is similar to that of Evan (1971), Taesoongnern (2000), and Kumpak (1996).

Critical thinking can predict itself at 24% correct. The highest predictive power belonged to self-power belief, followed by leadership, internal motivation, learning habits, stress (0.95, 0.79, 0.78, 0.70, and 0.10). This means that RMUT administrators are already endowed with the ability to think critically and other factors help to promote this ability further.

CONCLUSIONS

This model can reveal the factors influencing RMUT administrators' critical thinking, as it is significantly supported by empirical evidence. Four factors that significantly have direct effects on their critical thinking are leadership, character, internal motivation, and self-power belief. Leadership and character positively influence their critical thinking, while the other two negatively influence it. The model can be applicable to RMUT administrators and possibly to other Rajamangala University of Technology administrators, as well.

RECOMMENDATIONS

RMUT should have a policy to hold different activities and utilize innovations to enhance the critical thinking of its administrators at all levels. This study was based on Watson and Glaser's theory, and so further study should be based on other theories, such as Ennis or Guilford or Sternberg's theory of critical thinking. Other factors—e.g., social, cultural, demographic, EQ and IQ—should also be considered. It should also focus on developing a model of factors structurally related to other staff's critical thinking. Besides, other techniques to check the validity of the instrument, such as the Delphi technique, MACR, focus group, etc., should be used.

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REFERENCES

- Boonwig, D. 2000. *A Study of Some Factors Related to Critical Thinking for the Lower Secondary Level 3 (Matthayom 3) Students in Nakhon Si Thammarat province*. M. Ed. Thesis. Srinakharinwirot University, Bangkok, Thailand (in Thai).
- Boonyaphat, D. 2000. *A Study of Construct Validity of the Personality Test According to Eysenck's Personality Theory for the Upper Secondary level 1 (Mathayom 4) Students in Ratchaburi province*. M. Ed. Thesis. Srinakharinwirot University, Bangkok, Thailand (in Thai).
- Campbell, R.F., Corbally, J.E., and Ramseyer, J.A. 1983. *Introduction to Educational Administration*. 6th ed. Allyn and Bacon, Boston.
- Cronbach, L. J. 1990. *Essentials of Psychological Testing*, (5th ed.). Harper Collins, New York.
- Damkong, B. 1998. *Some Factors Related to Critical Thinking Ability of Primary 6, the Lower Secondary Level 3 and the Upper Secondary level 1 Students in Mueang district, Songkhla province*. M. Ed. Thesis. Srinakharinwirot University, Bangkok, Thailand (in Thai).
- Evan, M. T. 1971. Managing the new managers. *Personnel Administration* 34(May-June): 31-38.
- Fischer, S. C. and Spiker, V. A. 2004. *Critical Thinking Training for Army Officers*. U.S. Army Research Institute for the Behavioral and Social Sciences. Alexandria, Virginia.
- Hancock, P.A. and Meshkati, N. 1988. *Human Mental Workload*. Elsevier Science Publisher, Amsterdam, North-Holland.

- Hudgins, B.B. 1997. *Learning and Thinking*. P.D. Peacock Publishers, Inc., Illinois.
- Inthusamith, M. 2004. *A Structural Equation Modeling of Job Burnout Among Primary School Principals in Northeast Thailand*. Ph.D. Thesis. Khon Kaen University. Khon Kaen, Thailand (in Thai).
- Jex, S M. 1998. *Stress and job performance: Theory, Research, and Implication for Management Practice*. Sage, London, UK.
- Jittaputthi, S. 1996. *Study of Factors Related to Critical Thinking Abilities of Nursing Students at Private Academy in Bangkok*. M.N.S. Thesis. Mahidol University, Bangkok, Thailand (in Thai).
- Katz, D. and Kahn, R. 1966. *The Social Psychology of Organizations*. John Wiley and Sons, New York.
- Katz, R. L. 1955. Skill of effective administrator. *Harvard Business Review* 33(1): 33-42.
- Krejcie, R.V. and Morgan, D.W. 1970. Determining sample size for research activities. *Journal of Educational and Psychological Measurement* 30(3): 607-609.
- Kwanchuen, P. 2000. *Variables Related to Nursing Students Creativity of Health Education of the Baromratchonnane Saraburi Nursing College in Saraburi province*. M. Ed. Thesis. Srinakharinwirot University, Bangkok, Thailand (in Thai).
- Kumpak, K.1996. *Relationships between Instructional Conditions Emphasizing Real Situations and Critical Thinking Ability of Nursing Students*. M. Ed. Thesis. Chulalongkorn University, Bangkok, Thailand (in Thai).
- Maddox, H. 1963. *How to Study*. Fawsett Premier, New York.
- Marra, J. L. 1990. *Advertising creativity: Techniques for generating ideas*. Prentice Hall, Englewood Cliffs, NJ.
- Nekamanurak, P. 1993. *The Development of Critical Thinking Developing Model for Teachers College Students*. Ph.D. thesis. Chulalongkorn University, Bangkok, Thailand (in Thai).
- Paiungkool, P. 2004. *A Construction and the Development of Police Cadets' Critical Thinking Appraise*. Ph.D. thesis. Srinakharinwirot University, Bangkok, Thailand (in Thai).
- Sairirat, S., Hiranyakitti, S., and Tangsinsupsiri, T. 2006. *Management and Organizational Behavior*. Diamond in Business World, Bangkok, Thailand (in Thai).
- Songthanapitak, N. 2005. New Rajamangala University of Technology. *Journal of Rajamangala University of Technology* 30(1):51.
- Sumner, W.G.1906. Critical Thinking. Retrieved on October 18, 2007 from: http://en.wikipedia.org/wiki/Critical_thinking
- Taesoongnern, K. 2000. *The Effect of Using Learning Package for Critical Thinking Skills Development of the Upper Secondary level11 Students in Mahisaratibodee School, Nakhon Ratchasima province*. M. Ed. Thesis. Kasetsart University. Bangkok, Thailand (in Thai)
- Watson, G., and Glaser, E.M. 1964. *Watson-Glaser Critical Thinking Appraisal Manual: Form Ym and Zm*. Harcourt Brace and World, New York, p.1-10.