CSCanada
Management Science and Engineering
Vol. 7, No. 2, 2013, pp. 50-55
DOI:10.3968/j.mse.1913035X20130702.3024

ISSN 1913-0341 [Print]
ISSN 1913-035X [Online]
www.cscanada.net
www.cscanada.org

A Study on Factors Increase Utilization of Quantitative Analysis Tool in Decision Making

Nopadol Rompho[a]

[a] Operations Management, Thammasat University, Bangkok, Thailand.
* Corresponding author.

Supported by the Faculty of Commerce and Accountancy, Thammasat University.

Received 12 April 2013; accepted 23 May 2013

Abstract

In today's business world, making business decisions is extremely complicated. Managers who have a full range of tools that assist in decision-making have the opportunity to lead their organization to a competitive advantage. The Quantitative Analysis Tool (QAT) is one such tool that managers can utilize in their decision-making. Interestingly, the QAT is dimming in popularity as seen in the decreasing emphasis on the QAT in the business and management curriculum in universities and lower application in the workplace. This study is aimed at studying the benefit of QAT to hopefully increase the utilization of this useful tool in organizational decision-making.

Technology Acceptance Model, Unified Theory of Acceptance and Use of Technology, and Theory of Planned Behaviour have shown that there is a relationship between (1) performance expectations and (2) self-efficacy and behavioural intention to use. Studies have found that there is a relationship between facilitating conditions and actual usage of QAT but no relationship between behavioural intention to use and actual usage of QAT. Findings in this study will definitely benefit managers who want to apply QAT to help manage their organizations.

Key words: Quantitative Analysis Tool; Decision Making; Thailand

Nopadol Rompho (2013). A study on factors that increase utilization of Quantitative Analysis Tool in decision making. *Management Science and Engineering, 7*(2),50-55. Available from: http://www.cscanada.net/index.php/mse/article/view/j.mse.1913035X20130702.3024
DOI: http://dx.doi.org/10.3968/j.mse.1913035X20130702.3024

INTRODUCTION

Managing organizations today is far more complex than in the past, with business operations now made up of variety activities with a higher level of complexity. Most organizations have more than one type of product and in order to compete, access a variety of resources to gain customer satisfaction with their products while at the same time needing to control the cost of production. Numerous products can be improved and sold at a lower price, which will inevitably lead to customer satisfaction and lead the organization to competitive advantage. With an enormous variety of limiting factors, decision-making has become increasingly complex in today's business world and difficult to undertake without complete and correct supporting data. This would seem to mandate the application of QAT with its benefits to management. At the same time, managers require time to gain an understanding of these mathematical tools and some may find it too difficult to use or perhaps even totally unaware of such tools exist. Both conditions mean these tools cannot be utilized.

The aim of this research is to study the levels of understanding of QAT, including the utilization of the tools for the benefits of management. The results will be analyzed and presented to managers so that they can see the benefit from utilizing these operational tools and begin using them. In order to make this research reliable and practical, a clear research scope and reliable methodology are needed. The details are explained in the next section.

1. LITERATURE REVIEW

The main objective of this research is to study factors that affect the utilization of QAT; however, there is as yet no specific model developed for this purpose. Since the complexity and the level of understanding required to use QAT are similar to usage of technology, we can adopt the Technology Acceptance Model to explain the utilization of QAT. We can also apply theories related to general human behavior to this case to ensure completeness of the research scope. Models referred to in this research are as follows.

1.1.1 Technology Acceptance Model

This model was developed from the study by Davis et al (1989) by incorporating the factors relevant to utilization of technology. It found that intention to use technology was dependent on users' attitudes towards technology usage, performance expectancy, and ease of use. Continuing studies were made and found that attitude towards technology was the most important factor that explained the utilization of technology (Igbaria et al., 1997; Jackson et al., 1997).

1.1.2 Unified Theory of Acceptance and Use of Technology

This theory was developed from the study by Venkatesh et al (2003) which combined the relevant factors regarding technology acceptance from earlier studies. It was found that the intention to use technology was dependent on three important factors i.e. performance expectancy, ease of use, and social influence. This theory also proposed that actual usage of technology, which was different from intention to use technology, was affected by two factors: facilitating conditions and intention to use technology. This theory was supported by a number of research studies including studies by Payne and Curtis (2008) and Vatanasakdakul et al. (2010).

1.1.3 Theory of Planned Behavior

This theory noted that human intention to perform behavior was dependent on attitudes toward such behavior and social influence (Fishbein and Ajzen, 1975). This theory was later revised and developed as Theory of Reasoned Action which added the Perceived Self-Efficacy factor to better explain human behavior (Ajzen, 1991).

Even though all three of these theories studied the usage of technology or explanation of general behavior, the use of QAT can be assumed to be similar to the use of technology in that it requires knowledge, ability and learning. By adopting these three theories as our base, we can then build the research scope as shown in Figure 1.

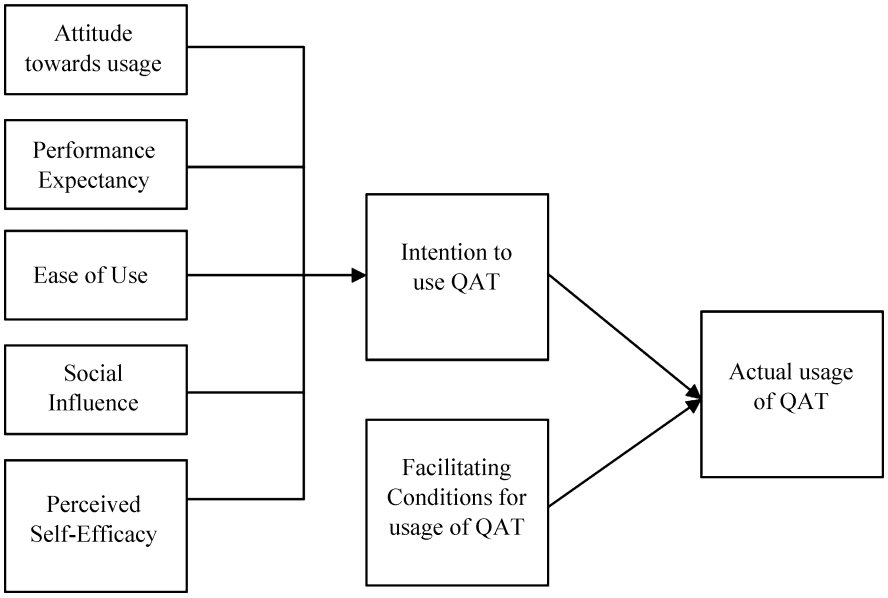

Figure 1
Research Scope

2. METHODOLOGY

This study is a quantitative research designed to assess the understanding of quantitative tools and utilization of such tools. The sample group is junior or middle managers who have the best chance of using QAT. We sent online questionnaires to students and alumni of the university's MBA program, both the standard and executive programs. The data was collected over the period of April to May 2012.

The reason behind the selection of only students and alumni of this particular MBA program is that this group had studied the QAT and might subsequently been given the opportunity to utilize these tools. Conducting a survey with random individuals who may or may not possess background knowledge could lead to a failure of this study to meet the objectives.

Quantitative Analysis Tools that will be studied in this research are determined from the Management Science

course that is taught in both Bachelor's and Master's degrees as follows:

- Linear Programming
- Queuing Theory
- Project Management
- Decision Analysis
- Game Theory
- Dynamic Programming

Only topics covered in the Management Science course were selected, as this research aims to find factors that promote the utilization of QAT; if the sample group had no background knowledge of the QAT, it would be difficult to expect them to use QAT and thus the study might not accomplish the research objectives. As a result, the researcher chose only topics that the sample group has studied.

The questions for measuring all the factors as mentioned in the scope of research were created from conducting a survey with users and included adjusting questions used in other relevant researches as shown in Table 1.

Table 1
Sources of Factor Measurement

Factors	Source of Question
Actual usage of QAT	Not referred to in any research. Measured by average number of times of QAT usage per year.
Intention to use QAT	Revised from research by Ajzen and Fishbein (1980, p.42 and p. 104)
Facilitating conditions for usage of QAT	Revised from research by Venkatesh et al. (2003)
Attitude towards usage	
Performance expectancy	
Ease of use	
Social influence	
Perceived self-efficacy	Revised from research by Compeau et al. (1999)

The methodology used to analyze the data is the structural equation modeling (SEM) by applying the AMOS program. The research results are presented in the next section.

3. RESULTS

An online survey was sent to current students and alumni of the MBA program, both the standard and executive programs, and 165 surveys were returned. Most respondents were male (54%), aged 26-30 years (51%), had a Master's degree as the highest level of education (53%), were working in the Industrials group (18.8%), had been working at the current workplace for 2-5 years (44.9%), were in a management position for less than two years (56.4%), and 20.8% worked in the Accounting and Finance fields. The profile of respondents is shown in Table 2.

Table 2
Profile of Respondents

Data	Percent
Sex	
Male	54.0
Female	46.0
Age	
Up to 25 years	16.0
26-30 years	51.0
31-35 years	16.0
36-40 years	10.0
Over 41 years	7.0
Highest Level of Education	
Bachelor's Degree	45.0
Master's Degree	53.0

To be continued

Continued

Data	Percent
Doctoral Degree	2.0
Company's or Organization's Industry	
Agro & Food Industry	4.2
Consumer Products	13.5
Financials	15.6
Industrials	18.8
Property and Construction	7.3
Resources	4.2
Services	14.6
Technology	9.4
Government Agency or Nonprofit Organization	12.5

Table 2
Profile of Respondents (cont.)

Data	Percent
Years of Service in Current Workplace	
Less than 2 years	23.5
2-5 years	44.9
6-10 years	19.4
11-15 years	8.2
More than 15 years	4.1
Experience in Managerial Position (position with subordinates)	
Less than 2 years	56.4
2-5 years	25.5
6-10 years	12.8
11-15 years	3.2
More than 15 years	2.1
Type of Current Job	
Accounting/Finance	20.8
Marketing/Customer Relations	17.8
Services/Production	15.8
Human Resources	4.0
Planning	13.9
General Management	12.9
Communication/Public Relations	3.0
Teaching/Training/Consulting	10.9
Research	1.0

It can be seen that most respondents had less than two years experience in a managerial position and might not be authorized to make a decision on the utilization of QAT. However, since the research objective was to study factors that encouraged utilization of QAT rather than factors that supported investment in these tools, the individual able to provide the best information would be the one who would actually use the tools. Thus, having the most respondents in operational positions would not have any effect on this research.

It is believed that even though most in the sample group worked in the field of Accounting/Finance, the type of job would not have impact on the study since QAT can be used in any part of the organization.

The level of acquaintance of respondents with QAT is shown in Table 3.

Table 3
Level of Acquaintance with QAT of Respondents

How Acquainted are you with the Following Quantitative Analysis Tools? (1 = Do not Know at all and 5 = Know, Understand and Can Use)	Average Value	Standard Deviation
Linear Programming	3.59	1.161
Queuing Model	3.08	1.310
Project Management Technique	3.10	1.345
Decision Analysis	3.27	1.126
Game Theory	3.11	1.200
Dynamic Programming	2.22	1.060

Table 3 shows that Linear Programming was the quantitative tool respondents were most acquainted with, while Dynamic Programming was the one that they were least acquainted with. The level of usage of QAT is shown in Table 4.

Table 4
Usage Level of QAT

What is Your Usage Level of Quantitative Analysis Tool in Decision Making? (1 = Never Used and 5 = Always Use)	Average Value	Standard Deviation
Linear Programming	1.91	1.083
Queuing Model	1.40	.686
Project Management Technique	1.89	1.221
Decision Analysis	2.01	1.117
Game Theory	1.44	.769
Dynamic Programming	1.16	.483

Table 4 shows that the usage level of each QAT was quite low. Decision Analysis was the tool used most and Dynamic Programming used the least. This was in line with the acquaintance test result that showed Dynamic Programming was the one that respondents were least acquainted with.

The result of the measurement of each factor according to the research scope comprised average values and standard deviations. In the measurement, 5 meant absolutely agree while 1 meant absolutely disagree. The exception was the factor of the number of times QAT was used each year, which was measured by average number of times of usage per year. Since many factors in the research scope were measured by a number of questions, we calculated the average value to create a score for each by putting average value and standard deviation in parentheses after each main factor as shown in detail in Table 5, where each factor was broken down.

Table 5
Descriptive Statistics of Factors Used in the Study

Factors Analyzed in the Study	Average Value	Standard Deviation
Actual usage of QAT		
Average number of times you use QAT per year (units are in times per year)	5.51	12.865
Intention to use QAT		
You intend to use QAT in your work whenever possible.	3.31	.970
Facilitating Conditions for usage of QAT (Average Value: 2.65 and Standard Deviation: 0.88)		
You have sufficient tools or programs to apply QAT to your work.	2.66	.930
Your organization provides support in programs for QAT.	2.65	1.081
Attitude towards usage (Average Value: 3.61 and Standard Deviation: 0.85)		
You like using QAT.	3.40	.994
You like the work that needs QAT to help decision making.	3.50	.959
You think that it is a good idea to use QAT in your work.	3.92	.904
Performance Expectancy (Average Value: 3.51 and Standard deviation: 0.75)		

To be continued

Continued

Factors Analyzed in the Study	Average Value	Standard Deviation
You think that the use of QAT is beneficial to your work.	3.75	.927
Using QAT will help you shorten your working process.	3.60	.882
Using QAT will increase your productivity.	3.64	.862
Using QAT will increase your chance of getting salary rises or promotions.	3.04	.949
Ease of Use (Average Value: 3.43 and Standard Deviation: 0.91)		
You think that it is not hard to use QAT in your work.	3.34	.980
You think that learning how to use QAT is not hard.	3.52	1.018
Social Influence (Average Value: 3.03 and Standard Deviation: 0.90)		
Someone important to you thinks you should use QAT in your work.	3.08	1.036
Someone who has an influence on your work thinks you should use QAT in your work.	3.06	.998
Your organization supports you to use QAT.	2.95	1.088
Perceived Self-Efficacy (Average Value: 3.25 and Standard Deviation: 0.73)		
You are confident that you have sufficient knowledge to use QAT in your work.	3.13	.925
You are confident that you can use QAT very well even without any help.	3.12	.962
You are confident that you are capable of using QAT even though you have never used that tool before.	2.94	.888
You are confident that you can use any QAT as long as someone explains and shows you how to use it.	3.80	.944

Table 5 showed that respondents used QAT about 5.5 times per year (approximately once every two months) and had intention to use in the range of normal to high (average value: 3.31). However, most respondents thought that their workplaces did not have facilitating conditions for utilization of QAT as there was no program to help calculations (average value: 2.65).

The attitude towards QAT was generally positive (average value: 3.61) and respondents believed that performance expectancy was normal to high (average value: 3.51). Respondents also believed that Quantitative Data Analysis was not too hard to understand and could be utilized (average value: 3.43). However, respondents did not really receive much social influence on the usage of QAT (average value: 3.03) and were confident in their ability in normal to quite high level (average value: 3.25)

To test the research, the structural equation modeling technique was used by applying AMOS program. The result was as shown below.

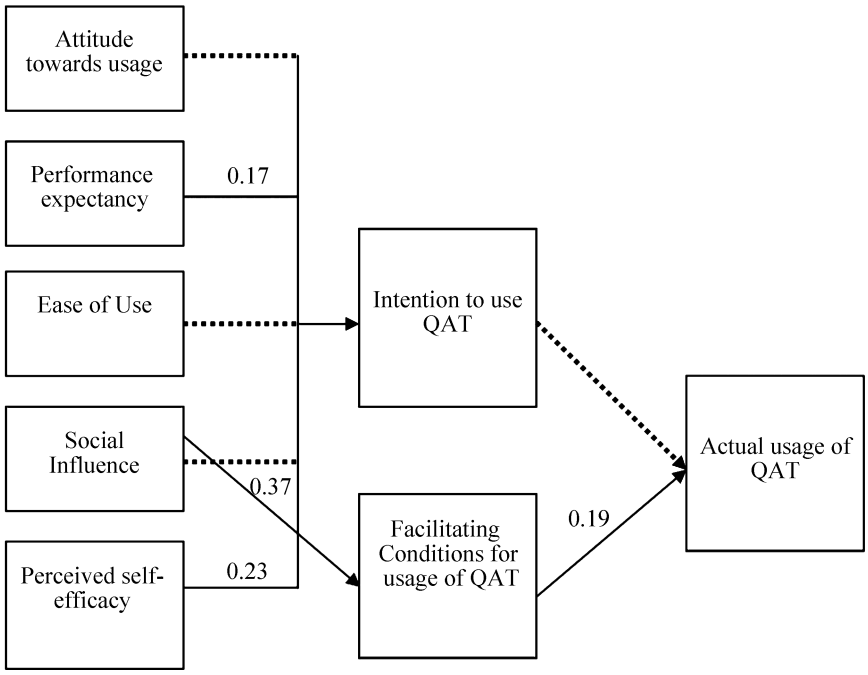

Figure 2
Model Resulting from the Study
* Dotted lines show statistically non-significant correlation

From applying structural equation modeling technique, we adjusted the model as shown in Figure 2 which had Chi-Square = 14.978 (p-value = 0.133), Chi-Square/df = 1.498, GFI = 0.978, and RMSEA = 0.055 (p-value = 0.39). These figures were in an acceptable range that could assure the accuracy of the model (Hair et al. 2010, pp. 664-673).

The research results showed differences from the research scope as shown in Figure 1 in many aspects. The research results showed that attitude towards usage, ease of use, and social influence did not have statistically significant correlation with intention to use QAT. There were only two factors that correlated with the intention to use QAT, i.e. performance expectancy and perceived self-efficacy. This indicates that the intention to use this tool is dependent on two factors: it is necessary to know how QAT would benefit the job and the person using it must have confidence in his own ability, which could occur from learning and studying about these techniques.

The next issue that differed from the research scope was that even though social influence did not have an impact on intention to use QAT, it did have an effect on facilitating conditions to use QAT. This was seen in pressure to use QAT by either colleagues or supervisors that pushed the organization to find programs or tools to satisfy the demand.

The next interesting issue found in the study was that intention to use QAT had a statistically non-significant correlation with actual usage of QAT, while there was correlation between facilitating conditions to use QAT and actual usage of QAT. This meant that actual usage took place more because of necessity than intention. When there was need to use, a facilitating condition, e.g. QAT software program, was more important. As a result, organizations that had complete QAT software programs would have higher chance for utilization of QAT than it employees just had the intention to use the tools.

CONCLUSION

This research result is academically beneficial as it extends the knowledge about the usage of Quantitative Analysis Tool (QAT). It found that facilitating conditions to use QAT, e.g. package software, is more important than simply an intention to use these tools. Moreover it also found that intention to use QAT arises out of two main factors - performance expectancy from the use of the tools and perceived self-efficacy of the users.

The results will assist the organization in understanding that in order to promote the use QAT, it is necessary to show benefits brought by the use of these tools. In addition there should be training programs to enhance the capabilities of their employees to encourage them to be confident in their own ability. Another important aspect is that organizations should put into place facilitating conditions for QAT usage, such as investing in package software that would help to facilitate the convenience, rapidity and accuracy of quantitative analysis.

Apart from the benefits that managers will receive as mentioned earlier, this research result will help relevant parties such as instructors or other academics to amend their teaching approach or supply direction to the teaching of quantitative analysis in decision-making so that managers can utilize these tools in their workplaces and the organization will become aware of factors that will promote utilization of the tools.

At the same time, it is important to note that this research was limited in terms of the scope of QAT studied, as it did not cover all the tools available, specifically financial analysis tools. Future research could be extended to include other QAT to make the results more complete. In addition this research does not consider the size of an organization and this could affect the use of QAT. It would be interesting to test this factor in the next step in order to make the result of the research clearer and more accurate.

This research aims to find factors that encourage utilization of QAT, however there is still no proof of how effective these tools are and whether the investment is worthwhile. Therefore, future research on the effectiveness of the usage of these tools will be interesting and be useful for the study of this topic.

REFERENCES

Ajzen, I. & Fishbein, M. (1980). *Understanding attitudes and predicting social behaviour*. New Jersey: Prentice Hall, Englewood Cliffs.

Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Process, 50*(2), 179-211.

Compeau, D. R., Higgins, C. A., & Huff, S. (1999). Social cognitive theory and individual reactions to computing technology: A longitudinal study. *MIS Quarterly, 23*(2), 145-158.

Davis, F. D., Bagozzi, R. P., & Warshaw, P. R. (1989). User acceptance of computer technology: a comparison of two theoretical models. *Management Science, 35*(8), 982-1003.

Fishbein, M. & Ajzen, I. (1975). *Belief, Attitude, Intention and Behavior: An Introduction to Theory and Research*. MA: Addison-Wesley, Reading.

Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2010). Multivariate data analysis: a global perspective, 7th Edition. New Jersey: Pearson Education.

Igbaria, M., Zinatelli, N.,Cragg, P.,& Cavaye, A. (1997). Personal computing acceptance factors in small firms: A structural equation model. *MIS Quarterly, 21*(3), 279-302.

Jackson, C. M., Chow, S., & Leitch, R. A. (1997). Toward an understanding of the behavioural intention to use an information system. *Decision Sciences, 28*(2), 357-389.

Vatanasakdakul, S., Aoun, C., & Li, Y. (2010). *AIS in Australia: UTAUT application and cultural implication*. Brisbane Association of Information Systems, Proceedings of 21st Australasian Conference on Information Systems, Australia.