



Factors affecting the effectiveness of police performance in Metropolitan Police Bureau



Wuthichai Tengpongsthorn

Doctoral Program in Criminology and Justice Administrative, Faculty of Social Sciences and Humanities, Mahidol University, Nakhon Pathom 73170, Thailand

ARTICLE INFO

Article history:

Received 23 July 2015
Received in revised form 11 July 2016
Accepted 12 July 2016
Available online 27 December 2016

Keywords:

effectiveness
Metropolitan Police Bureau
police performance

ABSTRACT

The purpose of this research was to study the factors relative to the work effectiveness of police officers in the Thai Metropolitan Police Bureau. The methodology in the research was the implementation of both quantitative and qualitative research using questionnaires and in-depth interviews as research tools. In the quantitative research methodology, the overall samples based on both cluster and simple random samplings included 405 police officers from different police stations under the control of the Thai Metropolitan Police Division, whereas the 25 samples in the qualitative research were selected using purposive sampling. Statistics used for data analysis were the frequency, percentage, mean, standard deviation, and Pearson correlation. We found that motivator factors and hygiene factors had positive relationships with the effectiveness of work performance. The Metropolitan Police officers in all divisions felt strongly that enough equipment was a factor facilitating an increase in work performance, whereas the imbalance of manpower and scarcity of modern equipment were factors which were obstacles to work performance.

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Introduction

Work effectiveness is the key to successful operation in an organization. Organizations with appropriate procedures supporting and increasing the work effectiveness of their employees tend to receive a good return on that investment and achieve rapid, effective, and sustainable development. In contrast, a lack of appropriate procedures supporting and increasing the work effectiveness of internal employees results in employees being ineffective, apathetic and unable to achieve the desired work performance (Santiwong, 1984). Inevitably, these poor situations were directly influenced by the employees being unable to apply all their competencies to address tasks, while at the

same time, they had a negative effect on the improvement of work systems within the organization which resulted in very slow organizational development. Moreover, the return on investment in such businesses was quite low and eventually, led to being disadvantaged in business competition (Kananurak, 2011). For these reasons, the most important thing that the executive of an organization can address to successfully improve the organization is to not overlook increasing the work effectiveness of employees as this is crucial to rapid improvement in a positive and prompt manner.

Police officers are one of various careers that are significant to the growth of national economic and social development because they have a key function and authority with regard to keeping the peace, maintaining public security and safety, and preserving common property for citizens in the community and society which are

E-mail address: wuthichai_law@hotmail.com

Peer review under responsibility of Kasetsart University.

basic, physical needs in human society (Chokprachakchat, 2011). In any society, living in an unsafe and disruptive environment holds back the diverse advancement of a country. In addition, the roles and duties of police officers are highly influential in the improvement of infrastructure in a nation (Royal Thai Government Gazette, 2004). Therefore, the government should focus on the Royal Thai Police, especially the work effectiveness of police officials. It is a fact that police officers are central in setting the directions of the Royal Thai Police. If police officers have high effectiveness, awareness, and alertness in their work performance, it would positively affect the Royal Thai Police and the development of the economic system and society in the country. Conversely, the ineffective work performance of police officers would have negative impacts on the Royal Thai Police and their reliability concerning the challenges associated with safely maintaining life and property from the citizens' viewpoint. Inevitably, such a poor situation would result in national decline.

Bangkok is a significant strategic point in Thailand because it is the capital and the center of the administrative, political, and economic systems of Royal Thai Government agencies (Yiampisan & Srivanit, 2010). Consequently, it is essential for police officials to show good work performance, especially the police officers in the Metropolitan Police Bureau, a government sector handling the main responsibilities of keeping peace and law enforcement in Bangkok. Ineffective work performance by police officials could negatively influence people's confidence in being safe and secure in the city, and foreign business and investors' confidence in business entities could suffer, which would degrade Thailand's economic system and inevitably lead to social problems (Hongto, 1996).

Even though Bangkok is Thailand's capital city, which houses the important central workplaces of politics, government, economy, and many executive government officials and politicians, many zones in Bangkok are the most dangerous and risky with regard to the occurrence of crime in Thailand. The latest countrywide statistical survey of criminal information, from the Statistical Forecasting Bureau of the National Statistical Office in B.E. 2555, reported that Bangkok had the highest number of criminal cases in Thailand. Furthermore, for Bangkok, only 6,693 out of 22,173 criminal cases (30%) involved arrests by police officers. The criminal arrest data for the whole country showed that only 44,398 out of 108,003 criminal cases (41%) were by police officers (Bureau National Statistical Office, 2012).

Aims and Objectives of the Study

The preceding discussion raises interesting questions about the work performance of the Metropolitan Police Bureau. For example, what factors influence the work performance of police officers in the Bureau and why? Hence, the main purpose of this study was to investigate the factors that impact on the work performance of police officers in the Metropolitan Police Bureau so that solutions and measures to improve their work performance could be identified to change their behavior and increase their work effectiveness.

Content Theory

Herzberg's Two-Factor theory was implemented in this research. This theory focuses on the inner needs and their expressions in work behavior. The theory consists of two main categories—motivators and hygiene factors. Motivators lead to positive job attitudes because they satisfy the need for self-actualization. Motivators cover achievement, recognition, work itself, responsibility, promotion, and growth. Conversely, hygiene factors surround the doing of the job. Hygiene factors include company policy, supervision, work conditions, salary, security, relationship with the boss, and relationships with peers. The satisfaction of hygiene needs can prevent dissatisfaction and poor performance, but only the satisfaction of the factors of motivation will bring the type of improvement in productivity sought by companies (Herzberg, 1993).

Hypothesis

Motivators and hygiene factors have positive relationships with the work performance of Thai Metropolitan Police officers.

Methodology

This research implemented both quantitative and qualitative methodologies. In the quantitative methodology, multi-stage sampling was required. For the first step, cluster sampling was needed to select some Metropolitan Police Bureaus from the nine divisions as the sample used in this study. Next, a simple random sample was implemented to draw by lots the three police stations in each division of the Metropolitan Police Bureau to choose the overall 27 police stations. In the second step, accidental sampling was used to choose 15 police officers per police station during the period of the survey to achieve a sample total of 405. After completing the survey, it was found that all 405 samples (100%) were completed successfully and 25 samples for the qualitative methodology was used to choose five police officers per division in the five divisions of the Metropolitan Police Bureau, consisting of Investigation, Inquiry, Crime Prevention and Suppression, General Staff, and Traffic.

The quantitative research dealt with information analysis using the percentage, mean, and standard deviation. In addition, Pearson Product Moment Correlation analysis at the .05 level of significance was applied. For the qualitative research, the data collected case by case were analyzed in detail to explain the outcomes of the quantitative study.

The independent variables in this research came from Herzberg's Two-Factor theory involving the following details.

1. Motivator factors (achievement, recognition, work itself, responsibility, and promotion)
2. Hygiene factors (company policy, relationship with boss, work conditions, salary, relationship with peers, relationship with citizens, security and balance of work and life)

In this research, the dependent variables were based on the effectiveness of the Metropolitan Police which was evaluated under the assessment of Thai Royal Police effectiveness rule B.E. 2547 (Thai Royal Police, 2004) comprising 10 indicators (responsibility, quality of work, knowledge and critical thinking, willingness, punctuality, compliance, ability to manage, initiative, cooperation, and resource use).

Results and Discussion

The results showed that all of the motivators had a positive relationship with the work performance of the Metropolitan Police officers. Metropolitan Police had high levels of satisfaction with the motivators associated with achievement, recognition, work itself, and responsibility, whereas promotion (one of the factors of motivation) was rated as at a fair level of satisfaction (Table 1). The correlation between motivator factors and performance are summarized in Table 2.

The results of the qualitative research on promotion illustrated that unfairness in the consideration for promotions and rewards was an obstacle to Metropolitan Police work performance in the Traffic and Investigation divisions. Metropolitan Police in the Traffic division felt strongly that fairness in the consideration of promotion and rewards was able to increase the effectiveness of their work performance. Regarding unfairness in the consideration of promotion and rewards, Metropolitan Police in both the Traffic and Inquiry divisions agreed that the Royal Thai Police should revise and improve the current procedures of consideration of promotions and rewards so that there was greater fairness in the criteria for the consideration of promotions and rewards. The research results indicated that unfairness occurred in the process of consideration of promotions and rewards because the normal consideration of promotions and rewards of Metropolitan Police has always been related to the patronage system (Chokprachakchat, 2011).

We found that all the hygiene factors had a positive relationship with the work performance of the Metropolitan Police officers. The Metropolitan Police had a high level of satisfaction towards the motivators associated with relationship with boss, relationship with peers, relationship with citizens, and security (Table 3). The correlation between hygiene factors and performance are summarized in Table 4.

The qualitative performance results were analyzed with regard to the factors which facilitate and obstruct increased work performance (Tables 5 and 6, respectively), with suggestions by the respondents to increase work

Table 1
Metropolitan Police satisfaction levels for motivator factors

Motivation factor	\bar{X}	SD	Level	Ranking
1. Achievement	3.96	0.81	Good	1
2. Recognition	3.69	0.79	Good	2
3. Work Itself	3.58	0.81	Good	3
4. Responsibility	3.51	0.88	Good	4
5. Promotion	3.25	1.03	Fair	5

Table 2
Correlations between motivator factors and Metropolitan Police performance

Motivation factor	r	p
1. Achievement	0.371	.00*
2. Recognition	0.480	.00*
3. Work Itself	0.394	.00*
4. Responsibility	0.447	.00*
5. Promotion	0.433	.00*

* $p < .01$

Table 3
Metropolitan Police satisfaction level for hygiene factors

Hygiene factor	\bar{X}	SD	Meaning	Ranking
1. Company policy	3.38	0.85	Fair	5
2. Relationship with boss	3.72	0.90	Good	2
3. Work conditions	3.02	1.01	Fair	7
4. Salary	2.88	1.13	Fair	8
5. Relationship with peers	3.73	0.80	Good	1
6. Relationship with citizens	3.65	0.94	Good	3
7. Security	3.51	0.93	Good	4
8. Balance of work and life	3.08	1.18	Fair	6

Table 4
Correlation between hygiene factors and Metropolitan Police performance

Hygiene factor	r	p
1. Company policy	0.367	.00*
2. Relationship with boss	0.305	.00*
3. Work conditions	0.415	.00*
4. Salary	0.444	.00*
5. Relationship with peers	0.387	.00*
6. Relationship with citizens	0.414	.00*
7. Security	0.402	.00*
8. Balance of work and life	0.317	.00*

* $p < .01$

performance provided in Table 7. Even though the result of this research regarding the issue of relationship with boss identified that commanders and their subordinates had good relationships with each other, the results of the qualitative research illustrated that an obstacle to work performance improvement in the divisions of Crime Prevention and Suppression, Investigation, and the General Staff was that this was rarely a concern of commanders. However, the respondents in these three divisions felt strongly that more attention from their commanders would facilitate increase effectiveness of work performance. Regarding the problems of rarely a concern from commanders, respondents in the divisions of Traffic Police and General Staff believed that the Royal Thai Police should look for measures to select commanders with more effective work performance and a higher interest in their work compared to the existing commanders (Kuptarnond, 1987).

Clearly, the motivator regarding responsibility is very interesting. From the study of qualitative information, we found that Metropolitan Police in the divisions of Traffic and Inquiry felt strongly that attention to and passion for work are significant factors to facilitate effective operation. All police divisions in the research agreed that the Thai Royal Police should be more strict and monitor work

Table 5

Opinions of Metropolitan Police on factors which facilitate increased work performance from qualitative research

Factor	Division				
	Prevention and suppression	Traffic	Inquiry	Investigation	General
1. Clear rules and regulations	✓		✓		
2. Attention from commanders	✓			✓	✓
3. Appropriate compensation	✓	✓	✓	✓	
4. Praise and reward.	✓	✓			
5. Good colleague	✓			✓	✓
6. Enough equipment and work tools	✓	✓	✓	✓	✓
7. Balance of manpower and workload		✓	✓	✓	
8. Fairness in the consideration of promotion and rewards		✓			
9. Attention and passion in work		✓	✓		
10. Good cooperation with any other external divisions		✓	✓	✓	
11. New and modern technology equipment and work tools			✓	✓	
12. High knowledge and abilities of Metropolitan Police	✓		✓	✓	✓

Table 6

Opinions of Metropolitan Police on factors which are obstacles to work performance from qualitative research

Factors	Division				
	Prevention and suppression	Traffic	Inquiry	Investigation	General
1. Lack attention from commanders	✓	✓			✓
2. Lack of cooperation with any other external divisions	✓			✓	✓
3. Lack of work plan	✓				
4. Imbalance of manpower and workload	✓	✓	✓	✓	✓
5. The scarcity of modern equipment and work tools	✓	✓	✓	✓	✓
6. Lack of knowledge in work	✓		✓	✓	✓
7. Bad attitude of citizen		✓	✓		
8. Inappropriate compensation		✓	✓	✓	
9. Decadent society		✓			
10. Unfairness in the consideration of promotion and rewards		✓	✓		
11. Unclear rules and regulations		✓	✓		
12. Unsuitable equipment and work tools technology in work			✓	✓	
13. Imbalance of workload			✓		
14. Delays and complicate in government procedure			✓		

Table 7

Opinions of Metropolitan Police on suggestions to increase work performance in qualitative research

Suggestion	Division				
	Prevention and suppression	Traffic	Inquiry	Investigation	General
1. Unclear rules and R regulations should be revised	✓				
2. Team working with other external divisions should be improved	✓			✓	
3. Should be increased operational budget	✓	✓			
4. Salaries and benefits should be modified to be more suitable to the costs of living	✓	✓	✓	✓	✓
5. Should support modern technology in work operation	✓	✓		✓	
6. Should be more strict and monitor work performance	✓	✓	✓	✓	✓
7. Select commanders who have more effective work performance and are really more interested in work		✓			✓
8. Should revise the current procedures for consideration of promotion and rewards		✓	✓		
9. Should use resources in terms of human and material for the best benefit		✓			
10. Should allocate appropriate equipment and work tools		✓	✓	✓	✓
11. The imbalance of manpower and workload should be resolved.		✓	✓	✓	✓
12. Should be improved physical conditions of Metropolitan Police.			✓		
13. Should be praised and rewarded			✓		
14. Knowledge and skills should improve before initiating or doing new tasks			✓	✓	✓

performance due to the inappropriate processes used to select commanders with regard to the patronage system and the purchasing of such positions (Buapheun, 1992).

Although the hygiene factor outcome regarding relationship with peers illustrated that Metropolitan Police had

good relationships with their colleagues, they still had problems concerning a lack of cooperation with any external division. From the qualitative study, it was found that Metropolitan Police in the divisions of Prevention and Suppression, General Administration, and Investigation

were still facing problems of a lack of cooperation with any external division which produced obstacles to effective work outcomes. Metropolitan Police in the divisions of Traffic, Inquiry and Investigation agreed that good cooperation with any external division would achieve more work effectiveness. Regarding the lack of cooperation with any external division, Metropolitan Police in the divisions of Prevention and Suppression and in Investigation felt strongly that team working with any external division should be improved and this was a reason for the current poor relationships with external divisions.

However, regarding satisfaction of hygiene factors, the Metropolitan Police Bureau valued company policy, work conditions, salary, and the balance of work and life at the fair level of satisfaction. In the qualitative studies, it was found that the rules and regulations were unclear. Moreover, the police officers in the divisions of Prevention and Suppression and in Inquiry believed that clear rules and regulations would support achieving a more effective Metropolitan Police force. The Metropolitan Police officers in the Prevention and Suppression division with regard to the problems of rules and regulations suggested that the unclear rules and regulations should be revised.

In the dimension of work environment we studied, it was found that work conditions were a problem that the Metropolitan Police had to face all the time especially with regard to scarcity of modern equipment and work tools as an obstacle in all police divisions. The Metropolitan Police in almost all divisions felt strongly that enough equipment and work tools were the factors to facilitate more effective work performance. Therefore, adequate required equipment and work tools should be appropriately allocated to the police. Furthermore, inadequate equipment and work tools were not the only obstacles to reduce the effectiveness of Metropolitan Police work performance, as the qualitative research also identified that the factor dealing with unsuitable technology at work as an obstacle to work performance effectiveness in the Inquiry and Investigation divisions, where the respondents considered that new and modern technology would assist them to work more effectively. Additionally, the thoughts of the Metropolitan Police in the divisions of Prevention and Suppression, Traffic, and Investigation illustrated that they needed a contemporary information technology system in their operations but they had limited budgets for purchasing such a system and also budgetary constraints contributed to the scarcity of effective and modern work tools and equipment for work (Khuerlamai, 1998).

The outcomes of this qualitative research implied that the Metropolitan Police in almost all divisions except the Traffic division felt strongly that a lack of knowledge was one of the main factors impeding the effectiveness of their work performance. The Metropolitan Police in nearly all divisions except the Traffic division agreed that a good level of knowledge and ability in the Metropolitan Police could help them achieve greater effectiveness in their work performance more easily, especially in the General, Investigation, and Inquiry divisions who suggested that their knowledge and skills should be improved by additional training before initiating or doing new tasks because criminals and the crimes they committed today are much

more various and complicated than in the past. Hence, the Metropolitan Police needed adequate and contemporary equipment and work tools (Krisawang, 2010).

The research study demonstrated that the hygiene factor regarding salary had the lowest level of satisfaction. This fact identified that the Metropolitan Police were still facing problems of low salaries and inadequate fringe benefits. This was consistent with the outcome of the qualitative research which illustrated that compensation was crucial to the effectiveness of officers' work performance. In other words, inappropriate compensation in the divisions of Traffic, Investigation, and Inquiry could have a negative impact on the effectiveness of their work performances. Moreover, Metropolitan Police in the divisions of Prevention and Suppression, Traffic, Investigation, and Inquiry agreed that sufficient compensation would support them to work more effectively. Metropolitan Police in all divisions had the same viewpoint that salaries and benefits should be modified to be relative to the costs of living.

Not only the problem of salary and benefits but the problem of imbalance of work and life, especially in the aspect of the imbalance of manpower and workload, also influenced the effectiveness of the Metropolitan Police officers. The qualitative research found that the factor concerning the imbalance of manpower and workload was an obstacle to the effectiveness of police work performance. The Metropolitan Police in the divisions of General, Traffic, Investigation, and Inquiry, said that the manpower policies should be adjusted to be more suitable for police workloads. Clearly, the issue of the imbalance of manpower and workload should be promptly resolved by the Royal Thai Police for the greater effectiveness of Metropolitan Police work performance (Hongto, 1996).

Suggestions

1. The current system for considering promotions and rewards in the Metropolitan Police should be improved and adjusted to be fairer and clearer by using real values of work performance to identify what are called "Key Performance Indicators" or "KPIs". In other words, the KPIs should be implemented in the consideration of either promotions or rewards for Metropolitan Police officers. For example, the number of cases completed on time should be used as one criterion to consider promotions and rewards.
2. To acquire a fair and explicit system for considering promotions and rewards, the Royal Thai Police could set up a framework as a central standard, and then release it as a rule for commanders from the Office of Police Commission. The newly developed system from the Royal Thai Police for considering promotions and rewards of Metropolitan Police officers could limit the powers of commanders so that they must carefully think before making decisions regarding which Metropolitan Police officers really deserved promotion and reward for their hard work.
3. The Royal Thai Police should monitor Metropolitan Police officers who had received promotions and rewards associated with large amounts of money or from using

- the special patronage system. Subsequently, the Royal Thai Police should apply severe penalties to those police officers who were involved in misleading activity, including the police officers who paid money for their promotions and the commanders who received the money, based on the criminal laws and the rules and regulations of officials. At the same time, a variety of claim channels for the Metropolitan Police staff should be available and easily accessible so that cases of unfair promotion and reward could be directly sent to the Royal Thai Police to investigate and determine all such cases with the implementation of a transparent proving and checking system. The researchers felt strongly that the above suggestions would help greatly to create fair competition among Metropolitan Police officers for their advancement and also for their police organization.
4. Encouragement is crucial to the work performance of the Metropolitan Police officers. Improvement in their salaries and benefits relative to the costs of living is one effective way to encourage the police. Our study found that Metropolitan Police staff still received much lower salaries and benefits when compared with any other career path in the criminal justice system, such as a judge, prosecutor or Department of Special Investigation officer. This acted as discouragement to the Metropolitan Police staff to work effectively. Hence, the researcher suggest more appropriate salaries and benefits for the Metropolitan Police officers should be set by the Royal Thai Police to reduce the gap between the Metropolitan officers and other career paths in the criminal justice system.
 5. The rules and regulations associated with work should be modified to be more in tune with the Metropolitan Police officers and their work circumstances. The results of the research illustrated that the Metropolitan Police officers had to face unclear and inadequate rules and regulations in their work. To overcome this problem, the researchers agreed that the Royal Thai Police should designate a research committee to survey and seriously study the problem and the enforcement of police rules and regulations in every police division and unit to determine what were the important obstacles in police operations and what part of the rules and regulations required revision to achieve effective work performance.
 6. Adequate budgets for purchasing sufficient quantities of new, modern, and capable materials and tools for work use should be allocated to match the requirements of Metropolitan Police officers. At the same time, the Metropolitan Police staff had to be trained in the rules and regulations, operational techniques, applications of new technology, and gain knowledge of the information technology system, which were crucial to their tasks. Otherwise, the scarcity of necessary equipment, materials, and work tools would reduce the effectiveness of the work performance of Metropolitan Police officers as the current research identified
 7. Police manpower rates should be suitable to their workload. Referring to the imbalance of police manpower rates and workloads, the researchers believed that the right rates of police manpower should be set by a

consideration of the annual numbers of reported cases compared to the number of Metropolitan Police officers at police stations regardless of the area.

8. The problem of cooperation with other external divisions should be resolved. From our study, the Metropolitan Police officers tended to have good connections only with their co-workers in the same division. For this reason, it is very difficult for officers to coordinate effectively with any other officers in other divisions or departments. This situation has led to the lack of good cooperation between internal and external police divisions or departments. Clearly, the Royal Thai Police need to search for the proper measures to connect Metropolitan Police staff among internal divisions, external divisions, and other organizations, such as forensic police, prosecutors, and government officers. Sport activities and special parties could support and create good relationships between the Metropolitan Police staff and other units they deal with. Social networks, such as Line, Facebook, and Web boards can help Metropolitan Police officers share ideas and essential information on their work and problems in tasks.

Conflict of interest

There is no conflict of interest.

References

- Buapheun, G. (1992). *Factors affecting the effectiveness of the detective police of the Metropolitan police station* (Unpublished master's thesis). Nakhon Pathom: Mahidol University. [in Thai]
- Bureau National Statistical Office. (2012). *Reported crimes 2007–2012*. Bangkok, Thailand: Author. Retrieved from <http://service.nso.go.th/nso/web/statseries/statseries13.html> [in Thai]
- Chokprachakhat, S. (2011). *Guidelines for the Royal Thai police's human resource management*. Bangkok, Thailand: The Secretariat of the Senate. [in Thai]
- Herzberg, F. (1993). *The motivation to work*. New Jersey, NJ: New Brunswick.
- Hongto, S. (1996). *Factors affecting working morale of sub investigation inspectors in Bangkok metropolitan police stations* (Unpublished master's thesis). Nakhon Pathom: Mahidol University. [in Thai]
- Kananurak, N. (2011). Leadership role for producing professional employees. *University of the Thai Chamber of Commerce Journal*, 31(1), 123–133. [in Thai]
- Khuerlamai, T. (1998). *Job satisfaction of the police detectives in the metropolitan police bureau* (Unpublished master's thesis). Nakhon Pathom: Mahidol University. [in Thai]
- Krisawang, L. (2010). *The factor that is the motivation in duty practice of the inquiry official metro police division 6* (Unpublished master's thesis). Bangkok: Thammasat University. [in Thai]
- Kuptarnond, T. (1987). *Factors affecting the effectiveness of the inquirers performance in the metropolitan police bureau* (Unpublished master's thesis). Nakhon Pathom: Mahidol University. [in Thai]
- Royal Thai Government Gazette. (2004). *Police Act 2004 (14 February 2004)*. Retrieved from http://www.mots.go.th/ewtadmin/ewt/mots_km/ewt_dl_link.php?nid=153 [in Thai]
- Santiwong, T. (1984). *Human behavior in organizations*. Bangkok, Thailand: Thaiwattanapanich. [in Thai]
- Thai Royal Police. (2004). *The evaluation of Thai royal police effectiveness rule B.E. 2547*. Retrieved from <http://www.edupol.org/edp/edp1/LAW/POLICE14.PDF> [in Thai]
- Yiampisan, M., & Srivanit, M. (2010). *Using the kernel density estimation surface for criminal patterns: A case study in Phranakhon District, Bangkok*. Bangkok, Thailand: Thammasat University. [in Thai]