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The Use of Analytical Approach for the Selection of Dispute Resolution

Aref Charehzehi, Alireza Ahankoob*

Department of Structure and Materials, Faculty of Civil Engineering, Universiti Teknologi Malaysia (UTM), Johor Bahru, Johor, Malaysia.

*E-mail of the corresponding author: alireza.a1982@gmail.com

Abstract

One of the usual problems in the construction industry is the existence of a dispute that arises because of the different reasons. So the main concern of the experts is to identify the way to settle disputes on time and within budget. There are various types of dispute resolution that can be selected. However, parties are required to know the specification and suitability of each method to manage the selected process and the final decision while the shortcoming of enough experience in analytical tools is intense restriction for decision makers to pick up the most proper resolution method. The purpose of this study is to utilize the Analytical Hierarchy Process (AHP) and Multi Attribute Utility Technique (MAUT) to select the most appropriate dispute resolution method that is carried out in the state of Johor in Malaysia.

Keywords: AHP, Construction Industry, Dispute Resolution, MAUT.

1. Introduction

Nowadays construction dispute is really a common problem in various projects and it is extending in term of size and complexity nature (Cheung et al., 2006). Senior vice president of the American Arbitration Association (Mark appel), mentioned that "the construction industry is really the industry that sponsors our work." (ENR, 2000). Therefore, various researchers have done different studies related to construction dispute to manage and suggest the best dispute resolution technique (Marzouk et al. 2011; Chan et al. 2006; Chan and Suen 2005). The main issue in managing dispute is to select the most appropriate dispute resolution method.

According to Yusof (Yusof, M.A et al., 2007), construction industry plays a critical role in the development of Malaysia. It is predicted that the construction industry will be one of vital contributors in 2020 but the same as other countries they are faced with different construction conflict in different circumstances. Therefore, the companies and also government are forced to expend millions of dollars annually to resolve the construction dispute problems include working relationships, communications, and contractual commitments that are so costly and inefficient if the appropriate method is not selected to settle dispute. Therefore, these deficiencies lead to search for better alternatives on how to manage disputes in the construction industry. Though it has been seen that disputes in the industry is like irremediable disease so, it is a continues challenge to manage dispute problems.

In this situation it is recommended to select the dispute resolution method analytically to achieve to the purpose of the system. Different tools are introduced by different researchers that are useful to settle dispute. Decision analysis and set theory is a method that can be used to decrease conflict and settle disputes (Pawlak, 2005). Lootsma (1989) suggested a comparison model to assess the potential solution of conflict between parties. Multi Attribute Utility Technique (MAUT) is one of the most effective approaches that can aid systematically to select the dispute resolution method which is close to the project objectives (Cheung and Suen, 2002). The aim of this paper is to develop the MAUT and AHP model to select the proper dispute resolution method.

1.1. Definition of conflict and dispute:

Kumaraswarmy and Yogeswaran (1997), stated that "a dispute can be said to exist when a claim or assertion is made by one party is rejected by the other party and that rejection is not accepted." On the other hand, incongruence among various parties in terms of their profits, requirements, and purposes which can lead them to try for the achievement of their own goals, refer to construction dispute (Tillet G, 1991). Overall dispute occurs when parties

reject to deliver their obligations under the contract provisions.

2. Source of Dispute

Decreasing dispute require to identify the source of dispute that cause to commence the conflicts. According to Cheung (2006) some significant factors that can lead to dispute are adversarial behavior; contractual problems; and project ambiguity. On the other hand, It is clear that the sources of construction disputes refer to the contractual factors such as variation, propagation of time, payment, quality according provisions, accessibility of complete information, management, insubstantial client expects, and wrong decisions (Conlin et al, 1996).

3. Problem Statement

The various numbers of dispute cases in construction industry emerge unconsciously. It means that dispute is inevitable while, the way to minimize and avoid dispute is related to the rate of complying with contractual obligations by all stakeholders. However, the dispute is a considerable event that cannot be settled easily just by utilizing previous experience or manipulating one of the dispute resolution methods without sufficient knowledge. Although in some cases the dispute can be solved just by means of commercial settlement that is related to bilateral agreement between the parties to modify the terms of contract. Most of the time settlement of the conflict is strictly difficult for participators because of complicated processes. Therefore in these circumstances parties must refer to dispute clauses that are simple expression of dispute resolution methods in the contract.

The methods that are mentioned in the construction contract have different features and processes in term of binding and non-binding. For instance, alternative dispute resolution is being used in wide area because of their speedy, costly and non-adversarial features that provide informal means of dispute resolution however; ADR is not the best in all disputes and in some circumstances despite the adversarial nature of arbitration and litigation, they can be most appropriate rather than ADR. Therefore balance is required through the whole trade of dispute resolution to achieve the particular goal (miller, 1995).

By the way the parties must be able to distinguish the most appropriate dispute resolution method depending to the situation and their prospect. Therefore, it's required to collect adequate information about circumstances and also the features of each dispute resolution to go for the most proper one that can be capable to settle the dispute problems in the right way. It is clear that the construction projects are really different in term of nature, size and complexity when use the wrong method to settle the dispute the process will be really expensive in term of expenses, personnel, time and opportunity cost (ENR,2000). Brennan, (2006) stated that the productivity cost and deadline of the projects are influenced by dispute so the stockholders must choose the proper strategy to settle and manage dispute on schedule and budget.

York (1996) tried to collect information regarding specification of each dispute resolution method. Following elements in “Table 1” can be useful to follow for identification of dispute selection criteria.

Table 1: Key concepts for selecting dispute resolution model

Dispute resolution method	Advantages	Disadvantages
Negotiation	• Cost effective • Speedy • Noncomplex • Maintain relationships, • Risk free • Informal, high control • Confidential	• Depend to the parties cooperation • No binding agreement
Mediation	• Maintain relationships • Flexible • Speedy • High control • Short duration • Private • Low cost	• Lack of enforcement of final decision • Lack of binding decision • The mediator has no power to force
Arbitration	• Finality and binding • Confidential result • Cheaper than litigation • More control than litigation • Occur in privacy place	• Remedies are limited • Costly • Take long time • The decision cannot be appealed • Low flexibility
Litigation	• Independent • Binding decision • High witness control • Cost of law court is free • Parties can appeal if unsatisfied	• No confidential • No privacy • High cost • No flexibility • Can break down the relationship of the parties • Long duration • Risk of delay • Not possible to control by the parties • Limited result

Source: York (1996)

Jenny David (1988) suggested that the following elements can be considered in the selection of dispute resolution method also:

1) Delay
2) Relationship between the parties
3) Power imbalance
4) Cultural differences
5) Confidentiality
6) Final decision

As mentioned there are different types of dispute resolution that the selection of the proper one can provide prosperity in settlement of disputes. According to Neil Gold (1990), extension of analytical attributes in issue of dispute is a way to identify the proper resolution regarding type of dispute. Although today the researchers are going to develop an analytical method to assist in the selection of optimized dispute resolution method, most of the clients, contractors, consultants, engineers, and quantity surveyors are without sufficient knowledge in this area. The purpose

of this study is to use multi attribute decision making process to select the best method in particular circumstances.

4. Research Design

In this study research method is based on gathering information by questionnaire and interview of professional experts in the construction field. The focus is on knowledge acquisition by providing a quantitative survey research. It is fair to say that twenty criteria highlighted during the study on the basis of York's research. After distributing questioner among respondents nine of the most significant criteria were specified by Average Index Technique. After that, collected data from questionnaires is used to develop a theoretical model which involves of analytical Hierarchy process (AHP) and Multi Attribute Utility Technique (MAUT) by Equations (1) to (3). The purpose of using these two models together is to reduce the percentage of personal error. MAUT can quantitatively use both tangible and intangible factors in computing data.

The scope of MAUT is very wide and can be applied in the following issues:

1) Define the alternative and relevant attributes.
2) Appraisal of each alternative on each attribute.
3) Assign relative weight to the attributes to reflect preference.
4) Combine the weight of attribute and satisfaction evaluation of each alternative.
5) Provide sensitivity and finally make a decision.

MAUT is on the basis of assigning number called outcome utilities to each outcome state. The measure of the desirability or satisfaction of an attribute is called utility (normally expresses as Ui).

The overall concept of MAUT covers two main aspects with respect to both model and utility weight derivation. This theoretical method is applicable to the selection of a dispute resolution method according to the following:

$$A\,Crj = \sum_{i=1}^{n} Ui \tag{1}$$

$$Ui = \sum F\,(UXi) \tag{2}$$

Where:

I = Represents the attribute considered by decision makers.

A Crj = Aggregate score for dispute resolution j.

F (UXi) = Calculation based on considered parameter.

Alternatively, Ui may be based in combination with AHP or weighting coefficient as follows:

$$A\,Crj = \sum_{i=1}^{n} Ui\ Wij \tag{3}$$

Where:

Wi = maximum score for each criteria.

The conjunction of these two models will provide the weighted score for each dispute resolution method based on the highest score.

The main advantage of MAUT is that the problem converts to a single objective problem once the utility function has been assessed correctly.

Analytical Hierarchy Process (Saaty, 1980) is a type of multi decision making tool which can be applied to obtain the best alternative in a series of options by pairwise comparison between criteria.

In this study the priority rate for each criterion is resulted from a comparison between criteria and finally multiplies in the utility factor to compute the final score. These criteria have been designed by literature review and highlighted

from the questionnaires by respondents according to Average Index Technique (4). The data collected was analyzed using the average index formula based on Abd. Majid and McCaffer (1997) as shown below:

$$\text{Average Index} = \frac{\sum ai\ xi}{\sum xi} \quad (4)$$

Whereas,

ai = constant which represents the weight for I,

Xi = variable that represents the frequency of respondents to the I (I = 1, 2, 3, 4, 5).

The classifications for the rating scale based on Abd. Majid and Mc Caffer (1997) are:

1= 1.00 ≤ Average Index < 1.50 (not important or strongly disagree)

2= 1.50 ≤ Average Index < 2.50 (less important or disagree)

3= 2.50 ≤ Average Index < 3.50 (neutral or moderately agree)

4= 3.50 ≤ Average Index < 4.50 (important or agree)

5= 4.50 ≤ Average Index ≤ 5.00 (very important or strongly agree)

5. Data Analysis:

At the first step, the experts were asked to answer the questionnaire that commences by specifying the rank for each criterion from the least important to the most important. The results of this phase have been identified in "Table 2".

Table 2: The most significant criteria ranked by Specialists from JKR department in Malaysia

CRITERIA								
Cost		**Frequency Analysis (FA) (%)**						**Level of Agreement**
		TD(1)	**D(2)**	**MA(3)**	**A(4)**	**TA(5)**	**I**	
	NR	0	0	6	7	2	3.73	Agree
	PR	0.00%	0.00%	40.00%	46.67%	13.33%		
Speed or duration		**Frequency Analysis (FA) (%)**						**Level of Agreement**
		TD(1)	**D(2)**	**MA(3)**	**A(4)**	**TA(5)**	**I**	
	NR	0	0	7	8	0	3.53	Agree
	PR	0.00%	0.00%	46.67%	53.33%	0.00%		
Flexibility		**Frequency Analysis (FA) (%)**						**Level of Agreement**
		TD(1)	**D(2)**	**MA(3)**	**A(4)**	**TA(5)**	**I**	
	NR	0	2	5	6	2	3.53	Moderately Agree
	PR	0.00%	13.33%	33.33%	40.00%	13.33%		
Confidentiality		**Frequency Analysis (FA) (%)**						**Level of Agreement**
		TD(1)	**D(2)**	**MA(3)**	**A(4)**	**TA(5)**	**I**	
	NR	0	0	7	7	1	3.60	Agree
	PR	0.00%	0.00%	46.67%	46.67%	6.67%		
Final decision		**Frequency Analysis (FA) (%)**						**Level of**

		TD(1)	D(2)	MA(3)	A(4)	TA(5)	I	Agreement
	NR	0	2	7	2	4	3.53	Agree
	PR	0.00%	13.33%	46.67%	13.33%	26.67%		
Settlement finally		Frequency Analysis (FA) (%)						Level of Agreement
		TD(1)	D(2)	MA(3)	A(4)	TA(5)	I	
	NR	0	1	7	4	3	3.60	Agree
	PR	0.00%	6.67%	46.67%	26.67%	20.00%		
Fairness		Frequency Analysis (FA) (%)						Level of Agreement
		TD(1)	D(2)	MA(3)	A(4)	TA(5)	I	
	NR	0	3	2	8	2	3.60	Agree
	PR	0.00%	20.00%	13.33%	53.33%	13.33%		
Efficient		Frequency Analysis (FA) (%)						Level of Agreement
		TD(1)	D(2)	MA(3)	A(4)	TA(5)	I	
	NR	1	1	4	7	2	3.53	Moderately Agree
	PR	6.67%	6.67%	26.67%	46.67%	13.33%		
Ease of procedure		Frequency Analysis (FA) (%)						Level of Agreement
		TD(1)	D(2)	MA(3)	A(4)	TA(5)	I	
	NR	0	3	4	3	5	3.67	Moderately Agree
	PR	0.00%	20.00%	26.67%	20.00%	33.33%		

It can be clearly seen that these nine criteria placed in table 2 has an average index number between the range of 3.5 and 4.5 which are distinguished in level four. A summary of these criteria is described below:

Cost: the concept of cost means the amount of money that both parties spend on dispute resolution procedure. Therefore, this element should be analyzed precisely in order to aim decision maker to select an appropriate resolution method.

Speed: time is required to examine the problem and achieve the proper decision is different for various resolution methods so, by using analytical methods, the proper resolution technique should be distinguished.

Flexibility: flexibility implies the ability of parties to alter the dispute resolution result and control the procedure.

Confidentiality: this factor protects the privacy of the parties during the settlement of disputes. As a matter of fact, parties prefer to keep their conflict issues hidden in order to maintain their credibility in the market.

Final decision: one of the main concerns of the parties in selecting the resolution method is obtaining binding decision that would be fair for both parties. This decision differs in each type of dispute resolution method. For instance, in arbitration the result leads to an award but in litigation it ends with a judgment.

Settlement finally: to finalize the result of the resolution the neutral party is required to be strong enough so that to impose the decree on parties.

Fairness: the ultimate judgment should take into account the interests of both parties because claimants have referred the matter of dispute to a competent authority.

Efficient: an efficient dispute resolution means that the parties reach a general overview and comprehensive knowledge to make a right decision in future conflicts and avoids seeking absurd processes.

Ease of procedure: the much easier dispute resolution process can solve the problem faster and minimize waste of time and cost which maintains business relationship. Moreover, it can play a crucial role in controlling dispute

matters.

1.1 Utility factors gathering:

This step determines utility factors for suitability of each criterion within dispute resolution methods which resulted from questioners scored by the same respondents and professional experts of Jabatan Kerja Raya (JKR) in Malaysia. It should be noted that these scores are based on previous experience. To facilitate data collection the questioner was distributed within in respondents the nine selection criteria derived from previous step were used to draw up the utility factors table. In reality, they were asked to score from 10 to 110 to appraise the degree of importance of each dispute resolution strategy against each criterion (zero is not considered because of error elimination). The average results of utility factors are summarized in "Table 3".

Table 3: Utility factors matrix for dispute resolution models

No	Criteria (From Average Index)	Suitability of criteria within dispute resolution methods (Utility factor)				
		Arbitration	Litigation	Medication	Negotiation	Conciliation
1	Cost	31.33	18.00	72.00	93.33	80.00
2	Speed or Duration	32.67	16.67	76.60	92.67	91.33
3	Flexibility	36.67	14.67	87.33	101.33	88.00
4	Confidentiality	83.33	20.67	63.33	82.67	80.00
5	Ease of procedures	34.00	17.33	89.33	92.00	85.33
6	Final decision	91.33	99.33	30.67	13.33	20.00
7	Settlement finally	93.33	100.00	33.33	12.67	19.33
8	Fairness	70.67	93.33	31.33	32.00	40.00
9	Efficient	88.67	99.33	42.67	17.33	33.33

The table exhibits the utility value of each dispute resolution for the selection criteria. For instance, negotiation has highest utility value for cost and lowest utility value for settlement finally. Hence; the useful range of the performance of each method can be easily obtained from table 3.

Dispute resolution is a type of decision making strategy which is categorized in Multi-Criteria Decision Making (MCDM) methodology. Since, specifying the relative importance of each criterion is the structure of MCDM, hence it is essential to rank them and specify their priority rating. This process can be implemented by MCDM tools such as analytical hierarchy process. By determining the priority rating for each criteria decision makers are able to find their relevant dispute resolution strategy. The needs of the parties differ in terms of economic, political, and legal options. It means that if the cost of the dispute resolution process is important to parties, then they would undoubtedly rank the criterion cost e higher priority rate than other criteria. Thus, the importance of priority rate for each criterion may vary in different cases of dispute. This feature reveals the need for a flexible method such as AHP.

Analytical Hierarchy Process is based on a pairwise comparison between criteria which allow user to characterize their desirable criteria such as cost, speed, fairness and so on. AHP makes the selection process very transparent. It also reveals the relative merits of alternative solutions for a Multi Criteria Decision Making problem (Drake, P.R., 1998). AHP approach is a subjective methodology (Cheng and Li, 2001); information and the priority weights of elements may be obtained from a decision-maker of the company using direct questioning or a questionnaire method. It is the nature of analytical hierarchy process that human judgments and not only the underlying information can be used in developing the evaluation. A distributive summary of JKR case study has been shown in "Table 4". The nine criteria and their priority rates sorted in descending order "Fig 1".

Table 4: Eigenvector for each criterion obtained from AHP model

Normalized										Average or Eigenvector X
Criteria	Criteria									
	cost	speed	flexibility	confidentiality	ease of procedure	final decision	settlement finally	fairness	efficient	
Cost	0.11	0.21	0.13	0.23	0.03	0.09	0.21	0.05	0.16	**0.135**
Speed	0.05	0.11	0.13	0.12	0.13	0.09	0.11	0.18	0.11	**0.113**
Flexibility	0.04	0.04	0.04	0.02	0.03	0.06	0.07	0.02	0.03	**0.038**
Confidentiality	0.03	0.05	0.13	0.06	0.13	0.04	0.05	0.09	0.11	**0.077**
Ease of procedure	0.21	0.05	0.08	0.03	0.07	0.06	0.07	0.09	0.03	**0.077**
Final decision	0.21	0.21	0.13	0.23	0.20	0.18	0.11	0.27	0.16	**0.189**
Settlement finally	0.11	0.21	0.13	0.23	0.20	0.36	0.21	0.18	0.21	**0.204**
Fairness	0.21	0.05	0.17	0.06	0.07	0.06	0.11	0.09	0.16	**0.108**
Efficient	0.04	0.05	0.08	0.03	0.13	0.06	0.05	0.03	0.05	**0.059**
Sum	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	1.000

Settlement finally: 0.204, final decision: 0.189, cost: 0.135, speed: 0.113, fairness: 0.108, ease of procedure: 0.077, confidentiality: 0.077, efficient: 0.059 and flexibility: 0.038.

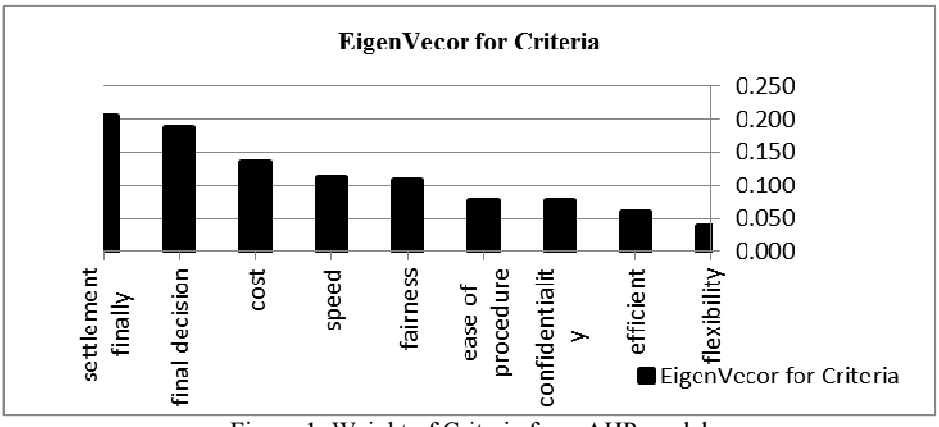

Figure 1: Weight of Criteria from AHP model

After calculating these weights, it is imperative to multiply them by utility factors obtained from questionnaire to acquire final scores for each dispute resolution alternative. The completed multi-attribute selection of dispute models is shown in “Table 5”. This table shows the ultimate priority for the JKR department in Malaysia:

Table 5: Final multi-attribute calculation for JKR case study

Suitability of criteria within dispute resolution methods (Utility factor)												
No.	**Criteria (From Average Index)**	**Criteria Priority according to AHP**	**Arbitration**		**Litigation**		**Medication**		**Negotiation**		**Conciliation**	
			Utility Factor	**Score**	**Utility Factor**	**Score**	**Utility Factor**	**Score**	**Utility Factor**	**Score**	**Utility Factor**	**Score**
1	Cost	**14%**	31.33	4.23	18.00	2.43	72.00	9.73	93.33	12.61	80.00	10.81
2	Speed or Duration	**11%**	32.67	3.69	16.67	1.88	76.60	8.65	92.67	10.46	91.33	10.31
3	Flexibility	**4%**	36.67	1.41	14.67	0.56	87.33	3.35	101.33	3.89	88.00	3.38
4	Confidentiality	**8%**	83.33	6.39	20.67	1.58	63.33	4.86	82.67	6.34	80.00	6.13
5	Ease of procedures	**8%**	34.00	2.62	17.33	1.33	89.33	6.87	92.00	7.08	85.33	6.57
6	Final decision	**19%**	91.33	17.22	99.33	18.73	30.67	5.78	13.33	2.51	20.00	3.77
7	Settlement finally	**20%**	93.33	19.08	100.00	20.44	33.33	6.81	12.67	2.59	19.33	3.95
8	Fairness	**11%**	70.67	7.63	93.33	10.08	31.33	3.38	32.00	3.46	40.00	4.32
9	Efficient	**6%**	88.67	5.23	99.33	5.85	42.67	2.51	17.33	1.02	33.33	1.96
	SUM	**100%**		**67.50**		**62.90**		**51.96**		**49.97**		**51.21**

According to the table, arbitration is the first choice for JKR department based on the value of each criterion and if the priority rate of the criteria differs in the other case studies undoubtedly the final result will be changed and a new prioritization system will be produced.

6. Discussion

This study performed to minimize the humans' faults and inaccuracy in the process of dispute resolution selection. The cardinal criteria highlighted by questionnaire were cost, speed or duration, flexibility, confidentiality, final decision, settlement finally, fairness, efficiency and ease of the procedure. By specifying these criteria, parties will be able to recognize their desires of dispute resolution methods. This survey doesn't intend to introduce the best method of dispute resolution, but it looks for the most appropriate methods which suit the needs of the parties regarding to their selected criteria in the conflicts and construction disputes. Therefore, each criterion is ranked by a weight according to its priority for parties compared with the rest of the criteria. The use of AHP and MAUT at the same time intensifies the degree of success in the selection process within the complex nature of construction disputes.

7. Conclusion

It is noted that any particular dispute resolution can provide a different expectation of the parties based on the situation and their requirements, so it is not possible to use the same method in different circumstances and achieve the same result. In many cases the wrong choice of dispute resolution methodology has led to the waste of time and finally produced delay in the project fulfillment. These delays have contributed to costly process as well. Therefore, the experts require to establish a new analytical approach to settle conflicts reasonable in time and budget. The model discussed in this study is able to respond to our needs in a wide range of criteria.

This paper characterized the criteria for decision makers by applying the AHP method. Finally the weight of each criterion obtained by AHP should be multiplied by the MAUT (utility factor's table) to specify the best resolution method. In this particular study, that is implemented for JKR Malaysia, it has been achieved that the arbitration is the most proper method to manipulate for dispute settlement based on determined criteria by JKR. As a result this method can prepare an opportunity for decision makers to select the proper dispute resolution technique.

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First A. Author: Aref Charehzehi received B.Sc. degrees in Civil Engineering from Islamic Azad University (IAU), Zahedan branch (Zahedan, Iran) in 2008 and M.Sc. in Construction management from Universiti Teknologi Malaysia (UTM), Malaysia in 2013.

Second A. Author: Alireza Ahankoob received B.Sc. degrees in Industrial Engineering from Islamic Azad University (IAU), Qazvin branch (Qazvin, Iran) in 2006 and M.Sc. in Construction management from Universiti Teknologi Malaysia (UTM), Malaysia in 2013.