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Perception of Software Agile Methodology Understanding among IT practitioner in Malaysia's IT Industry

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Abstract:
IT practitioners of different genders i.e. male and female found in the Malaysian IT industries. The research is conducted among IT Practitioners of male and female in Malaysian IT industries which focusses on variety of IT and Software companies in Malaysia. The study is conducted to investigate the level of understanding among both genders. The questionnaires were distributed and among eight software development companies or companies that consist of departments that actively engaged with the software development in Malaysia. There were four Malaysian companies and four Multinational companies based in Malaysia. Prior to the distribution of the questionnaires, a pretest of survey was made on a small number of questionnaire forms. There are total of 127 respondents in this research.

The respondents were selected based on the size of the paid-up capitals of the companies, i.e., from small to large companies with the maximum paid-up working capital of RM 5.5 Billion. Due to some technical and management conditions (less Agile practitioners in Malaysia), the number of respondents were selected by the non-probabilistic samplings and the identification of the companies was done manually. The stratified sample was then subjected to the non-probabilistic sampling method and the snowball sampling technique when needed. The number of male staffs and officers were much higher than the female (71% and 29%, respectively with $\chi 2=22.1$ at $p < 0.0001$. By considering if the above proportion were representative to the whole population of the software developers in Malaysia, thus it could be stated that more males than females involved in the software development sectors that focus on the use of Agile in Malaysia. As indicated in the finding of this study, only 9% of the respondents understand Agile at the maximum scale of 10. Similar percentage was for scale of 9. The percentages for scales 8, 7, and 6 were 24%, 21%, and 11%, respectively. The Female had shown the score of 6.56 out of 10 scale of understanding the agile, while male score of 6.87 of understanding the agile. However, the level of understanding in Agile technique was still low as indicated by the percentage and relative frequency of the IT practitioners or the mean level of scoring responded by the study subjects. It was also shown that in relativity, the full understanding of Agile technique would lead into the production of high quality software.

Keywords: *Agile, Understanding, Plan Driven, Process.*

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I. INTRODUCTION

Software Agile Techniques has been implemented since the early 1990 and widely used especially in North America (Sison et. al, 2006; VersionOne, 2012). This is due to the rapid of requirement changes during software development in which the conventional method that implement the plan driven model such as Waterfall had shown some unsuitability of the model in Software Development. Most of IT practitioners state that the usage of Agile has given a lot of benefits to software development industry, i.e., by using Agile technique, the produced software would have high quality (Ahmed

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et al., 2010; Mnkandla et al.,2006) and being produced in shorter time duration (Ahmed et al., 2010; WoihinKee, 2006). And this is may due to the iterative elements in within the cycle (Rico, 2008). VanderLeest et. al (2009) also stated that Agile technique is better than the traditional technique of Software Development, as the techniques is a non-plan driven that able to cope with changes compared to other plan driven methodologies. As the techniques introduce so called ad-hoc (non-plan driven) which allow changes to be implemented right away during the software development, it had shown that the method is helpful in producing better software in term of the overall quality. In addition, it had shown that Agile had consistently adapt changes of requirement regardless of requirement types from the client. It is well known that in most of the Software development, changes are inevitable due to the nature of the project. However, Paasivaara and Lassenius (2011) indicated that it was not easy to use Agile especially in large scales projects. Despite, due to the growth of software development industries in Malaysia recently, it is found that the software process or software development methodology is seemed to be one of the crucial part in software industries in Malaysia as for the industries to have smooth operation in software development in ICT (Asnawi et al, 2012). The creation of Multimedia Super Corridor of Malaysia (MSC) is an effort to support the development of Information and Communication Technology (ICT) industry in Malaysia (Asnawi et. al, 2012). Asnawi et. al (2012) indicated the importance of software process in a software product development in ensuring the smooth running of the operation of software development programs and activities. With the current IT related existing knowledge, experiences and infrastructures in Malaysia, it is therefore vital for the software developers in Malaysia to further know the basic and detail frameworks and suitable software development methodologies that needed to be implemented in their software development projects. As the traditional software development methodologies are no longer being used widely, the Agile technique is seen to be the new and current method that could replace the traditional or conventional method (Murphy et. al, 2013; WoiHinkee, 2006). In addition, Zainol et. al (2008) stated that the Malaysia IT Company does not have a clear idea of the methods used to get the requirement. Due to observed gaps in the understanding and use of agile between Malaysian IT practitioners and those advanced counterparts in the developed nations, thus it is crucial to know the current status of the Agile use and their benefits towards the development and acceleration of software industries in the going-to be developed nation of Malaysia in year 2020.

II. METHODOLOGY

The questionnaires were distributed and then collected among eight software development companies or companies that had departments or division that actively engaged with the software development in Malaysia starting from February 2014 to the end of March 2014. There were four Malaysian companies and four Multinational companies that based in Malaysia. Prior to the distribution of the questionnaires, a pretest of survey was made on a small number of questionnaire forms. The permission were obtained from the respective companies, i.e, either by official letter or verbal agreements. A total of 127 respondents or study subjects had responded in this study. The dependent variable or responses were in the form of numerical scales. Records which are presented in the numerical form are in the form of quantitative data (Given ,2008).

The respondents were selected from the stratified samplings (Kitchenham and Pfleeger ,2002) in which the stratification was based on the size of the paid-up capitals of the companies, i.e, from small to large companies with the maximum paid-up working capital of RM 5.5 Billion. Due to some technical and management conditions, the number of respondents were selected by the non-probabilistic samplings (Kitchenham and Pfleeger, 2002). The study was in the form of field or observational study as opposed

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to the control experiments **(**Kitchenham and Pfleeger, 2002**).** The stratified sampling in this study was conditioned or in contingent with some points as indicated in the following discussions.

In this project, the target population was the software development practitioners of the related companies in Malaysia that fully or partly involved in the Agile technique for software development activities. The non-probabilistic sampling method was used since there were less Agile practitioners in Malaysia. Additionally, there were no specific agency in Malaysia that had list of all software development companies in Malaysia that involved in Agile technique for the software development and production. Thus, the identification of the companies was done manually. The stratified sample was then subjected to the non-probabilistic sampling method and the snowball sampling technique when needed. The snowball sampling was partly employed since the researcher found that the respondents involved in this survey were able to recommend other eligible and credible participants to participate in this study(Kitchenham and Pfleeger ,2002). Based on all of the above, the selected 127 respondents were sufficient for this study. Kitchenham and Pfleeger (2002) further indicated that the non-probabilistic sampling method is used when they believe that the respondent are accessible and when the researcher believe that the sample is representative based on reasons and justification.

This questionnaire consisted of the closed ended questions as the question provided answers of scales for the respondent to choose as shown in Tables 1 and 2, respectively. Kitchenham and Pfleeger (2002) indicated that a question is a closed question when there are choices of answers of that particular question to be choosen by the respondent. The closed-ended question was rather used in this study with the anticipation of reducing the probability of the respondent to get confuse and facing difficulty in answering the question. The respondents were needed to answer one answer from the given answers. In order to have valid statistical analysis of certain data, the

Table 1 : The groups within each independent or biographic variable used in the study

Independent Variable (Biographic Information)	Groups
Position	1. Top Management (Non-technical) 2. Top Management (Technical) 3. Staffs (Non-Technical) 4. Staffs (Technical)
Age	1.> 50 Years Old 2. 25-50 Years old 3. < 25 Years old
Sex	1. Male 2, Female
Education Level	1. Bachelor's Degree 2.Master's Degree 3. PhD's Degree 4.Bachelor's Degree+ Professional certificate 5. Master's Degree + Professional Certificate 6. PhD's Degree + Professional Certificate 7. Other's

Notes : For statistical analysis purpose (ANOVA), the regroupings were made, i.e., **Position** : Non-Technical, technical **Age** : Less than 25 Years Old, 25 yearls old and above **Education** : Bachelor or Bachelor + professional certificate, Master and above or Master and above + Professional certificate, Others

Table 2: The dependent variables or responses, the scale of responses used in the study

Responses	Scales	Notes
Agile Understanding (agileu) Acceptance of Agile-based Product by End Users (aeu) Agile implementation Easiness (agilei)	1,2,3,4,5,6,7,8,9,10	1= Very Poor 10=Too excellent

regroupings of groups within each biographic or independent variable were made in this study. The related data (working paid-up capital) were obtained from the Malaysian Government Commissioner of Companies (SSM). The scales of the response as indicated in Table 2 were with the range of 1-10 that it could give respondents more flexibility in answering the question asked. The range was also used by Azri Ahmad (2008) in his study on the level of satisfactory among lower ranking police officers towards working benefits. The overall design of idea of this questionnaire was based on the project goal. Kitchenham and Pfleeger (2002) stated that the questions asked should be related to the objectives of the study.

A pre-testing questionnaire was conducted among a small group of IT Practitioners that were divided into two groups. The first group was asked to response to the given questionnaires, while those in the second were asked to discuss and interpret the analyzed responses given by the first group. The purpose of the pre-testing was to ensure that all the terms and the phrases are understood by the respondents. Kitchenham and Pfleeger (2002) mentioned that the evaluation or pre-testing is required in order to test the validity of the questionnaire. The survey's results is analyzed using frequency and percentage, Chi-Square test, and the analysis of variance (ANOVA), and Lest Significant

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Difference (LSD) for mean separation analysis. The SAS Version 9.2 statistical packages (SAS Institute, 2009) was used in performing the statistical analysis of the research data. In addition Chi Square (Snedecor and. Cochran,1989) is as important due to test the null hypothesis (H_o) of equal proportion among groups within each independent or biographic variable at significant level (type I error rate) or p at 5% or at 0.05.

III. DISCUSSION

A. Company Description

There were a total of eight companies that had participated in this study. Due to management related procedures, the companies were made into six categories that based on their working paid up capitals (Table 3). They were those of the software developing companies or companies that had departments or divisions that involved in the software development activities, i.e., four of them are Malaysian companies and the other four are the multinational companies that based in Malaysia. The information on the paid-up capitals of the companies were sourced from the government related agency (Companies Commission of Malaysia or SSM). Table 3 shows that the companies were ranging from small companies (enterprises) to large companies in which the maximum paid-up capital was RM 5.5 Billion. Sixty percent of 127 respondents were employed by the companies with paid-up capital of RM 100,000 to RM 100 Million, whereas 31% were those from the big companies of RM 3.5 Billion – RM 5.5 Billion capitals. Above reveals that study's coverage is comprehensive in term of company's size. If the companies were categorized into the duration for involvement in using Agile technique in their software development activities, the percentages of respondents that being employed in the companies with the company categories of less than 1 year , 1-2 years, and more than 2 years in Agile involvement were 21%, 19%, and 60%, respectively.

Table 3: Distributions of randomly selected 127 subjects based on the size of the company's paid-up working capital and the duration of the company involvement in using Agile technique in the software product development.

Company's category (Based on paid-up capital)	frequency	percent
Small enterprises	10	7.87
Private limited companies of RM100,000-RM500,000	50	39.37
Private limited companies of RM100 Million	27	21.26
Limited companies with RM3.5 Billion	21	16.54
Limited companies with RM5.5 Billion	19	14.96
Company's involvement in using Agile		
Less than 1 year	27	21.26
1 – 2 years	24	18.90
More than 2 years	76	59.84

Notes: Total respondents= 127

B. Biographic variables

Eighty two percent of the respondents were holding position of non-executive levels (Table 4). Among them, the technical staffs (71%) were much more than the non-technicals (10%). The trend was also observed in the top management levels, i.e., the non-technicals and tecnicals were at 1.5% and 16.5% , respectively. As indicate by $\chi 2$ test for equal proportions among levels of positions (Table 4), the test ($\chi 2=153.1$, $p < 0.0001$) showed that the proportions were not equally divided among groups. Thus, the

Table 4: Distributions of 127 subjects based on the position in the company, age, sex, education level, and working duration.

Independent variables	grouping	frequency	percent	Chi-square*	p > Chi-square
Position:	Top management (non-technical)	2	1.57	153.16	<0.0001
	Top management (technical)	21	16.54		
	Staffs (non-technical)	13	10.24		
	Staffs (technical)	91	71.65		
Age:	More than 50 years old	4	3.15	125.78	<0.0001
	25 – 50 years old	101	79.53		
	Less than 25 years old	22	17.32		
Sex:	Male	90	70.87	22.12	<0.0001
	Female	37	29.13		
Education:	Bachelor degree	76	59.84	183.25	<0.0001
	Master degree	3	2.36		
	Ph.D.	3	2.36		
	Bachelor + professional cert.	20	15.57		
	Master + professional cert.	7	3.94		
	Ph.D. + professional cert.	0	0		
	Others	18	14.17		

Notes: * Test for equal proportions among groups within each independent variable

above finding shows that a reasonable and acceptable proportion in the IT software development companies ,i.e., the technical officers and staffs were more than the non-technical and administrative staffs. The percentage of the top management must also be small from the staff strength of the companies.

B. Age Group

Table 4 shows that the age groups were not in the same proportion ($\chi 2=125.8$, $p<0.0001$). The number

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of lower and top level officers within the age range of 25-50 years old (79%) was the highest than those at aged of less than 25 years old and more than 50 years old (17% and 3%, respectively). By considering person with the age 50 years old and less are relatively young and energetic, above results show implicitly that the IT software development especially in the use of Agile technique is relatively 'new' in Malaysian as compared to that of the developed nations.

C. Sex Group

Table 4 clearly shows that the number of male staffs and officers were much higher than the female (71% and 29%, respectively with $\chi 2=22.1$ at $p < 0.0001$. By considering if the above proportion were representative to the whole population of the software developers in Malaysia, thus it could be stated that more males that females that involved in the software development sectors that focus on the use of Agile in Malaysia.

D. Educational Level

Table 4 shows that with seven groups that based on the education levels of IT practitioners, those qualified with bachelor's Degree (75%) were dominating the workforce in the Malaysian commercial software industries that emphasize on Agile technique as compared those with Master's Degree and above (9%). Those with lower academic or other qualifications had the share of 14%. Above data might suggest that for accelerating and improving the Agile based software development in Malaysia, professionals with more higher education (Master and Above) should enrich the workforce in the industry.

E. Regrouping of groups of the respondent biographic variables

Similar to those indicated in Table 4, Table 5 shows the non-proportionally among new groups (After regrouping of groups in Table 4) in all biographic variables, i.e., positions, age, and education ($\chi 2=74.1$, 54.2, and 102.3, respectively). Since some groups in Table 4 had few frequencies, regrouping was done for the purpose of having valid statistical analysis (ANOVA) in analyzing the dependent variables or responses as affected by the biographic variables.

Table 5: Distributions of 127 subjects based on the position in the company, age, and education level by regrouping among groups within each independent or biographic variable.

Independent variables	grouping	frequency	percent	Chi-square[a]	p > Chi-square
Position:	Non-technical	15	11.81	74.09	<0.0001
	Technical	112	88.19		
Age:	25 years old and above	105	82.68	54.24	<0.0001
Less than	25 years old	22	17.32		
Education:					
Bachelor or Bachelor + professional cert.		96	75.59	102.34	<0.0001
Master and Above or Master and Above + professional cert.		13	10.24		
Others		18	14.17		

Notes: [a] Test for equal proportions among groups within each independent variable

Table 6 indicates that the female IT Agile practitioners had higher scoring than those of male in terms of the easiness of implementing the Agile (agilei) technique which is 7.27 and 6.93 and the same trends is observed on Acceptance of Agile Based Products (aeu) which shows the score of 7.27 and 7.17 for female and male respectively. However male had shown higher scoring of the understanding (agileu) towards the Agile technique concept than those of female which is 6.87 and 6.56 respectively. Regards to the results, it is concluded that the female and male possess the same level of understanding towards the Agile technique and therefore this lead to the same difficulty level in implementing the agile technique in Software Development. It is perhaps had affected the level of acceptance of Agile Based product by end user whenever there is a quality development process which affected the products quality. the viewing on critical issues towards IT technical matters between the sex groups. There were no significance difference between male and female with respect to the other nine response variables, i.e., as indicated in Table 6.

Table 6: Means of scales of groups of sex among respondents and the respective one-way analysis of variance (ANOVA) for dependent variables as affected by sex. Maximum scale for Agile Understanding (agileu) to Agile implementation Easiness (agilei) was 10 (Scale1=very poor to scale 10= very excellent). The maximum scales for Response time of Agile product(respt) to Future Agile Suitability & implementation(agileis) was 5 (Scale1=very poor to scale 5= excellent that adapted to 1=strongly disagree, 2=disagree, 3 =neither disagree or agree, 4=agree, 5=strongly agree)

	Sex group				
	Male (n=90)	Female(n=37)			
	Mean		Maximum scale	F value	p > F
Agile Understanding (agileu)	6.87	6.56	10.00	0.53	0.4663
Acceptance of Agile-based product by End users (aeu)	7.17	7.27	10.00	0.08	0.7831
Agile implementation Easiness (agilei)	6.93	7.27	10.00	0.78	0.3778

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As for the analysis, the respondents were divided into three groups, i.e., those with Master's Degree & above or Master & Above with Professional Certificate, Bachelor or Bahelor with Professional Certificate, and other. There were significant differences at p=5% or p=0.05 in the Agile understanding (agileu) and Agile implementation easiness in software development (agilei). Out of 10 maximum scale for the measurement of the response, those with Master and higher degree had highest score (8.78) then those with bachelor or bachelor with professional certificate (6.81) and other lower academic and non-academic qualifications (5.50) in the understanding of the software Agile technique (Table 6). The similar trends of large differences among the above groups were also observed in the dependent variable of the Agile implementation easiness in developing the software product. The respective scoring in the above order were 8.30, 6.98, and 6.33.

For developing software by using the Agile technique with high degree of efficiency, high knowledge and understanding of Agile are certainly required. Also with the higher understanding, it would lead one to use Agile easily in the software product development. Above results reveal that those with higher relevant academic qualification had higher degree of understanding and usage easiness of agile technique.

Table 7 further shows that there were no difference in other responses in terms of the acceptance of agile based product (aeu).

Table 7: Means of scales of groups of education levels among respondents and the respective one-way analysis of variance (ANOVA) for dependent variables as affected by education level. Maximum scale for Agile Understanding(agileu) to Agile implementation Easiness (agilei) was 10 (Scale1=very poor to scale 10= very excellent). The maximum scales for Response time of Agile product(respt) to Future Agile Suitability & Implementation(agileis) was 5 (Scale1=very poor to scale 5= excellent that adapted to 1=strongly disagree, 2=disagree, 3 =neither disagree or agree, 4=agree, 5=strongly agree)

	Education level groups[1]					
	Bac or Bac + PC (n=96)	M & above or M & above +PC (n=18)	Others (n=13)			
	Mean			Maximum scale	F value	p > F
Agile Understanding(agileu)	6.81[b]	8.38[a]	5.50[c]	10.00	7.37	0.0009
Acceptance of Agile-based products By End users (aeu)	7.16	8.00	6.83	10.00	1.88	0.1571
Agile implementation Easiness (agilei)	6.98[b]	8.30[a]	6.33[b]	10.00	4.17	0.0177

The figure below shows the scale of 10 in terms of understanding by the toal of 127 respondents.

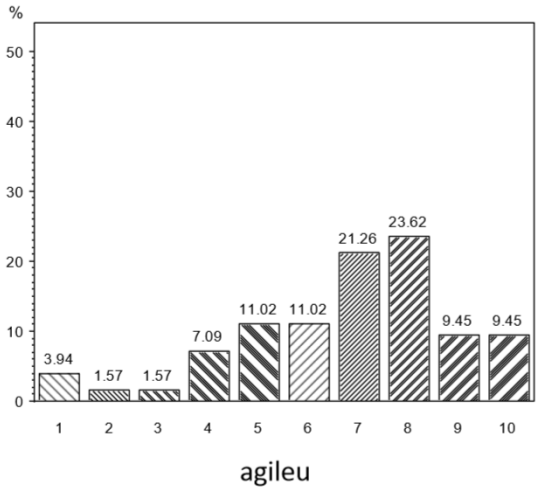

Figure 1: Percentages from 127 respondents in the responses of Agile understanding (agileu) with the scales 1 to 10. Scale1=very poor to scale 10= very excellent. The figures written on tops of the vertical bars are the respective percentages of respondents in answering the respective scales assigned to the respective independent agile-based variables.

As indicated in the finding of this study, only 9% of the respondents understand Agile at the maximum score of 10. Similar percentage was for scoring 9. The percentages for scales 8, 7, and 6 were 24%, 21%, and 11%, respectively. As tested statistically against the biographic information (independent variables), the education had significant effect (at p=5%=0.05) on the level of understanding in the use of Agile technique in software development. The IT practitioners with Master's Degree and above or Master's Degree and above with Professional certificate(s) understand Agile better (8.4/10), than those with Bachelor's degree or Bachelor's degree with professional Certificate(s) holder (6.8/10) and other or lower academic qualifications (5.5/10). Even though without statistical significant, the more older IT practitioners tended to have higher degree of understanding Agile then the younger staffs (6.9/10 and 6.2/10 for staffs of 25 years old and above vs those under 25 years old, respectively). As it would be possibly agreed in general, the full understanding of Agile technique is a pre-requisite and crucial for developing the high quality Agile-based software products. Thus, as based on the

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above discussion, the educational programme and training on the use of Agile technique should be implemented so as the distribution of Agile understanding among the Malaysian IT Agile-based practitioners would be heavily right skewed on the direction of 1-10 scale.

As indicated by all discussed variables above, there were positive realization and perception by IT practitioners on the importance on the use of Agile technique for having high quality Agile-based software products underlined by some biographical groups differences on the matter. More importantly, the higher levels of education, i.e., either by acquiring higher related academic standards or by attending relevant training program or both on the use of Agile technique are important factor for developing good quality software products in Malaysia.

RECOMMENDATION

As Malaysia is being considered relatively new in the Agile-based software industries, Asnawi et al. (2012) had only used 14 respondents from seven companies in their study related to the Agile technique use in Malaysia in year 2011. Based on the above two situations, it would strengthen that the results of the study with the involvement of 127 IT respondents were valid in providing the information and recommendations in strengthening and accelerating on the use of Agile technique for the development and advancement of the Malaysian software industries. The good scoring was indicated by a scale 4 of maximum 5, or scale 8 of maximum 10. However, the level of understanding in Agile technique was still low as indicated by the percentage and relative frequency of the IT practitioners or the mean level of scoring responded by the study subjects. It was also shown that in relativity, the full understanding of Agile technique would lead into the production of high quality software and the degree of the easiness in using Agile in the software development project. It was also indicated that high level of education would cause the increase in the level of understanding of the Agile technique.

In overcoming the above problems or gaps, it is recommended that more IT practitioners should be sent or further enrolled for higher Agile-related education and/or concurrently of attending intensive and practical training programs in the basic, understanding and applications of the Agile technique that to be used in the production of high quality software. As indicated by numerous scientific reports and reviews that the advancement in the Agile-based software was in tandem with the achievements of the scientific, economics and social sectors in the developed nations. As indicated and visioned by Malaysian government in year 1988, Malaysia would be a developed nation by year 2020. As of current situation, most of the administrative and monitoring activities or transactions by the government or private sectors in Malaysia are mostly being digitalized by using ICT facilities and infrastructures. In some instances, the temporary or occasional ICT malfunctions, 'brake down', or lagging has affect the smoothness and efficiencies in the daily administrative and business activities in the government, public or private sectors. Thus, in moving towards a developed nation, the software advancement that conditioned to the Malaysian cultures, administrative and governance should and must be realized as soon as possible in the race with time. It could possibly be said that the quality software products are some of the tools or catalysts for accelerating the advancement of Malaysia. As shown in this study, Malaysia has the environments, infrastructure and administration (Multimedia Super Corridor of Malaysia ,or MSC) for the advancement and further expansion in the use of Agile technique for the development of software industries in Malaysia. In view of the above, the speeding up in human resources in the field of software development would maximally utilize the facilities provided by the existing ICT environment and infrastructures. Thus, to increase more expertise that well verse on the Agile technique by means of the above mentioned educational and training programs is vital and a pre-requisite for achieving fast-

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growing Malaysia.

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