

## Multi-Dimensional Assessment (MDA): Setting the Research Diversity

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**Abstract:** The pillar of excellence in research is based on research findings such as publishing, commercialization and the creation of new policies. Excellence in publishing is viewed from three angles, namely the number of citation, quality and quantity of publications. This study proposes a method to maximize the research results through the review and set a variety of research. A technique introduced as Multi Dimensional Assessment (MDA). Through this technique, the research and research results observed from a different angle seen by the components and each angle produces a component that will be manipulated and processed for publications. Therefore, a small research with few results capable to produce a high number of publications. This study also proposes the use of these MDA techniques, so they can create other research projects from a single research project. Through the MDA technique, the diversity in research and the results can be achieved.

**Key words:** Research diversity, MDA technique, research method, research project, policies, Malaysia

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### INTRODUCTION

Through the National Higher Education Strategic Plan (PSPTN) which was announced on 31 March, 2006 has been targeted in 2020 at least three public universities listed among the 100 best universities and at least one university is among the 50 best universities. Therefore, on October 11, 2006 the Cabinet at that time announced 4 universities as Research University (RU) which has a mission as the growth engine of opportunity for scholars and students to exchange the ideas and conduct research in a conducive environment to stimulate exploration and creativity to explore the knowledge and wealth and so on to change the quality of life. There are criteria used to evaluate the performance of RU as quantity and quality research, research quantity and quality, student quantity, student quality, innovation, facilities support, network and link, professional services and gifts. The largest weighting is in the quantity and quality of research refers to the number of terms, the number of articles published in leading journals, external research grants obtained and many others. One method to maintain the status of RU is all academics conducts the research and publishing scientific journals. However, not all research can produce a large number of journals. Therefore, the need for an

effective technique is necessary to maximize the research results. This study proposes a technique that can be used to increase the number of research and thus maximize the results. The technique is a Multi Dimensional Assessment (MDA). Through this technique, the results of every research presented in a different dimension and each of its angles will be manipulated to produce its own output.

However, other components such as discipline, effective supervision and Effective monitoring are factors that lead to achieve the goals (Ab-Rahman *et al.*, 2011b, c; Zain *et al.*, 2011). MDA cannot stand by itself, in fact it is also requires strong commitment from the researchers and the support of others.

**Multi dimensional assessment:** Multi dimensional assessment is an approach that can be used to maximize the results obtained from the research. It can be achieved through research and by seeing the results (e.g., a graph) from a variety of different view and dimensions. Therefore, a little research findings can be processed to produce large output. It requires creativity of researchers as well as extensive knowledge in a specific area or through collaboration with researchers from different fields. The result of different views can be translated into innovative products such as journal writing technical

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papers, proceeding and patents. The combination of each chapter that tells each part can be edited into a book. Among the measures to be taken in applying MDA in the research (Fig. 1):

- List the areas related to research carried out
- Obtaining the views of experts in different fields

Setting diversity includes processes, functions, methods of research used, the application, characterization and testing and others as shown in Fig. 2. Each of these components is described systematically and relationship with the other components is also included. In this way, the researchers had the idea to publish a maximum as the components separately.

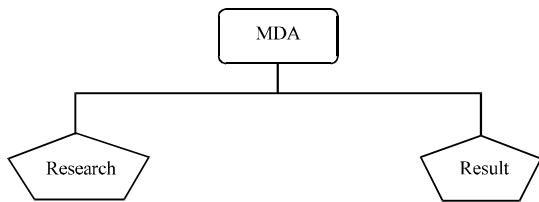


Fig. 1: MDA can be applied in research and result level

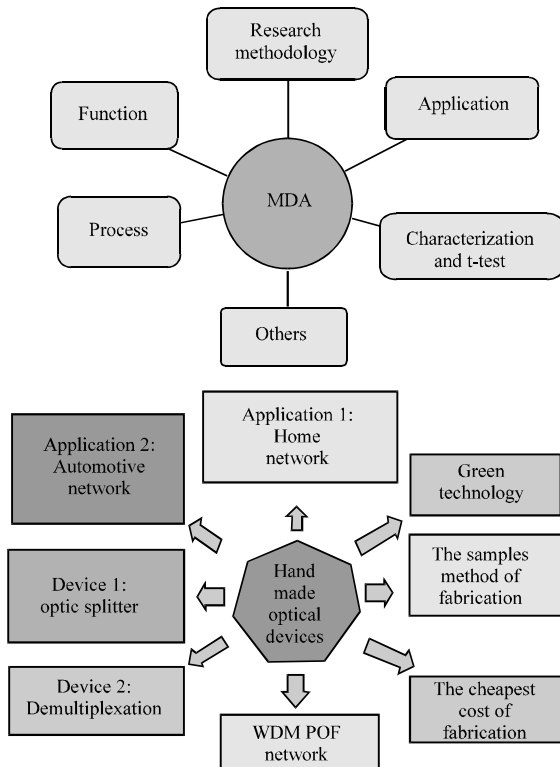


Fig. 2: Examples of components that can be described in a research

**MDA of research:** MDA of the research is the first stage in determining the diversity in research. It can be achieved by looking at a research and determine the studies that can be done under the topic. For example, studies can be performed on a variety of methods that can be used and the purpose of each method, the cost of development, each of the processes involved in the development usage in different applications, environmental impact, different characterization and others. Each study will generate different results and reports need to be done on it. The most important thing is that every study has a specific purpose. It would be better if we have co-researchers who can uncover each study.

**Example 1: User access network security system:** If researchers propose a solution to security in high-speed telecommunications system. The signal is sent to users using laser pulses and alternative routes are provided to ensure that the signal can be delivered to the user. Dimensions of diversity can be defined as in Table 1 and Fig. 3.

**MDA of research result**

**Example 2: Polymer materials polish rates:** Figure 4 shows the data obtained from experiments for polymer waveguide polish rate of US-8 on a silicon substrate that has been collected. Polish rate on the velocity graph for the sample 1-3 plotted for changes in the length of the

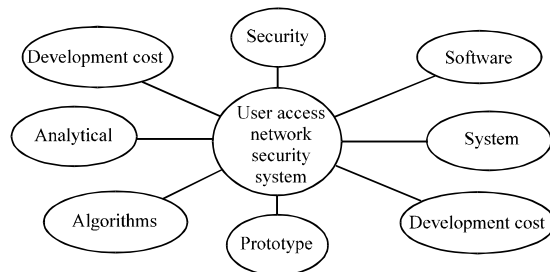


Fig. 3: Important criterias in the use access network security system

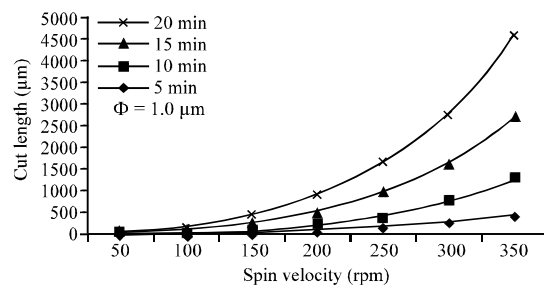


Fig. 4: Cut length vs. rotational speed at different time using sand paper size 1.0 µm

Table 1: Diversity of the dimensions and subject

Dimension	Subject
View of the system	Design and characterization of the entire security system
View of the device	Design and characterization of the device or equipment used to achieve the goals
View of the development costs	The cost of the system development
View the cause of the damage	Factors affected by the damage occurred in the system and how to minimize their impact
View of the security	The ability to publish the security issues for networks other than manipulated the prototype design and the proposal of mechanism
View of the system	The device interfaces process with the existing equipment
View of the software	Program developed to identify the damage area

waveguide cut off the side when the polish process is done using sand paper size 1.0, 0.5 and 0.3  $\mu\text{m}$ , respectively with a time of 5, 10, 15 and 20 min. Based on Fig. 4, a graph of rotational speed vs. cut length, cut length is increased when the rotational speed increases. The analysis of the cut surface of the image at different rotation speed of 200, 250, 300 and 350 rpm. From the Fig. 4, various analysis can be done which includes the polish process and the maximum allowable points until the best method to carry out the process of this polish. For example to cut the side length of 3000  $\mu\text{m}$  polymer side. It is not practical if they use sand paper size of 0.3  $\mu\text{m}$ . It can be done effectively if the polish starts with large sand paper for example 1.0  $\mu\text{m}$  with a high velocity (not reaching destroyed limit) and follow with a medium sand paper and finally using a small-sized sand paper to get a better surface. In addition, the glass was deposited with the polymer can also look clear. Figure 4 shows a mind map of MDA applied to the research results.

**Admission the component K+ (creativity):** Component K+ or creativity in ensuring that research results can be published to the maximum. Component K+ is important in ensuring that each study was developed with a different strength and focus. The same research results as graphs and tables can be published if the description and the focus of study with the previous studies are different. What is important that each of these sources (graphs, tables, etc.) must be mentioned and referred. In other words, component K+ is important to implement the MDA. MDA is also practiced to undergraduate students in my teaching.

I introduced an algorithm that represents a system and students are required to study the relationship of each parameter, determining the validity of the developed mathematical formulas and then find the maximum value or limitations can be achieved by the system. Based on the technical reports that have been sent, I felt there was a quality in the assignment. Thus, based on the reports submitted and supported by improvement research done by research assistants, researchers have contributed for four of the journals indexed in Scopus (Fig. 5).

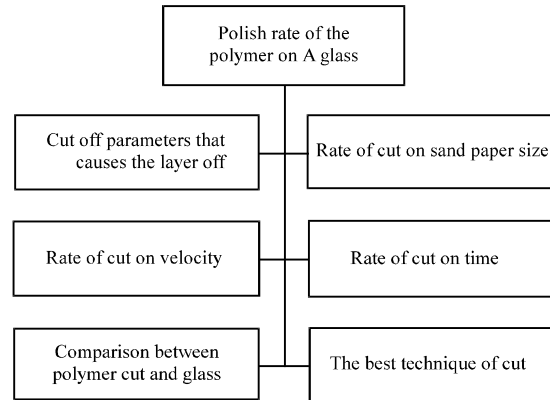


Fig. 5: MDA in the results of the cut of polymer on the glass

Many benefits achieved if there are an initiative and creativity in themselves and the research. Apart from contributing for 0.01% to University's KPI, innovative teaching system can also be applied to improve teaching and learning.

**Diversity of research using MDA:** Determination of the research project must be prudent in reducing energy but with high impact. It could be achieved by implementing the MDA (Multi Dimensional Assessment) on a project. Through MDA (Multi Dimensional Assessment), a certain project could be split into several other projects. By using this approach the achieving of one objective could help them to solve other projects under it simultaneously under one shoot. For example, the research is to develop high capacity and protection for customer access network. Using the MDA (Multi Dimensional Assessment) technique, the idea of this project is separated into three parts and each project will apply its own research grants. The knowledge of research type is very important to divide the project into several different sub-project/research. Bear in mind, all three projects have a primary objective of developing a high-capacity and protection system for consumers (Fig. 6). Solutions to the main objectives will lead to solutions of the three projects under it (Ab-Rahman *et al.*, 2011a, d, e) (Fig. 7):

Table 2: The proposed project is approved and the grant allocation for the initial and pre-commercialization (Ab-Rahman *et al.*, 2011a)

Project title	Spin-off	Financial support	Research category	Volume
Optical cross add drop multiplexer (OXADM)	Development of intelligent Fiber-to-the-Home (I-FTTH) for customer access network	Fundamental Research	Fundamental	USD...
Survivable FTTH network	Development of in-linemonitoring optical device and centralized roubleshooting system for new FTTH network	Grant Scheme (FRGS)	Applied	USD...
WDM-POF for small word communication		Science fund grant	Applied	USD...
		Pre-commercialization grant	Innovation	USD...
Total				USD...

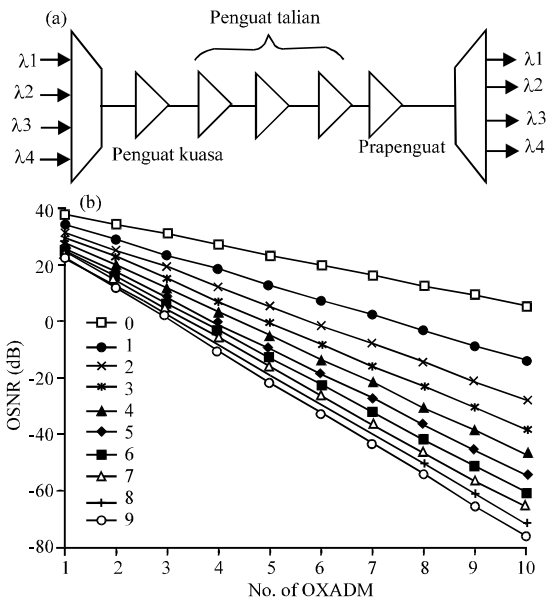


Fig. 6: Sample of project embedded in class to develop the students' skill in MDA ( $OSNR = G_{prapenguat} - (P_{rx} + NF_{Rx}) + \sum [P_{out} - 10 \log_{10} (M_{ch}) = Lesapan_{sp} - NF_{ASE} - 10 \log_{10} (NUM_{span} + 1)] + 5 \log_{10} [1 - 4 \times \epsilon \times [(\sum N_i M_i - L) \times Q^2]$  [Persamaan 1]

- Project 1: Optical cross add and drop multiplexer (OXADM)
- Project 2: WDM-POF for small world communication
- Project 3: Survivable FTTH network

Before constructing the research proposal, it is important to determine the type of research that is to be carried out. More importantly is the grant that is to be applied for. In Malaysia, there are several research grants offered by government and private sections. Among them are the FRGS, ERGS, LRGs, PRGS, Science fund, Technofund, Agridana, ESSO, MTSF, university grants and others. Table 2 shows the proposed project, the research grants are successfully applied for research grants that had been. Besides splitting the project into two different sub-projects could help improve the financial assistance in carrying out these projects. From the total proposed projects, only project 1 and 2 have

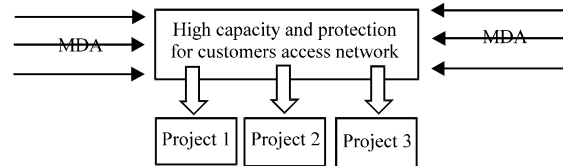


Fig. 7: MDA technique is used in solving the main project into several sub-projects to ensure that other projects run smoothly (Ab-Rahman *et al.*, 2011a)

been provided a research grant. However, project 3 is still running and is being financed by other provisions. The results obtained are used to apply for other grants such as pre-commercialization or innovation.

Creativity is very important in research management by enlarging the research scope and at the same time can apply many research funds under one key research. Instead of creativity, knowledge and high effort are the key element to excel in research and producing more benefits and outcomes for social economy development in Malaysia. Ethical issues are very important because they act as a guide to complete the research. Research that does not comply with the ethical reputation of an investigation can be damaging.

### CONCLUSION

Financial support, researchers and facilities is a component for research and subsequent produce the research output. But to achieve maximum output, these components were not enough so a good strategy should be applied together with the entry of the generator system in the research. This generator system consists of three bottom lines as effective technical, cultural catalyst and motivated activity. A technique introduced is the multi dimensional assessment. Through this technique, a research and research results from a different angle based on the components. Each angle that produces a component will be manipulated and studied to produce a publication. Therefore, a small research with a few results is also capable of producing a high number of publications. This study also proposes the use of MDA

techniques to produce other research projects from a single research project. Through the MDA technique, the diversity in research and research results can be achieved. To increase the effectiveness in research, MDA technique can also be extended to the students (Ab-Rahman *et al.*, 2011 e).

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