INVESTIGATION INTO THE BOTTLENECKS OF CONDUCTING RESEARCH IN FACULTY OF RESOURCE SCIENCE AND TECHNOLOGY (FRST)

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Bachelor of Science with Honours (Resource Biotechnology)
2012
Investigation into the bottlenecks of conducting research in Faculty of Resource Science and Technology (FRST)

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Acknowledgement

I want to express my sincere thanks to my supervisor, Dr. Hairul for his guide and advice in order for me to finish this project. I also would like to say thanks to postgraduates and lecturers that give their full cooperation to do the questionnaires and the interview. In addition, I also would like to thanks my friends and my family members for their continuously support during all this time.
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Abstract

University Malaysia Sarawak (UNIMAS) is one of the universities in Malaysia which aims to be a Research University (RU). A RU vision is to actively participate in new adventures of ideas, experiment with innovative methods, and take intellectual initiatives to further discover and expand the frontiers of knowledge. The mission of RU is to be an engine of growth of the nation where scholars and students exchange ideas as well as conduct research in a conducive environment that nurtures exploration and creativity discover knowledge and create wealth, leading towards an improved quality of life. The goals of the RU are to be a leader in innovation, to produce Nobel Prize winners, to produced world class research outputs, to generate high impact research publications, to secure research funds from industry and to attract and to graduate students of high standard. Faculty of Resource Science and Technology (FRST) is one of eight faculties in UNIMAS that actively participated in research activities. However, it is not easy to become a research university. The researchers in this faculty always encounter bottlenecks during their research. Therefore, it is crucial to identify what are the bottlenecks that encounter by the researchers in FRST in order to become a research university. From the survey, it is identified that funds, lack of materials and lacks of equipments is the most common bottlenecks. Hence, it is very important to find solution for the bottleneck in order for UNIMAS to become a research university.

Universiti Malaysia Sarawak merupakan salah sebuah universiti di Malaysia yang bermatlamat untuk menjadi sebuah universiti penyelidikan. Visi sesebuah universiti penyelidikan adalah untuk menyertai secara aktif dalam kembara idea yang baru, melakukan eksperimen dengan kaedah yang inovatif, dan mengambil intelektual secara inisiatif untuk mengetahui dan menyebarkan pengetahuan kepada seluruh dunia. Misi universiti penyelidikan pula ialah untuk menjadi enjin perkembangan untuk negara di mana orang bijak pandai dan pelajar bertukar idea selain menjalankan penyelidikan dalam suasana yang kondusif yang akan mengembangkan penyelidikan dan kreativiti untuk mengetahui pengetahuan dan mencipta kekayaan yang mana akan membawa kepada kualiti hidup yang lebih baik. Tujuan utama sesebuah universiti penyelidikan ialah untuk menjadi ketua dalam bidang inovasi, menghasilkan pemenang Nobel, menghasilkan keputusan penyelidikan bertaraf dunia, menghasilkan cetakan penyelidikan yang membawa kesan yang tinggi, melindungi geran penyelidikan dari industri, dan untuk menarik pelajar untuk bergraduat dengan standard yang tinggi. Fakulti Sains dan Teknologi Sains (FSTS) merupakan salah satu daripada lapan fakulti di UNIMAS yang terlibat secara aktif dalam aktiviti penyelidikan. Walau bagaimanapun, ia tidaklah semudah itu untuk menjadi universiti penyelidikan. Penyelidik-penyelidik di fakulti ini selalu berhadapan dengan masalah semasa menjalankan penyelidikan. Oleh itu, amatlah penting untuk mengenal pasti apa masalah yang dihadapi penyelidik-penyelidik di FSTS dalam usaha untuk menjadi universiti penyelidikan. Melalui kajian yang dijalankan, telah dikenalpasti bahawa kekurangan dana, bahan-bahan dan alat-alat penyelidikan merupakan masalah yang biasa dihadapi. Oleh itu, adalah amat penting untuk mencari penyelesaan bagi mengatasi masalah-masalah ini demi UNIMAS untuk menjadi universiti penyelidikan.
Investigation into the bottlenecks of conducting research in Faculty of Resource Science and Technology (FRST)

1.0 Introduction

University Malaysia Sarawak (UNIMAS) was officially incorporated on 24th December 1992. Faculty of Social Science and the Faculty of Resource Science and Technology is the first pioneering faculties (University Malaysia Sarawak, 2011).

The establishment of the Institute of Biodiversity and Environment Conservation has started the research activities which focus on the myriad of flora and fauna in Borneo. Further consolidation in the academic and research structure of the university is seen on the period between January 1995 and the end of December 1996. At least three niche areas of research are being acknowledged by peers which are biotechnological research in epidemiology, biogeography and agriculture.

1.1 Faculty of Resource Science and Technology (FRST)

Faculty of Resource Science and Technology is one of the eight faculties in University Malaysia Sarawak. This faculty has five departments namely Department of Aquatic Science, Department of Chemistry, Department of Plant Science, Department of Zoology and Department of Molecular Biology.

Department of Chemistry offer Resource Chemistry programme which is designed as a central discipline in the study of resource science. The programme has been designed to equip students with knowledge and expertise needed to undertake an
analytical approach in research of natural resources for sustainable exploitation (Roslan, 2011).

The Science and Management of Plant Resource programme offered by Department of Plant Science and Environmental Ecology aims at providing students with the intellectual expertise and practical abilities to identify problems and provide solutions to issues related to the management, exploitation and protection of plant resources.

The objectives of academic programme in the Department of Zoology are to provide a comprehensive knowledge and skills in management and conservation of animal resources.

Department of Aquatic Sciences offer one undergraduate programme which is Science and Management of Aquatic Resource. This programme aims to provide students with a sound understanding of the various aquatic ecosystems and resources so that these resources may be utilised, for socio-economic and other benefits, in a sustainable way.

Undergraduate academic programme offered by Department of Molecular Biology is Resource Biotechnology. The aims of this programme is to trained the students with the latest technologies which plays a crucial role in many fields such as agriculture, food production, livestock breeding, environmental protection and restoration, and resource-based industries in Malaysia. In addition, students will be exposed to various social economic applications relevant to biotechnology industries.
1.2 Goal and vision of FRST

The educational goal of FRST is to produce broadly educated science graduates. This is done by providing knowledge and skills based on scientific principles, nurturing attitudes, ethics, sense of professionalism and leadership skills as responsible citizenry for societal advancement within the framework of the national vision. The students of this faculty also will have skills in problem solving, ability to evaluate and make creative decisions based on evidence and experience. They will also develop interest in finding knowledge and life long learning skills that will help them to keep pace with the rapid growth in global knowledge (Hussain, 2011).

The vision of the faculty is to be a renowned centre of learning and research in science and technology related to the natural resources. The faculty is committed to achieve excellence through high quality and relevant teaching-learning and research activities related to management and utilization of natural resources in various fields of science and technology.

The faculty is committed in the promotion of both basic sciences and industry-oriented research and as a consequence has built-up a strong research base over a wide area of resource science and technology. The faculty has established a strong foundation for research in some selected areas for which considerable expertise and adequate facilities have been developed. The major niche areas are Molecular Biology and Biotechnology, Environmental Studies, Sustainable Resource Management, Natural Products and Material Sciences.
The faculty has specialized laboratories which include molecular biology, microbiology, biochemistry, cell and tissue culture, geochemistry, natural products and analytical chemistry laboratories. The laboratories are also well-equipped with a wide range of modern equipment. The faculty has also established a natural history museum, which now houses a collection of zoological specimens. In addition, there is a herbarium which has a large collection of botanical materials.

In order to strengthen research activities, a number of collaborative efforts between the faculty and research institutions abroad have been established. The faculty has also established collaboration with local research institutions. The faculty of Resource Science and Technology also has successfully developed a process to convert sago starch to lactic acid for the production of environmentally-friendly plastic.

1.3 Research University

Research University was a category previously used by the Carnegie Classification of Institutions of Higher Education to indicate those universities that engaged in extensive research activity (Wikipedia, 2010). Research universities were defined as those which offer a full range of baccalaureate program, are committed to graduate education through the doctorate, give high priority to research, award 50 or more doctoral degrees each year and receive annually $40 million or more in federal support. This is as in the 1994 edition of the Carnegie Classification.
2.0 Problem statement

Research is important as a part of learning process in higher level of education. It is undertaken by undergraduates, postgraduates and even lecturers. Research is really important in order to strengthen our knowledge on certain topic or to create a new knowledge which can benefit the human being. However, doing research is not as easy as being said. There is always problem that will be faced by researcher throughout the research. The problem could be from external sources or from the research itself. Therefore, the objective of this study is to identify what is the main bottleneck in doing research and how the problems affect the research. Some suggestion on how to overcome this problem also provided.
3.0 Literature review

3.1 Research definition

Research is any systematic investigation including research development, testing and evaluation. It is designed to develop or contribute to generalized knowledge not primarily for the benefit of the research participants (Crowl, 1996). According to Salkind (2003), research is the process of finding solutions to a problem after a thorough study and analysis.

The word research is composed of two syllables, re and search. Re is a prefix meaning again, anew or over again search is a verb meaning to examine closely and carefully, to test and try, or to probe. Together they form a noun describing a careful, systematic, patient study and investigation in some field of knowledge, undertaken to establish facts or principles (Dawson & Catherine, 2002).

Research is application of the scientific approach to the study of a problem. It is a way to acquire dependable and useful information. The purpose is to discover answers to meaningful questions through the application of scientific procedures. According to Ary et al. 1990, scientific procedures is a process in which investigators move inductively from the observations to hypotheses and then deductively from the hypotheses to the logical implications of the hypotheses. They deduce the consequences that would follow if a hypothesized relationship is true. If these deduced implications are compatible with the organized body of accepted knowledge, they are further tested by the gathering of empirical data.
Theoretical or experimental research which being conducted to develop hypothesis or theories in order to acquire new knowledge on phenomena or observable is called basic research. According to Ary et al. 1990, basic research is not oriented in design or purpose toward the solution of practical problems. The aim of basic research is to expand the frontiers of knowledge without regard to practical application. For example, advances in the practice of medicine are dependent upon basic research in biochemistry and microbiology.

Research divided into two which is basic research and applied research. Applied research is research which aims to ascertain the possibility of practical application by establishing specific goals or that which explores new applications of method which are already in practical application. According to Best and Kahn (1993), the aim of applied research is to solve an immediate practical problem. This research performed in relation to actual problems and under the conditions in which they are found in practice.

Basic research is to better understand some phenomena. To differentiate applied research and basic research Salkind (2003) states, “Research done with the intention of applying the result of the finding to solve specific problem is called applied research. Research done chiefly to enhance the understanding of certain problem and seek method of solving them is called basic or pure research”.

There are many fields of research. Fields of research are such as natural science, technology and engineering and social sciences and humanities. Researchers are
professional engaged in the conception or creation of new knowledge, product processes, methods and system and in the management of the projects.

3.2 Research Methodology

Research methodology is very important in research. It is a general strategy followed in gathering and answering the question at hand (Creswell, 2002). There are five categories of research methodology. The first category is experimental where the researcher manipulates one or more independent variables in a controlled setting in order to determine the effect on the dependent variables. Causal-comparative is similar to experimental but investigators cannot directly manipulate the independents variables. The next category is descriptive which the purposes are to tell what it is, survey, developmental studies, follow-up studies, documentary analysis, trend studies and correlational studies. A situation where researcher observes persons or events in their natural setting is called qualitative research. The purpose is to understand the influence of the particular context on the events which includes case studies. The last category is historical which involve the collection of data from the past in order to understand past events and their implications for present events.

There are several steps in research. The first step is identifying the research problem. This is done by specifying the problem, justifying it and suggesting the need to study it for audiences. Next is reviewing the literature. Then, specifying a purpose for the research. After specifying the purpose, data is collected. The data is then analyze and interpreted. The last step is reporting and evaluating the research.
3.3 Problems in research

The most common problem in research is getting the fund. According to Kariuki (2008), this is the problem faces by higher education in Africa. University research is central to the development of the continent which will lead relevant research for answering questions that contribute to Africa’s development, especially employment creation and poverty alleviation. This requires more resources such as equipments, technology, finances and etc. Studies on higher education management in Africa have concluded that effective use and management of limited resources is compromised through poor accountability. If universities cannot excel in research, they cannot therefore, provide or create new knowledge. Lack of sufficient research undermines the very core business of the Africa Universities and undermines sustainable development.

Most of the research applications or proposals do not meet the necessary criteria of the funders or the end results of the research will not meet the expectation of the funders. Hence, many proposals get rejected. This at times, is due to inexperience. Most of the time, adequate or detailed reports on the research carried out are not produced and adequate follow up of research activities are not done by the authorities of higher education. This hinders further research grants from the same funders. When writing research proposals, different experts are not called to write different parts of their expertise. This lack of collaboration is a major challenge to researchers.

Inadequate record keeping by higher institutions, of research activities and details of research to actually follow up the reasons why some research proposals are funded
and others rejected. Hence, the problems or causes of research not being funded continue.

4.0 Method
4.1 Survey method

This approach is most suited for gathering descriptive information. It is divided into structured surveys and unstructured surveys. Structured surveys use formal lists of questions asked of all respondents in the same way. Unstructured surveys let the interviewer probe respondents and guide the interview according to their answers.

The advantage of using survey method is it can be used to collect many different kinds of information. The method is also quick and low cost as compared to observation and experimental method. However, this method has its limitation. One of the limitations is respondent’s reluctance to answer questions asked by unknown interviewers about things they consider private. Busy people may not want to take the time and some may try to help by giving pleasant answers. They also might unable to answer because they cannot remember or never gave a thought to what they do and why. They also may answer in order to look smart or well informed.

The method used in this research is by searching for information from internet, reading the journal and by using sources from the library. The data are obtained by doing survey question and interviewing the respondents. The questionnaires are distributed to 150 respondents which consist of postgraduates and lecturers. Since there are 5 departments in FRST, 30 respondents are chosen from each department.
with 10 respondents from the lecturers and 20 respondents from the postgraduates. The survey questions are rated from 1 to 5. 1 is rated for strongly disagreed follow by 2 which is for disagree, 3 for neither agree nor disagree, 4 for agree and 5 for strongly agree.

5.0 Result and discussion

5.1 Survey questions

The first section in this research is survey questionnaires. It consists of three parts.

5.1.1 Part 1: Level of interest

The first part is to see the level of research interest among the researchers in FRST. From the survey questions, 65.3% of the respondents strongly agree that they are very interested in their current research. The other 34.7% respondents are also agreeing with this statement. 41.3% of the respondents are strongly agreed that the title of their research is provided to them. However there are 11.3% of the respondents are disagree with this statement. This shows that they know what they want to research and proposed it by themselves. 8.0% of the respondents are neither agree nor disagree. This may be because someone provided the title but the researchers add some other things that they want to research.

62.6% of the respondents strongly agreed that discussion of the research details during research proposal writing with the supervisor is crucial, while the other 37.3% of the respondents agree. This shows that the discussions with the supervisor during the research proposal writing are very important. The students know what they supposed do to in the research and not out of topic. 48.0% of the respondent strongly
agreed that their interest lead them to choose the current research topic, 42.0% agreed, 8.6% neither agree nor disagree and 1.3% disagree. The respondents that vote for disagree maybe have no choice other than to do choose that topic. It is same for respondent that vote for neither agree or disagree. They may only want to get Master Degree. Thus, they do not mind to do whatever topic.

From the questionnaire, 52.6% of the respondents strongly agreed that they read up on related issues concerning their research topic and 38.0% agreed. However, 9.3% of the respondent neither agree nor disagree. They may only read issues about their topic but not related issue. Interest in research is important in order to conduct better research and 66.6% of the respondents strongly agree with this statement. The other 33.3% of the respondents are only agreed with this statement. This shows that the interest in research will affect the research outcome.

Most of the respondents (51.3%) strongly agree that they enjoy spending time on their research. The other 44.0% of the respondents agree and only 4.6% of the respondents neither agree nor disagree. From here, we can conclude that the researchers that interested in their research topic will enjoy spending time on the research. However, the researchers may also developed interest on their research topic as time goes by and enjoy spending time doing the research. It also may possible that they are interested in their research topic but facing difficulties during the research. Therefore, they do not enjoy spending time on the research.

When the researcher does not enjoy spending time on their research, they may not enjoy discussing their lab work with their peers. According to the questionnaire, 3.3%
of the respondents vote for neither agree nor disagree while the other 44.0% agree and 51.3% strongly agree. This shows that the researcher whose enjoy spending time on their research will also enjoy discussing their lab work with their peers. They have new knowledge to share with their peers and the knowledge is updated by this way.

The sources to find additional information concerning the respondents research are library and from the internet. 62.6% of the respondents strongly agree and 37.3% agree that they use internet to find additional information. While for the library, 42.6% strongly agree, 43.4% agree, 12.6% neither agree nor disagree and 1.3% disagree. This shows that the respondents used internet more to find additional information. This may be because using internet is easier.

The next question in this part is whether interest in research greatly influence the research culture in FRST. 48.0% of the respondents agree with this statement while 46.6% agree. This shows that the interest role is very important. The other 5.3% of the respondent only neither agree nor disagree with this statement. They may not aware of the research culture in FRST. Thus, they do not sure about this statement.

The last statement in this part is about the respondents’ belief that their current research will help them in finding a job in the future. 1.3% of the respondents disagree with this statement. They do not think that their current research will help in finding job in the future. However, 63.3% of the respondents strongly agree that their current research will help them in finding job in the future.
5.1.2 Part 2: Research strength and weakness

In this part, 73.3% strongly agree that they do a thorough background before conducting their lab experiments and 26.6% agree. This shows that, the researchers want to know and understand more about their topic.

50.6% of the respondents strongly agree that they can use all the equipments in their lab well and 39.3% agree. However, 3.3% neither disagree nor agree and 6.6% disagree. This shows that some of the respondents can really use the equipments in their lab very well and some not. This maybe because the equipments are hard to operate and they do not use the equipment all the time.

59.3% of the respondents are strongly agree that training on selected instruments can help in conducting research, while the other 40.6% agree with this statement. This suggests that the faculty should hold a session in which the researchers are train to operate some selected instrument.

10.0% of the respondents are disagreeing that the instrument are well maintained. This is maybe because, some of the instruments are broken for a long time and no action is taken to repair the broken instrument. The other 21.3% respondents are neither agreed nor disagree, 37.3% agree that the instruments are well maintained and 31.3% strongly agree. In this case, the lab assistant or the lecturer should be aware of the broken instrument and take a quick action.

48.6% of the respondents strongly agree that they keep themselves updated with the latest research techniques. The other 30.0% agree and the other 20.6% of the respondent neither agree nor disagree.
Planning the steps required in the methodology before conducting research is very important. 72.0% of the respondents strongly agree that they plan the steps required in the methodology prior to conducting them. The other 27.3% agree while the other 0.6% disagrees.

4.0% of the respondents are strongly disagreed that they can always overcome the problems during their research and 24.6% disagree with this statement. This maybe because they have tried their best but still cannot overcome their problem. They need to come out with something new about their research. However, the other 8.6% strongly agree that they can always overcome the problems during their research and 21.3% agree. Other than that, the other 41.3% neither agree nor disagree. Here, we can conclude that sometimes the researchers can overcome the problems and sometimes they cannot overcome it.

There is no respondent that is strongly agree that they give up easily when faced with a problem during their research. Most of them (40.0%) disagree with this statement. The other 30.6% strongly disagree and the other 28.6% neither agree nor disagree. This shows that the researchers will try to find out solutions for their problem and not easily give up. This is a very good characteristic for a researcher and that person will certainly come out with a good outcome.

Most of the researchers (63.3%) are agree that they will seek help when cannot overcome a certain problem. This mean they will ask their friends, lab mates, their supervisor or even the lecturer that is expert in that field on how to overcome the
problems. The other 32.6% strongly agree with this statement and the other 4.0% neither agree nor disagree.

Most of the respondents (42.6%) are neither agree nor disagree that they have difficulty coping with the stress of not obtaining a result. 10.0% of the respondents agree with this statement and 38.0% disagree.

63.3% of the respondents are strongly agreed that they are fully understood the purposes for their research and 36.0% are agreed. Only 0.6% is neither agrees nor disagrees. This is maybe because the respondent still has doubt about the topic.

The last statement in this part is to know the respondent opinion on whether the research capabilities are an important part of the research culture. 42.6% of the respondents strongly agree, the other 36.6% agree and the other 20.6% neither agree nor disagree. For the respondents that vote for neither agree nor disagree, they maybe because unsure about this statement.

5.1.3 Part 3: Suggestions on how to solve the bottlenecks.

25.3% disagree with the statement that the always recycle disposable materials and 6.6% strongly disagree. This is maybe because they dealt with the research that is strictly sterile and cannot use the same materials twice. For the other 12.6%, they strongly agree with this statement and the other 36.6% agree. These respondents maybe dealt with research that is not so strict and so they can use the disposable material twice as long as the materials are sterile.
30.6% of the respondents are neither agree nor disagree for the statement that they prepared the correct amount of reagent in order not to waste it. This is maybe because they need more than the needed amount and they need will be used the reagent in their whole research. Therefore, it is troublesome to prepare the reagent each time they need to use it. However, the other 8.6% strongly agree with this statement. This is maybe because the reagent cannot be kept for a long time and the methodology required a fresh reagent. Therefore, they just have to prepare the correct amount. The other 23.3% of the respondent disagree and the other 32.6% agree.

6.0% of the respondents are strongly agreed that they used everyday household jars as alternative for preparation or storage of reagents. However, 14.0% of the respondents are strongly disagreeing with this statement.

39.3% of the respondents agree that they do not mind to share the materials and equipments with other researchers. This shows that they can tolerate with other researchers and help each other. However, 0.6% of the respondent is disagreed with this statement. This is maybe because, the researcher feel that it will affect the research if he or she need to share the materials and equipments.

58.6% of the respondents strongly agree that the university should collaborate with other agencies other than government to get fund. The other 37.3% agree and the other 4.6% neither agree nor disagree.

Most of the respondents (50.6%) strongly agree that the researchers should use the expensive equipments carefully. The other 44.0% also agree with this statement and only 5.3% neither agree nor disagree.
The researchers should help each other in order to do the research and 66.6% of the respondents strongly agree with this statement. The other 33.3% also agree.

70.0% of the respondents are strongly agreed that the government should support the research activities by giving more funds. This shows how important the role of the fund to ensure the continuity of the research. The other 30.0% of the respondents also agree with this statement.

According to the questionnaire, 54.6% of the respondents strongly agree that the lab design should be more convenient for the researcher to do their research. This is because some lab does not safe enough to do lab work especially one dealt with chemical solution. Other 39.3 % agree with this statement and other 4.0% neither agree nor disagree. Only 2.0% of the respondents disagree with this statement. This is maybe because they think that the lab layout does not really affect the research as long as it is well-equipped.

The last statement in this part is the bioinformatics tools should be more informative and updated. 57.3% of the respondents strongly agree with this statement. The other 35.3% agree and the other 7.3% neither agree nor disagree. Bioinformatics tools are very important as a reference for the researchers. Hence, most of the researchers strongly agree with this statement.

5.2 Interview questions

The interview questions consist of 11 questions. The first question is about the respondents understanding on the research they are working on. 98.0% of the respondents state that they understand the research that they are doing. Only 2.0% of
the respondents state that they do not fully understand about their research at first. However, as time goes by, they get to understand about their research. This suggests that the researchers should find enough information about their title first. They also can discuss it with friends or with their supervisor. With this, they can understand more about their research.

The next question is about the respondents’ opinion on the role of interest and how it affects the outcome of a research. 100.0% of the respondents agreed that interests in research are very important. According to the respondents, interests can make researchers do their research better. They are motivated to do the research and this guides them to be more capable when overcome the difficulties and problems that might affected the duration of study. The researchers also think that the research is not a burden or a study but as a hobby. The result is different if there are no interests in doing the research. If the researcher is not very interested, the research outcome is not good. The researchers also cannot achieve the objectives of their study and they will encounter problems during their research.

The third question is to identify if the researchers are able to make use of all the resources in the lab to help their research. 95.3% of the respondents state that they are able to make use all of the resources. However, 4.7% of the researchers mention that the resources are not updated and not enough. They also cannot use the instrument well. Therefore, it is difficult for them to do the research.

The next question is to identify what the researchers do when they encounter bottleneck during their research. 96.0% of the respondents state that they will try to