A Performance Measurement of Research Productivity in Saudi Universities

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Abstract: Research and Development (R&D) is one of the main factors to develop the nation and improve their civilization. Whereas, research productivity can be defined as the outcomes of the specific research in which it can produce either publication, creating innovation as well as to foster networking and linkages. Nowadays, the demand of funds to conduct R and D is significantly increasing. Besides, many countries all over the world is now competing to produce new findings as the outcome of the research in order to be more enhanced with an improved lifestyle. The main objective of Saudi Arabia Ministry of Higher Education is to be recognized at the international level as well as to be in line with other world top ranking universities. The purpose of this study is to show the importance of the performance measurement on R and D through research productivity among academic staff as well as to identify the suitable indicators to improve the rank of Saudi Arabia universities. Therefore, in order to realize the measurement, there are four criteria are investigated that research grants, research publication, networking and linkages among universities and industries and innovation in research and teaching and learning. The data from selected Saudi universities are acquired from deanship of scientific research. We compiled analyzed them according to above criteria. The useful evidence was chosen through analysis and we organized them into two specific issues: ranking of Saudi universities in QS ranking and the four components of measurement indicators such as publication citation. The results of the research process show that Saudi universities do not achieve the objectives of Saudi higher education as it did not meet the requirements. Whereas, in terms of publication not many articles were published in high impact journal by Saudi academicians. Although, publication is one of the most important indicator that can affect the rank of the university if it fails to perform.

Key words: R&D, research productivity, Saudi Arabia universities, publication, academicians, ranking of Saudi Arabia universities, four main components

INTRODUCTION

In recent years, Saudi Arabia has adopted a policy to introduce the information and communication technologies to cater for its rapid economy development. Most of government administrative agencies in Saudi Arabia face great pressure in order to overcome the challenges of introducing such new information technologies and service. One the most important development sector in Saudi Arabia is the education sector including lower and higher education. The issue that is concerning the country is to provide an adequate management framework for the available resources. Besides, there are some efforts to be committed to encourage research productivity as part of national strategy to stimulate the economy and social development for the country.

The Ministry of Higher Education of Saudi Arabia is the responsible government body to implement this policy. It has 26 public universities (Education, 2013) and all of them are under administration of Saudi's government. The main objective of the establishment of these 26 universities is to strengthen R and D that can contribute to the advancement of the country. One of the main pulling factors of the country development and civilization is to conduct R and D that combines multi-disciplinary knowledge (Khalifa, 2014). Nowadays, the demand of producing research productivity is even stronger than before as many countries are now competing to strengthen the knowledge among their people. This is seen to be the factor that can certainly lead the country to the ultimate development that has been adopted by Saudi's Ministry of Higher Education.

Moreover, all nations have started to be aware of the benefits to have new findings out of research conducted by the academic staff at the universities. In addition, those advanced countries like the United States or Singapore; they have been prioritizing the researchers at the universities by providing them more funds to conduct R and D. Therefore, research productivity is clearly seen as the better way to solve problems and become more harmonious country.

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Table 1: Publication in Saudi Arabia 2007-2011 in ISI journal

University	2007	2011
King Saud University	455	2500
King Fahd University of Petroleum and Minerals	493	667
King Abdul-aziz University	142	862
Taibah University	30	100

Table 2: International publication in 2012

University name	Publications
King Saud University	22000
King Fahd University of Petroleum and Minerals	13000
King Abdul Aziz University	6000
King Khalid University	2690
King Faisal University	1760
Harvard University	320000
Stanford University	230000
Cambridge	179000
Mit	164000
University of Oxford	153000
The University of Tokyo	240000
Seoul National University	120000
National University of Singapore	83000
The Hebrew University of Jerusalem	60000

Table 3: National budget spent on research

Country	National budget spent on research (%)
Egypt	0.23
Tunisia	1.0
Saudi Arabia	0.05
Bahrain	0.04

Table 4: Budget spent on research ($ million)

Country	Spending on research ($ million)
Egypt	927.917
Jordan	60.403
Kuwait	111.357
Morocco	761.726
Saudi Arabia	273.072
Sudan	179.085
Tunisia	660.607

There are many academic disciplines that can be integrated in order to enculturation the research culture amongst researchers. Therefore, when they tend to conduct R and D and publish study as the outcome of the research, the university can be ranked based on the number of publications that will result in boosting up its ranking among the top world universities (Khalifa, 2014). Most of universities in Saudi Arabia face deterioration in publication for the last two decades. According to in 2008, the number of publication was increasing. Table 1 shows the increments of publication in Saudi Arabia in ISI journal.

There are some recommended initiatives to be applied that aim to improve the number of publications as one of the main research productivity. University has to encourage researchers to explore crossed-disciplinary fields of one another to publish more impactful papers, consolation payment to those who publish study in ISI journals, encouraging researchers to attend the seminars that index the papers in Scopus journals, creating good connection with the editorial board of language specialists to audit and review article published by any Saudi university, international alliances and development programs pursued by universities increased support from the private sector and international cooperation which produces a distinctive scientifically published and International staff to reduce teaching loads of academic staff.

In 2012, Saudi Arabia universities did not achieve enough number of publications to meet the objective of higher education to be at the international level. In 2012, according to "Thompson and Reuters", the total number of publications as in Table 2.

According to Science (2010) Arab countries are the world's lowest countries on budget spending for research. The reason why Britain was the superpower in the 19th century was that It emphasized on conducting research and producing more research productivity, including creating new inventions. Arab world produces 373 researchers for one million of their populations. Stander number of researcher is 1081 researchers. Also from top 100 researchers in the world, there is only one from the Arab world. Saudi Arabia alone only spends 0.05% from total budget on research (Table 3 and 4).

In 2008, Saudi government did not spend high budget on research compared to other Arab countries. According to Khalifa (2014) research and development become the most important aims for Saudi Arabia universities in order to achieve the level of international universities.

Literature rivew

Research productivity: Generally, R and D is a way to produce many outcomes that can help the nation to become progressively advanced. Research has become part of the academic in line with teaching. There are many aspects in life require R and D which helps science as a knowledge that can be taught in schools. As we all know that science helps and improves the lifestyle of humanity, prognosticate natural phenomena, foster humanistic traditions, educate the society and change the society's development and, etc. (Lamanauskas and Augiene, 2015). There are three driving forces rules for the world today and those are politic, economy and science. Politic and economy, both clearly need science to improve and enhance them in many ways such as doing research to solve there problem. Universities act in order to create and communicate knowledge, mainly via research and teaching (Sordo *et al.*, 2012). Therefore, it is very important to all government regardless whichever the country it may be to progressively emphasize on managing R&D at the universities. For example in the

United States, they use scientific research to reduce the complexity of education at school at it works out. Above all these, there are seven questions that can be used to improve research productivity in Saudi universities (Lamanauskas and Augiene, 2015).

The questions are: How do you evaluate the current situation of university students' interest in developing research activities in the study process? Do you think the Saudi universities have favorable conditions for students to develop scientific Research activities? Are the academic staffs in Saudi university interested in conducting R and D activity? Do you ever think that current study process is favorable orientating to be applied for the academic staff in Saudi Arabia? What factors, in your opinion can encourage academic staff to do research? How you can evaluate the developing of scientific research in your universities? What would you recommend to change (organize) in the study process seeking to strengthen academic staff's interest in research activity?

According to Khalifa (2014), it is not easy to find publication productively from Middle East countries particularly the Arab countries such as Saudi Arabia. Measurement of academic publication is very important to help identify leading institutions and researchers in a given discipline. Research and development are becoming the most important aims for Saudi university due to the new regulations given by Saudi Ministry of Higher of Education for research funding disbursements (Khalifa, 2014). In order to achieve a level of international universities. In fact, we noticed that the affiliated researchers that publish in high impact factor journals were not actually from Saudi universities. There are three reasons to decrease the number of publication at Saudi universities: Researchers prefer to publish their research results in domestic journals or fast-track non-indexed journals, Most of Saudi Arabia universities have only a teaching function which hinders scientists from conducting research, language barriers might be another reason of the low productivity of computer science publications, even though most of the PhD holders in this field have graduated from Western universities in USA, UK, Canada and Australia (Khalifa, 2014). Also, research productivity is most important factors to increase the international ranking of universities (Pouris and Pouris, 2010).

Publications: Publication is the act of making information or stories available to people in a printed or electronic form. There are many forms of publication but the most counted are published in the ISI journals with citations (Khalifa, 2014). Nonetheless, it does not mean other publications like book chapter, original books, non-indexed journals, magazine or any other are not counted whatsoever but in order to compete with other top world's universities, the academic staff have to actively publish in the Scopus or ISI journals (Khalifa, 2014). Measurement of academic publication is very important to identify leading institutions and researchers in a particular discipline (Khalifa, 2014). The number of papers published in conference proceedings and academic journals and their citation counts are considered one of the most commonly used indicators that describe a research output. The research that is shared with private sectors will increase the industry income of universities as well as the number of publications. In fact, we noticed affiliated researchers that publish in high impact factor journals were not actually from Saudi universities (Khalifa, 2014). According to (Khalifa, 2014) there are limited papers publish by different discipline at Saudi university.

The current reality in Saudi universities clearly indicates that there is some short of production grow racing engagement, due to the fact that in most cases article publications count as a critical factor of their overall quality picture (Alali and Nikolaidis, 2015). Besides, it can influence significantly the ranking up level efforts of all higher educational institutions, publications with high SCI (Science Citation Index) can add significantly more value in Universities global ranking effort evaluations. But this global game of publications and ranking is actually limited to a small but important minority of academic institutions in every country (Alali and Nikolaidis, 2015).

Even more, in Czech Republic now a days, the Universities governmental funding system is close related to an official methodology of scientific research output evaluation as an incentive for more publications (Alali and Nikolaidis, 2015). They basically proposed that institutions can be ranked according to their whole faculty's total publication output in comparison with the total publication of their full time faculty. In addition, they argued over the relationship of these measures with other selected figures of research resources and institutional quality in general (Alali and Nikolaidis, 2015).

But in any case scientific productivity volumes by themselves were counting a lot in the overall value added prestigious of every university no matter private or public. Returning in the Gulf area, monitoring the productivity performance in academic societies has not been a strong case. In Saudi Arabia especially the last decade, the competition of universities for better world ranking seems to have low impact in articles' productivity compared to

Table 5: The weight of each indicator for promote academic staff

Indicators	Weight (%)
Teaching	25
Publication	60
Community service	15

Table 6: Number of ISI publication in Saudi universities

University	2011	2012	2013	2014	2015
King Fahd University of Petroleum and Minerals	638	665	802	741	647
king Saud University	5073	5930	5888	6773	5213
King Abdul-aziz University	977	1838	5294	7919	5674
Taibah University	109	148	233	325	273
Hail University	43	63	69	94	70

the huge investments made in the educational sector of this country (Alali and Nikolaidis, 2015). Many barriers exist and incentives are needed for improving intellectual capital performance even though a high priority for more research efforts sustained in the region (Alali and Nikolaidis, 2015).
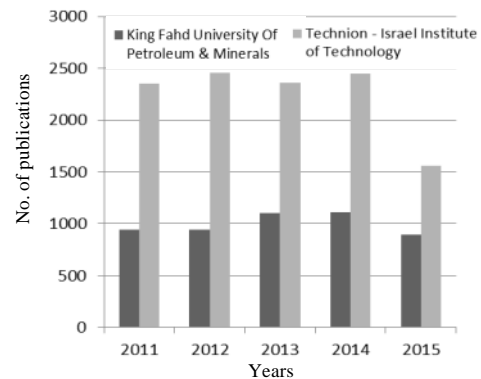
Publication in high status referred journals has become a major criterion of academic success in the competitive environment of global higher education (Altbach, 2015). Appearing in internationally circulated journals published in English is especially prestigious. Therefore, universities are engaging in a global arms race of publication; and the academics are the shock troops of the struggle. At stake is placement in the global rankings, the allocation of budgets from governments, national prestige and ability to attract the best students and professors and a preferred place in the pecking order of academic (Altbach, 2015). In order to upgrade the academic staff at Saudi universities is depending on three indicators. The indictors are teaching, publication and community service (Table 5).

Universities in many countries stress the importance of their professors' publishing in internationally circulated scientific journals (Altbach, 2004). The publication of research results is a significant link between the areas of communication and academic awards, thus academic societies were founded to encourage communication amongst their members. Research can be considered to be the backbone for the development of any society (Alzahrani, 2011). According to (Hanafi, 2011) Research output (based on publication) is indeed the most important criterion for promotion.

Scholars indicated that R&D is an imperative component of success in the academic and medical disciplines and that the assessment of the research productivity in academic institutions is an important measure of the extent of their contributions to developing new knowledge (Alghanim and Alhamali, 2011). Understanding factors associated with research productivity is important for leaders of academic institutions and health professionals. Publications are the major output of scientific research and they are the most commonly used vehicles through which new scientific discoveries are conveyed to the rest of the world. Publication counts, articles printed in well-known academic journals and research grants are among the common measures of faculty research performance. Publication is particularly important in developing

Fig. 1: Comparing number of publication between King Fahad University in Saudi Arabia and Technion-Israel Institute of technology

countries where funding for research is limited and where senior administrators have to decide whether to invest their limited resources in scientific research or in support of the educational goals of these institutions (Alghanim and Alhamali, 2011).

One way of increasing and enhancing medical publication in the region is to encourage researchers to publish their work regionally (Aziz *et al.*, 2004). According to (Alhaider *et al.*, 2015) research competencies have been recognized as one of the key competencies (scholar) in post-graduate medical education. Research is beneficial because it leads to better patient care, enhances the pursuit of an academic career and improves fellowship acceptance and success. In addition, Table 6 shows the difficulty of seeing publication from Saudi universities. Next table include the top three universities in Saudi Arabia.

Figure 1 shows the comparing number of publication between the King Fahad University in Saudi Arabia and Technion-Israel Institute of Technology. King Fahad University in Saudi Arabia follows Technion-Israel Institute of Technology according to QS ranking. According to this figure shows the number of publication for both universities.

Saudi universities ranking: One of the most important objectives for the Saudi Arabia Ministry of Higher Education is to achieve the level of international universities. This level can be measured from the ranking

Table 7: QS Ranking of selected Saudi Universities

University	2012	2013	2014	2015
King Abdul- Azia University	301-400	201-300	151-200	151-200
King Saud University	201-300	151-200	151-200	151-200
King Fahd University of Petroleum and Minerals	301-400	301-400	401-500	401-500

Table 8: Time higher education ranking of selected saudi universities

University name	2012	2013	2014	2015	2016
King Abdul Aziz University	0	350	400	0	300
King Fahd University of Petroleum and Minerals	0	0	0	0	600
King saud university	0	0	400	0	600

Table 9: Webometrics ranking of selected Saudi Universities

University name	Ranking	Openness	Excellence
King Saud University	281	190	329
King Abdul Aziz University	592	280	479
King fahd university of petroleum and Minerals	851	266	743
Taibah University	2397	5900	2070

Table 10: Best Global University ranking of selected Saudi Universities

University name	Rank
King Abdul-aziz University	378
King Saud University	489

of universities. In recent years, the evaluation, classification and ranking of universities have become very important at regional, national and international levels throughout the world (Noruzi and Abdekhoda, 2014).

World university rankings represent not only a tool to measure university success but can be considered as a new challenge to all universities worldwide. However, in recent years, rankings are becoming more significant elements in the academic community that influence the development of international understanding of the quality of education, scientific activity and university functioning with regard to the world leaders. Nowadays, there are three most famous academic rankings. Academic Ranking of World Universities (ARWU), Shanghai Ranking (published since 2003), QS World University Rankings, QS ranking (published since 2000) and Times Higher Education World University Ranking-Thomson Reuters (THE), Times ranking (published since 2010) (2014) (Sidorenko and Gorbatova, 2015).

According to (Pouris and Pouris, 2010) rankings of higher education institutions are important for students, research administrations, industry and academics. A number of rankings are published internationally, most of which aim to identify the top universities in the world. Developing countries are also interested for relevant rankings that could assist them to develop appropriate higher education policies.

There are a number of different national and international rankings of higher education institutions. Examples include those produced by the Times Higher Education Supplement, by the US News and World Report and the Shanghai Jiao Tong University (2009) amongst others. Such rankings are of interest to students and others looking for universities in order to study or find employment. More importantly however, rankings have marketing and assessment characteristics. In a globalizing world, students, staff and funders would prefer to associate themselves with high-ranking universities rather with low-ranking ones. Similarly, national policy-related authorities can use

rankings to assess (officially or unofficially) the performance of the management of the various institutions they support (Pouris and Pouris, 2010). According to Table 7 shows the rank of Saudi universities which appear in QS world ranking on the following years.

There are a number of indicators QS website use them to as methodology to measure the performance of international universities. According to time higher education website is website to measure performance of international universities. Time higher education website has five indictors to measure performance of universities. Those indicators are teaching, research, citation, industry income (from research) and international outlook (from the research perspective) (Table 8). Webometrics is a ranking of all the universities of the world not only a few hundred institutions from the developed world.

Webometrics has two indictors to evaluate universities. Those indictors are openness published in dedicated websites according to the academic search engine Google Scholar and excellence the academic papers published in high impact international journals are playing a very important role in the ranking of universities (Webometrics, 2015) (Table 9).

The Best Global Universities Rankings has twelve indictors. Ten of those indictors are related directly with research productivity such as publication, citation and global research (Table 10). There is high effect of publication ranking to attract students to schools or universities. Also, publication of school ranking has positive impacts to students and their families as well. The publication of rankings has clear effects upon families and schools. After the rankings publication, fewer students enroll in schools that are rated poorly and the probability of closure of these schools increases. These effects are stronger for private schools (Nunes *et al.*, 2015). Just within a few years, rankings became a central social referent in the field, impacting how we make sense both of our work and that of others. Furthermore, rankings allow university administrators to increase their managerial

power over research. Rankings identify targets that academics should specifically pursue in order to develop their reputation. Moreover, Rankings can even be seen as a relevant tool from a broader legitimacy standpoint, for instance in showing audiences that ''tangible'' outputs ensue from the resources which society devotes to research-based universities. In this sense, rankings can be especially useful when departments, universities and funding agencies have to develop narratives to convince outsiders that academics ''perform'' in their social role as producers of knowledge (Gendron, 2015).

Research grant: Research grant is an assistance which comes from other sectors private or public to use academic staff to solve their problems. Also, to helps universities to increase number of publication. Research grant is one of most important factors to assist budget of scientific research at universities. International universities use adopt research grant as second source for their research. Research grant has multi-advantages to both senders and receivers.

According to Haruard university sponsored research, one of the primary missions of Harvard University is defined as funding from outside sources for scholarly inquiry performed by University faculty and staff. Sources of funding can include the federal government, state and local agencies, hospitals, foundations, corporations and foreign entities. Examples of sponsored research projects at Harvard range from laboratory research on AIDS at the Medical School to an Executive Leadership Program for government officials at the Kennedy School of Government. According to Khalifa (2014), there is a few of publication in computer science filed at Saudi universities. Because of many reasons, one of those reasons are Saudi universities do not have any communication with other private or public sectors.

Scientific research have positive effects to improve the profit of industries and to reduce the cost of some tool (Mansfield, 1998). Using surveys of research managers found university research to be an important source of innovation in some industries, particularly those related to the biological sciences (Jaffe, 1989). There are a few of publication in medical sectors in Saudi Arabia which lead to increase the number of patients in some diseases because miss connection between academics staff and health sectors (Alghanim and Alhamali, 2011). According to (Alakloby, 2012) researchers suggest increase in research grant to improve the number of publication and research in dermatology. Universiti Teknologi Malaysia (UTM) adopt research grant as one of key performance indictors to achieve the objective of university.
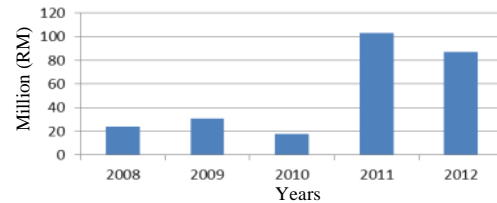

Fig. 2: Increments of research grant at Universiti Teknologi Malaysia (UTM)

It clearly to show in Fig. 2 the improvement of research grant from year to year in order to increase the number of research publication. Improvement on the number of research leads to improve the universities ranking. On 2015 Universiti Teknologi Malaysia (UTM) in the top 100 universities in different filed According to Mehrabian and Russell (1974) private sectors have to assist the budget of scientific research in country. Because they will also receive the benefits from the results of scientific research for long term. Leader universities use private sectors to assist budget of research center. For example in Israel private sector pay 74% of total budget to provide scientific research in Israel. On the other hand, Taibah University and North Border University do not have other sponsor from private or other public sectors. They just receive budget from Saudi government.

MATERIALS AND METHODS

Researchers use number of various data base to find evidence related with the important of research productivity to measure academic staff in Saudi universities. To investigates the level of publication in Saudi universities. Also, to explores the important of publication among other sectors. Using international websites to show ranking of Saudi universities such as QS ranking and Time Higher Education ranking. Also, to finds the most important factors which effect measuring performance of universities. Researchers conducted some interviews with the dean of deanship of scientific research at north borders universities and manager of deanship of scientific research at Taibah University.

Use rules which used by Saudi government to upgrade the academic staff in Saudi universities. Use websites of all Saudi universities to know about the objective of each university. Looking for website of international universities to finds strategy of scientific research. The domain of this study is showing the important of research productivity, level of publication and important of publication, effects of research grant and Saudi university ranking. In order to show the important of building model to investigate factors which influence Saudi academic staff to publish in ISI or Scopus journals.

Researchers use stimuli organism response theory to build proposed model. The S-O-R model from environmental psychology states that the various aspects of the environment act as Stimuli (S) that together affect people's internal states (O), which in turn drive their behavioral Responses (R) (Mehrabian and Russell, 1974). This study will use different environment such as university environment and IT environment as Stimuli (S). Academics staff will be the organism because need to see the impact of different environment to academics staff on research productivity. Also, it will have the research productivity as response.

RESULTS AND DISCUSSION

From above studies it can clearly see the important of research productivity in different perspective such as improve nation, serve society, increase economic and achieving the objective of universities. Also, it clears to find the lowest number of publication in Arab regain especially in Saudi Arabia. Which cause by many factors such as research grant, encouragement and motivation. The lowest number of research (publication) led to a number of difficulties face from other sectors such as health sector in Saudi Arabia.

Most of publications in ISI or Scopus journals are published by non-Saudi academic staff. Moreover, the lowest number of publication at Saudi universities causes the decrement of Saudi universities ranking. All of International ranking organizations use publication as indictors to measure the performance of university. Saudi universities which have relationship with industries can see them in acceptable international ranking such as King Abdul-Aziz universities and King Fahd University of Petroleum and Minerals.

Relationships between universities and private sectors have benefit to both sides. Helping academics staff at university to have new topic and issues to do research on it and look for difficulties which face by private sectors. In addition, numbers of studies agree that the international university ranking is promotion to attract students and international academic staff to join university. It is clear to see the lack of studies about the measurement or improving the research productivity or scientific research for academic staff in Saudi universities. Now, it's necessary to have models to measure the performance of Saudi academic staff in research perspective. This proposed model will measure and improve research productivity for academic staff in Saudi universities. It is very important to find other providers to assist budget of scientific research. Encourage other sectors (private or public) to use the experts of academic staff to solve their problems. This encouragement will find new idea for academic staff at Saudi universities to do research and publish their results in high level of journal. This publication will increase the rank of Saudi universities. The publication of university ranking is like promotion for universities which lead to increase the number of international student and high level of academic staff.

Also, it is important to have target of publication for academic staff each year. Got experience from international staff in faculty. In addition, Saudi universities have to use the indictors which use in leaders website of universities ranking as policy to measure the performance of their academic staff. On other hand, new published universities in Saudi Arabia have to establish PhD program and master program. Also, place to singe publication as requirement to graduate. Ministry of higher education in Saudi Arabia has to build their own ranking for Saudi universities to increase level of competition between them. These ranking uses indictors which use by international website to measure performance of academic staff.

According to above studies Saudi University have to adopt new tools to measure the performance of academic staff such as key performance indicators. The important indictors which can find them are publication and citation (research productivity). It is important to build new model to investigate the factors which can influence the academic staff to publish in high impact factors journal. Those factor will improve the performance of both indictors publication and citation. Some of those factors are related with ability of using IT, personal characteristics, user satisfaction, motivation and policy. The S-O-R model from environmental psychology states that the various aspects of the environment act as stimuli (S) that together affect people's internal states (O), which in turn drive their behavioral Responses (R) (Mehrabian and Russell, 1974).

CONCLUSION

R and D and research productivity are both very important for all countries around the world. The developed and advanced countries encourage academic staff to generate university income by augmenting research activities. Besides, Saudi universities are also planning to utilize R and D as one of the main natural resources. Even though, there must be a specific Key Performance Indicator (KPI) that is designed to measure the research activity is actively done in order to produce various outcomes that benefit the country. This can be seen as one of the strategy to achieve the objective of the

international universities in accordance to the requirement of the Saudi Ministry of Higher Education. With the existence of the KPI, it can certainly assist the university to monitor performance of each academic staff on their workload particularly the research activities. It can also be used to identify the most contributive staff from amongst so the categorization of them can be made. The KPI is a suitable approach for both profit organization and even non-profit organization such as Universiti Teknologi Malaysia (UTM). It definitely matters the university to measure the performance of all research staff to assure its ranking through world ranking website.

In additional to that, publication as one of the most important outcome of the R and D has to be rapidly improved by encouraging the academic staff using all strategies recommended. By having the spirit of conducting research and publishing papers, the number of research grant can also be increased either locally or internationally to help improving the country in many ways. The connection between universities and industries can be strengthening to foster more collaboration in the future.

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