THE ASSESSMENT OF RESEARCH QUALITY AND IMPACT IN SOUTHEAST ASIAN COUNTRIES

Policy Implications

Anetta Čaplánová - Ľubomír Darmo (Eds.)

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1 INTRODUCTION

Anetta Čaplánová (University of Economics in Bratislava, Slovakia)

In today's world universities are not only seen as centers, where a new generation of young professionals is being trained, but also as centers of research activities, which are to enhance our understanding of the pressing problems of our societies and show us the path to solving them. These days attention to and focus on academic research is growing, and the output of this situation has become more pronounced not only at highly internationally ranked universities, but also at less prestigious academic institutions striving find their niche among academic titans. At the same time, the growing global demand for higher education has led to the establishment of many new public and private higher education institutions. Many of these schools try to establish themselves in the education market. They also attempt to document that they meet the standards expected from such institutions both in the area of educating young generations of students and in contributing to the creation of new knowledge.

Another factor, which has gained the importance in the past few decades, is related to the globalization of national academic sectors. The technology facilitated the development of the online study programs and access to knowledge generated around the globe. Thus, higher education institutions from around the world have free access to the global education market and are trying to succeed in the existing competition to attract students and gain recognition. Needless to say, in this harsh competitive environment, internationally well-established universities enjoy comparative as well as absolute advantages over the less established ones. At the same time, the institutions new to these processes, either newly established or from countries, which do not have centuries long traditions in academic field, are pressed to compete with the best ones, though the former often lack comparable traditions, human resources, infrastructure, or funding. At the same time, it is frequently forgotten that there are only 500 places among 500 top world universities and if individual institutions do progress, usually it is not sufficient to succeed to get among the group of leaders.

Traditionally, from the point of view of how academic institutions contribute intellectually, the main focus is on bibliometrics, that is the individual categories

of publication outputs and related citations. The technological progress, digitalization and the spread of the internet networks affected this domain as well and led to the panoptic availability of academic publications. At the same time, the bibliometric method decreased the cost of assessing of intellectual contribution of universities and individual researchers. This situation led to the increased use of bibliometric methods and further enhanced the pressure on higher education institutions and individual scholars to publish their outcomes in duly registered and established databases. Similarly to the institutional ranking systems, the academic journals have a limited ranking capacity. Additionally, the number of pages in each individual volume of those prestigious journals is restricted. Getting published in established journals is for many researchers coming from less prestigious backgrounds and not being native speakers of English or any other dominant language, in which most of these journals publish, becomes in most cases an unachievable task, and thus, a source of frustration. However, what is frequently forgotten is that publications in prestigious academic journals capture only a small fraction of diverse impacts within various research fields.

It is generally agreed that internationally published academic papers are frequently read by only a very small circle of specialists working in similar areas. On the other hand, the papers addressing local and national challenges published at local or national levels can be read by larger research communities, that focus on problems of similar practical value, and thus, the impact of publishing in them can be actually higher, even though, these publications lack international acclaim. At the same time, apart from publishing their academic results, researchers are expected to reflect the progress in their local societies, economies and businesses and contribute to solving the pressing challenges the former face. This fact has been recognized widely by the policy makers in different regions of the world. For instance, the Horizon 2020 Program in the European Union supports the interdisciplinary research, which addresses societal and global challenges. The Program puts emphasis on research which would generate a set of academic and non-academic impacts and ensure that invested resources will not only lead to the advancement of knowledge *per se*, but will also contribute to the world becoming a better place.

This publication represents one of the outputs of the REPESEA[1] project carried out in the framework of the EU EACEA Capacity Building in Higher Education Scheme. One of the key focuses of the project has been current best practices in the assessment of the impact and quality of academic research. It also aims at

[1] The Acronym REPESEA stands for Assessing and Improving Research Performance at South East Asian Universities.

developing a system, which would reflect these practices and at the same time, would fit the needs of partner institutions and partner countries participating in the project (Indonesia, Malaysia, and Thailand). Our work has also important policy implications. Even though the partner countries mentioned above are at different stages of development of their national academic research assessment systems, in each of them there is a place for reconsideration of existing practices. Implementation of suggested adjustments will lead to further improvements. This publication presents the policy issues identified by the researchers from the REPESEA consortium for Indonesia, Malaysia and Indonesia. Each chapter focuses on the situation in one of the countries and deals with the existing status quo in the assessment of academic research at the national level in those countries. It also addresses the knowledge accumulated by the REPESEA consortium during the implementation of REPESEA project and focuses on a policy relevant to proposals, which should enhance the existing practices and make the existing systems more comprehensive. We hope that our work will find fertile ground and will help the partner countries to develop their research assessment systems well aligned with the best global practices and at the same time suitable for the needs of their own academic sectors.

Bratislava, Slovakia, December 2019

2 POLICIES NECESSARY FOR THE DEVELOPMENT OF COMPREHENSIVE RESEARCH ASSESSMENT SYSTEMS AT ACADEMIC INSTITUTIONS IN INDONESIA

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Abstract

Current development of the Indonesian research sector has been predominantly associated with the effort to enhance research performance at Indonesian higher education institutions. The targeted government policies support and guide those efforts. The development of the university sector was also established as a priority within the national development policy. After having abandoned the focus on improving the quality of university teaching, the improved research performance has become a priority of designed government policies. However, until recently, the research performance of Indonesian universities has been rather low and is still lagging behind the universities in other ASEAN countries. To overcome this situation, the Indonesian government introduced new measures, which include governance changes, increased funding and tools to enhance the impact of the research carried out at Indonesian universities. Indonesia is still on its way to developing a comprehensive research performance assessment system. Thus, the main aim of this chapter is to offer policy recommendations based on the REPESEA accumulated knowledge and experience. It is expected that those recommendations would facilitate and contribute to this process.

[1] The contribution of the other colleagues from Gadjah Mada University (UGM) and Islamic University of Indonesia (UII) to the earlier version of this paper is thankfully acknowledged. We thank Jogiyanto Hartono, Tur Nastiti, Nurul Indarti, Choirunnisa Arifa of UGM and Fathul Wahid, Hangga Fathana and Feris Firdaus of UII for their input to the paper.

2.1 Introduction to the Research Assessment Systems in Indonesia

A report by the World Bank (The Task Force on Higher Education and Society, 2000) indicates that major problems faced by universities in developing countries include absence of vision as well as poor conditions for development. Indonesia is no exception and nowadays faces two major issues. Its first problem relates to lack of understanding of the importance of universities for contributing to social and economic development, while the second one deals with problems of a poor starting point, such as lack of supportive intellectual culture.

In general, universities in developing countries are lagging behind their counterparts from developed countries in terms of their research performance. This situation is affected by such factors as no demand in the society for research knowledge, lack of research skills, research equipment, and funding. Inadequacy of mentoring and unsupportive conditions, such as overwhelming teaching loads and problems in accessing the latest publications (Bako, 2005; Lewis & Simmons, 2010) also contribute to this. However, we believe that with carefully designed and appropriately executed strategies, universities in the developing countries, including Indonesia, can contribute to creation of useful knowledge that will better serve the society through their research output and academic publications.

2.2 The Development of Indonesian Higher Education from the Historical Perspective

The development of Indonesian higher education has undergone four stages. Of course, as far as policy is concerned, the most relevant stage is the current one; however, present times are affected by the past. This is why, we would briefly explain the key features of each identified period.

a) Dutch Colonialization and Establishment of Independent Indonesia

The development of higher education institutions in Indonesia began during the Dutch colonial period, in the early 20th century. During that time business investments increased, particularly, in the field of plantation, industry,

transportation, mining, and other areas. Back then, this Dutch colony was expected to provide skillful and educated human resources, essential for supporting the development of the infrastructure. To achieve this, the Dutch government established Technische Hooge School (THS) in Bandung in 1920, which merged with medical schools that had been established earlier, such as STOVIA (School tot Opleiding can Inlansche Artsen) in Jakarta (1902) and NIAS (Nederlansch Indische Artsen School) in Surabaya (1913). Subsequently, other higher education institutions were established including Landbouwkundige Hooge School, an agricultural school in Bandung, and Rechts Hooge School, a law school in Batavia. During this period, the development of higher education institutions was highly linked to the policy of ethical politics, which emphasized moral responsibility towards colonized countries to provide education and emancipation of the society. However, the latter objective had not been achieved as graduates became a part of the colonial system, instead of putting their endeavors to improving welfare of the Indonesian society. This situation had not been tolerated by the society and thus triggered the National Awakening on May 20, 1920, which was marked by the establishment of Budi Utomo, the first native political society, by the students of STOVIA.

However, the Japanese invasion of 1942 resulted in a drastic reform of higher education in Indonesia. Having seized the Dutch colony, the Japanese military power shut down all higher education institutions and banned all Dutch in the existing education system. In 1943, the Japanese government reopened some higher education institutions with significant differences in terms of education and teaching design, strategy and approach, influenced by the military reign of the Japanese. During this period, the Japanese educational system produced nationalistic-minded graduates, who later played an important role in promoting independence and creating the new government during the post-independence era.

Although the Indonesian independence was declared on August 17, 1945, the problems, including the ones in higher education, brought by colonialism era and wars, had persisted. The Indonesian people had to deal with socio-cultural issues, as well as fight the Dutch, who wanted to re-colonize Indonesia. After World War II almost all big cities, where most of the higher education institutions had been formerly established (Jakarta, Bandung, Bogor, and Surabaya), were occupied by the Dutch; hence Yogyakarta, a new capital of Indonesia during the post-independence war period, became an important target of the Republic of Indonesia to develop higher education institutions in the country. On December 19, 1949, Gadjah Mada University (UGM) was formally established and became the first public university under the authority of the Republic of Indonesia. Additionally,

on July 8,1945, slightly before the proclamation of independence, a private higher education institution called the Islamic Higher School (Sekolah Tinggi Islam – STI) was established by some prominent figures for Indonesia including Dr. Mohammad Hatta, the first Vice President of Indonesia, in Jakarta. In 1946, STI was moved to Yogyakarta and subsequently became known as Islamic University of Indonesia (UII) in 1947. It became the first private university in Indonesia.

Substantial transformation of the higher education system during Indonesian post-independence period was initiated right after the end of the Dutch colonization in Indonesia, following the proclamation of the Union Republic of Indonesia on December 27, 1949. During this period, all Dutch-governed universities were nationalized under the jurisdiction of the Union Republic of Indonesia. For example, Universiteit van Indonesia was then renamed University of Indonesia (UI). In 1954, the government of the Republic of Indonesia established Airlangga University (Universitas Airlangga) in Surabaya, which became the third national university in Indonesia.

Meanwhile, private universities began to proliferate as well across the Indonesian archipelago. Between 1950 and 1980, both public and private higher education institutions in Indonesia were on the rise. As Indonesia is an archipelago country inhabited by diverse ethnic groups and cultures, there is always a threat of conflicts. Hence, Indonesian systems in all administrative regions, including education, must be based on the principles of fairness. As a result of this policy in 1950s, the Indonesian government promptly established 12 universities in several regions, including Hasanuddin University in Makassar, Andalas University in Bukittinggi, Padjadjaran University in Bandung, and the University of Sumatera Utara in Medan. In addition, to better control the growing number of private higher education institutions, the government established the Coordinator of Private Universities (Koordinator Perguruan Tinggi Swasta, or Kopertis) in every province in 1975.[2] In 2018, the Ministry of Research, Technology, and Higher Education converted all the Kopertis centers into the Higher Education Institution Services (Lembaga Layanan Perguruan Tinggi, or LLDIKTI), which deals with both public and private universities at the level of provinces.[3] The decision to convert Kopertis into LLDIKTI shows government's egalitarian policy towards public and private universities. In fact, as of July 2019, the total number of higher education institutions in Indonesia reached 4,586, with 4,186 private and 400 public higher

[2] See: https://www.kopertis4.or.id/organisasi/sejarah-kopertis/ (Accessed on July 3, 2019).
[3] http://lldikti5.ristekdikti.go.id/home/sejarah (Accessed on July 3, 2019).

education institutions.[4] Such a massive increase in universities across Indonesia has strengthened the status of Indonesia as an independent country in all sectors, including higher education.

The history of Indonesia as an ex-colonial country shaped the prospects and mindset of university students. Student organizations along with other communities have been actively involved in criticizing the government system and influencing the political situation. Since then, the involvement of higher education institutions in promoting national development is expected.

b) The Focus on Quality Assurance Policies (1960-2000)

During the second half of the 20th century, Indonesia experienced dynamic economic growth, resulting in the expansion of work opportunities in many sectors, and hence, the increase of the demand for professional workforce with a university degree. This development led the Ministry of Education to encourage individuals, foundations, local governments and other institutions to establish private universities to help the government meet the growing public demand for higher education. Due to this policy, private universities were growing rapidly during 1980s, with the total number of institutions exceeding one thousand.

Although this significant increase in the number of universities helped to meet the demand for qualified workforce, the problem of the quality and competences of graduates emerged. In response to this situation, the government applied the so-called "status control system" to manage the quality of private universities. This system divides the programs (diploma, undergraduate, and graduate) run by private universities into three status recognition levels: "terdaftar" (registered), "diakui" (recognized), and "disamakan" (analogous). None of these applies to public universities because the intention was to push the educational programs at private universities to the level comparable to that of public universities. The differences between these three levels with regard to quality standards are shown in Table 2.1.

[4] https://forlap.ristekdikti.go.id/ perguruantinggi/ (Accessed on July 3, 2019).

Table 2.1. Status System as a Quality Control Instrument at Private Universities (pre-2000 policy)

No.	Level of Status	Rights of Managing Quality
1	*Terdaftar* (registered)	All the core subjects in the curriculum must be included in the state examination
2	*Diakui* (recognized)	Only several core subjects are included in the state examination
3	*Disamakan* (analogous)	The program has reached the highest quality level comparable to that of the public universities; therefore, the program does not have to meet the state examination requirements

Source: University Islam Indonesia

Table 2.1 indicates that the programs that were marked as either "registered" or "recognized" must have their curriculum included in the state examination of the specified subjects. A private university had to have an agreement with its partner university, usually a public university located in the same province or supervisory region of Kopertis. In addition, to be able to apply for the state examination, students of such private university had to first pass the so-called "local examination" organized by their university. As a result, it was not uncommon for private university students to spend more than ten years just to finish their undergraduate program, which normally took five years at a public university. While this policy was applied to all programs at private universities regardless of when they were established, a new program within a public university sector, applied to those institutions with resources far below the funding of existing programs at private universities, allowed the former to become independent, since they did not have to undergo such a lengthy and complicated quality assurance process as private universities.

As the result of this egalitarian policy, the Board of National Accreditation of HEI (Badan Akreditasi Nasional Perguruan Tinggi, or BAN PT) was established in the late 1990s. The main task of BAN PT was to assure the quality of both public and private higher education institutions in Indonesia through the accreditation process. The accreditation of public and private higher education institutions was treated equally by BAN PT. The Ministry also required universities to hire high-quality lecturers, who graduated from top universities in Indonesia and/or highly reputable universities overseas.

Before 2000, all universities in Indonesia strived to put more emphasis on teaching and community services. Most of them wanted to be known as universities that produced highly-skilled graduates because of their staff with good pedagogical skills. Almost all of time of faculty members was devoted to teaching and government or private sector consultancy. There were no financial incentives to conduct academic research.

c) Applied Research Focused on University and Business Sector Collaboration (2001-2010)

During 2001-2010, more universities were founded. Indonesian public universities had been gradually losing their dominant role, as their tasks were shared with thousands of private universities. The government also encouraged universities to publicly conduct research activities and disseminate their results. Consequently, the quantity of applied research produced by Indonesian universities increased dramatically between 2000-2010.

Several follow-up regulations also improved the capacity of universities for managing their research (Moeliodihardjo et al., 2012). Currently, seven public universities in Indonesia are given more freedom for managing their activities. This is possible because of the issuance of the State-Owned Government University Regulation (Badan Hukum Milik Negara, or BHMN). These are the following universities: University of Indonesia (UI) Government Regulation (Peraturan Pemerintah PP) no. 152 / 2000, Gadjah Mada University (UGM) Government Regulation no. 153 / 2000, Pertanian Bogor Institute (IPB) Government Regulation PP no. 154 / 2000, the Bandung Institute of Technology (Institut Teknologi Bandung, or ITB) Government Regulation no. 155 / 2000, the University of Sumatera Utara (USU) Government Regulation no. 56 / 2003, the Pembangunan University of Indonesia (Universitas Pembangunan Indonesia, or UPI) Government Regulation no. 06 / 2004, and Airlangga University (UNAIR) Government Regulation no. 30 / 2006.[5]

The University Advisory Board, a representative body of the government, is a granting government body, which grants universities their autonomy to manage their own rules and regulations, including their finances and human resources (Moeliodihardjo et al., 2012). Such autonomy increased the opportunities of these universities for funding their research through both domestic and international

[5] See http://lldikti12.ristekdikti.go.id/2011/04/25/peraturan-pemerintah-tentang-penetapan-7-universitas-sebagai-bhmn.html (Accessed on December 26, 2019).

collaborations. Also, due to the 4th Amendment to the Constitution adopted by the Supreme Assembly (MPR) in August 2010, twenty per cent of the government budget had to be allocated to the educational sector, which significantly increased the higher education budget (ACDP, 2013). In 2007, the budget allocated to the Directorate General of Higher Education (Ditjen Dikti) amounted to Rp. 12.9 trillion, and this figure almost tripled in 2012 and reached Rp. 32.6 trillion (ACDP, 2013).

Such an increase in the budget may have also been perceived as a response to limited government spending on research and development, which was only around 0.08 per cent of GDP in 2010. This share of R&D expenditure was low compared to R&D spending in other developing and developed countries, such as most developed OECD countries, Brazil, Russia, India, or China. Not only that, Indonesia was also lagging behind its neighboring countries, such as Australia, Singapore, and Malaysia. Because of this low R&D investment, the number and quality of Indonesian research, copyrights, and journal publications fell behind its neighboring countries (Moeliodihardjo et al., 2012). However, Indonesian government spending on R&D increased to 0.24 per cent in 2017.[6] This figure was higher than Myanmar's R&D expenditure of 0.03 per cent of GDP and Kazakhstan’s of 0.13 per cent of GDP in 2017. However, Indonesia's R&D expenditure was still far too low, when compared to China’s 2.13 per cent of GDP and Japan’s 3.20 per cent of GDP in 2017,[7] for example.

d) Globalization and a World-Class Research University (2011- up to now)

The globalization era of Indonesian higher education started around 2011. Since then, with the advancement of the internet technology, Indonesian universities have been competing not only at local level, but increasingly at international level to pursue a world-class university ranking. At this new stage of development, the globalization creates opportunities for Indonesian higher education institutions to establish their status as world-class universities. As one strategy to achieve this, top public and private universities require their lecturers to pursue doctorate degrees from overseas, and in this way to improve the quality of higher education institutions in Indonesia and to allow them to compete with top universities around the world. To support this goal, the government, through the Ministry of Higher

[6] http://data.uis.unesco.org/Index.aspx?DataSetCode=SCN_DS&lang=en# (Accessed on December 26, 2019)

[7] http://data.uis.unesco.org/Index.aspx?DataSetCode=SCN_DS&lang=en# (Accessed on December 26, 2019)

Education, provides scholarships for those who are willing to study abroad to pursue their doctoral degree. Furthermore, to support the pursuit of the world-class university status, universities also encourage their academic staff to conduct research and disseminate their results in various ways, through public debates, international conferences, seminars, workshops, and so on, as well as to publish their research papers in reputable journals. The government also strives to raise the number and quality of research and publications by providing grants to motivate academics to do research and improve the excellence of higher education institutions in Indonesia.

2.3 Policies to Enhance Research Performance in Indonesia: Experience and Opportunities

The effort to improve the research culture has long been a point of debate among Indonesian scholars and policy makers. Various policies and initiatives at both national and institutional levels have been offered to stimulate academics to become active researchers and to produce high-quality publications. For example, the Indonesian Government through the Ministry of Research, Technology, and Higher Education has been offering competitive research grants to all universities.

There exist more than 20 grant schemes, ranging from grants for basic research to grants to support applied and collaborative research, which have been offered by the Directorate General of Higher Education since the early 1990s. Initially, these programs were only aimed at increasing R&D capacities of universities, but later on, supported university research was also required to contribute to the development of technology needed by the industry. One of the examples of grant schemes designed to encourage the synergy between university and industrial R&D is Research in Higher Education for Industry (Riset Andalan Perguruan Tinggi dengan Industri-Mainstay, or RAPID). Another grant scheme that also requires collaboration between universities and industry/government institutions is STRANAS (National Strategy of Research). In addition to the Directorate General of Higher Education, there are other government institutions, such as the Ministry of Research and Technology (Kemenristek), that also actively contribute to funding research at universities. The Ministry of Communication and Information manages the National Incentive Research Program in seven fields: food resilience, ICT, transportation, defense and security, health and medical

technology, and advanced materials. The Program covers individual R&D stages: basic research, applied research, improvement of production system capacity, and diffusion and application of research findings. The aim of this grant scheme is to support the Masterplan for Acceleration and Expansion of Indonesia's Economic Development (MP3EI), which is an ambitious plan developed by the Indonesian government to accelerate the progress of Indonesia becoming a developed country, in which the outcomes and prosperity will be shared equally by all people. Unlike the grants from the Directorate General of Higher Education, this incentive grant research program is open to ministerial R&D units, government research institutions, universities, local governments, and also to the private sector (Moeliodihardjo et al., 2012).

Table 2.2. Publication Productivity in ASEAN Countries in 1996-2018 (Scopus-indexed papers)

No.	Country	No. of documents	No. of citations	H index
1	Singapore	292,560	5,656,862	535
2	Malaysia	286,411	2,107,306	281
3	Thailand	178,133	2,043,065	311
4	**Indonesia**	**110,610**	**600,569**	**214**
5	Viet Nam	51,748	527,419	198
6	Philippines	32,326	468,403	224
7	Brunei Darussalam	224	35,841	71
8	Cambodia	4,007	67,312	101
9	Laos	2,672	38,962	80
10	Myanmar	2,965	31,964	71

Source: http://www.scimagojr.com (accessed on June 30, 2019)

However, from the national perspective, the speed of improvement has been considered low. Moreover, Indonesian universities are still lagging behind their neighboring ASEAN countries[8] in research performance. Table 2.2 summarizes Indonesian research productivity measured by the number of Scopus-indexed papers and benchmarked against other countries of the region. It should be noted

[8] A larger comaparative analysis of the papers indexed by Scopus can be found at https://www.scimagojr.com/countryrank.php?region=Asiatic%20Region (Accessed on 02.01., 2020).

that Indonesia's results are compared with much smaller countries both on the top and bottom of the ranking list, thus, the relatively high ranking of Indonesia is largely skewed. On the other hand, we should note that academic publications alone do not provide a comprehensive view as it does not take into account another effect of the academic research, namely its non-academic impact in commercial and social spheres. Additionally, international academic reference databases are largely biased in favor of publications in English, and they do not reflect the publications in non-indexed journals and in the national language, which, however, can have substantial impact on the Indonesian society and economy.

If we look at the table closely, according to h-index (which expresses the journal's number of articles (*h*) that have received at least *h* citations), Indonesian papers have low number of citations (only about 5 citations per paper), which is low compared to those published by researchers from Singapore, Malaysia or Thailand, since Scopus papers submitted from those countries were citated more than 10 times.

In response to these challenges, Indonesian government has developed policies to improve the research performance of Indonesian universities. These include the change of the research assessment system itself, the change of incentives, capacity building and hortatory policies aimed at providing more incentives to priority research fields as part of its policy instruments (Sykes, Schneider, & Plank, 2012).

2.3.1 System Change: Organisational Restructuring

To increase competitiveness of the Indonesian research sector, the government put the priority on the need to integrate research and higher education in the ministerial structure. Formerly, research policies were under the Ministry of Research and Technology (Kemenristek), whereas higher education policies were managed by the Ministry of National Education (Kemendiknas). In 2014, these initiatives were revitalized, as President Jokowi announced implementation of a new structure in research and higher education sectors. The Ministry of Research, Technology, and Higher Education (Kemenristekdikti) was formed to enhance the benefits and impacts of the research on society (Ishanuddin, 2014). Under such new initiatives, the Indonesian government developed more thorough and stronger approaches to support academic research. Policies have been designed to pave the way for a more integrated research vision, and one of them includes a Master Plan of National Research 2015-2045.

Also, a non-governmental Indonesian Science Fund (Dana Ilmu Pengetahuan Indonesia – DIPI) was established in 2015, which aims to support high quality research in Indonesia through the provision of research funding. The need to establish an independent science fund in the country was earlier discussed in the report "Creating an Indonesian Science Fund", which indicated that Indonesia should accelerate its research and innovation growth (Brodjonegoro & Greene, 2014). Brodjonegoro and Greene (2014) further asserted that the funding instruments of DIPI should include but not be limited to research grants compensating principal investigators, travel grants, student fellowships, industrial cooperative fellowships, cooperative research awards, entrepreneurial support grants, and grants for educational research. In fact, the alternative sources of research funding mentioned above have increased the opportunities of the Indonesian scholars to implement research in selected, more focused topics. Thus, currently there are three sources of funding for R&D institutions in Indonesia: government budget mechanism, market mechanism, and internal funding. Mulyanto (2014) shows that out of these three, R&D institutions with sufficient internal funding have the highest productivity and performance. Also, the audit of the funding recipient institutions carried out by the donor institution may contribute to making these institutions perform better and become more productive (Mulyanto, 2014).

2.3.2 Incentives: Increasing Funding

The Indonesian government has been fully aware that the policies related to the provision of funding play a vital role for determining the research outcomes. The statistics from the World Bank demonstrates that in 2014 Indonesian research and development expenditures comprised only 0.09% of its Gross Domestic Product (GDP), which is much below the world average (2.127%) and that of the neighboring countries such as Singapore, Malaysia, and Thailand (UNESCO Institute for Statistics, 2014). On a number of occasions, the Indonesian government expressed their concerns about the increase of the research funding. In 2014-2016, the research expenditures increased considerably to 0.2% of the GDP (Saroh, 2017). However, larger contribution from the private sector is still needed, as in 2014, 80% of the total research expenditures came from the governmental funding (Rayanti, 2016).

The increase of the R&D expenditures in 2014-2016 resulted in higher funding provisions of the research grants from a number of governmental and non-governmental bodies. DIPI, for example, since its establishment in 2015, have

been offering competitive research grants of up to IDR 1.5 billion (around USD 112,500) per proposal per year. This support can be provided for a maximum of three consecutive years (Indonesian Science Fund, 2016). However, the projects funded are limited to two key areas: (a) life, health, and nutrition; (b) identity, diversity, and culture. Also, these grants have not only been provided by the Indonesian government, but also by partner countries, such as the United States, the United Kingdom and Australia (Indonesian Science Fund, 2016). Still, there is the demand to expand the opportunities to include other research areas. To support the development of the Indonesian research sector, researchers from all academic disciplines should have access to competitive funding within the existing national funding scheme. This can be implemented in the form of a general project scheme, which could expand the opportunities of the existing scheme. The information on how many research projects, researchers, and publications of the research findings have received funding is not publicly available, which reduces its transparency.

Positive trends in the increase of the research funding can also be traced in the Kemenristekdikti data. The Ministry announced the research budget of IDR 1.4 trillion (around USD 105 million) in 2017 (Kemenristekdikti, 2017), which means that the research funding remained about the same as in 2016 (1.53 trillion IDR), but increased almost by 100% compared to 2015 (800 million IDR) (Setiawan & Widya, 2016). Additionally, tthe Indonesian government increased the research sector budget to IDR 100 trillion (around USD 7.5 billion) during the period between 2017-2019 (Kemenristekdikti, 2016). However, it is not well explained, how the research deemed as National Research Priority contributes to the development and welfare of the population. Minister Nasir stressed that the results of the research must be improved and adopted by industries. In addition, the Minister of Research and Technology added that “research activities in Indonesia must be able to tackle a variety of real problems in the community and to address national, regional, and international challenges” in line with RPJPN 2010-2025. Two additional fields, namely research related to disasters and policy,[9] were added to the priorities. E.g. the policy research questions studied in the field of food stuffs, pharmaceuticals and technology are to specify, how Indonesia can achieve self-sufficiency and food security, reduce import of medicines and nanotechnology (Ristekdikti Focus Group Discussion, December 14, 2015). These funding opportunities mark ten focus areas as priority (see Table 2.3).

[9] RPJPN 2010-2025 is the government long-term development plan available online: www.bappenas.go.id

Table 2.3. The Indonesian Government Research Budget Allocation for 2017–2019 (IDR, Trillion)

No.	Focus Area	Budget Scenario (in IDR Trillion)			
		2017	**2018**	**2019**	**Total**
1.	Food resilience	4	6	10	**20**
2.	Maritime	4	6	10	**20**
3.	Creation and utilization of new and renewable energy	2	3	5	**10**
4.	Development of health and medical technology	2	3	5	**10**
5.	Development and management of transportation technology	1.5	2.25	3.75	**7.5**
6.	Development of defence and security technology	1.5	2.25	3.75	**7.5**
7.	Disaster management	1.25	1.875	3.125	**6.25**
8.	Information and communication technology	1.25	1.875	3.125	**6.25**
9.	Advanced materials	1.5	2.25	3.75	**7.5**
10.	Social humanity, arts culture, education	1	1.5	2.5	**5**
	Total	**20**	**30**	**50**	**100**

Source: Rencana Induk Riset Nasional 2015–2045

2.3.3 Capacity Building: Short-Term and Long-Term Assistance Approach

To enhance the impact of Indonesian university research, Kemenristekdikti also developed a capacity-building approach associated with the provision of short-term or long-term assistance. As for the short-term funding, the Ministry provides certain technical assistance such as trainings and workshops focusing on the fields of research methodology, academic writing and other specific outcome-oriented topics. These programs are offered to Indonesian academics and researchers from non-university research institutions on the annual basis.

While short-term assistance is to target a specific outcome, the long-term assistance is aimed at providing broader and more comprehensive capacity-building results. Most of the later is provided as doctoral research scholarships. The government offers a wide variety of scholarships from a number of ministries, with most offers coming from Indonesian Endowment Fund for Education (LPDP)

and Kemenristekdikti. LPDP provides scholarships for Master (S2) and Doctoral (S3) degree studies both at domestic and international universities. There are various scholarships provided, such as Indonesian Education Scholarships (BPI) for Master and Doctoral Programs, Indonesian Education Scholarships (BPI) for Thesis/Dissertation Programs, Affirmation Scholarships, Indonesian Education Scholarships for Specialist Doctors, and Eastern Indonesian Scholarships. Additionally, lecturers pursuing a Master or Doctoral degree are encouraged to apply through Indonesian Lecturer Excellence Scholarship (Beasiswa Unggulan Dosen Indonesia, or BUDI), a scheme jointly hosted by LPDP and Kemenristekdikti. In addition, LPDP also provides research funding services, namely Productive Innovative Research (RISPRO) and National Affirmation Research. LPDP scholarship programs are quite popular, as they attracted 9,868 applicants in 2017, out of which 654 were BUDI applicants. However, only around 22 per cent actually received a scholarship, which is 2,171 people (353 of them were BUDI scholarship recipients). The number of recipients of scholarships dropped dramatically in 2017 compared to the previous years. In 2016, there were 7,205 scholarship holders, 4,651 in 2015, and 2,884 in 2014. Overall, between 2013-2017 the number of recipients of LPDP scholarships reached 18,466 (2,521 of them were BUDI scholarship recipients)[10].

2.3.4 Hortatory Approach: Scaling Up Awareness

To enhance the research quality of the Indonesian universities, the government introduced a number of scaling-up policies:

a) Mapping of Indonesian universities research capacities was undertaken to create a comprehensive picture of the national research quality. The research performance is categorized as (a) independent (mandiri); (b) primary (utama); (c) medium (madya); (d) supervised (binaan). According to the Directorate of Research and Community Service (2013), the “Independent” category is assigned to universities that have implemented a quality assurance system in research management, have excellent research resources, and have very high outputs of research productivity with an international reputation. The “Primary” category is given to higher education institutions that have not produced a lot of internationally reputable research results but have good achievements in the research management systems. “Medium” category is awarded to universities with a lot of research

[10] LPDP Indonesian Endowment Fund for Education. 2017. *Annual Report* 2017.

output and fairly good research management system. “Supervised” category is assigned to higher education institutions that have only recently initiated their research.[11]

Thus, different groups of universities represent a different level of research capacity, and a number of indicators are used to assess it: research resources (human resources, infrastructure, facilities, and source of funding); research management; research output; research revenue; and research performance analysis. Table 2.4 demonstrates the growth of Indonesian universities’ research capacities over three time periods.

Table 2.4. Research Capacities of Indonesian Universities

No.	Period	Clusters (number of universities)				
		Mandiri	**Utama**	**Madya**	**Binaan**	**Total**
1.	2007–2009	10	22	71	291	**394**
2.	2010–2012	14	36	79	772	**901**
3.	2013–2015	25	73	160	1,219	**1,447**

Source: Direktorat Jenderal Penguatan Riset dan Pengembangan. 2016.

b) The Indonesian government also introduced a National Research Agenda (Agenda Riset Nasional, or ARN) as a main reference for the research development in the country. The document was prepared by the National Research Council (Dewan Riset Nasional, or DRN), an institution outside of the existing system established by the Indonesian government to explore stakeholders’ thoughts and views regarding the development of science and technology in Indonesia.

The ARN focuses on eight research areas: food and agriculture, energy, transportation, information technology and communication, defense and security, health and medicine, advanced materials and social humanities (Dewan Riset Nasional, 2016). These focus areas are designed so as to provide key guidance for research agenda at universities and research institutions. The Master Plan of National Research 2015-2045, for example, has been developed to comply with the ARN. By monitoring of the implementation of the research focus areas in local

[11] Directorate of Research and Community Service. 2013. *A Guide to the Implementation of Research and Community Service at Universities.* IX Edition. Jakarta: Ditlitabmas, Dikti.

regions, local governments are also encouraged to establish regional research councils (Dewan Riset Daerah, or DRD).

c) To scale up the awareness of research quality, the promotion of research for the benefit of industry has also become important. In 2018, Indonesia was ranked 45th (out of 140)[12] according to the global competitiveness index by World Economic Forum. Therefore, the government made a commitment to enhance the contribution of the research by creating an innovation-driven economy (Schwab, 2017). The synergy between the universities and industry will also be achieved through Inventor – Innovator – Investor collaborations, for example.

d) The government also focuses on streamlining of the research grant reporting. Previosly, any researcher who receive research grant from the government have to submit two reports: the research report and the financial reports. The problem is that the financial reports sometime is cumbersome and took more energy and time of the researchers to complete the reports. Otherwise, the researcher has to return the funding to the government. Now, with researcher only have to submit the output hey promised in their proposal such as publishable paper or else. This is the main point underlined in the Ministry of Finance regulation 106 (2016).

Administrative workload imposed on the researchers increases their burden and may disrupt research process. Complying with the demands of accountability, transparency, and security takes a good share of researchers' time. For example, in 2009, National Research Council (NRC) Report “Research Universities and the Future of America: Breakthrough Actions of Vital to Our Nation Prosperity and Security” stated that this excessive administrative burden may be costly and hinder efficiency of university research. Therefore, reducing excessive administrative burden is expected to have considerable benefits, such as lowered administrative costs and increased research productivity. In Indonesia, the modification of proposal requirements led to a two-stage application process: preliminary proposal and full proposal. The latter is submitted only by those applicants, who make it to the second stage of selection process. Additionally, uniform and consistent audit practices have proven to be helpful. The audit focuses solely on large expenditures (such as receipts required only for expenditures over a specified value) and

[12] http://reports.weforum.org/global-competitiveness-report-2018/country-economy-profiles/#economy=IDN (Accessed on December 26, 2019).

research output (publications), rather than administrative aspects of project implementation.[13]

2.4 Existing Challenges in Indonesian Higher Education Research Area

The first challenge Indonesian academic research faces is creating international collaborative publications. Data from Scopus database[14] indicate that in 2007 the proportion of collaborative publications of Indonesian researchers accounted for 69.48 percent of total indexed publications, but in 2016, the proportion decreased significantly to 29.08 percent. At the same time, the citations also decreased from around 19,000 (2007) to less than 3,000 (2016). However, a more systematic study is needed to understand the reasons of such decrease, when global tendencies point to the opposite trend. One reason behind this drop may be the increase of governmental protectionist tendencies in the research sector, such as the need for a permit to implement collaborative research with a foreign partner.[15]

However, the research trends show that Indonesia was ranked 7th in Asia with regard to the number of Scopus-indexed publications in 2018, and thus, below Malaysia and Thailand (see Table 2.5 below).

The second challenge concerns fostering collaborative research with industries. This is a classical problem in the Indonesian context, although university-industry collaboration trend seems to be improving. The Ministry of Research, Technology, and Higher Education encourages Indonesian academics to develop this kind of research through a specialized research scheme. A study conducted by Indarti and Wahid (2013) found three serious problems that need to be taken into account in this regard. The first is the problem of sustainability. The authors found that large part of university-industry collaborative research is not sustainable and framed within the short-term goals. However, without sustainability, fruitful collaboration cannot be fostered (Lee, 2000). Findings of Indarti and Wahid (2013) pointed out that although firms perceived joint research as relevant for their activities,

[13] National Science Board. 2014. *Reducing Investigators' Administrative Workload for Federally Funded Research*.
[14] https://www.scimagojr.com
[15] Explained by the Director of Intellectual Property Management from the Ministry of Research and Technology Ristekdikti, during the seminar at UGM. See https://www.ugm.ac.id/en/news/16298-government-to-tighten-research-permits-for-foreigners (Accessed on December 26, 2019).

university-based researchers did not become adequately involved with their industry partners. This created an involvement problem. Appropriate involvement through personal interaction is needed to build trust between both parties. Trust represents crucial condition for successful collaboration in situations, which are characterized by high level of result uncertainty (Schartinger, Rammer, Fischer, & Fröhlich, 2002). The study by Indarti and Wahid (2013) also found that the industry is frequently dissatisfied with the results of the research, which leads to quality and relevance problem. This may be because university-based researchers fail to appropriately identify real problems in industry. It is vital to strengthen the university-industry collaboration to ensure the relevance of the research for industry (D'Este & Patel, 2007).

Table 2.5. Article Citations Based on Country Ranks

Rank	Country	Documents			Citable Documents			Citations		
		2016	**2017**	**2018**	**2016**	**2017**	**2018**	**2016**	**2017**	**2018**
1	China	496397	534879	599386	484506	519764	569227	27450	1642037	399135
2	India	152760	154619	399135	140479	139901	152110	566777	310564	75947
3	Japan	130441	130823	131198	119966	120324	118409	650848	344505	75593
4	S. Korea	83157	83910	85725	79576	83910	79646	469089	254227	53132
5	Taiwan	37713	36757	36691	35668	34441	33455	201920	100992	22186
6	Malaysia	30334	32774	33295	29072	31115	31102	127306	68747	17348
7	**Indonesia**	**12429**	**20459**	**32456**	**11965**	**19948**	**31708**	**35967**	**27746**	**9710**
8	Singapore	21657	22372	22495	19577	20005	19903	207068	106933	23613
9	Hong Kong	18099	19660	21849	16492	17666	19571	151503	91576	21733
10	Pakistan	14787	17528	20548	14033	16443	18885	83725	54613	13842
11	Thailand	14887	16447	17943	13901	15364	16485	68557	35083	8581
12	Viet Nam	5866	6604	8837	5597	6252	7908	34761	21079	5741
13	Bangladesh	4395	5113	5533	4143	4775	5024	23826	14822	2922
14	Kazakhstan	3483	3588	3819	3354	3464	3606	9258	6598	1917
15	Philippines	3100	3377	3775	2851	3090	3398	19017	9615	2205

Source: www.scimagojr.com (Accessed on June 30, 2019)

Based on the research carried out during the REPESEA project as well as other research initiatives undertaken by the authors as well as based on their personal

experience with the state of the research capacities and infrastructure in the Indonesian public and private academic sector, we consider the following eight aspects to be crucial at institutional level. However, these should also be kept in mind, when developing research policies at national level, since at this level preconditions can be created for individual institutions to adopt them:

1. Formulating a clear vision for research
2. Developing a collective/institutional research roadmap
3. Improving research capacities
4. Allocating internal research funding
5. Designing an encouraging incentive scheme
6. Increasing international exposure and linkage of researchers
7. Fostering collaborative research with industries
8. Developing a comprehensive national and institutional system of Assessment of Quality and Impact of Research

1. **Formulating a clear vision for research** is very important, as this allows to derive a set of operational initiatives. However, translating an aspiration into an action plan is another challenge. It is essential to formulate a clear vision and solid operational policies at the institutional level. The vision should not be elitist, but instead, it should be the result of collective awareness. It is important to create a collective sense of belonging and research endeavors, a so-called "assertive participative governance" (Bland & Ruffin 1992). Only through this, the research culture can be cultivated across members of organizations. Then, well-planned and well-organized activities, or a roadmap is needed to achieve this vision.

2. **Developing a collective/institutional research roadmap** is critical for organizing research efforts at the institutional level. It is equally important to set a common ground that stimulates the interdisciplinary research. The research roadmap, in this context, could be considered "a policy document" that accommodates a variety of research interests and takes the national research agenda into account as a reference. A large team of academics from the institution should be assigned to develop this roadmap.

3. **Improving research capacities** is crucial, since research and writing skills, for example, are important for fostering a research culture. The capacity building can take up different forms; these can include research methods and writing

workshops, mentoring schemes, and other. These capacities equip researchers with skills necessary to compete at national and international levels alike. Another aspect necessary to consider is teaching load: private self-financed universities rely on tuition fees as a source of their income that helps to maintain an acceptable student-teacher ratios. In the Indonesian context, lecturers, generally, have limited or no opportunity to choose between a teaching or a research position. Community service, teaching and resource activities are typically called "three missions" (tri dharma), which should be carried out by every academic and are the main assessment components for the tenure. In many contexts, teaching burdens are considered the factors hindering academics from conducting quality research (Bako, 2005; Lewis & Simmons, 2010).

4. **Allocating internal research funds** is critical for sustaining the research activities both in public and especially in private universities. Various schemes with different focus and grant value should be developed. For example, a rule was introduced for some internal research schemes at UII that prior to submitting research proposal for internal funding, it should first be submitted for external funding. If external funding is declined, the proposal can be submitted for support from the internal scheme after revision. This subtle but effective mechanism helped the university to encourage its researchers to apply for external research funding.

5. **Designing a motivating incentive scheme** is equally important. Salaries of Indonesian researchers at universities are generally low compared to their colleagues in the neighboring countries, such as Malaysia. Salary increase typically undergoes a long administrative and a complicated decision-making process. The shift towards a merit-based incentive scheme is needed at both institutional and national (with regard to public universities) levels to create preconditions for growing research performance. It is important to introduce this scheme at the university level to avoid discrepancies and frictions, which might arise, if individual schools or departments have different incentive schemes.

6. **Increasing international exposure and linkage among researchers.** Real problems in today's world are complex and need a broader perspective. Hence, collaborative international research is important to provide more in-depth analytical perspectives, which can contribute to better performance of individual researchers and a research community as a whole. International research collaboration is crucial for improving research quality. The studies indicate that

research collaborations are interlinked with academic performance (Aldieri, Kotsemir, & Vinci, 2017) and research impact (Benavent-Pérez et al., 2012; Manganote et al., 2014). This is due to several reasons. First, knowledge exchange between researchers from different universities is important for improving the research quality. Second, enhanced publication quality will lead to higher numbers of citations, which are used as a proxy for research impact. Thus, researchers should be encouraged to network with reputable international universities and organizations, to pursue their graduate studies there, to participate at international conferences and to get involved in joint-activities such as organization of conferences, co-working, or co-authorship. Increasing internationalization of research requires substantial financial resources, which should be made available at national level on the competitive basis. In case of private universities, in particular, there is a need to direct institutional support into this area as well. It should be noted that international organizations can also provide their contribution in this respect, for instance, this paper was developed as a part of the project supported by the EACEA Agency of the European Commission.

7. **Fostering collaborative research with industries** is a standard problem in the Indonesian context, although the trend of the university-industry collaboration seems to be improving. The Ministry of Research, Technology, and Higher Education encourages Indonesian academics to develop this kind of research through a specialized research fund.

8. Developing a comprehensive national and institutional **System of Assessment of Quality and Impact of Research** is of crucial importance. Research is one of the most stringent sectors and should be consistently evaluated as part of assessing the quality of higher education institutions (Cabral and Huet, 2014). Moed (2011) states that research assessment is related to research quality, input, output and impact, and includes qualitative and quantitative methodologies. Moreover, research should be evaluated to facilitate higher education institutions observation and management; to understand their contribution to local, national and international communities; to underline the value of research to the society, stakeholders, and government, which can help them to reallocate funds to research that has the highest impact in the society and to learn which method and approach create the highest impact (Penfield et al., 2014).

The main research evaluation systems used in Indonesia are National Accreditation and BAN-PT. These accreditation programs focus on evaluating

academic activities that must be carried out by lecturers from higher education institutions in Indonesia, namely education, research, and community service.

In addition, prestigious international accreditations of business schools, such as AACSB, are pursued by many universities (including UGM, ITB, UI, and BINUS). The AACSB accreditation concentrate on assessing educational and other activities carried out by faculty members, which must be implemented in line with mission, vision, goals and objectives of the institution.

Carefully designed intervention strategies that take into consideration their context specificity can help the universities to progress in the right direction (The Task Force on Higher Education and Society, 2000). The insights presented above are meant to serve as an inspiration for the development of the context-sensitive intervention programs. However, first, a better understanding of the context and impact of the designed programs is needed.

2.5 Towards the Development of a Comprehensive Measurement System of Research Quality and Impact in Indonesia

There is not much agreement on how to measure research impact. Many previous studies point to the use of the number of publications (Vieira & Gomes, 2010) and citations (Benavent-Pérez, Gorraiz, Gumpenberger, & de Moya-Anegón, 2012; Manganote et al., 2014; Vieira & Gomes, 2010) as an indicator of research impact. Although these indicators may be effective for comparison, this approach is not prone to criticism, as it neglects the context in which university or country functions as well as other forms of research impact. At times, solving local or national problems through research activities and research outcomes may be more important than publishing the results. Traditionally, tracking the publications and citations has been the most commonly used method of research performance measurement. Nowadays both scholars and managers have realized that the use of a publication count provides a very simplified way of looking at the research outcomes; thus, there is a need to use a broader approach to assess the impact of research carried out.

Sound impact measurement helps to justify public spending on research activities and allows funding bodies to demonstrate that their own research policies are effective. It also facilitates the engagement of stakeholder communities in the dissemination of research outcomes. Additionally, private funding bodies need to

monitor benefits of the research, which they sponsored. Hanney et al. (2006) point out that the relationship between the evaluation and the strategic framework of a funding organization plays a key role in the design of a research impact assessment system. For example, if a mission of an organization is to generate new knowledge, then the bibliometric assessment of publication outputs may provide an appropriate way to measure the impact of research in natural sciences, engineering, and technical disciplines. They point out that in arts, humanities, and social sciences the measurement of impact should be based on a more complex set of indicators, since publication of research outcomes in peer-reviewed journals does not necessarily measure the impact. Also, the outlets in these disciplines are not well represented in most common bibliometric indexes. This is beause output sof these sciences such as scuplture, choreography, and research report to government to support policy formulation are not necessarily published in such peer-reviewed journal.

In fact, the term “impact” can be explained in different ways. In line with Morton et al. (2015), research impact is identified as changes in awareness, knowledge and understanding, ideas, attitudes and perceptions, policy and practice as the result of research. This is a broad definition, which points out to the need to look beyond academic publications, when focusing at research impact measurement. Also, a distinction between non-academic and academic impacts should be based on how the results influence academic, social and commercial environments. Also, time criterion is important – research impact can vary over time: one research may be important for the short-term perspective, while another for a long-term one. For example, short-term impact of research focusing on a current pressing policy issue can be substantial; yet, after a change in policy, the impact will probably diminish. On the other hand, a discovery of a new medicine can have relatively small impact from the short-term perspective, if the cost of producing it was high or it has not yet been approved for public use. However, from a longer-time perspective, the impact of research leading to the discovery of new medication can rapidly increase, if production methods improve, the cost of production falls, and it becomes widely accessible. These factors among others should be reflected in the design of the systems of research quality and impact measurement.

As it was mentioned above, academic research impact is traditionally measured by various bibliometric methods (e.g. H-index, number of peer reviewed publications and number of citations). Different methods have also been designed to allow assessing non-academic, socio-economic impact of research (for example, taking into account intellectual property registered and commercial income

generated by research). The Payback Framework (Wooding et al., 2007), which has been used in health sciences, or Australian Research Quality Framework (ARQF) provide examples of alternative approaches to the research impact measurement. The later one was based on case study approach, when researchers were expected to provide evidence of economic, societal, environmental and cultural impacts of their research documented as concrete examples. The evidence provided was verified by an expert panel. Individual types of research impact were compared across different disciplines. Though this framework has not been implemented in Australia, it served as an inspiration for the design of the Research Exercise Framework in the UK (Penfield et al., 2014).

After being published, the information generated by research enters public domains, is absorbed by relevant entities and can influence further development of the research field, and beyond (for example, the development of related economic policies). In most cases, this impact is not clearly visible; it cannot be linked to a specific piece of research and it is not possible to attribute it to authors who generated it (Wooding et al., 2007). If research is of applied character, it is important to understand, how new knowledge is transformed into a new practice or product. At this point bibliometric methods unfortunately fail. They provide an appropriate indicator of knowledge production for fundamental research, the results of which are typically published in peer-reviewed literature. On the other hand, applied research requires the use of a broader set of indicators, since its results are usually published in non-academically focused journals and take up other forms, such as new products, methods, and other. Yet, a focus on the use of a single method for both basic and applied research can lead to distorted results. Therefore, it has been suggested that research impact measurement would use a set of assessment methods, which would include indicators capturing relevant qualitative and quantitative information (Hanney at al., 2006).

Penfield et al. (2014) distinguish several categories of indicators, which can be used to measure the impact of research: (a) metrics – using indicators such as a number of jobs created as a result of a given research outcome, or profit earned as a consequence of research finding, number of papers published and others. These indicators are usually easily identifiable, and the outcomes of different research programs can be easily compared, but full impact of research is not comprehensively captured and recorded; (b) narratives describing the impact of research can be used to provide supplementary information to metrics; (c) surveys and testimonials on different aspects of research impact can provide additional information. However, they are time consuming and frequently difficult to gather, especially if the evidence is to be collected retrospectively; (d) citations of research

findings can be retrieved from academic and non-academic outlets. Citations can be used to show how findings are further used to develop new ideas or products. Systems of research impact measurement should allow comparability of research performance and impact across individual institutional units and different institutions at national and international levels for the purposes of international comparisons or international accreditation, and also across different disciplines. Appropriate information systems can be used for assistance, while existing software can be applied or adapted to facilitate the measurement.

Viable systems of research impact measurement should allow comparability of research performance and impact across different disciplines, individual institutional units and different institutions at national and international levels for the purposes of international comparisons or international accreditation. Appropriate information systems and existing software can be applied or adapted to facilitate the measurement.

As we have pointed out, a comprehensive measurement of research outcomes is not an easy task. While part of the research output can be easily measured and quantified by the number of patents or the number of publications produced, for example, other research outcomes are not easily quantifiable and the information is not easy to obtain, such as the number of lives saved as a result of discovery of a new medication or treatment. Also, research impact assessment systems can also vary depending on which stakeholders are to be informed, such as media, general public, accreditation agencies, funding donors, and others. The forms of research outcomes and their impact also vary across related academic disciplines. The impact of basic and applied research will also be different. In some disciplines, the research impact is more easily measurable, for example, applied research in technical sciences apart from publications might also lead to new patents, new products, or production methods. These innovations are then spread both locally and internationally. In such cases commercial and social value of research outcomes is relatively easy to assess. On the other hand, the impact of basic research is frequently hard capture and measure immediately after the research has been completed. Frequently, the impact of a specific finding becomes clear only after some time. Thus, if we only focused on assessing the short-term impact of basic research and link support and funding to it, we might jeopardize the progress of knowledge, since basic research without immediately recognizable impact would not be supported.

The policy-makers and administrators responsible for the development of the research impact assessment systems should understand that the measurement of the research impact is a complex matter, some research impacts are not easily

quantifiable and there is usually a significant time lag between the funding and the benefits coming from the research. However, it should also be understood that the systems of the assessment of research impact should not focus on the use of metrics only, but they should include also the narratives, which allow documenting the contextual aspects of the research impact. Also, it is crucial to interpret the results correctly and to pay sufficient attention to clarifying the meaning of individual indicators to stakeholders. Institutions, administrators, and researchers must have common understanding of the meaning of each category of the data entered. When the impact of a specific research on a measured variable is to be identified, the comparison of the situation *ex ante* and *ex post* should be provided. Also, the policy makers should understand the challenge to assess and compare the research performance and its impact across different academic disciplines. However, a generic system of measurement of research impact should also overcome a narrow disciplinary approach.

The REPESEA team developed a System of the Assessment of the Impact and Quality of Research (SAIQoR) using multiple indicators and methods to assess the impact of research in its complexity. This system had been developed as a generic one first, and then it was adjusted to suit the needs of different partner countries (Indonesia, Thailand, and Malaysia), different academic disciplines, and individual partner institutions. Thus, the REPESEA team with the lead of Indonesian partner universities prepared the adjusted System of the Assessment of the Impact and Quality of Research (SAIQoR) to reflect the specifics of Indonesia and Indonesian REPESEA partner universities in the research quality assessment system developed by the project consortium. This system is not only to be used by REPESEA partner institutions, but it is available for the use and inspiration by other Indonesian academic institutions and policy makers in the field of research and higher education. The Indonesian adjusted SAIQoR takes into account academic and non-academic impacts of research, which are measured using 20 quantitative and qualitative indicators. It was pilot-tested at Indonesian REPESEA partner institutions (UGM and UII) and subsequently finetuned to reflect the findings from its pilot implementation. Thus, the REPESEA team is confident that the developed system represents a viable alternative for measuring the quality and impact of research at institutional, department, and individual levels.

2.6 Conclusions and Discussions

Due to the measures introduced in Indonesian policy sector, the Indonesian research field has progressed in its development. Its current state should be considered when further focusing on enhancing its performance. Progress has been achieved with regard to increasing research outcomes, number of universities, and number of academic staff/researchers, with relatively substantial budget allocations for academic research.

Additionally, historical development of Indonesia has shaped the ways in which academics contribute to the development of knowledge, particularly through research. The reform of Indonesian higher education system since its post-independence shifted the basis and drivers of research from government agenda-based towards international exposure and technology-based research. The goals of Indonesian universities were also altered from merely teaching purposes to pursuing the status of a world-class research university.

However, the research and publication outcomes of Indonesian universities are currently quite low. At the same time, Indonesia has good research potential in terms of the number of universities and academic staff/researchers. This strength can be exploited to improve the research performance, as long as it is supported by other factors, such as incentives, grants, and opportunities for promotion that can motivate academics to do more research and publish in reputable journals. Furthermore, the changing of the research focus towards international exposure can contribute to shifting the paradigm towards more globally focused teaching and research-based education. This has become an additional driver for Indonesian universities to improve their performance and to put more emphasis on establishing reputation at the international level, but at the same time to remain rooted in local practices. To fully benefit from these opportunities, there is a need to implement a comprehensive system of measurement of research performance, research outcomes and their impact, which will not only take into account quantitative data linked to research publications and their citations, but also other forms of research impacts (often even of higher importance).

In Indonesia, many universities have been trying to raise their own standards of education and research by means of international accreditation. International accreditations, such as AACSB, focus on a variety of activities carried out by higher education institutions to implement their mission, vision, goals, and objectives of learning and research. These initiatives should be supported at

national level. They should also contribute to the achievement of the goals of Indonesian higher education development with regard to enhanced quality and internationalization.

The implementation of SAIQoR developed by the REPESEA team is actually in line with both national and international levels of accreditation. The elements of measurements proposed through SAIQoR such as research environment, publications and citations, non-academic research impact that includes social and commercial impact, as well as research capacities are also included in the accreditation systems. At the same time SAIQoR provides a systematic and comprehensive approach with regard to assessment of academic and non-academic impact of research and as such should be used as a tool for the research impact assessment at national or institutional levels.

3 ASSESSING AND IMPROVING RESEARCH QUALITY IN MALAYSIA

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Abstract

For more than three decades, Malaysian development trajectory has been deeply entrenched in economic wealth and ethnic context. As one of the critical parts of its ecosystem growth, the Higher Education Unit at the Ministry of Education (MoHE) introduced Malaysian Research Assessment (MyRA) in 2012. MyRA is a tool that fairly evaluates academia from diverse disciplines, embraces the needs for non-academic or social impacts, and integrates aspects of scholarly and industry-directed capacity building among the graduates. MyRA requires revision to be able to identify and assess non-academic impacts of the extensive research outputs. Additionally, MyRA does not effectively capture specifics of universities operation in different environments and individual demands of numerous academic disciplines. MyRA is skewed more to the sciences and their scientific and experimental findings. The REPESEA project proposes the System of Assessing Impact and Quality of Research (SAIQoR) that provides a tool for improvements, which are crucial at institutional level and in the development of research policies at the national level. There are four core evaluation levels of research assessment in SAIQoR. In addition, we propose adding an extra dimension, namely the measures for evaluation of research capacity building. The chapter lists all possible indicators, which could be used in Malaysian environment to move

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towards a holistic approach that would fit the system of Malaysian higher education. In a nutshell, this chapter advocates the use of SAIQoR as a supplement to MyRA in order to foster a research culture that would anchor competitive ranking, policy enhancement and inclusive transformation.

3.1 The Importance of the Existence and Use of the Research Assessment System

As it was mentioned in Chapter 2, research for economic and societal development is pivotal for the progress of both developed and developing regions in the world. Without doubt, science, research and development are key factors supporting innovation and economic development (Badinger & Tondl, 2003; Sterlacchini, 2008; Acs, 2002). The universities and research institutions are often seen as a part of the so-called innovation system in which the perpetuation and sustainability of innovative outputs are deemed essential for progress. These outputs inevitably become a part of established models such as the "triple and quadruple helix", which evolved out of earlier National Innovation Systems (NIS) (Freeman, 1987; Lundvall, 1992; Nelson, 1993). The triple helix model captures potential relationships between universities, industries, and government. The qualities of outcomes as well as relations between these three parties are critical for developing innovation and technological development of the economy (Etzkowitz & Leydesdorff, 2000). Academic research delivers different types of outputs and may lead to specific impacts of academic and social outputs.

Academic publications are traditionally seen as one of the most important outputs of research. Thomas et al. (2011) stated that academic publications are one of the most common indicators that can be used as a proxy for academic productivity and excellence. Despite the fact that publications only focus on academic impact and may not be fully related to business or public issues, there is significant number of studies that claim the opposite. For example, Orviska et al. (2019) found strong evidence that academic publications may eventually result in innovation and technological development of the economy. Similarly, Nguyen and Pham (2011) argue that academic publications have positive effect on a knowledge-based economy index. They analyzed articles published in international peer reviewed journals between 1991 and 2010 in East Asian countries and found that at the country level, the correlation between a knowledge-based economy index and academic publications was 0.94. The authors concluded that the results suggested the existence of a strong relationship between academic

research and the degree of the so-called “knowledgization” of the economy. Moreover, several other studies found evidence of positive effect of academic outputs on economy and innovation performance (see Stephan et al., 2007; Carayol & Matt, 2004; McMillan et al., 2014). Likewise, academic publications appear to have positive effect on industry. For instance, Herrera et al. (2010) confirm that scientific knowledge provided by public researchers has significant influence on both inputs and outputs of corporate innovation.

At the same time, scholarly impact will always be of most interest and importance to academics; yet, they do not operate in a vacuum detached from real world problems. Through their research and related social activities scholars can make fundamental contributions in generating practical solutions important for social development. Non-academic or social impact derived from the academic studies is essentially as “productive” as other academic outputs.

There is very strong evidence of these positive effects of academic research on related social activities outside academia. This therefore implies that good quality research is necessary to foster the innovation spirit and boost economic development.

Why and how to evaluate research impacts?

There exists however a problem: not all scientific activities can be supported equally as the sources of research funds are limited. This is true for both business and public sources of funding as individual and institutional researchers and groups compete to attain such funds. This situation compels the funding bodies to devise appropriate research evaluation tools that can help in identifying viable projects. These include accreditation process and the selection of excellent research teams, human resource management and setting up of the guidelines leading to professional growth. Since evaluation has become an important topic for researchers striving for comprehensive and viable projects, there is now more interest in addressing the evaluation of research outputs and their impacts. As such, there is now a need for a comprehensive system of assessing research quality in different research fields and in different countries.

The traditional approach of evaluation is often based on a somewhat small number of indicators. Assessment that relies on one or two specific indicators may provide limiting and biased results. Most assessments are often quantitative in nature They often tend to be rigid and focused at readily available measures only. On the other hand, qualitative assessments are often affected by certain levels of subjectivity. Therefore, several important steps towards more complex assessment have been made in many countries. Policy makers and regulatory bodies have

started provision of funding for researchers not only to generate academic publications, but also to contribute to non-academic impact including innovation enhancement, cultural understanding and implications, socio-economic development, and environmental sustainability. Hence, a more advanced system of research assessments is now expected to take into account non-academic impacts. The development of such system, however, is a rather complex issue. The system should include measurable indicators based on available data. Martin (1996) argues that evaluation of basic research is best carried out using a range of indicators. It would be beneficial to use indicators which are internationally acceptable and practical for the users. Furthermore, certain qualitative and quantitative measures have to be combined in order to achieve less biased or subjective results. Relatively high level of complexity is necessary, but time and costs devoted to preparing such assessment should also be considered. The aim of our project is to develop an organically holistic methodology, which would incorporate both quantitative and qualitative measures, for research assessment in selected Southeast Asian countries, including Malaysia.

3.2 Current System of Research Assessment in Malaysia

The process of research assessment usually consists of several necessary steps. These steps are into some extent similar in different assessment systems. In Malaysia the measure is constructed as ‘research process’ or ‘’guidelines for an effective process of research assessment’. Combining the various research assessments leads us to the following list that makes up research environment:

a) Context Analysis

Context can be assessed from the point of view of both internal and external environments. The internal environment of an institution that consists of its leadership position, support from top management, research strategy, staff and student mix, equality and diversity, research income and support, infrastructure and facilities, collaboration and contribution to the field (Adam et al., 2018) can become its strength or weakness. A strong leadership committed to research, for instance, usually develop a sense of direction towards international visibility, social value through good ethical practice and inspiring working climate (Schmidt & Graversen, 2018). In case of external environment, universities could apply established frameworks such as PESTLE (political, economic, social, technology,

legal, and environmental) and STEEPLED (social, technological, economic, environmental, political, legal, ethical, and demographic) in order to develop a clear mission, vision, and strategies for research. Researchers should be trained as home-grown, encouraged to endeavor studies that benefit their local contexts while the spillovers could be relevant to larger contexts of the globe. For instance, various nation-states in Southeast Asia are yet to find their place in the league of countries with high transparency index and good governance practices. Thus, Southeast Asian social scientists should search for and examine optimum solutions to the existing situations to improve societal wealth and well-being.

b) Clarity of Purpose for Research

A clear mission and strategy for research at university and department levels should give a sense of purpose in research activities. When funding organizations ask for impactful returns to specific stakeholders, researchers must be trained to identify their own reasons for pursuing research. Adam et al. (2018) outlined four purposes of research assessment (see Fig. 3.1).

Figure 3.1. The Four A's of Research Impact Assessment (Adam et al. 2018).

First, assessment can be based on advocacy, applied when an audit panel evaluate the needs for studies in specific areas. Research could also be assessed from the standpoint of accountability. In this case, researchers must be reminded that they must be responsible and accountable to the taxpayers, donors, sponsors or even crowd-funders who ask for social rate of returns or cost savings. Clarity of purpose that focuses on fund allocation could also play an important role in determining research performance. Can a research project provide returns

beneficial for environment, socio-culture, technological advancement or political economy within a specific context? Research Performance Excellence Framework (REF), for instance, takes these matters seriously in evaluating university research performance. Finally, it is crucial for novices and senior researchers to be able to do analysis of the contribution of their individual studies and connectivity with other past, current and future finding. Researchers need to upgrade their skills to be able to plan regional and international collaboration as well as to develop a strategy to maximize impacts.

c) Identification of Stakeholders and Their Needs

Research is not a personal priviledge. It is an informative action to produce something of a greater value for individual researchers, colleagues, their institutions, and other organizations and contexts. Hence, excellence in research at both institutional and individual levels heavily depends on satisfying priority concerns of stakeholders. They can be funders, research participants, the beneficiaries and research users. Researchers need to engage them as early as possible and communicate the progress as well as the results of the project before, during and after the studies are completed (Adam et al., 2018).

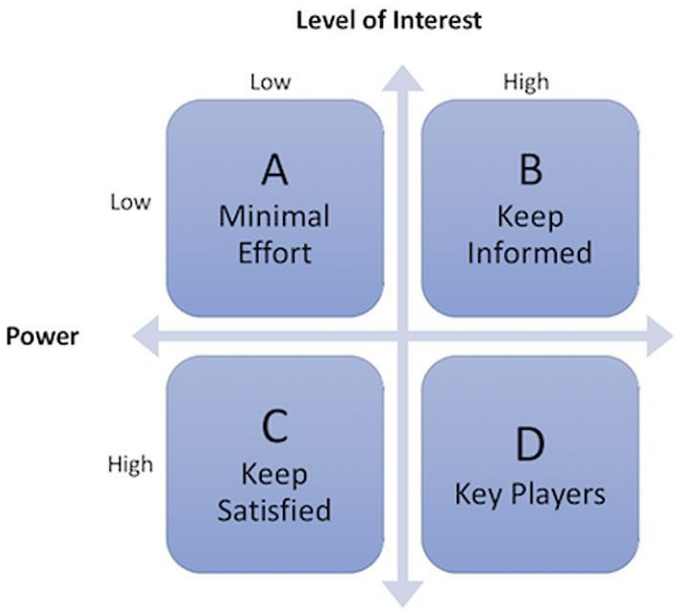

Figure 3.2. Mendelow Matrix for Analysis of Stakeholders (Adam et al., 2018).

With the growth of international collaboration and projects, it is pertinent for researchers to equip themselves with the right interpersonal skills and inter-cultural competence. The Mendelow Matrix is recommended to be used to manage stakeholders (see Fig. 3.2).

d) Stakeholders

With the recent trends of participatory and transparent research design, stakeholders are needed for advocating research and being a part of solutions ownership. They should be taken into consideration even at early stages of application processes. The Mendelow Matrix allows to analyze researchers' engagement with stakeholders on the bases of power, influence and/or interests. In case of a government-funded grant, for instance, the flow of information about a project progress is expected to be continuous and consistent as the government has a high level of interests and influence on the project. For projects with distinct social impacts such as those concerning environment, culture, and heritage, it is crucial that researchers invite stakeholders to participate before, during and after the studies. In this way, a feeling of ownership is promoted, social gaps are closed, and solutions are developed.

The main assessment system of research in Malaysia for higher education known as MyRA, or the Malaysian Research Assessment, is organized by the Ministry of Higher Education. This instrument in assessing the quality of research is applied at every university in Malaysia. It is a comprehensive system developed to assess the research capacity and performance of all Higher Education Institutions (HEIs) in Malaysia. Developed in 2006, its first objective was to meet the Malaysian Research University (MRU) agenda of the Ministry of Higher Education (MoHE). The aim was to identify five universities in Malaysia to be awarded the MRU status. Today, the MRU agenda is well enshrined in the National Higher Education Strategic Plan (PSPTN) 2007-2020, which is to elevate the standing of public HEIs with regard to world-class status and to create differentiated higher education scenarios to meet the socio-economic aspirations of the country while being aware of the limited resources available. Thus, MyRA was used to certify and monitor the research performance of public universities, but early in 2014, all HEIs in the country were mandated to participate in the annual assessment that coincided with MoHE's opening up of research grants to all public or private universities in the country. MyRA now includes a 6-star rating system and all participating HEIs are document-audited and site-audited by a panel

of trained auditors. All public universities are required to self-assess and submit MyRA data to the Department of Higher Education. MyRA is divided into nine sections (A to I) as shown in the Table 3.1.

Table 3.1. Description of Malaysia Research Assessment (MyRA) Instrument

	Description	Indicators
Section A	General information: the university provides data related to the number of academic staff and total number of fulltime students	Number of academic staff: a) Professors b) Associate Professors c) Senior Lecturers d) Lecturers
Section B	Provides details on the aspects of quantity and quality of researchers	Total number of academic staff involved as principal investigators: a) university founded b) nationally founded c) university/nationally funded d) international grants
Section C	Provides the details of the information on quantity and quality of research	a) Total number of publications in citation-indexed journals including the refereed ones b) Cumulative impact factor of publications c) Cumulative citations of publications d) Total number of publications in non-indexed journals e) Number of research books
Section D	Focuses on the number of postgraduates (Master and PhD by research field)	a) Total number of PhD graduates in a given year b) Ratio of PhD graduates to academic staff c) Total number in a year d) Ratio of PhDs enrolled to academic staff e) Percentage of PhDs enrolled in S&T
Section E	Elaborates on the quality of postgraduates	a) Number of postgraduates' intake with CGPA≥ 3.0 or equivalent b) Number of postgraduates' intake with CGPA≥ 3.0 or equivalent c) Percentage of postgraduates via research modes with fellowships/grants
Section F	Promotes innovation and intellectual property	a) Total number of patents granted (national, international) b) Total number of patents pending (national, international)

Section G	Details out income generation activities (through professional services) and gifts	a) Income generated from training courses (non-degree program)/post-graduate fees b) Income generated from consultancy excluding contract research c) Endowment (including professorial chairs) d) Gifts (money, equipment/ research materials, etc.) (worth ≥ RM5,000.00 each)
Section H	Lists all the networking and links succesfully forged by the universities	a) Total number of MOUs signed b) Total number of programs implemented under each MOU c) Total number of staff involved in joint research projects d) Total number of international students participating e) Total number of students sent abroad for training
Section I	Highlights all the support services available to the university.	a) Total number of laboratories (GMP/GLP/ISO17025/ GRP accreditation) in full operation and calibrated b) Total number of books /titles c) Total number of online books /titles

Source: Ministry of Higher Education, Malaysia

All indicators mentioned are taken into consideration in the MyRA. From an evolutionary perspective, MyRA also has limitations despite its strong implementation and objective measurement. Both strengths and limitations of MyRA lie within the criteria it uses to evaluate the research performance of Malaysian universities. The nine assessment criteria which MyRA addresses encompass the quality and quantity of research. MyRA is the instrument intended for universities to provide evidence of research excellence, to produce human capital of greater quality and to generate more impactful research beneficial for the society and country. Essentially, both researchers and their research processes and outputs are evaluated comprehensively based on the numbers as well as the superiority of the outputs. Within this approach, MyRA is regarded as inclusive and essentially able to assess academic rigor and excellence of universities and their researchers. One of the main evaluation factors is the publication strength which has now become one of the most important performance indicators for Malaysian academics where publication count is acknowledged as an indicator of research productivity. It is used to rank faculties and academic institutions, ascertain author's productivity or publication productivity of research groups (Norhazwani & Zainab, 2007). MoHE has recently necessitated Scopus and ISI

journals as the target for publication and such publications are accounted for in performance indicator of the public universities (Abu Bakar, 2010). MyRA facilitates the process of such evaluation.

However, as much as MyRA is credited for its comprehensive evaluation protocol, there are loopholes which call for improvement. MyRA does not identify strongly and assess non-academic impacts produced by the voluminous research churned out by universities. Impactful outcomes are not necessarily seen through numbers but, more importantly, as collective impact they bring to the community and the society. MyRA captures what has been studied and what has been published and cited from such research findings. However, it has not totally addressed the practical benefits that have been derived from such outputs. Detailed descriptions of research findings and contribution are not reflected well in MyRA. Neither are the peculiar features that universities have in operating in different environments and the specific demands of numerous academic disciplines. MyRA is skewed more to the sciences and their scientific and experimental findings whilst the social sciences and the humanities strive to find a path to schynchronize their existence vis-à-vis the sciences and engineering disciplines in order to validate their research output in more quantifiable and measurable means. This is where a more feasible measurement tool, which is expected to fill the gap of social impacts and academic nuances of the social sciences, is required. Within this approach, variations in research input, process and outputs could be measured appropriately.

3.3 Description of the Proposed System for Assessing Impact and Quality of Research (SAIQoR)

The integration of inputs from all partner and program universities in the REPESEA consortium resulted in creation of the instrument termed SAIQoR – the assessment tool that will incorporate the needs of all partner countries. The basis of SAIQoR is essentially current practices in the evaluation of research of all the consortium countries. Slovakia, United Kingdom, France, and Poland as program countries and Thailand, Malaysia, and Indonesia as partner countries in the consortium contributed their inputs in terms of the existing practices and possible improvements to them.

The rationale for developing SAIQoR as a research performance tool is to serve as an effective and efficient instrument in such contexts as Southeast Asia (SEA)

that strive to achieve societal development within a constantly dynamic political, economic, social, and technological landscape. These complexities raise commitment among researchers, social architects as well as policy makers in Southeast Asia to identify how to steer research performance best. In response to such issues, evaluation of research efforts becomes a necessity in order to understand whether we are doing the right things at the right time and with the right resources, policies, and systems.

Hence, SAIQoR represents a unique system of research assessment, which was created in order to overcome certain problems related to research assessment with the focus on selected ASEAN countries (Malaysia, Thailand, and Indonesia). SAIQoR is a complex assessment system that focuses primarily on the improvement of previous assessment methodologies. The system considers research environment, inputs, resources, outputs, capacity building, and researchers' impact. It is built upon the best practices with research assessment in several European as well as Asian countries. SAIQoR aims to combine international comparability with strong focus on local needs in the ASEAN region. Furthermore, it provides innovational approach to research assessment whilst preserving tradition and heritage. The focus of SAIQoR within dimensions mentioned is graphically represented in Figure 3.3.

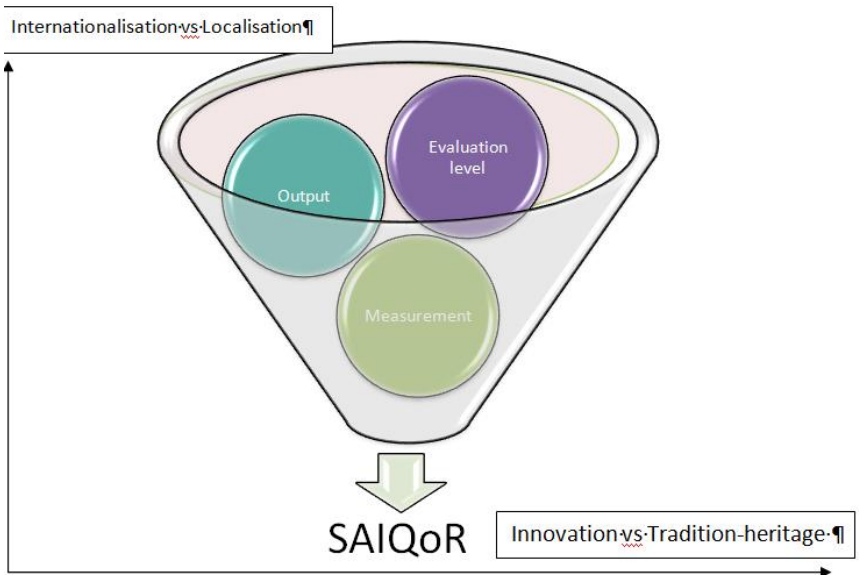

Figure 3.3. Focus of SAIQoR

There are several evaluation levels at which the research assessment can be done within the SAIQoR (see Table 3.2).

Table 3.2. SAIQoR Evaluation Levels

Evaluation level 1	**Research environment**	**Mission statement directed towards values, integrity**
Evaluation level 2	**Underlying research**	a) Funding
		b) Facilities
		c) Academic recognition
		d) Online presence
Evaluation level 3	**Publications**	a) Quality
		b) Ranking
		c) Journal list for ASEAN
Evaluation level 4	**Impact**	a) Business and industry community
		b) Government
		c) Environment
		d) Critical mass: - doctoral students - young researchers

Source: Authors

All four evaluation levels considered in SAIQoR are crucial elements of the research quality and impact. Some of them are more visible in a short-term perspective. Others are more or less measurable from a longer standpoint. Traditionally, institutions shape research environment for researchers and see publications as their main research output. Quality of the publications is still considered an important sign of overall research quality in certain universities. Moreover, SAIQoR also takes into account research impact outside the academia. Business and industry, government, environment, and critical mass were identified as four most important areas in which the impact of academic research should be present. The following sections describe the criteria with respect to evaluation levels.

3.3.1 Evaluating Research Environment

First, we focus on the assessment of research environment. The research environment embraces vision, mission, and infrastructure. These two sub-levels capture two different types of outputs related to environment and infrastructure-related strategies. We proposed several distinct criteria that should be taken into account during research environment assessment in Malaysian research institutions (see Table 3.3).

Table 3.3. Evaluation of research environment

Evaluation Level	Sub-level	Output	Criteria
Research Environment	Vision and mission	Environment-related strategies (values, integrity, equality and diversity)	Congruence of the institutional mission and vision with the development trends in the academia (with respect to the research concerned and postgraduate education)
			Reflection of diversity and equality in the strategies and policies of the institution
			Code of ethics and policies in place and the adherence to them
	Infrastructure	Infrastructure-related strategies	Availability of dedicated research facilities like conference rooms, teleconferencing rooms, science labs, or special research labs
			Organization of research conference within the university/school to disseminate research findings
			Established research department/unit to promote and coordinate research activities
			Established research management center to manage and support all research activities and funding
			Established quality department
			Established Center of Research Excellence (COE)

3.3.2 Evaluating Underlying Research

Further, the assessment should also include measuring of research inputs (see Table 3.4). We suggest universities to consider the number of grants, other funds received, total number of grants per capita and total grant value per capita.

Table 3.4. Evaluation of Research Inputs

Evaluation level	Output	Criteria
Research inputs	Nature of research (research grants, research facilities, academic recognition)	Number of grants – domestic – public institution, private institution
		Number of grants – international – public institution, private institution
		Funds received – domestic grants
		Funds received – international grants
		Total number of grants per capita (university level, faculty level and department level) – domestic
		Total no of grants per capita (university level, faculty level and department level) – international
		Total grants per capita (university level, faculty level and department level) – domestic
		Total grant per capita (university level, faculty level and department level) – international

3.3.3 Evaluating Publications

The next part of the assessment proposal focuses on outputs such as publications in impactful scientific journals, other publications, and citations. Journals indexed in Scopus and Web of Science databases are considered as impactful when included into Q1 and Q2 quartiles. Despite the fact that publications in these journals can be accepted as top-quality papers, there are also many other journals that should be comparable in quality with the top ones. Hence, we also recommend taking into account publications in other journals as well. The number of citations is another significant and traditional factor reflecting the quality of scientific papers. However, it is important to mention that citation counts are significantly affected by time. Hence, older good quality papers get generally more citations compared to more recent papers of similar quality. Other publications such as

books and articles in newspapers or teaching-related articles should be summarized separately. We also recommend incorporating a number of patents into the evaluation. The number of patents is often seen as a proxy for innovation activity. Patenting represent one of the ways how academia can directly transfer results of the research into practice. Despite the importance of this indicator for knowledge transfer, the results can be rather biased with respect to different research fields. Hence, this should be applied for natural sciences, medical, or biological sciences.

Table 3.5. Evaluation of Publications (and Other Academic Outputs)

Evaluation level	Output	Criteria
Research output	Publications: include articles in journals and conference proceedings	Number of publications in impactful journals (SCOPUS-indexed, WOS, Q1-Q2, national citation index)
		Number of publications in non-impactful journals
	Citation: according to Google Scholar citations	Number of citations
		Citations per capita of researchers who published
	Other publications	Number of other publications such as books, articles in newspapers, teaching-related publications
	Other research output within a specific discipline (for example, books on history, fine arts projects, paintings, music arrangements, dance choreography)	Number of research output (It would then depend on specific disciplines: for example, books on history, fine arts projects, paintings, music arrangements, dance choreography)
	Other research output such as number of patents, industrial designs (applicable to medical, biological, natural sciences, engineering)	Number of patents or industrial design (Number of patents: normally applicable to medical, biological, natural sciences, and engineering)

3.3.4 Evaluation of (Social) Impact

Assessment of social impact of a given research can be considered as the most important, but also the most challenging, part of the evaluation. As for this type of research impact, we distinguished it based on different subjects. First, we consider

the impact on government policy. This mostly means the influence and incorporation of results into specific government policies. We also consider the impact on communities, environment, cultural heritage, and business and industry. There are various types of indicators which to some extent reflect the research impact on all subjects mentioned. They include, for example, the number of projects related to certain issues, number of consultancies, memberships in advisory boards, number of contracts, and commercialization of intellectual property rights. The assessment of research impact outside the academia is a complex issue and require the usage of various quantitative indicators as well as a qualitative approach.

Table 3.6. Evaluation of Social Impact of Research

Evaluation level	Sub-level	Output	Criteria
Research impact	Impact on government policy	Specific government policies impacted (policy changes influenced)	Documented impact on the development of public policies
			Joint events with government institutions
			Number of public engagement events/contributions
			Number/value of consultancy services provided to public bodies
			Membership in advisory authorities/entities
		Publications translated into national policies, regulations, economic inputs and other	Publications and documented work on the policy development (consultancy for governmental institutions)
	Impact on communities	Communities program conducted, and participation in communities and NGOs	Number of community programs
			Number of expert panels for community agencies
			Number of staff participating in NGOs
			Number of entrepreneurs/industries benefitting or impacted

Evaluation level	Sub-level	Output	Criteria
Research impact	Nature and environment	Impact on improvement of nature and environment	Number of projects related to the improvement of nature and environment
	Culture and heritage	Impact on culture and heritage	Number of project/initiatives related to heritage conservation
	Impact on business and industry	Business and commercializatio n initiatives	Number of contracts with private/public companies from sale of products/services
			Value of contracts with private/public companies from sale of products/services
			Value generated from commercialization of intellectual property rights, patents, or trademarks
			Expert panels for businesses and commercial ventures or membership in boards of trustees
			Revenue from technology or knowledge transfer (for example joint venture)
			Number/turnover of start-ups resulted from research output
			Number/turnover of spin-offs resulted from research output
			Revenue from performance/exhibition/other
		Consultancy	Value of consultancy (national/international) – revenue generated by the consultancy
			Quantity (national/international) – number of consultancy projects

3.3.5 Evaluation of Research Capacity Building

In addition to four SAIQoR evaluation levels (Table 3.2), we proposed the criteria for evaluation of research capacity building, taking into account academics involved in research as well as the research outputs coming from undergraduate and postgraduate students. All indicators related to this issue are summarized in Table 3.7.

Table 3.7. Evaluation of Research Capacity Building

Evaluation level	Output	Criteria
Research capacity building	Faculty staff who are involved in research	Percentage of academic staff that actively engage in research (actively = producing research output)
	Research output from undergraduate students	Percentage of undergraduate students graduated with research thesis / independent studies / research output
	Research output from postgraduate students	Percentage of postgraduate / Master students who successfully graduated (graduated on time)
		Percentage of postgraduate / doctoral students (graduated on time)

Research capacity building is another important factor for providing good quality research. It is one of the prerequisites for the creation of research outputs with high impact in and outside academia. The percentage of academic staff actively engaged in research is an indicator capturing the research intensity at the institution. The engagement of students into research conducted at university can be seen as a support of research activities. However, it is even more important for selecting and shaping potential researchers.

3.4 Benefits and Limitations of SAIQoR for Malaysia

This paper advocates a vision toward a holistic approach in pursuing a healthy balance in research culture that fit the eco-system of Malaysian higher education. While we acknowledge the strengths of MyRA, perhaps extending the existing system of measuring research performance by finding the equilibrium between academic and non-academic impact could enhance institutional proactiveness. In

this paper, we focus on the future of global and regional higher education that is bound to be complex, interdependent, and volatile as it intersects with political, socio-cultural, and technological landscapes. In the Malaysian context, SAIQoR is positioned to supplement rather than duplicate or supplant MyRA. Relying on the critical realist paradigm, SAIQoR aims towards a continuous improvement of research leadership endeavors that benefit both academia and society. SAIQoR is based on a flexible and contextual methodology rather than a strict one-size-fits-all approach. Our pilot SAIQoR results across partner institutions of the Erasmus+ CBHE project in Malaysia, Indonesia, and Thailand prompted the following considerations:

- Individual Assessment vs Institutional Assessment: Each element is important for determining the whole value. SAIQoR can be used to measure research accomplishment of various units starting from the individual academic, research group, faculty, or school to the whole institution. On an individual scale, SAIQoR provides research progress of the smallest unit in an institution. When aggregated, these progresses build up an institutional performance. Nonetheless, the challenge of SAIQoR is to ensure that research administrators are able to balance their attention and power between the system, institutional goals, basic units, and individual researchers. While institutions need to achieve specific research performance, management and administrators must develop an effective mechanism to ensure no individual academics, schools or disciplines are side-lined either due to lack of performance, policy, or structural changes as well as institutional research focus (such as among sciences and non-scientific research disciplines).

- Yearly vs 3-5-year Time Frame: Repetition is commonly associated with rigor and resilience; probably due to this various assessments are done annually to ensure a steady growth of research impact. However, certain quality and impactful academic work such as publication in top-ranking journals as well as social research projects and capacity building process require a period of more than a year to identify its impact and success. For this reason, SAIQoR has the capacity to be used in institutional context that applies a time frame of three to five years. Thus, societal projects which impacts are hard to measure, are indirect and merit from longitudinal settings could benefit from ASRIQ. In a nutshell, institutions, either through top-down or bottom-up structure need to decide and understand what time frame fits best their condition. If the institutions aspire for reputation, branding, and ranking, then annual evaluation could be an effective solution. With this in mind, the infrastructure as well as other supporting resources must also be aligned toward such short-term repetitive assessment. Yet, SAIQoR is particularly suitable

for evaluations within a 3 or 5-year time frames as it focuses on social impact. In fact, institutional contexts that aim for deep cultural transformation may also require a time frame of five-year research evaluation practices, while a 3-year span can be applicable to institutions that focus on successful policy implementation.

- One Size Does not Fit All: When it comes to using a research performance tool to measure rate of accomplishment versus accomplishment in itself, the ability and capacity of institutions to reach a state of sustainable research culture vary according to their internal and external conditions. In achieving this state of equilibrium, what matters most is a consistent rate of growth of research talents (in terms of capacity building) and their accomplishment in generating quality and impactful research. It requires an evolutionary trajectory with some policy refinement and capacity building exercises. SAIQoR can be used as a tool to measure accomplishment based on specific goals of various universities. The benefit of SAIQoR is based on its principle of adaptability. Malaysian institutions that wish to adopt SAIQoR can flexibly adapt the measurement items (as well as develop a suitable weightage) depending on their size (large or small), age (new and mature), context, and vision.

4 CURRENT ISSUES IN THE ASSESSMENT OF RESEARCH IMPACT AND QUALITY IN THAILAND

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Abstract

In recent decades, there has been a rise of such principles as formal accountability, commercialization, and competition in research policies. A symptom of this change is the increasing reliance on performance-based assessment systems, not only with the aim to inform research funding agencies, but also to direct research activity towards goals connected with global competitiveness and measurable contribution to the knowledge economy. Nowadays, research is expected to be both academically meaningful and usable in practice. Hence, national research assessments play an increasingly significant role in providing accountability to policy makers, private funders, and civil society. This provides the rationale for the chapter, which aims to present the key principles and proposals when assessing the research impact and quality. At the same time, we provide an overview of the research assessment systems in Thailand and offer policy recommendations for further development. We recommend to address social needs, rely on the evidence and indicators that can incentivize the best research and publication practices, publish all research completely and transparently, implement fair assessment of teamwork, reward open research, fund research based on the research assessment criteria, support innovative ideas, and create a reasonable system that is feasible and not intrinsically contradictory.

4.1 Introduction to the Assessment of Research Impact and Quality in Thailand

National governments in different countries invest significant financial resources in supporting research activities. However, the need to ensure the rationale of public spending makes policy makers investigate the returns from public investments, including expenditures on science and innovation. The justification at a macro level for government support for research is that through the process of innovation, it can improve productivity and international competitiveness of economy. Nevertheless, the exact nature of these impacts and benefits that countries receive from investment in knowledge-generation sub-system are much less clear. With that respect, Morgan, Manville and Chataway (2017) pose important questions that remain valid in the current economic climate: "What does society get in return for this investment? Does this research improve the health and well-being of society? What is the nature or size of these returns, benefits, or, more broadly, impacts?" An even more fundamental question is connected with measuring the quality of research, in order to make public money channeled to these activities that really contribute to scientific development in the country. This provides the rationale for this policy paper, which aims to present the key principles and proposals when assessing the impact and quality of research, together with an overview of research assessment systems in Thailand, and policy recommendations for this country. It is important to take into consideration general socioeconomic conditions of the country as research assessment systems in developing markets vary from systems that evolved in developed countries, and the extent of progress in that area differs from country to country. In general, the common deficiencies in developing countries are connected to insufficient institutional arrangements, lack of political will, and bureaucratic culture.

4.2 Insights into International Competitiveness of Thailand

According to the International Institute for Management Development (IMD), Thailand's ranking in World Competitiveness was the 27th and 30th among 63 countries in 2017 and 2018 respectively. Although Thailand's ranking was not in the top ten, it was in the upper half of the list.

Table 4.1. World Competitiveness Ranking of Asian +6

Country	Period	
	2017	2018
Singapore	3	3
China	18	13
Australia	21	19
Malaysia	24	22
New Zealand	16	23
Japan	26	25
South Korea	29	27
Thailand	**27**	**30**
Indonesia	42	43
India	45	44
Philippines	41	50

Source: IMD[1]

4.3 Financing of Research in Thailand

The National Research Council of Thailand (NRCT) is probably one of the main sources of research funding in Thailand. Developing and improving the ranking of research of Thailand, creating a value-driven knowledge base, and developing local knowledge have been important goals of the NRCT over the past 50 years.

The funding granted by the NRCT is divided into three main categories which are:

1) Targeted Research Funding
2) Graduate Research Funding
3) MOUs Research Funding

[1] Reproduced from World Competitive Ranking 2018 versus 2017, IMD, Switzerland, https://www.imd.org/wcc/world-competitiveness-center-rankings/world-competitiveness-ranking-2018/ (Accessed on December 26, 2019).

To co-fund research, the NRCT has signed a number of MOUs with institutions in Europe and Asia such as Deutsche Forschungsgemeinschaft (DFG), the Japan Society for the Promotion of Science (JSPS), National Natural Science Foundation of China (NSFC), National Research Foundation of Korea (NRF), and Indian Council of Social Science Research (ICSSR). Therefore, Thai researchers have better opportunities to conduct research at an international level and receive funding from institutions from European and Asian institutions.

However, Thai researchers still have some limitations in achieving financial support. Table 4.2 shows the spending on research and development per country. Thailand spent almost the least among 11 countries. In 2016, Thailand spent 1,744 million Euros on research and development and 2,206 million Euros in 2017. The amount of spending includes both internal and external funding sources.

Table 4.2. Research and Development Spending[2]

Country	**2016**			**2017**		
	Million €	Percentage	Per capita	Million €	Percentage	Per capita
USA	407,814	49.19	1,261	448,790	51.91	1,377
China	189,069	22.80	0.13	203,058	23.49	0.14
Japan	147,180	17.75	1,158	128,550	14.87	1,013
S. Korea	54,016	6.51	1,053	52,039	6.01	1,011
India	16,296	1.96	0.012	16,296	1.88	0.012
Singapore	6,005	0.72	1,070	6,190	0.79	1,102
Malaysia	3,809	0.45	122	3,441	0.39	108
Thailand	**1,744**	**0.21**	**25**	**2,206**	**0.25**	**31**
N. Zealand	1,956	0.23	416	1,956	0.22	408
Indonesia	689	0.08	2.63	1,538	0.17	5.82
Philippines	334	0.04	3.23	334	0.03	3.18
Total	**828,912**	**100**	**5,111**	**864,398**	**100**	**5,059**

In addition, the research and development in Thailand was largely funded by the private sector (see Table 4.3). The second biggest R&D spending come from universities, yet, their total amount is less than half of that of the private sector.

[2] Reproduced from Secondary Data and Primary Data of Research Indices Handout of National Research Council of Thailand (NRCT) for the year 2018.

Apart from the total value of spending, the areas of the Research Fund are also divided into five major categories proposed by the Organization of Economic Co-operation and Development (OECD). They include basic research, applied research, experimental research and non-categorized. Table 4.3 shows the value of spending for those categories, and the research spending is identified by field of study proposed by OECD.

Table 4.3. Thailand Research and Development Spending Classified by Sector[3]

Description	**2016**		**2017**	
	Million €	Percentage	Million €	Percentage
Government Unit	239.85	15.02	158.73	6.70
University	**528.78**	**33.11**	**447.78**	**18.89**
State Enterprise	69.13	4.33	77.20	3.26
Private Sector	**749.50**	**46.93**	**1,664.38**	**70.20**
Non-Profit Organization	9.80	0.61	22.71	0.96
Total	**1,597.06**		**2,370.79**	

Source: NRCT[4]

4.4 Research Assessment Systems in Thailand

Based on the Thailand Development Research Institute (TDRI) data, there are three research assessment models (see Table 4.4):

1) Preliminary report
2) Adoption study
3) Impact study

[3] Reproduced from Secondary Data and Primary Data of Research Indices Handout of National Research Council of Thailand (NRCT) for the year 2017.
[4] https://www.nrct.go.th/scholar/mou and https://www.nrct.go.th/en/backgroud (Accessed on December 26, 2019)

Table 4.4. Thailand Assessment Models

Models	Assessment period	Assessed by	Assessed content
Preliminary report	Immediately after the completion of a research project	Head of research project or main author	Outcome and expected impact
Adoption study	3 – 5 years after the completion of a research project	NRCT and expert	Implementation of research results, outcome, and primary impact
Impact study	5 – 10 years after the completion of a research project	Expert	Analysis of profits and cost

Below a research, creative arts, and academic paper assessment system developed by the Thailand Development Research Institute (TDRI) is summarized in Table 4.5.

Table 4.5. Weigthing Criteria of Research Outputs

Research

Weight	Quality
0.125	Published in national proceedings
0.25	Published in international proceedings or TCI
0.50	Published in national journals that are approved by the National Education Standards and Quality Assessment
0.75	Published in international journals ranked by SCImago as Q3 – Q4 or published in international journals that are approved by the National Education Standards and Quality Assessment
1.00	Published in international journals ranked by SCImago as Q1 – Q2 or published in international journals that are approved by ISI

Creative Arts

Weight	Quality
0.125	Disseminated at institution or province level
0.25	Disseminated at national level
0.50	Disseminated in international cooperative project (for example, the Khon co-performed by Thai and Laos)
0.75	Disseminated in at least five ASEAN member countries
1.00	Disseminated in at least five countries that are not ASEAN members

Academic paper

Weight	Quality
0.25	Published at national level
0.50	Published at international level
0.75	Textbook or book approved by a qualified professor
1.00	Textbook or book used for academic position application or high-quality textbook approved by a qualified professor based on academic position application criteria

Source: RI[5]

The above research assessment system is a common practice generally found in the neighboring countries such as Malaysia and Indonesia. Therefore, the international academic and research collaboration between higher education institutions in Europe and Asia, led by ERASMUS, has been formed to produce the tool known as The System for Assessing Impact and Quality of Research (SAIQoR). The effectiveness of this tool made it standard for all institutions around the globe in assessing research impact and quality. Moreover, it guarantees the improvement of research quality. Hopefully and eventually, SAIQoR could also become a tool to eliminate the following limitations listed below.

[5] https://tdri.or.th/wp-content/uploads/2012/10/D2012014.pdf and http://www.surdi.su.ac.th/weight_QA.html (Accessed on May 12, 2019)

4.5 Limitations

The above facts and figures revealed potential issues Thai researchers face that limit their opportunities at both of the micro and macro level:

4.5.1 Micro Level Limitations

1) Teaching Focus vs Research Focus

Traditionally, many Thai universities focus on teaching rather than producing researches. According to the data provided by the Ministry of Higher Education, Science, Research, and Innovation, there are around 166 higher educational institutions in Thailand and less than 10 of those universities are classified as research universities. Many faculty members from different universities also mention the problem of teaching commitment as many universities focus on producing bachelor graduates. Therefore, many of the university assignments and tasks are aimed at teaching students rather than producing academic researchers. Moreover, producing a piece of research requires large financial efforts. The reward from doing academic research is perceived as small in comparison with financial gain from teaching extra classes.

2) Limitation due to the Application of the Same International Standards of Research Quality Assessment to Novices and Expert Researchers

A beginner's paper is usually rejected for publication as he may not appear as a well-known academic professional. For example, research A is produced by a young instructor and researcher working in one of the local educational institutions in Thailand. The research has a high possibility of rejection for publishing, which may discourage naïve researchers. However, if research A co-worked with someone who is well-known or probably has an academic title, such as Assistant Professor, Associate Professor, and Professor, they could obviously have better chance of getting their research paper published. This limitation does not only discourage young and naïve researchers but can also potentially damage both physical and mental health. Some of the beginners may give up and turn their backs on producing research projects.

3) Language Barrier

To qualify for the world-class research assessment, Thai researchers have to produce world-class publications in English. English is taught in Thailand as a foreign language, but it is not commonly spoken by Thai people on a daily basis. Therefore, writing research papers in English has become one of the main limitations. For example, a researcher B might be able to complete a research paper in probably six months if it was written in his mother tongue, the Thai language. However, this researcher might need to double the time from six months to one year in order to finish writing the research paper in English. If researcher B has zero or limited background knowledge in English, he will have to rely on translation service or depend on an English-speaking co-author. Unfortunately, by the time the researcher B could complete the researcher paper and get it published, the result might become outdated already.

4.5.2 Macro Level Limitations

1) Policy Support

The number of research grants from both government and private funding bodies and their value is quite limited. If compared with other countries, Thailand is ranked low by the number of grants supporting research projects (see Table 4.3). Moreover, current national research and development (R&D) budget was approximately 0.78 per cent[6] of the national Gross Domestic Product (GDP) in 2016 in comparison with Singaporean and Malaysian R&D of 2.2 per cent of GDP and 1.3 per cent of GDP respectively.

As a result, limited grants or funds could lead to reduced quality of research results. For example, if a researcher C wishes to develop an innovation to support an aging society in Thailand, a grant received may only help him to complete 60 – 80 percent of research.

2) Lack of Research Databases

One of the most common problems in conducting research is the availability and free access to data. In comparison with other developed nations, the

[6] According to worldbank.org (Accessed on May 12, 2019).

availability of access to the national and international data sources in Thailand is rather limited. With regard to domestic access, data sources from different ministries and institutions are often fragmentary. Moreover, many of these data sources are not up to date. As for international data bases, many of them are quite expensive and are only available to those universities or institutions which have large pool of financial resources to purchase or subscribe to these databases.

4.6 Possible Solutions

An inadequate system of evaluation entails numerous risks. Above all, it may not encourage scientists to study problems that are important to society. Moreover, research may be inadequately planned and carried out, which may lead to a lack of research reproducibility[7]. The results may not be available to the research community because they do not get published or are only selectively reported. This can become a reason for wasting the research funds, as they will not go to the best researchers, research institutions, or journals. Ultimately, it can demotivate potential and future scientists and discourage them from pursuing scientific careers or motivate them to manipulate the results. Altogether, it may lead to wasting the research potential of the country, whereas the appropriate incentives and rewards are aimed at improving all types of sciences and their societal value.

There are some key principles, which should be taken into consideration while developing a national system of assessing research impact and quality (Moher et al., 2018; Naudet et al., 2018):

[7] Research is reprodicible, if the same results can be obtained by different researchers applying different methods. According to Goodman et al. (2016) there are three basic types of research reproducibility: methods reproducibility (requires the provision of enough detail about study procedures and data so the same procedures could be exactly repeated), results reproducibility (enables obtainign the same results from an independent study using procedures, which are as closely matched to the original study as possible) and interferential reproducibility (makes it possible to draw qualitatively similar conclusions from either an independent replication or a reanalysis of the original study).

1) Addressing Social Needs

The system should focus on research which addresses significant social problems and needs. Therefore, a mechanism assessing whether a research helps the society is needed.

Policy suggestions for research policy makers:

- The contribution of the researchers and research institutions to both the local community and the whole society should be evaluated.
- It should be taken into consideration that in some of the sciences, the immediate and midterm societal impact can hardly be expected.
- As most of the bibliometric indicators do not assess such contributions, the research assessment should not be based on the bibliometrics only.

2) Relying on the Evidence and Indicators that can Incentivize the Best Research and Publication Practices

The elements of the assessment system should be chosen very carefully to promote the best practices, rather than the ability to deliver studies publishable in top-ranked journals.

Policy suggestions for research policy makers:

- The Journal Impact Factor (JIF) should not be to strongly emphasized in the assessment system.
- The strengths and limitations of different bibliometric indices should be understood by the policy makers, and indices which are eventually associated with better science should be chosen.
- The indicators should be chosen after the debate with the representatives of the universities, research institutions, and the local community.
- Open Access publications should be promoted.
- The respective indicators for assessing a scientist (RIAS) should promote research reproducibility, contributions to peer review, and sharing the methods and results.

Both the ease of collecting the RIAS and objectivity should be taken into consideration when developing the system.

3) Publishing Research Transparently and in Full Regardless of the Results

All the research should be published transparently and completely to reduce the problems of reporting and publication bias.

Policy suggestions for research policy makers:

- Research institutions should be rewarded for publishing all the research results either in formal publications, in Open Access repositories, or as preprints.
- Reporting guidelines should be introduced (both by the authorities and by the journals) to secure the transparency and completeness of the research results.
- The obligation of registering all the planned studies should be considered.
- The obligations regarding publishing complete results and data should depend on the research area, be feasible and justified (for example, different in case of clinical trials and in social studies).

4) Fair Assessment of Teamwork

As modern research is mostly collaborative, so finding fair ways to assess team endeavors is crucial.

Policy suggestions for research policy makers:

- A decision should be taken, whether all the authors appear in the citation matrix (in case of multiple co-authorships).
- International cooperation should be rewarded.

5) Rewarding Open Research

As open research is vital for enabling the research reproducibility, the research assessment system should promote the sharing of data, software, codes, protocols, materials, and other.

Policy suggestions for research policy makers:

- All the stakeholders (authorities, journals, funders, and academic institutions) should promote and reward open research.

6) Funding Research on Research Assessment Criteria

Research providing the evidence base for finding the best ways to assess science should be encouraged and funded.

Policy suggestions for research policy makers:

- As not only the research results but also the quality of the research is essential for the policy makers, funders, and society in general, funds should be provided for the publication, science and meta-research, which may help to find the optimal ways for assessing the science.

7) Supporting Innovative Ideas

Additionally, the studies without specific aims should be encouraged and financially supported.

Policy suggestions for research policy makers:

- Different models of evaluating a novel, creative, non-standard studies should be discussed, in order not to hinder them.
- Funders should support nonconventional studies and not expect an immediate return on investments in them (long-term funding should be provided).
- A special fund should be secured for such studies to allow creative and novel research.

8) Reasonableness

The system should be feasible and not intrinsically contradictory in order not to demotivate the researchers.

Policy suggestions for research policy makers:

- The system should not comprise indicators that conflict with each other (for example, RIAS and JIF based indicators).
- The system should not be overcomplicated.
- The system should be stable.
- While introducing a new system, researchers and research institutions should be given time to adopt it. If the requirements are too high, it may result in brain drain and outflow of scientists to the business.

9) Overestimating the Role of Internationalization

A share of the studies is aimed at and of interest only for the Thai people. Too much pressure to publish in the international journals can discourage researchers from conducting such research. Moreover, local stakeholders should be able to understand the research results.

Policy suggestions for research policy makers:

- Although international exchange of the research results promotes scientific development, the system should also promote publishing the results in the local language and in the local journals to make them available to local stakeholders.

There are two main ways of constructing national systems of evaluation of scientific units (Aagaard, Bloc, & Schneider, 2015; Kulczycki, Korzeń, & Korytkowski, 2017):

1) using the peer review by disciplinary panels: one of the best-known examples is British Research Excellence Framework, in which only selected outputs are evaluated

2) using the bibliometric indicators, whether publication or citation-based: the most common way of measurement of research outputs used, for example, in Poland. This model generates a more transparent evaluation and is more reliable than an evaluation based on the peer review, but it may lead to diminishing of outstanding contribution value so that many articles in lower impact factor journals may become more valuable than one paper in a very prestigious journal.

The research performance of scientific institutions is measured by various research outcomes, such as publications, research projects, organized conferences, workshops or seminars, and others. However, Kulczycki, Korzeń, and Korytkowski (2017) notice that contrary to the concept of performance, the concept of "excellence in research" indicates that only some parts of the performance are desirable. In fact, it is the excellence that should be rewarded in the opinion of most researchers and stakeholders, despite remaining difficulties in defining and quantifying such "excellence" (Arthur, 2015; Sunkel, 2015). Hence, not all the collected data are necessary to achieve the main goal of the system, namely the categorization of scientific units in terms of their research performance. According to the research made by Kudła et al. (2016), the correlation and regression results indicated that public universities that have received higher scores for teaching quality simultaneously have higher average scientific quality. The findings of Kulczycki, Korzeń, and Korytkowski (2017) highlight the fact that there is a high correlation between performance in terms of publications and a scientific potential of a given research unit. Hence, their recommendation is to transit from a system, in which the scientific units report all their metrics, to a system based only on the most important metrics that meet the requirements of excellence in research.

In the last years, there appeared many proposals (both on international and national levels) of how the system of research assessment should be improved and enhanced (see detailed description in Moher et al., 2018). There are two proposals that have been developed by different organizations on the international level: DORA (Declaration on Research Assessment) and Leiden Manifesto. DORA was presented in 2012 during the annual conference of the American Society for Cell Biology held in San Francisco (DORA, 2012). Leiden Manifesto was promoted in 2015 during the International Conference on Science and Technology Indicators in Leiden (Leiden Manifesto, 2014; Hicks, 2015).

There are other two documents, developed at national levels: ACUMEN (Academic Careers Understood Through Measurement and Norms) and Amsterdam Call for Action on Open Science. ACUMEN was developed through

the European research collaboration in 2014 which proposed guidelines aimed at understanding the ways in which researchers are evaluated by their peers and by institutions and ways to improve it (ACUMEN, 2014). Amsterdam Call for Action on Open Science was announced in 2016 during the conference "Open Science – From Vision to Action" in Amsterdam (Amsterdam, 2016). Their perspectives together with proposed solutions and potential limitations are presented in Table 4.6.

Table 4.6. A List of Most Recent Proposals for Assessing Science and Scientists

Problem stated	Current assessment system limitations	Proposed solutions	Potential limitations
DORA (2012)			
DORA points out the critical limitations of Journal Impact Factor which is used as the main indicator of the scientific output of individuals and institutions	Limitations of JIF: 1) citation distribution within journals is highly skewed 2) the properties of the Journal Impact Factor are field-specific: it is a composite of multiple, highly diverse article types, including primary research papers and reviews 3) JIF can be manipulated (or gamed) through editorial policy 4) data used to calculate JIF are neither transparent nor openly available to the public	DORA suggests not to use metrics as the quality measure for articles and scientists to make decisions about employment, promotion, or financing	The process of evaluation becomes more complex and requires additional skills from funding bodies and institutions. It can also be time-consuming.

Problem stated	Current assessment system limitations	Proposed solutions	Potential limitations
Leiden Manifesto (2014)			
Authors of Manifesto stated, that research evaluations that were once bespoke and performed by peers are now routine and reliant on metrics”	The consequence is the misapplication of indicators to the evaluation of scientific performance in the process of funding application, promotion, or hiring	The Leiden Manifesto is based on 10 principles: 1) Quantitative evaluation should support qualitative, expert assessment. 2) Measure performance against the research missions of the institution, group or researcher. 3) Protect excellence in locally relevant research. 4) Keep data collection and analytical processes open, transparent and simple. 5) Allow those evaluated to verify data and analysis. 6) Account for variation by field in publication and citation practices. 7) Base assessment of individual researchers on a qualitative judgement of their portfolio. 8) Avoid misplaced concreteness and false precision. 9) Recognize the systemic effects of assessment and indicators. 10) Scrutinize indicators regularly and update them.	The Manifesto question the assessment policy, but does not propose anything that can easily replace the existing measurements

Problem stated	Current assessment system limitations	Proposed solutions	Potential limitations
ACUMEN (2014)			
Discrepancy between the criteria used in performance assessment and the broader social and economic function of scientific and scholarly research	The following problems are pointed out to: (1) the evaluation criteria are dominated by mono-disciplinary measures (impact factors and numbers of citations) (2) many career decisions are informed by a routinized, operationalization of the notions of scientific quality and relevance" (3) the evaluation system has not been able to keep up sufficiently with the transformations in the way researchers create knowledge and communicate their research to colleagues and the public at large (4) bibliometric and quantitative scientometric indicators currently used to measure research performance do not produce viable results at the level of the individual researcher (5) the scientific and scholarly system is gender-biased	ACUMEN proposed "Guidelines to Good Evaluation Practices" (GEP) and prototype for a Web-based ACUMEN performance Portfolio. The ACUMEN Portfolio is a way for researchers to highlight their achievements and to present themselves in the most effective way. The main areas of academic assessment are: 1) Expertise – methods, areas of theory, etc. 2) Outputs – publications, patents, etc. 3) Impacts – citations, honors, etc.	Profiles are designed by the scientists on their own, which may lead to the situation when too much self-marketing is involved

Problem stated	Current assessment system limitations	Proposed solutions	Potential limitations
Amsterdam Call for Action on Open Science (2016)			
The document calls for "full open access for all scientific publications" and promotes an environment where "data sharing and stewardship is the default approach for all publicly funded research"	There is a strong need for cooperation, common targets, real change, and stocktaking on a regular basis for a speedy transition towards open science	Twelve action items removing barriers to open science have been included in this Call for Action: 1) Change assessment, evaluation and reward systems in science. 2) Facilitate text and data mining of content. 3) Improve insight into IPR and issues such as privacy. 4) Create transparency on the costs and conditions of academic communication 5) Introduce FAIR and secure data principles. 6) Set up common e-infrastructures. 7) Adopt open access principles. 8) Stimulate new publishing models for knowledge transfer. 9) Stimulate evidence-based research on innovations in open science. 10) Develop, implement, monitor and refine open access plans. 11) Involve researchers and new users in open science. 12) Encourage stakeholders to share expertise and information on open science.	Proposal developed with European Union but not equally agreed upon worldwide

4.7 General Policy Recommendation to the Thai Government

The Assessing and Improving Research Performance at Southeast Asian Universities or REPESEA is the project funded by ERASMUS+ Program, Capacity-Building Projects in the Field of Higher Education (E+CBHE). The project has the aim to improve and to build the capacity among the academic and research staff of selected countries in Southeast Asia. Thailand, in particular, could benefit from the project, especially the implementation of the 'System for Assessing Impact and Quality of Research' (SAIQoR) which could help to increase the capacity of research among the Thai academics. Moreover, the adoption of SAIQoR could also help Thai universities to measure their impact from research performance better, which could have a true impact on the national development. Therefore, below are some of the strategies recommended to the Thai Government.

4.7.1 Creating Awareness Among the Management of Thai Universities

The awareness should be raised among the management of different universities within different university networks. This could be done through the initiatives of selected Thai universities such as the International College of National Institute of Development Administration (ICO NIDA) and Burapha University International College (BUUIC). The awareness could also involve the adoption and adaptation of the 'System for Assessing Impact and Quality of Research' (SAIQoR for the measurement of research performance of individual universities.

4.7.2 The Council of University Presidents of Thailand (CUPT)

After creating the network of universities and the adoption of SAIQoR, the Council of University Presidents of Thailand, or CUPT, can be seen as another channel to raise the awareness of research performance measurement among the majority of Thai universities. As one of the aims of CUPT is to "set policy in the manner of actions or reflecting broad opinions in accord with beneficial issues or common problems among universities and offer a suggestion to the government, while issues that can be handled internally, will be processed in collaboration

among the network". Therefore, the role of CUPT can be seen as a catalyst to encourage SAIQoR adoption among Thai universities.

4.7.3 Related Institutions and Agencies

The awareness should also be raised among other institutions and agencies which may potentially influence the adoption among universities and influence the national policy agenda. Some of the institutions and agencies to be targeted are:

- National Research Council of Thailand
- Office of the Official Information
- The National Higher Education, Science, Research, and Innovation Policy Council
- Office of the National Economic and Social Development Council

4.7.4 The Ministry of Higher Education, Science, Research, and Innovation

Thailand has recognized that education, science, research, and innovation are some of the most important aspects for the development of the nation. The re-organization of the Ministry of Higher Education, Science, Research, and Innovation in 2019 can be seen as one of the biggest steps towards recognizing the importance of research performance. The Ministry of Higher Education, Science, Research, and Innovation could be regarded as a body that can promote research performance measurement system as part of the national policy agenda.

4.7.5 Timeline for the Implementation of Policy Recommendation for the Thai Government

Table 4.7. Policy Recommendation Implementation **Timetable**

Tasks	Duration (month)								
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
1. Creating awareness among the management of universities									
• Building of network among research universities	■	■							
• Building of networking with other universities	■	■	■						
2. The Council of University Presidents of Thailand									
• Raising an issue with the Council of University Presidents of Thailand		■	■						
• Developing CUPT agenda / recommendations			■						
3. Alignment with other institions and agencies									
• National Research Council of Thailand			■						
• Office of the Official Information Commission			■						
• The National Higher Education, Science, Research, and Innovation Policy Council				■					
• Office of the National Economic and Social Development Council				■					
4. Ministry of Higher Education, Science, Research, and Innovation									
• Raising awareness in the Ministry of Higher Education, Science, Research, and Innovation					■	■			
• Development of national agenda						■	■	■	■

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Policy Implications

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