Perceptions of Research Excellence in Thailand and Japan†

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Abstract

This paper explores how research excellence is perceived among researchers in Thailand and Japan with an aim to explore whether there are any new indicators that could later be proposed and adopted as criteria of excellence. Based on a questionnaire survey, the findings reflect ideas and viewpoints that could be found among researchers in both countries. Creative researchers are crucial to a strong national research and innovation system. Institutions should provide an environment or incentives based on research performance for their researchers to flourish and be productive. For decades, bibliometrics have been used to evaluate individual research performance for its easy approach and faster speed than a qualitative assessment would warrant. Nonetheless, there have been a number of studies on research performance evaluating systems that point out how a purely bibliometric approach is inadequate in summarizing the quality of the scientific performance. The pressures on researchers today influence their thinking and oppose their creativity. To investigate the perception of research excellence, three key research questions were set in this study: what counts as excellence, how to measure excellence, and how to support excellence. The findings confirm that traditional granting criteria that frames an idea of excellence remain valid, but they also suggest novel criteria be considered and prioritized. This paper argues that the existing evaluating system is insufficient for unleashing the curiosity and creativity of researchers and fostering excellence. In the final section, the paper discusses factors that contribute to scientific creativity that we should not overlook.

Keywords
research excellence, perception, creativity, indicators

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1. INTRODUCTION

Discerning what counts as "research excellence" is a critical challenge for academics around the world. Over the past decade, many science, technology, and innovation (STI) policies have been established to promote good science for society. Incentive policies to promote research and development (R&D) participation in the private sector or governmental policies that promote new developments in university-industry-government relationships all have societal goals in mind as much as scientific. Nonetheless, if without "excellent" scientists, these policies could hardly achieve their goals of delivering good science and/or research to society.

In the early years, the Organization for Economic Co-operation and Development (OECD) was influential in developing international standards for R&D measurement and in stimulating and improving input and output measurement for R&D and other services (Freeman, 2009). This was further developed and expanded into the Key Performance Indicator (KPI) system used in many research and academic institutes in Asia. Within the past decade, bibliometrics have been used to evaluate individual, team, and institutional research because of its ease and speed compared to qualitative assessment by experts (Sahel, 2011). Sahel's study of quality versus quantity reflects a vital view that bibliometry tends to be applied in excessive and incorrect ways, particularly when used in standalone analyses. In addition, many recent studies also point out academia's obsession with quantity (Fischer 2012, Loyola 2012, and Halme 2012).

The pressure on scientists today influences their way of thinking and goes against their creative thought processes (Loehle, 1990). These pressures include but are not limited to hunting for grants, teaching, publishing, and transferring knowledge to industry. As a result, these activities would leave the researchers less time to think and be creative. There have also been many studies on the relationship between productivity (publications), social arrangement and engagement, reward structures, and organizational context in scientific research (Heinze, 2009). Selected indicators of scientific research were surveyed by different scholars. For example, a survey by Aksnes and Rip (2009) examined researchers' perceptions of citations. It was carried out based on a questionnaire survey that investigated perception about citations that could be found among Norwegian scientists who had published oft-cited papers.

† This study is based on the project entitled "Unleashing Curiosity and Creativity" undertaken by the Global Young Academy Working Group (www.globalyoungacademy.net). The survey of the case of Thailand was partially sponsored by the National Science and Technology Development Agency. An earlier version of the first phased survey in Thailand was presented at the symposium entitled "Shaping the Future of Young Academies" on November 1, 2012, Dutch Young Academy, the Netherlands. (http://www.dejongeakademie.nl/Pages/DJA/34/403.bGFuZz1FTkc.html). To complete this study, the authors are grateful to many scientists/researchers both in Thailand and Japan who took their valuable time to complete our questionnaires. We would like to also thank Dr. Martin Dominik, University of St. Andrews, for his great comments and advice in developing the questionnaire, Dr. Rob Jenkins, University of York, for his idea that helps framing the open ended questions and Dr. Miwa Satoshi, Tohoku University, for his effort in analyzing the early raw data from Japan. Finally, our works would not have been accomplished without help from Rachot Tanthasuraseth on his Japanese-English translation of raw data in the 2nd phase survey.

In another case, Heinze and Shapira (2009) explored institutional and organizational influences on creativity in scientific research. The investigated influences included but were not limited to leadership, funding structures, and competitive pressures under Heinze's study. Youtie, Shapira, and Rogers (2009) carried out a similar study examining approaches for constructing a comparison group relative to highly creative researchers in the U.S. and Europe in two different technological fields, namely nanotechnology and human genetics.

However, despite the number of studies carried out over the past decade, many questions remain as to what true excellence is, how we can identify it, in what situations it occurs most often, what factors influence their manifestation in performance, how to foster it, and finally, whether the existing performance evaluation criteria are adequate in unleashing *curiosity* and *creativity* of scientists.[1] Thus, in order to explore what true excellence is and how to foster it, our research team investigated a group of scientists' perceptions of research excellence as a part of a project initiated by one of the Global Young Academy (GYA) Working Groups. The purpose of this study partially corresponds to the GYA working group's goal, which is to explore and investigate how "research excellence" is perceived among scientists from developed and developing countries.

Thailand and Japan were selected to run this precursor study for a number of reasons. First, during the General Assembly GYA in 2012, there were two groups of researchers from Thailand and Japan who happened to volunteer for this precursor study. Second, both countries have already established national young academies. The National Young Academy (NYA) is independent from the GYA but shares a common goal, which is to promote the career paths of young scientists in his or her own country. The NYA in Thailand and Japan could therefore be a good source for reaching out to the targeted community. Third, considering the wide socioeconomic gap between these two countries, the ways in which the targeted groups from both perceive research excellence similarly or differently was worth exploring. Finally, in mind of the time constraints of the project, the research team preferred to focus on countries whose representatives already understood the concept of the project.

This study begins by reviewing literature related to the existing grant criteria of the relevant funding agencies and introducing the research methodology. Second, we discuss in detail the results from the first phased survey in Thailand. This part is divided into three sections, namely the characteristic of respondents, the criteria of excellence, and the necessary support for excellence. Third, we provide the results from the second phased survey in Japan. Since the target population of this second phase is relatively small, the discussion is therefore limited. The next section provides a comparative analysis of data derived from both country cases, demonstrating how the targeted scientists perceive the concept of research excellence in Thailand and Japan.

[1] These questions were raised during the Global Young Academy (GYA) General Assembly in Johannesburg, South Africa, in May 2012. This study is a part of the GYA Working Group Project entitled "Unleashing Curiosity and Creativity." This project aims at investigating perception of scientists regarding research excellence.

Although the findings of this study do not statistically represent a collective and conclusive perception of scientists in these two countries, the respondents' answers and comments offer the first systematic glimpse into how a young generation of scientists in the two cases perceive the concept of research excellence. A larger scale study has been scheduled to be carried out at a later stage, as put forth in this study's final recommendation section. Finally, we propose policy recommendations and tasks anticipated for the near future.

2. RESEARCH FRAMEWORK AND METHODOLOGY

The project is divided into two phases. The first phase of the precursor study was conducted at the National Science and Technology Development Agency (NSTDA) in Thailand from July – October 2012.[2] This first-phase survey was conducted online and divided into three parts: 1) personal information, 2) ranking and open-ended questions, and 3) close-ended questions of selected items for rating. The most critical part of this survey is the findings in the second part, where target respondents were asked to rank and nominate scientists who were examples of excellence within and outside the organization, and then to provide a detailed explanation of their nomination criteria.

During the first phase this study went through five main steps, namely literature review, brainstorming of a focus group, organization-wide survey, data analysis, and brainstorming for practical implications as well as recommendations for further study. With respect to the first step, analyses of existing grant criteria from research funding agencies both domestically and internationally was conducted to guide the coding process for open-ended questions. The reviewed grant criteria were drawn from such world-renowned funding agencies as the National Science Foundation (USA)[3], the Research Council of the United Kingdom (UK)[4], and the Research Excellence Framework (UK)[5]. As for the funding agencies in Thailand, the reviewed grant criteria were derived from the Thailand Research Fund (TRF)[6], the National Research Thailand Council (NRCT)[7], and the National Science and Technology Development Agency (NSTDA). The grant criteria could be grouped into three categories: intellectual merit, social and economic contribution, and personal qualifica-

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[2] Since this project is an initiative of GYA, GYA members nominated a targeted scientific community. NSTDA was nominated for three main reasons. First, regarding population size, the approximately 400 Ph.D. graduates within four different fields of specialties (biotechnology, electronics and computer technology, metal and materials technology, and nanotechnology) were a good size to run a pilot survey. Second, this qualitative survey is relatively new in Thailand, and an organization wide-survey within one organization would be useful for management purposes. Finally, NSTDA is well equipped with a policy research team with years of experience. The second phased-survey in Japan would take less time since the survey questionnaire was already put in place by the policy team at NSTDA.

[3] National Science Foundation: Grant Proposal Guide URL: http://www.nsf.gov/publications/pub_summ.jsp?ods_key=gpg

[4] Research Council of the United Kingdom URL: http://www.rcuk.ac.uk/research/Pages/grantstcs.aspx

[5] Research Excellence Framework URL: http://www.ref.ac.uk/panels/assessmentcriteriaandleveldefinitions/

[6] TRF Grants: URL: http://www.trf.or.th/index.php?option=com_content&view=article&id=51&Itemid=131

[7] NRCT: URL: http://www.nrct.go.th/

tion. These are shown in Table 1.

TABLE 1. Grant Criteria From Selected Funding Agencies

Intellectual Merits	Social and Economic Contribution	Personal Qualification
- Advancing knowledge in own fields - Advancing knowledge across fields - Demonstrating creativity/originality - Demonstrating awareness of wider environment/context of the research - Demonstrating awareness of social and ethical implications of the research - Offering potentially transformative concept - Conducting research that has critical edge, cutting edge, excitement, risk, power, or emotion - Having substantive empirical findings/ contributing to building of theory - Having theoretical-based and research-based innovation - Producing research with systematic and rigorous research methods	<u>Society</u> - Active public engagement at international level - Active public engagement at national level - Active public engagement at local level - Conducting developmental research/applied research - Producing research with policy implications <u>Economics</u> - Having licensed or commercialized the research - Having prototype/patent applications <u>Research community</u> - Promoting teaching, training, and learning - Enhancing infrastructure for research and education - Producing research that has implications for teaching and practice - Broadening the participation of underrepresented groups	- Producing internationally scientific publications - Producing nationally scientific publications - Receiving fellowships/Scholarships/research grants - Having sufficient access to resources - Having professional networks within discipline - Having professional networks beyond own discipline - Having widely published results (academics, and non-academics for research outcomes) - Managing profession collaboration - Ensuring curation, management, and exploitation of data for further use - Having transferred knowledge and technology to research, business, or local communities

Source: National Science Foundation, Research Council of the United Kingdom, Research Excellence Framework, Thailand Research Fund, National Research Council of Thailand and National Science and Technology Development Agency

Upon the completion of the literature review, a meeting of a small group of selected researchers was arranged to brainstorm the scope and direction of the study's open-ended questions. Then a pilot survey was conducted on a small community for feedback and further revision. The original survey questions were subsequently revised and officially distributed organization-wide on August 2012. The collected data were then coded and analyzed, followed by the writing up of results and recommendations and implications for future research.

For the second phase (or the Japan study), the study was conducted slightly differently from Thailand's. Instead of focusing on only one institution, the team launched an online survey across several different institutions in Japan. However, for comparative purposes, the selection criteria of target communities remained the same, focusing on a community of researchers and scientists with doctoral degrees and years of work experiences.

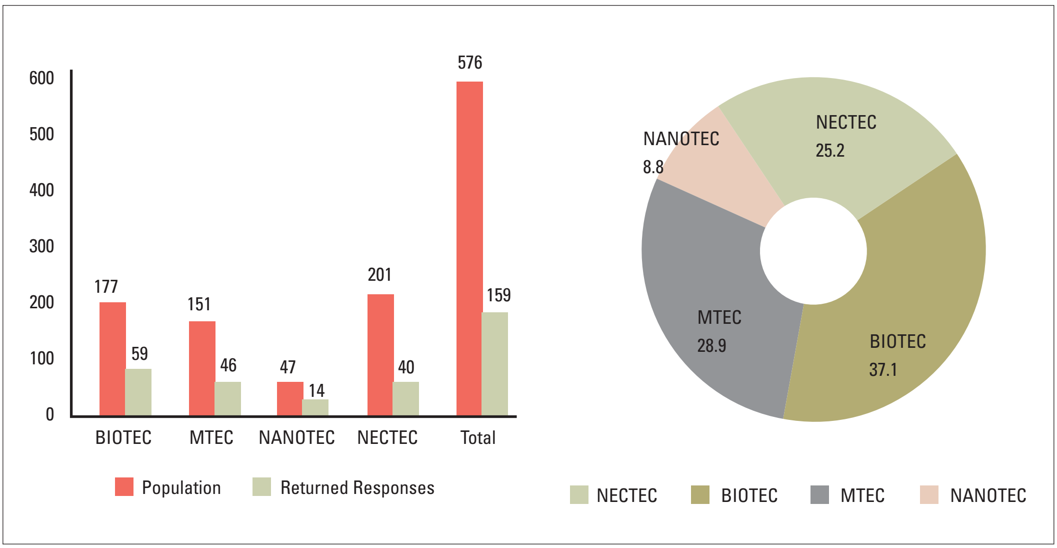
3. RESULTS OF THE SURVEY IN THAILAND

Results of the survey are divided into three parts. The first part describes the characteristics of the respondents, namely their research center, research fields, gender, age, education, awards/grants received, job profile, and work experience. The second part reports on the criteria that the respondents associated with excellence. The final part provides the description of the kind of support the respondents needed for them to achieve excellence.

3.1. Characteristics of Respondents

The target population for this survey was 576 research staff members in technical fields or in the so-called role profile 2000, ranging from Personal Grade (PG) 15-21[8] out of 2,660 employees at NSTDA. 159 people of 576 (or 27.6%) responded to the invitation to complete the online survey and these can be further broken down into four groups (by the four national research centers within NSTDA, with fifty-nine from the National Center for Genetic Engineering and Biotechnology or BIOTEC (37.1% of the total responses), forty-eight from the National Metal and Materials Technology Center or MTEC (28.9%), forty from the National Electronics and Computer Technology Center or NECTEC (25.2%), and fourteen from the National Nanotechnology Center or NANOTEC (8.8%).

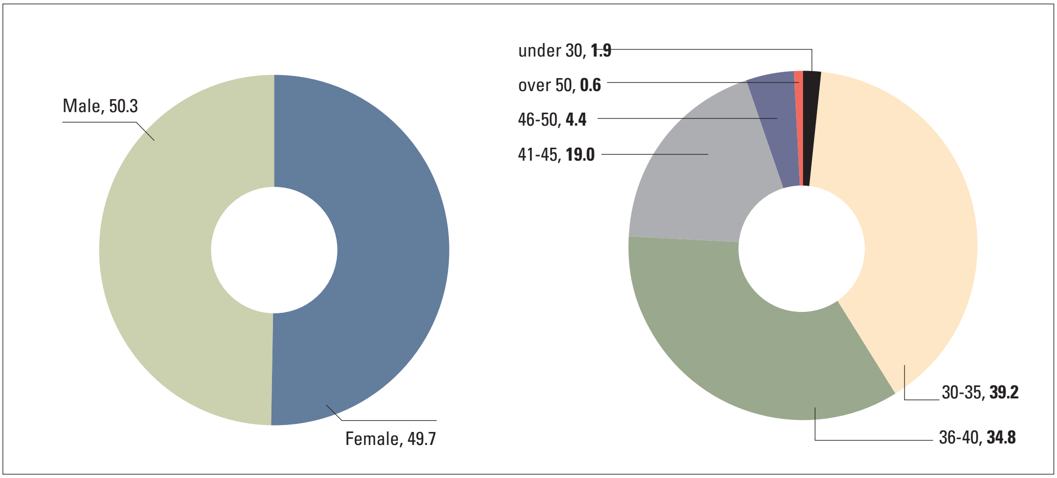
FIGURE 1. Population and Returned Responses



[8] At NSTDA, there are six role profiles. Each role profile has its own Personal Grade (PG). PG is a personal job profile, with the higher number indicating higher professional seniority for various job titles such as technician, engineer, junior/assistant researcher, researcher, senior researcher, and research unit director.

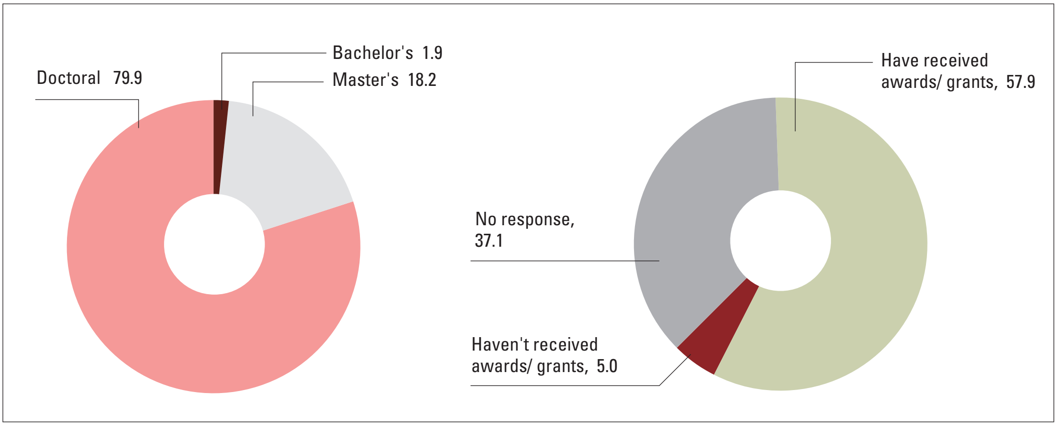
In terms of demographics, there was no gender difference in the number of respondents, with 50.3% being male and 49.7% being female. However, age groups varied, with the top three groups 30-35 years old (39.2%), 36-40 years old (34.8%), and 41-45 (19.0%), as indicated in Figure 2.

FIGURE 2. Respondents by Gender and Age



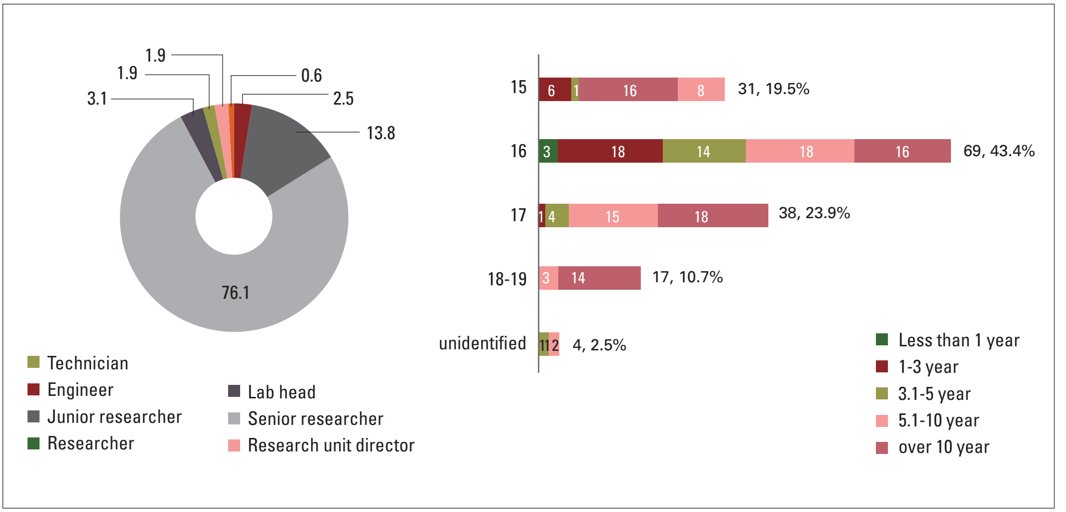
In terms of level of education, most of the respondents (79.9%) held a Ph.D. degree. Moreover, when asked if the respondent had received a research award or grant, over half of them (57.9%) reported having done so, while 37.1% chose not to answer. Only 5.0% had not received an award or grant as shown in Figure 3.

FIGURE 3. Respondents by Education and Research Awards/Grants



For job profile/title, most of the respondents (76.1%) were in the researcher category. Only 13.8% were junior/assistant researchers. Most respondents with PG 15 status reported having over five years of experience while roughly half of PG 16 researchers had over five years of experience[9]. Also, as for PG 17 and up, most had more than five or even ten years of experience. The details are shown in Figure 4 below.

FIGURE 4. Respondents by Job Profile and Work Experience

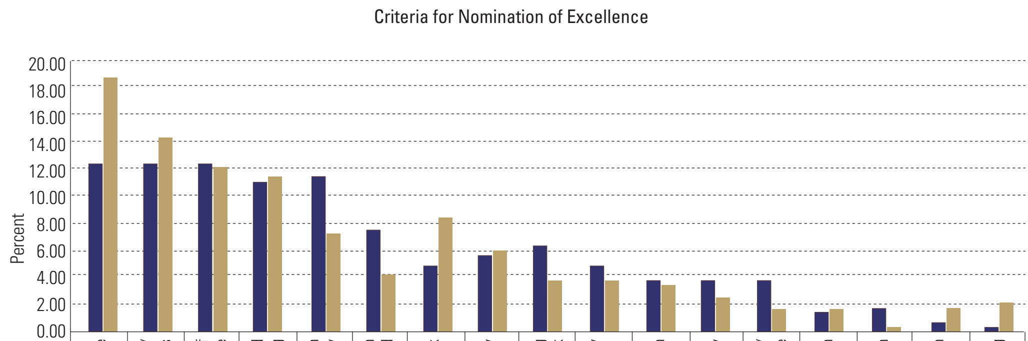


3.2. Criteria of Excellence

In this survey, respondents were asked to rank three researchers/scientists at NSTDA and three researchers/scientists outside NSTDA whom they would like to nominate for a professional award in research, with the first nomination being "the most preferred." At least one nomination was required. The goal was to uncover the characteristics of excellence the respondents deem important in their peer or colleagues without focusing on themselves.

[9] The reason a PG 16 employee may have less experience than a PG 15 (which is a lower title) is that upon entrance an employee with a Ph.D. in a technical field often automatically obtains PG 16 status.

FIGURE 5. Criteria for Nomination of Excellence for Researchers/Scientists Inside and Outside NSTDA (N=723)



	Expertise	Academic/ research merits	Recognition of excellence	Management and planning	Engagement with society	Engagement with industry/real world	Teamwork	Continuity	Having outstanding work	Creativity	Devotion	Integrity	Efficency/ performance	Inspiration	Value to organization	Communication	Risk Taking
NSTDA	12.15	12.15	12.37	10.87	11.09	7.25	4.48	5.33	5.97	4.48	3.62	3.62	3.41	1.07	1.49	0.43	0.21
Outsider NSTDA	18.50	14.17	12.20	11.02	7.09	3.94	8.27	5.91	3.54	3.54	3.54	2.36	1.18	1.18	0.00	1.57	1.97

As shown in Figure 5, the top five criteria applied to the nominations of researchers/scientists within NSTDA were “having expertise in own field” (12.15%), “having academic/research merits” (12.15%), “having been recognized by peers” (12.37%), “having engagement with society” (11.09%), and “having strong management and planning skills” (10.87). However, the criteria for the nominations of researchers/scientists outside NSTDA were not so different, with the top 5 being not much different from inside-NSTDA criteria, namely “having expertise in own field” (18.50%), “having academic/research merits” (14.17%), “having been recognized by peers” (12.27%), “having engagement with society” (11.02%), and teamwork (8.27%).

However, when analyzing the above criteria further, it was found that the respondents from each of the four national research centers did not share the same view of excellence. “Having expertise in own field” ranked first for BIOTEC and MTEC while ranking second for NECTEC and not showing up on the top five list for NANOTEC. “Having been recognized by peers” ranked first or second across the four centers. “Having produced work with great impact on the development of country and society” ranked third for all four centers. “Having publications” was preferred by BIOTEC and NANOTEC, whereas “having continuity of work” was listed fourth for MTEC and NECTEC. Other criteria included “coaching, supervising, and team building” for BIOTEC, “being responsible, efficient/having good work ethics” for MTEC, “having outstanding work/being well-rounded/knowledgeable” for NECTEC, and “having strong research methodology/skills” as well as “having creativity/looking for new research possibility” for NANOTEC. The details are shown in Table 2.

TABLE 2. Top 5 Criteria for Nomination of Excellence, by Center

Rank	BIOTEC	MTEC	NECTEC	NANOTEC
1	Having expertise in own field (41)	Having expertise in own field (25)	Having been given an award and/or recognized by peers for contributing to own field (22)	Having been given an award and/or recognized by peers for contributing to own field (12)
2	Having been given an award and/or recognized by peers for contributing to own field (32)	Having been given an award and/or recognized by peers for contributing to own field (23)	Having expertise in own field (18)	Having publications (12)
3	Having produced work with great impact on the development of society/country (29)	Having produced work with great impact on the development of society/country (19)	Having produced work with great impact on the development of society/country (11)	Having produced work with great impact on the development of society/country (11)
4	Having publications (24)	Having continuity of work (for a long period of time) (15)	Having continuity of work (for a long period of time) (9)	Having strong research methodology/skills (8)
5	Coaching, supervising, team building (19)	Being responsible, efficient/ Having good work ethics/High performance (15)	Having outstanding work/ Being well-rounded/Being knowledgeable (9)	Having creativity/Looking for new research possibility/Pioneering in new research (7)

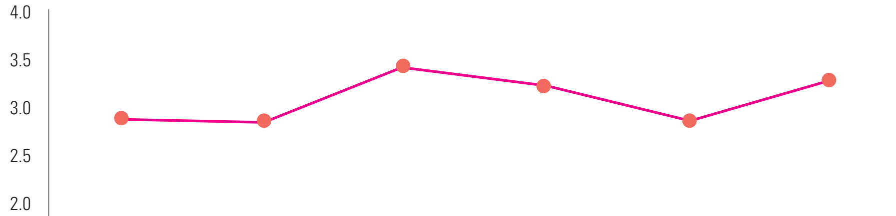
Furthermore, another picture emerged when analyzing the criteria by PG. It was found that respondents at different points of their career (e.g. different PG) might have different perceptions of excellence. On the one hand, "having been recognized by peers" and "having expertise in own field" ranked consistently high across the PGs. On the other, "having produced work with great impact on the development of society/country" ranked relatively low for the lower PGs and was placed first by senior researchers/excutives who had a PG 18 or 19 status. "Having publications" was also important to the respondents with PG 15 and 17, who had been in the organization for some time but did not make the list for PG 16, who had relatively shorter times with the organization. For the same reason, all but PG 16 found "having continuity of work" quite important. The PG 16 group was also different in that they found "coaching, supervising, and team building" as well as "having clear visions, targets, work plans, and processes" to be among the top criteria for nomination of exellence. The details are shown in Table 3.

TABLE 3. Top 5 Criteria for Nomination of Excellence, by PG

Rank	Assistant Researcher (PG 15)	Junior Researcher (PG 16)	Researcher (PG 17)	Senior Researcher/Executive (PG 18-19)
1	Having been given an award and/or recognized by peers for contributing to own field (19)	Having expertise in own field (35)	Having been given an award and/or recognized by peers for contributing to own field (33)	Having produced work with great impacts on the development of society/country (15)
2	Having expertise in own field (19)	Having been given an award and/or recognized by peers for contributing to own field (26)	Having publications (26)	Having been given an award and/or recognized by peers for contributing to own field (10)
3	Having publications (15)	Having produced work with great impacts on the development of society/country (26)	Having expertise in own field (25)	Having expertise in own field (9)
4	Having produced work with great impacts on the development of society/country (14)	Coaching, supervising, team building (17)	Having produced work with great impacts on the development of society/country (14)	Having continuity of work (for a long period of time) (7)
5	Having continuity of work (for a long period of time) (10)	Having clear visions, targets, work plans, and processes (16)	Having continuity of work (for a long period of time) (14)	Being devoted/dedicated to research (4)

While the first part of the investigation of excellence criteria relied on open-ended responses where the respondents could express freely on the criteria they used to nominate their peer and colleagues for an award, the second part of the investigation asked the respondents to rate specified items (based on literature review at the beginning the study) to find out how each of the pre-specified criteria ranked compared to one another. As shown in Figure 6, it was found that for research merit, "driving innovation in own field" (average score of 3.6), "driving innovation across fields" (3.5), and "producing research that has societal and policy impact (3.5) had higher average scores than such items as "having research with commercial impact" (3.2), "having publications" (3.2), and "having high citation figures" (3.1).

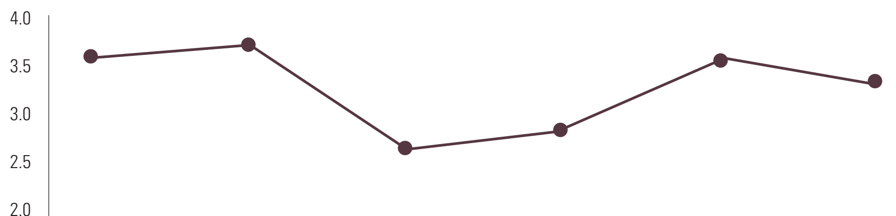
FIGURE 6. Comparing the Pre-specified Aspects of Excellence: Research Merits



	Having number of academic publications at local and/or international levels	Having high citation figures	Driving innovation in own field	Driving innovation across fields	Conducting applied research that has commercial impacts	Producing research that has societal and policy impacts
Average	3.2	3.1	3.6	3.5	3.2	3.5

As for researchers' personal traits, "inspiring others" (average score of 3.7), "being a role model in research" (3.6), "being capable of growing a team" (3.6), and "training and supporting future generations of researchers" (3.5) were preferred, whereas "having access to resources and professional networks" (3.0) and "being renowned in own fields and having received awards" (2.9) scored much lower.

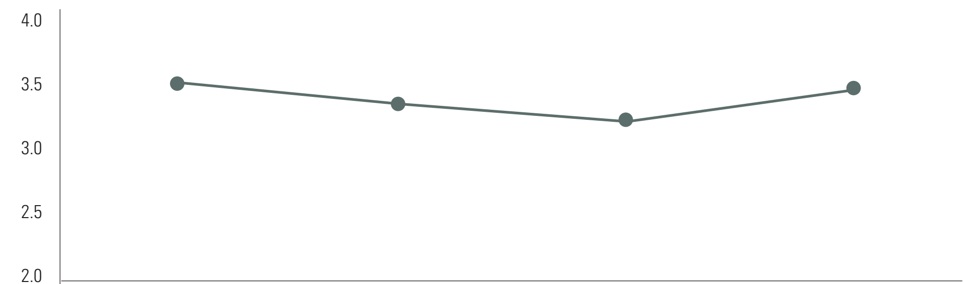
FIGURE 7. Comparing the Pre-specified Aspects of Excellence: Personal Traits



	Being a role model in research	Inspiring other researchers	Being renowned in own field; Receiving important awards	Having access to resources and professional networks	Being capable of growing a team that is long-term in scope	Training and supporting future generations of researchers
Average	3.6	3.7	2.9	3.0	3.6	3.5

With respect to communications skills, there was no clear difference among the choices, with "being capable of communicating to policymakers" (Average score of 3.2) scoring slightly lower than the "ability to communicate with the wider public" (3.4), "with other scientists" (3.4), and "with the related industry" (3.3).

FIGURE 8. Comparing the Pre-specified Aspects of Excellence: Communications Skills

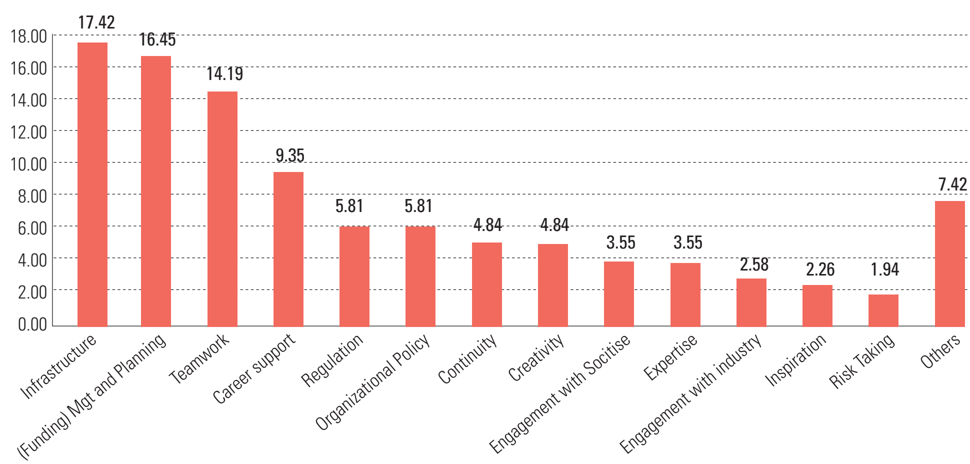


	Being capable of communicating research to scientists	Being capable of communicating research to industry	Being capable of communicating research to policy makers	Being capable of communicating research to the wider public
Average	3.4	3.3	3.2	3.4

3.3. Necessary Support for Excellence

The third part of the first-phase results presents the suggestion of support that researchers and scientists at NSTDA felt they needed to have in order to achieve excellence. Figure 9 reveals the top suggestions, which are in order of preference as follows:

FIGURE 9. Necessary Support for Excellence



- Infrastructure (17.4%): The first suggestion is that researchers/scientists would thrive in an environment conducive to research. Equipment, data/database, and research tools must be at hand. There must also be more support for presentation of work, and more sponsorship to attend seminars and training at both domestic and international forums.
- (Funding) Management and Planning (16.5%): This mainly involves the ability of researchers/scientists to access research resources and professional networks. Having strong vision, processes, and management skills at the organizational level are also helpful.
- Teamwork (14.2%): This suggestion involves more training/coaching/mentoring for entry-level researchers and scientists. There must be more team building, more knowledge sharing, and better team processes. Having considerate and open-minded staff/colleagues is also important.
- Career support (9.4%): Career support comes in the form of encouraging researchers and scientists who help to pursue their interests, promoting the works of junior researchers and scientists so they would become known to the wider public, and providing more scholarships in under-researched fields. Monetary incentives and intrinsic rewards/recognition of work are also suggested.
- Regulation (5.8%): Projects should be authorized on a basis of well-specified criteria so researchers could recognize and improve upon their shortcomings/weaknesses. The organization's accounting and documentation process should also be simplified to better accommodate/expedite the research process.
- Organizational Policy (5.8%): In order to help researchers and scientists to better achieve their goals of excellence, the organization's policy needs a clear direction so everyone is always on the same page.
- Others: Other suggestions for support of excellence include supporting continuity of research (4.8%), fostering creativity and innovation (4.8%), focusing on research that has great impact on country and society (3.5%), developing expertise and research skills (3.5%), having research questions that respond to the need of industry and users (2.6%), inspiring researchers to excel (2.3%), and encouraging researchers to take risk/have faith in their research (1.9%)

4. RESULTS OF THE PILOT SURVEY IN JAPAN

Results of the Japan survey are divided into three parts. The first part describes the characteristics of the respondents, namely gender, age, education, job title, research experience, and tenure. The second part reports the criteria that the respondents associated with excellence. The third part explains the environmental support the respondents said they needed for achieving excellence. The last part discusses indicators of excellence that are commonly overlooked as well as ways to overcome the barriers to excellence..

4.1. Characteristics of Respondents

As it would take a good length of time to do a full-scale research study on the concept of excellence at a given location, the research team opted to do a pilot survey within the three-month time limit for the Japan section. The target population of this pilot survey was 130 professors/researchers from various Japanese universities who work in the fields of medicine, pharmacy, engineering, life sciences, material science, information science, and law and policy. Twenty people (or 15.38%) responded to the invitation to complete the pilot survey. The characteristics of respondents were as follows:

- In terms of gender, 75% of the respondents were male while only 25% are female. For age groups, most of the respondents were qualified as young researchers, with 15% being between 30 to 35 years old, 25% between 36 to 40 years old, 55% between 41-45 years old, and only 5% (or person) over 45 years old.

- Related to research career, almost all (95%) of the respondents held a Ph.D. degree. Job titles were broken down into five groups, with 10% lecturers, 20% assistant professors, 40% associate professors, 20% full professors, and 10% other types of research. In terms of research experience, a little over half (55%) of the respondents had less than fifteen years research experience. However, 65% of the respondents had tenure while only 35% did not.

4.2. Criteria of Excellence

For this pilot survey, the respondents were asked both to nominate one or two colleagues who deserved an award for research excellence including the reasons for each recommendation and to freely think about their own ideas of excellence. Results (n = 46 items) show that the topmost criteria was having academic/research credentials (23.91%) such as having publications and created knowledge in their own or across fields. The other top criteria included “having management and planning skills” (13.04%), “having expertise in own field and strong research skills” (10.87%), and “having team quality” such as encouraging cooperation and exchange of ideas and coaching others (8.70%). It must be reiterated that this is merely a pilot survey. While the percentages indicate some potential issues, the number of respondents is too limited to provide a conclusive observation from the raw data. The data set, however, provides a good basis for further investigation on the topic of excellence.

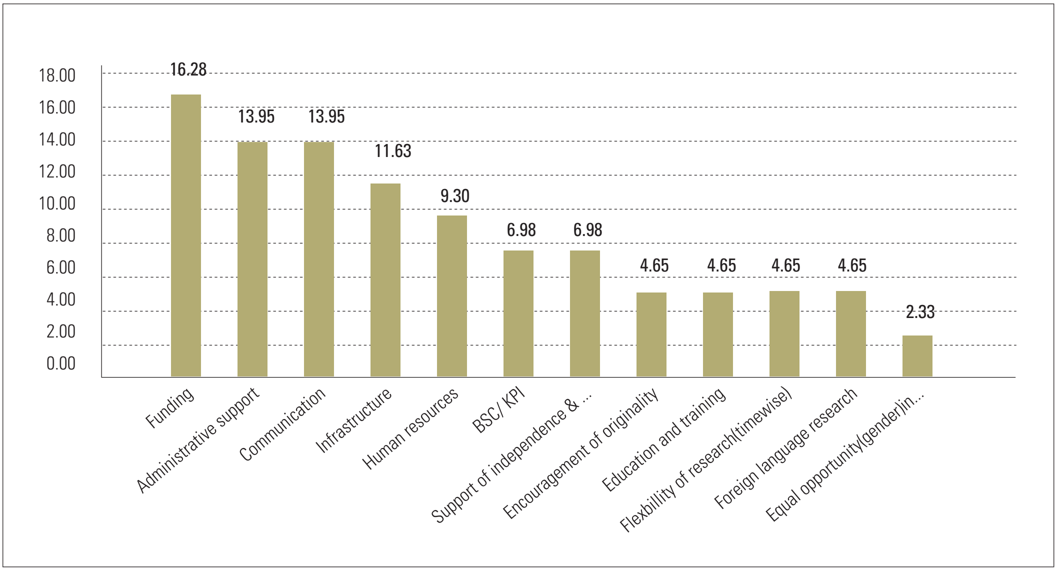
TABLE 4. Breakdown of Criteria for the Concept of Excellence in Japan's Case

Code	Themes	Items	Criteria of excellence (number of answers)	Total	Percent(%)
1	Academic/research merits			11	23.91
11		Having publications	4		
12		Having been cited (scores)	1		
13		Creating knowledge in own field	4		
14		Creating knowledge across fields	2		
2	Engagement with industry/real world			2	4.35
22		Having done contract research or partnered with private sector	1		
23		Having patents, products, prototypes, and/or inventions	1		
3	Engagement with society			3	6.52
31		Having produced work with great impacts on the development of society/country	3		
5	Efficiency/performance			1	2.17
52		Turning ideas into implementation	1		
6	Inspiration			3	6.52
61		Being a role model/Inspiring others	3		
7	Teamwork			4	8.70
71		Coaching, supervising, team building	1		
73		Encouraging cooperation and exchange of ideas	3		
8	Expertise			5	10.87
81		Having expertise in own field	3		
82		Having strong research methodology/skills/attitude	2		
9	Continuity			2	4.35
91		Having continuity of work (for a long period of time)	2		
10	Devotion				
101		Being devoted/dedicated to research			
11	Integrity			3	6.52
111		Being honest, sincere, moral, and ethical	3		
12	Management and planning			6	13.04
121		Having access to resources/having research networks	1		
124		Having clear visions, targets, work plans, and processes	5		
13	Creativity			3	6.52
131		Having creativity/Looking for new research possibility/Pioneering in new research	3		
14	Communication			3	6.52
141		Being able to communicate to peers, industry, policymakers, publics, and others	3		
	Total			46	100.00

4.3. Necessary Support for Excellence

The third part of the Japan pilot survey results suggested environmental supports that researchers and scientists need to have in order to achieve excellence (N = 43). Figure 10 shows the suggestions in order of preference. The top five items of support were funding, administrative support, communication, infrastructure, and human resources.

FIGURE 10. Necessary Support for Excellence



- Funding (16.28%): The first suggestion involves stable funding for research over a period of time as well as funding based on uniqueness or performance.
- Administrative support (13.95%): This is to relieve some of the administrative burden so researchers could focus their whole attention on research. Support for intellectual property management is included here as well.
- Communication (13.95%): This item involves support in the form of communication channels or forums where researchers can correspond and exchange ideas.
- Infrastructure (11.63%): This suggests that researchers/scientists would thrive in an environment conducive to research. Equipment, data/database, research tools, and facilities must be ready.
- Human resources (9.30%): This improvement of human resource for research could be done through having a fair evaluation system for young researchers, having clear and specific research-related jobs such as teaching assistants, technicians, and lab managers, and promoting researchers for tenure.
- Others: Other suggestions for support of excellence include having clear performance indicators (6.98%), encouraging originality (4.65%), providing more education and training (4.65%), giving more time flexibility for research (4.65%), having work in foreign languages

(4.65%), and equal opportunity for female researchers (2.33%).

4.4. How to Overcome Barriers to Excellence

In this pilot survey, the respondents were asked what could be done to overcome barriers to excellence. Suggestions can be categorized into three groups: funding, research, and additional indicators. Some of the recommendations/suggestions are as follows:

On Funding Issues

- Centralize the funding agency into one agency and one research fund to solve the problem of researchers having to gather multiple research funds.
- Set up a substantial and long-term research fund. Collaboration between independent research units must also be strengthened.
- Increase transparency of the research examination system and allow researchers to see the judges' evaluations and decisions after a certain period has lapsed.
- Increase grants for research led by young researchers. Grants should also be awarded on a competitive basis, not on a top-down or connection approach.
- Introduce a lottery system for public research funds to ensure diversity of research, as works that are not considered trendy will have a chance of being selected.

On Research

- Encourage multidisciplinary research as many innovations come out of the integration of traditional fields.
- Hold "the possibility to create a new and original insight" as one of the examination standards for application of fundamental research grants in order to support originality.
- Encourage tolerance of failure in research as a way of stimulating innovation.
- Encourage the independence of young researchers. Also, give more credit to young researchers who are working under/with professors/senior researchers. This is a cultural issue in Japan.
- Create a support system (with back office staff, class support staff, technicians, lab manager, etc.) so researchers can spend most of their time on real research.
- Avoid the short-term attitude for doing research such as increasing the number of papers, hence short-term performance.

On Additional Indicators

- When asked about indicators of excellence that have been somewhat overlooked in mainstream research, the respondents reported that:
  - Originality and "mind impact" (psychological shock while reading the paper) should play a bigger role in determining research excellence.
  - Evaluators of grant proposals have a tendency to choose people from the same field. There should be more third-party evaluators.
  - How to treat corresponding authors must be investigated further.
  - Excellence should be more associated with "society" and "humanity."

5. DATA ANALYSIS

Having learned the outcome of the first phase study in Thailand, the data reveal that in practicality a number of novel and highly ranked criteria suggested by the target community are worth further consideration, even though the indicators based on traditional criteria such as publications, citations, grants, or award recognition still play substantial roles. From 723 items of nomination criteria of excellence shown in Figure 5, the top five ranking criteria are 1) having expertise in his/her own field of expertise, 2) having been given an award and/or recognized by peers for contributing to own field, 3) works with great impact on the development of society/country, 4) publications, and 5) continuity of work for a long period of time. The findings further suggest that some criteria such as research with great impact on society, an industry engagement, and peer evaluation almost outweigh some traditional measurement criteria like highly-ranked citation.

In responding to the three key questions of what counts as excellence, how to measure excellence, and how to support excellence, the findings provide the following suggestions. With respect to the first question of what counts as excellence, the grant criteria is still valid and perceived as excellence. Nonetheless, the outcome from this first pilot study is that certain criteria are perceived as crucial among the target communities. For instance, from Figure 6 comparing the pre-specified aspects of excellence, under the part of research merits, the finding indicates that driving innovation in his/her own technological field, driving innovation across fields, and producing research that has societal and policy impact received higher scores than typical criteria like having publications. As for researchers' personal traits, inspiring other researchers, being a role model in research, being capable of growing a team, and training and supporting future generations of researchers were preferred.

This implied the needs of NSTDA researchers and their hope of seeing more of these types of personality traits at NSTDA. As for communication skills, they seem to receive less attention from the target community compared to the first two groups in the criteria. More importantly, there was not much difference whether it was communication to other researchers, related industry, the public, or policymakers. This set of data reflects the nature of researchers and the working environment at NSTDA. To sum up, excellence at NSTDA is perceived as the combination of driving innovation in his/her own technological field and across disciplines, being able to inspire other researchers as well as being capable of growing a team, and being capable of communicating research to scientists and to the wider public.

The next issue of how to measure excellence is challenging and the obtained results are still relatively limited. What is interesting, however, is the data received from the open-ended questions. Table 2 suggests that the national research centers within NSTDA may not share a consistent view of excellence and thus it would be quite difficult to measure excellence. Moreover, when it comes to different PGs, Table 3 shows that views also vary depending on years of experience as well as stages of career. For instance, while PG 16 and 17 may view having received an award, being recognized by peers for contributing to their own field and having expertise in their fields as a priority, higher PGs held in higher esteem active engagement with society and/or industry. It became apparent that with higher PG levels, the criteria related to society or industry engagement were prioritized. These different views suggest a further investigation on how to measure excellence. This could be done by further investigation of such measurement approaches as "goal measurement for efficient framework" and "peer evaluation approach."

Finally, answers to the question of how to support excellence were most clearly articulated. From Figure 9, the top five suggestions focused on the issues of 1) the needs of infrastructure, including but not limited to hard and soft infrastructure, opportunities for more sponsorships and chances to attend seminars domestically and internationally, 2) funding and good management and planning, 3) teamwork, including but not limited to suggestions of more trainings/coaching/mentoring for junior researchers and scientists, more team building, knowledge sharing, and better team process 4) career support, and 5) regulation and organizational policy.

Having learned of scientists' perceptions within Thai and Japanese R&D institutions, it is worth moving on to a discussion of similarities and differences between the perceptions of scientists in Thailand and Japan.

Starting with the similarities, the results from Japan do confirm previous findings in Thailand regarding the criteria for nomination of excellence. The findings from both case countries demonstrate that out of the seventeen theme-nominated criteria for Thailand in Figure 5 and the fourteen theme-nominated criteria for Japan in Table 4, the respondents from both countries perceive "academic/research credentials" as the number one criteria for nomination of excellence. The academic/research credentials in this regard refer to expertise in his/her own technological field and/or across multiple disciplines, having publications, and creating knowledge in his/her own technological field and/or across disciplines. Another similar perception of excellence shown in the two case countries was management and planning skills. Interestingly, among the theme-nominated criteria, communication skills did not receive much attention from the respondents, and the research team found this worthy of further investigation. By contrast, in many cases in Europe, scientists play a significant role in making and/or developing policy so communication skills are vital for those scientists who work with or become policymakers.

With respect to the differences in the perception of scientists in Thailand and Japan, progress in development between these two countries played essential roles. From Figures 9 and 10, although there were some similarities such as the requirements of funding, career path support, and administrative support, the necessity of research infrastructure was ranked differently. Among the top five necessary supports for excellence, the infrastructure for scientists in Thailand was ranked number one while the respondents in Japan ranked it the fourth.

From the discussion above, we can clearly identify the same trend of how young scientists perceive the concept of research excellence in these two countries. Additionally, in the pilot study in Japan, some suggestions to overcome barriers to research excellence were also provided, many of which corresponded to necessary support as illustrated in Figure 10. For instance, the top five items of necessary support for excellence in Japan were funding, administrative support, communication, infrastructure, and human resources. The respondents suggested an idea to centralize the funding agencies into one agency in order to avoid the problem of researchers gathering multiple research funds, which may lead to another problem of researchers' ethics. Some respondents suggested substantial and long-term research grants as well as an increase in the transparency of the grant approval process. This implies an inherent dissatisfaction among the respondents concerning the current funding system. Furthermore, in addition to the suggestions on the funding issues, the respondents encouraged multidisciplinary research, as they believed true innovation did not necessarily come from one technological field. In this part, respondents further perceived that failure in present research could potentially lead to future success. Since successful research takes time through trial and error and therefore a total understanding of the nature of research is required for the continuation of research.

There remain some important issues that are worth considering. Respondents in both countries believed multidisciplinary research, impact on society, and the industry engagement to be excellence. This conclusion brought us back to the existing performance indicators and career path promotion criteria of whether they really foster and encourage the researchers to do good science that can be regarded as excellent. The respondents could point out how they perceived excellence, but how to measure their own excellence is beyond their authority. If we are to encourage the excellence that corresponds to their perception, a revisit of the existing evaluating system is required. The next section will summarize the findings of this study with proposed recommendations.

6. CONCLUSION

This study investigated the perceptions of research excellence among researchers and scientists with the aim to explore whether there are any new ideas that could further be proposed and adopted as criteria of excellence. In doing so, three key research questions were set: what counts as excellence, how to measure excellence, and how to support excellence. Our findings confirm that traditional grant criteria that frame an idea of excellence still count, but respondents from both countries also suggest that some novel criteria be considered and prioritized. It is interesting to note that our findings have corresponded to some viewpoints already discussed in the scientific community (for example, Aksnese and Rip, 2009; Heinze and Shapira, 2009; Sahel, 2011; Fischer, 2009; Loyola, 2012; Halme, 2012). Key issues frequently discussed in these studies are the use of existing performance indicators for research and individual performance evaluation purposes and suggested solutions that promote quality in science rather than quantity. This paper argues that to unleash the curiosity and creativity of scientists/researchers, the existing evaluating systems are insufficient in fostering excellence. The performance indicators that are important and have been used for decades may no longer be adequate today. For instance, as pointed out by the respondents, in addition to the number of publications as criteria, we should include other factors that contribute to scientific creativity. Our respondents view that citation counts or high numbers of publications do not necessarily reflect quality. Large amounts of funding often go to large laboratory groups who could produce a high volume of papers (Fischer, 2012). This results in fewer opportunities for newcomers to receive research grants. For nominations of excellence, respondents from both countries perceive “academic/research credentials” as number one criteria. The academic/research credentials in this regard refer to expertise in his/her own technological field and/or across the disciplines, having publications, and creating knowledge in his/her own technological field and/or across the disciplines. Taken together, the respondents’ answers and comments offer an informal perception towards research excellence.

As discussed previously, the actual measurement and promotion of excellence is beyond the control of scientists and researchers, and at the same time, using improper measurements could result in damaging effects on the perception and morale of scientists. In order to foster excellence, our research team proposes the following recommendations at the national and regional levels.

At the national level, a revisit of the existing evaluating system is recommended. Today, many institutions review their evaluation systems on an institutional basis. One may refer to another’s model without examining whether the adopted model is practical or not. It would be advantageous if the evaluating system would be first discussed at the national level. By doing so, the discussion could be executed among a group of different stakeholders including but not limited to members from academic and research institutions, the National Young Academy, the National Science Council, and the industry. Certain countries in Asia such as China, Japan, Taiwan, Malaysia, Philippines, and Thailand have already established NYAs or similar institutions. NYAs could become another body that represents the voices of young scientists at the national level of their countries. In addition, the existing funding system also is in need of a thorough review. It decides research strategy and plays an otherwise vital role in the direction of national research. Our literature review shows common criteria used by well-known funding agencies across the globe. Nonetheless, whether grant recipients are regarded for their excellence in the eyes of those funding agencies is worthy of further exploration.

At the regional level, although this set of findings does not represent the conclusive perception of research excellence in Thailand and Japan, it could be used as grounds for other countries’ consideration. At present, many large laboratory groups run multidisciplinary collaborative research projects. If one could earn better scores or get promoted faster than others because of a different measuring system, collaborators from other countries who have poorer performance because of their measuring systems may be discouraged. Thus, at the initial stage, this study proposes to revisit existing performance evaluating systems. This could be done within a region before growing beyond the regional level.

Finally, our research team concludes that further investigation into this issue is needed in order to bring the findings of this precursor study to implementation. The team proposes recommendations for further action as follows:

An in-depth study for solid analysis

With respect to Thailand, the launch of this survey was partially impacted by another organizational survey scheduled at the same time. More consolidated data would require an in-depth investigation with fewer interruptions. The outcome would help confirming key characteristics of excellence corresponding to the three key research questions. This could finally result in organizational policy that would gradually unleash researchers' curiosity and creativity within the organization. The survey in Japan was also done under a severe time constraint. Compared to the populations of respondents in both countries, the survey in Japan may represent only a small fraction. However, it can be interpreted as a confirmation and extension of the first phase study in Thailand. Nonetheless, to obtain more comprehensive viewpoints, it is advisable to expand the size of the population and provide sufficient time to improve the response rate for the next study.

Individual interview of selected or nominated researchers

This action was suggested by many researchers during the pilot launch of the survey. The time constraints of this study did not allow any individual interviews. We anticipate useful comments and new insightful information should individual interviews be brought into the next study.

A comparative study with other similar organizations

Discerning what counts as "research excellence" is a critical challenge for academics around the world. It would be of great interest to scientific and academic society to explore what they consider "research excellence" in a comparative context. This would help bring the perceptions of research excellence up to higher standards since it would no longer be limited to perceptions from the respondents in Thailand and Japan. This could result in additional measurement indicators of research excellence for the global scientific community in the future.

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