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Strengthening Mahidol University Institute of Molecular Biosciences' Innovation and Research Policy toward a World-Class Research Institute

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Abstract
This study focuses on the current policy of the Institute of Molecular Biosciences, Mahidol University, Bangkok, Thailand, on innovation and research. Specifically, the purpose of this study is to determine what should be done to strengthen the implementation of the institute's Research and Innovation Policy and Strategy, which aims to turn the institute into a world-class research organization. To this end, a survey was conducted among executives, staff members, and students from the institute. The questionnaire was based on six variables: leadership, world-class policy, mission and vision, technological management, organizational change, and human resource management. The results indicate that the model of theory-based policy is consistent with the evidence-based data. Recommendations based on the responses of the population surveyed were made along the constructs used in this study with the aim of contributing to the strengthening of the policy implementation process.

Keywords: Innovation and Research Policy, World-Class Research Institute, Institute of Molecular Biosciences

1. Introduction

Pursuant to Thailand's 20-year National Strategy and Thailand 4.0, all educational institutions are required to develop a curriculum that will strengthen the country's economy and speed up its level of development (Office of the National Economic and Social Development Council, 2017) . Sciences and technology are targeted as the prime areas for advancement. The focus is on ten specific industries, a few special economic zones, and start-ups, which are all seen as essential mechanisms to propel growth and a digital economy. In many ways, the aims of these policies are not much different from those outlined in the policy of the Institute of Molecular Biosciences, Mahidol University, Bangkok, Thailand, (hereinafter 'the institute') toward innovation and research. In a nutshell, the policy aims to turn the institute into a world-class research organization. The emphasis is on developing innovation and state-of-the-art research facilities and articulating an internationally recognized curriculum (Institute of Molecular Biosciences, Mahidol University, 2019). The policy also requires students to have an apprentice experience in countries that are members of the Association of Southeast Asian nations (ASEAN), the 10-member regional grouping currently marching toward economic integration (ASEAN Community, 2015).

This is an opportunity for Thailand to become an education hub within ASEAN and for the institute to grow beyond its borders thanks to ASEAN-wide extensive research. This is all the more the case as with the advances of the digital and communication technology, educational channels have been expanding and boosting online teaching and life-long learning. Clearly, the Thai government's strategy marks the start of new standards for research and education, particularly in the field molecular biosciences, as it combines with

Mahidol's own efforts. All this spells of outstanding opportunities and potential for the institute potentially on track to seek world-class recognition. This also gives a clear sense of the benefits at stake for the Thai society as a whole as well as for the national and regional economies (ASEAN Department, Ministry of Foreign Affairs, 2020). The institute's current policy on innovation and research is at the core of this study. It has been in place since 2016 and outlines the path to be followed by the institute to become a world-class research center. The policy requires many changes over time in the management and staffing of the institution. In a highly competitive globalized economy, it is vital for its future as it will enable it to sustainably become part of the global community of scientists and academics.

Although the policy has now been in place for 5 years, it has yet to be fully implemented. This raises, among others, the question of what the institute should do in the future to ensure that the move towards a world-class institution follows its due course. In short, what should be done to ensure full implementation of the policy? To answer this question, this study surveyed various stakeholders in the policy, namely institute's executives, faculty members, administrative staff, and students. In light of the respondents' replies, this study thus aims to identify areas in the current policy implementation that that currently stand in the way steering the institute toward becoming a world-class research body. The hope is that this study will provide additional guidelines and insightful comments that will contribute to the achievements of the ultimate goals of the policy and that it goad all concerned parties to take every step required. Application of this study's findings will also be useful for other educational settings and could serve as an inspiration for them to broaden their scopes.

2. Key Concepts and Research Framework

This section clarifies the variables used in this study.

- Leadership

Broadly speaking, leadership may be defined as the ability to make things happen (De Waal, 2012). Leaders influence employees to work together toward the fulfillment of an organization's mission and the achievement of its goals. Two types of leaders frequently discussed in the relevant literature are transactional and transformational leaders. The latter are leaders who lead primarily by using social exchanges (or transactions; hence their name). Transformational leaders stimulate and inspire (transform) followers to achieve extraordinary outcomes (Bhaskar, & Paulina, 2016). There is overwhelming evidence supporting the superiority of transformational leadership over transactional leadership (e.g. Day et al., 2014; De Waal, 2012). Ideally, a leader should be charismatic, i.e., he/she should be enthusiastic, self-confident and his/her personality and actions should influence people to behave in certain ways. Charismatic leaders have a vision and are willing to take risks to achieve that vision (Dertouzos, 2009). There is a strong correlation between charismatic leadership and high performance and satisfaction among followers (Prasad & Junni, 2016). Another type of leadership discussed in the relevant literature (e.g. Taylor, Cornelius, & Colvin, 2014) is visionary leadership, which can be described as the ability to create and articulate a realistic, credible, and attractive vision of the future that improves upon the present situation (Prasad & Junni, 2016). In the context of this research, leadership means being the leader in collaborative knowledge discovery, vision coordination, and creativity and as a coach and moral leader.

- World-Class University

The concept of 'world-class university' is a contested concept. Worldwide competitiveness has given rise to the idea of world-class university (Levin, Jeong, & Ou Dongshu, 2006; Salmi, 2013). The term has now become a catch phrase not only for improving the quality of learning and research in higher education but also for developing the capacity to compete in

the global higher education marketplace through the acquisition and creation of advanced knowledge (Khadri Ahmed, 2015; Levin et al. 2006). Having a world- class university is everyone wishes and requires national, collective, and programmed efforts (Altbach, 2004). It is widely agreed that the first and foremost determinant of academic excellence is the presence of a critical mass of top students and outstanding faculty (Altbach & Salmi, 2011; Khadri Ahmed, 2015)). Another key dimension relates to the degree of academic and managerial autonomy the university enjoys (World Bank (2002). A third determinant is the abundance of resources (Sharma, 2011). In other words, world-class universities make significant contributions to the advance of knowledge through research (Salmi 2012), teach with the most innovative curricula and pedagogical methods, and produce graduates who stand out (Bellon, 2005). Their activities also contribute to the cultural, scientific, and civic life of society. That said, there is, however, no magic formula for making a world-class university. Each university must choose its own pathway and develop a strategy that plays to its strengths and weaknesses, such as flexible government arrangements and abundance of resources (Williams, & Van Dyke, 2007). A long-term vision for creating a world-class university–and implementing it – should be articulated (Salmi, 2009). The role of the government may also be a critical factor (World Bank (2002).

- Mission and Vision

Mission can be defined as systematic thinking and vision (Ludema, Laszlo, & Lynch, 2012). Mission provides an opportunity of organizational growth if the advanced technology is available and if academic users' needs are met. This requires setting the scope of work so that the organization's policies can be transferred from the executive to concrete implementation. In many instances, this also requires developing staff capacity. The mission must be identified unambiguously and appropriately, with feasibility (Hwang & Choung, 2013). As systematic thinking, an organization's mission cannot be disassociated from its vision, which must be seen in parallel with the vision and scope of work (McShane & Glinow, 2005). An organization's vision should tap into people's emotions and inspire enthusiasm. If properly selected and implemented, the mission and vision can energize individuals to use their skills, talents, and resources to fulfill the vision.

- Organizational Change

Organizational change refers to the act of altering a component of the organization, such as, for example, its culture, internal processes, or the underlying technologies or infrastructure it uses to operate (Wheelen & Hunger (2008). It happens when an organization decides to change its structure, strategies, culture, policies, technology, or in some cases even its core values in order to improve performance or adapt to new circumstances. Organizational change encourages innovation, and can lead to better opportunities (Buddhapoompitak & Inwang, 2011). Change, however, often meets with resistance as it affects vested interests. This is why the reasons for change and its benefits need to be clearly explained by leaders. Transparency is critical as changes that are clearly communicated are generally more accepted (Cummings & Worley, 2005). According to Szabla, Stefanchin, and Warner (2014), top executives should act as change agents. In the context of this study, organizational change means a shift of policy, vision and goals toward policies that guide the development of the institute at different levels of the organization, both as a whole and as a collection of units (Pearce & Robinson, 2011). It also refers to the application of innovation and teamwork in order for the organization to achieve its goals of internationalization.

- Human Resource Management

Broadly speaking, human resource management may be defined as the strategy and process to manage personnel (Schwartz, 2006). It is a technique to strengthen knowledge, competency and skills. HR management is concerned with people at work and their relationship within

the enterprise, enabling each to make his/her own best contribution to its success, both as an individual and as a member of working group (Decramer, Smolders, & Vanderstraeten, 2013). Operative functions include recruiting, (the most challenging task for any HR manager), training and developing, rewarding (compensation and benefits) and performance appraisal (Boxall, & Purcell, 2016). Strengthening the capacity of employees is often critical to enhance their performance to a level that will facilitate the organization's goal achievement. Human resource management also helps to ensure that the personnel is able perform functions at their best, which in the end will further contribute to the organizational success

- Technological Management

Technology management refers to the management of the use of technology for human advantage. It relates to the application of advanced technology and technological education (Reich & Hager, 2014) and promotes adoption of new equipment. Technology is regarded as an important resource that contributes to an organization's success. This is also a strategic device that gives it a competitive advantage as all activities are technologically applied (Olsson & Meek, 2020). Technology matters to staff's performance improvement (Pearce & Robinson, 2009). This, however, requires training and sufficient resources as well as good planning. Simultaneously, all stakeholders should be identified and the staff trained (Wiratchaniphawan, 2011).

Table 1 shows the conceptual framework used in this study and its components and sub-components.

Table 1: Conceptual Framework

Objective	Component	Sub-Component
Stregthening Mahidol University Institute's innovation and research policy toward a world-class research institute	Leadership	- Internal skills - External skills
	World-Class University Policy	- International graduate program - Instruction
	Mission and Vision	- Staff - Institute
	Organizational Change	- Staff's change - Institute's strategy
	Human Resource Management	- Individual - Group
	Technological Management	- Management - Policy

3. Research Methodology

- Data Collection

This quantitative research study relies on a survey to address the research questions outlined in the introduction, which can be rephrased as follows. What in the present implementation of the policy needs to be strengthened and/or changed in order for the institute to be on track to becoming a world-wide innovative research center? Based on relevant literature reviewed in the previous section, a questionnaire was developed in order to be submitted to the targeted population.

The questionnaire consists of three parts. Part 1 focuses on the respondents' demographics (sex, age, education, etc). Part 2 covers the six variables discussed above. It includes:

- 9 questions on leadership and its two sub-components (internal and external skills);
- 6 questions on the concept of world-class university and its two sub-variables (international graduate program and instruction);
- 10 questions on mission and staff and institute, its two sub-variables;
- 7 questions on organizational change and its two sub-components (staff's change and institute's strategy)
- 7 questions on human resource management and its sub-variables (individual and group); and
- 10 questions on technological management and its sub-components (management and policy).

This part uses a 5-point Likert scale. Part 3 consists of one open-ended question that seeks comments and recommendations on the institute's innovation and research policy. All responses were kept confidential. In total, 253 questionnaires were distributed.

The targeted population in this study consists of executives, staff members, and students of the Institute, all regarded as playing an important role in driving the Institute toward a world-class research body. They can be classified in three groups as follows:

- *Group 1*: 15 executives, including the director of the institute, the deputy director, assistant directors, heads of cluster, heads of research center, and department heads.
- *Group2:* 131 staff members, including faculty members (professor, associate professors, lecturers, etc) and supporting staff members.
- *Group 3:* 107 students currently completing a master's degree or a PhD at the Institute.

- *Content Validity*

The questionnaire was tested for content validity by five experts, who examined its consistency with the research objectives and its wording. The Index of item Objective Congruence (IOC) was determined. An IOC $\geq .50$ means that each question answered the research objectives and an IOC $< .50$ that each question did not answer the research objectives. Reliability was tested using the Cronbach Alpha Coefficient. The test was conducted on a population of 30 people with characteristics similar to those of the target population. The selected questions had a α value ranging from 60 upward, which showed acceptable reliability and discrimination. The questionnaire was reliable and consistent (Wanitbancha, 2014).

- *Data Analysis*

The data was analyzed using SPSS. Data on the respondents was distributed by frequency and percentage. The mean and standard deviation method was employed to determine the extent of the impact of the policy on the institute's effort to become a world-class research body. Statistical significance was set at 0.05 level and the correlation determined by using the correlation test and correlation component analysis. A Second Order Confirmatory Factor Analysis (CFA), using LISREL 8.8, was conducted to test the accuracy of the components in the development of a research and innovation policy at the institute. Content analysis was used to capture content with similar issues in the same group and draw conclusions.

4. Results

129 valid questionnaires were collected out of the 253 questionnaires that had been initially distributed (51%). A group-by-group analysis of the demographic data indicate that seven

members of Group 1 are males and five are females. 9 of them have a doctoral degree and 3 hold a master's degree. 75 percent of them are over 45 and 25 percent are 36-45 years old. Of the 72 respondents that makes up Group 2 (30 academic and 42 support staff members), 41 are females and 31 males. 43.1 percent of them have a doctoral degree, 34.7 percent a master's degree, and 2.8 percent a bachelor's degree. 51.4 percent of them are 45 years old or above, 26.4 percent between 36-45, 18.1 percent between 25-35, and 4.2 percent under 25. The 45 students in Group 3 are predominantly female (32, 71.1%) and 13. 66.7 percent of them are working on a PhD and the rest of them on a master's degree. 48.9 percent are between 25-35 years old, 37.8 percent 36-45, and 13.3 percent over 45.

The results of the Second-Order Factor Analysis indicates that all components fitted. The Second-order factor model presented a Chi-square (χ^2) of 59.13, a p-value of 0.06, a Relative Chi-square (χ^2/df) of 2.11, a Goodness of Fit Index (CFI) at 0.99, an Adjusted Goodness of Fit Index (AGFI) at 0.97, and a Root Mean Square Error of Approximation (RMSEA) of 0.04. When arranged in order, all the components are ranked as follows:

1. Leadership at 0.76
2. World-class university policy at 0.72
3. Mission at 0.71
4. Technological management at 0.70
5. Organizational change at 0.67
6. Human resource management at 0.59

5. Discussion

At the onset of this discussion of the content of the questionnaire and before focusing on the six components and making recommendations, it is important to note the following. All the executives, academic staff members, and students surveyed agreed on the relevance of identifying weaknesses in the current implementation of the policy and welcomed being able to offer their views on the issues at stake. They also perceived the six components and their sub-components as essential support to move the institute to the international level. Moreover, almost all of them concurred on the fact that the policy must be taken seriously by every stakeholder and requires efforts from every concerned party.

- Leadership

Recall from above that strong leadership skills include creative management, morality, learning, policy adaptation, and communication skills. As we saw then, ideally, a leader should also be charismatic, that is be enthusiastic and able to influence people to behave in certain ways. Many respondents view these attributes as essential. They also view communication skills as crucial. According to them, leaders should make the institute's vision clear and encourage open communication among academics. This requires two-way communication and transparency. According to some respondents, creativity and responsibility should also be integral to a leader's set of skills. In addition, some opined that executives should do more in terms of promoting molecular biosciences innovation.

- World-Class University

Today, more than ever, education is a global process; one greatly facilitated by the technological advances of the last decades. As a result, a majority of the respondents think that there should be more international programs as well as more use of distance learning technology. Many see the institute's efforts in terms of enrolling international students and recruiting international lecturers lagging behind, something which the Covid-19 pandemic has exacerbated. As a result, they perceive that there is a gap between what needs to be achieved and what has been achieved to attain world-class status. Many also see a pressing need for talent

mobility. According to them, exchanges with internationally recognized graduate programs with a strong innovation record would be highly beneficial.

- *Mission and Vision*

While by all accounts the institute's current policy has the ability to create and articulate a realistic, credible, and attractive vision of the future that improves upon the present situation, responses to the questions on this issue suggest that its content has not been clearly communicated to all stakeholders. The same goes for the mission. Yet, as stated earlier, missions and visions that are clearly communicated are generally more accepted and can energize individuals to use their skills, talents, and resources to fulfill them. This is all the more critical as, in the case of the institute, they require the long-term commitment of those involved. Some respondents also pointed out that the institute organizational culture is difficult to identify and remains ambiguous. In their view, more should be done to assert it and outlines its contours.

- *Organizational Change*

One recurrent comment from respondents is the need to establish a more productive and efficient cross-disciplinary working atmosphere; one, which in their view would create far more opportunities to exchange or learn across courses. This is a legitimate request as today, innovation is essentially a cross-functional process. Innovative companies have long adopted the practice of forming teams along competences rather than functions. This a successful model which the institute should make its own. This requires a shift of focus that is easier said than done though. As noted earlier, change often meets with resistance, especially when it threatens vested interests. In the same vein, a number of the responses stressed the need to further promote interdisciplinary and multidisciplinary studies as well as collaboration with public organizations and the private/industrial sector; two important potential sources of knowledge and funds. Some respondents also stressed the need to uphold research ethics and develop a research management and evaluation system that supports innovation through the integration of a reward and performance system.

- *HR Management*

Apart from the need to step up the hiring of international lecturers, which as we just saw is mentioned by almost all the respondents, other recurring themes in the questionnaires include capacity building among staff members and the need to motivate staff and researchers alike and set up a reward system for satisfactory performance. Moreover, scholarships for overseas studies are perceived as an essential tool for staff with potential to carry out the innovation policy. Also listed are academic conferences and working group visits overseas. Another recurring suggestion concerns research grants, which many respondents believe should be optimized as part of the institute's strategy to advance research.

- *Technological Management*

Issues raised by respondents with regard to technological management include appropriate training, adequate resource allocation, capacity building, and intellectual property management. One need identified is the need for a technological manager with the authority to enforce the policy. Simultaneously, all stakeholders should be identified and training on the latest technology provided to them. Relevant planning and assessment of policy implementation also matter to respondents. So is the development of research structures that promote resource optimization. As pointed out by a number of them, the institute should educate its personnel on intellectual property rights and the transfer of research results. They see this as part of creating an environment conducive to the development of research that has commercial applications. This need for innovation and research in the fields that are the institution's strengths to have practical applications is emphasized in their responses,

5. Conclusion and Recommendations

A number of obstacles to the full implementation of the policy articulated to turn the institute into a world-class research center have been identified by the respondents and viable solutions offered. Before listing the suggestions made by respondents as well as the recommendations made by the author, it will be helpful first to summarize these obstacles.

They can be summarized as follows;

- Insufficient promotion of innovative research for new knowledge in sciences;
- Insufficient networking with the government and the private industrial sector for competitive advantage;
- Insufficient action in response to societal needs;
- Lack of optimization of intellectual property rights;
- Underutilization of distance-learning technology;
- Public relations issues in regard to international courses;
- Failure to meet targets in terms of the number of foreign lecturers and students;
- Constant back and forth in terms of commitment to the policy;
- Lack of efficient technology-oriented management;
- Lack of staff training on the world-class policy; and
- Ambiguous organizational changes that require certain capacities for which the staff is not properly trained.

- *Recommendations*

In light of the perceived deficiencies in the application of the policy and the responses to the questionnaire, the following recommendations can be made toward its strengthening. It is important to note at this juncture that since some of the changes they imply may be met with resistance, it is especial critical that their relevance be clearly explained:

1) Seeing that an internationally recognized university should have excellence in education, the institute should (i) accelerate the development of international programs, (ii) increase the number of international faculty members and graduate students, and (iii) adopt a strong curriculum.
2) In order to enhance educational opportunities for competent students, high quality teaching and other instructional activities and the availability of state-of-the-art laboratories and other pertinent facilities should remain a priority.
3) Support resources should be increased accordingly as these measures call for substantial funding.
4) Given that research and the development and dissemination of knowledge are attributes of a world-class university, collaboration with international partner organizations should be promoted in order to facilitate the identification, growth, and extension of concepts and ideas as well as their transformation into goods, and services.
5) There should also be mechanisms to strengthen the staff's research capacity and related skills.
6) International standards of research should be strictly adhered to.
7) Interdisciplinary research, including with national and international institutions of higher learning should be strongly encouraged.
8) A different system to manage and evaluate research should be devised. Performance-based research funding should be the basis for funding support. Prioritization also should be a part of research evaluation and selection.
9) Since there is wide agreement that a great university conduct activities contributing to the cultural, scientific, and civic life of society, producing molecular bioscience graduates, offering academic services in molecular biosciences, and providing

services that engage and contribute to the larger community including the regional and national communities should be encouraged.

10) To ensure self-reliance and sustainable development, the institute's intellectual property rights should be fully exploited as part of collaborating with the private industrial sector and developing research that has commercial applications (applicability here means that the knowledge is value-added and ready for commercial purpose).
11) In the same vein, an ecosystem promoting the efficient management of intellectual property, the rise of entrepreneurship culture, and research that can be commercialized should be established.
12) To this end, education on intellectual property rights and the transfer of research results should be enhanced. Education on entrepreneurship and relevant related topics such as start-up and spin-offs should also be included.
13) Research grants should be optimized and efforts to raise funds from the private sector stepped up, including abroad.
14) Finally, making decisive bold steps to act on these recommendations is crucial for attaining international status.

- Recommendations for Future Studies

This study focuses on one university in Thailand and one institute. It would be very instructive to have the same type of research and concerns applied to different contexts. Future studies could look at similar institutes in Thailand or abroad and based on this study, compare them and explore differences. In the same vein, future studies could focus on overseas institutes and the different contexts in which they operate. Differences could be identified and analyzed in light of this study. Finally, these studies could use EDFR, MANOVA, or a Structural Equation Model (SEM) to analyze a wider variety of variables.

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