Programme on Innovation, Higher Education and Research for Development (IHERD)

Background document

Gaps in research and innovation management at policy and institutional levels in Cambodia, Malaysia, Thailand and Vietnam

Draft synthesis report

Compiled by **Åsa Olsson** and **Lynn Meek**

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*For further information, please contact IHERD Coordinator **Ms. Åsa Olsson** at*
asa.olsson@oecd.org

Acknowledgement

Executive summary

The OECD has carried out a study on *Effectiveness of research and innovation management at policy and institutional levels in Cambodia, Malaysia, Thailand and Vietnam* (Olsson and Meek,2013), as a part of the OECD project on Higher Education and Research for Development (IHERD), which is financed by the Swedish International Development Cooperation Agency.

This synthesis report summarises the results from the full report by:

- providing an overview of the emerging landscape in research and innovation management
- presenting the key features of a typology for a description and analysis of research and innovation management at policy and institutional levels
- summarising the empirical account of research management capacity of four countries in South East Asia – Cambodia, Malaysia, Thailand and Vietnam – based on the typology
- analysing current gaps for efficient research and innovation management in the selected countries
- suggesting options for countries to address these gaps.

The typology was developed as a methodological tool to assist the country studies, and as an analytical tool providing guidance for determining strategic options to address gaps in research and innovation management at policy and institutional levels. The typology is based on the following thematic areas:

Theme 1: governance and leadership of research and innovation by government

Theme 2: leadership *of research* in institutions

Theme 3: management to support leadership of research in public institutions

Theme 4: leadership *of researchers* in institutions

Theme 5: management to support leadership of researchers

Theme 6: personal behaviours and qualities of research leaders and managers

It is assumed in the report that leaders and managers who pay attention to the factors identified in these six themes will have the potential to improve their policies and practice which will in turn ensure that the future development of their societies and countries can benefit from the intellectual and imaginative efforts of their populations.

The case studies of Cambodia, Malaysia, Thailand and Vietnam show that:

- Policy makers in general need to become better informed about the national importance of making a stronger commitment to research and innovation (R&I) by investing more heavily in capacity building and the expansion of opportunities for research in universities.
- Policy makers and institutional leaders need to become much better informed about global research trends, policy settings and funding arrangements affecting R&I management.
- Policy makers need to be assisted to develop skills in developing R&I policies that are based on evidence and informed by strategic considerations.

- Policy makers need to develop an appreciation of the training needs of researchers in universities and research institutes, particularly when it comes to the processes of commercialisation.
- Policy makers need to develop a better appreciation of how important institutional autonomy is to universities if universities are to be expected to make a significant contribution to R&I.
- Research managers and administrators within universities and research institutes need more support with the development of knowledge and skills related to their responsibilities.

One option to address these gaps is to establish a regional collaboration across the four countries to improve R&I management at policy and intuitional levels, not necessarily limited to the Association of Southeast Asian Nations (ASEAN) framework of co-operation, so that these countries could develop their own expertise and access to a regional network of professionals in this domain.

Acronyms and abbreviations

AKEPT   Higher Education Training Academy (Malaysia)

ASEAN   Association of Southeast Asian Nations

IHERD   Higher Education and Research for Development

GERD   Gross domestic expenditure on R&D

GNP   Gross national product

IP   Intellectual property

PPP   Purchasing power parity

R&D   Research and development

R&I   Research and innovation

S&T   Science and Technology

STI   Science, technology and innovation

USM   Science University of Malaysia

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1. Introduction

The OECD has carried out a study on *Effectiveness of Research and Innovation Management at Policy and Institutional Levels* as a part of the OECD project on Higher Education and Research for Development (IHERD), which is financed by the Swedish International Development Cooperation Agency (Olsson and Meek,2013). This report syntheses the results of the full report and includes the following elements:

- Identifies the overall policy framework for innovation and a tertiary education policy overview.
- Presents a typology for description and analysis as well as for innovation management at policy and institutional levels.
- Provides an empirical account of four case studies in South East Asia, in Cambodia, Malaysia, Thailand and Vietnam, following the typology.
- Brings an overview of current gaps for efficient research and innovation management resulting from the typology and the case studies.
- Presents strategic options that countries could apply to address gaps in research and innovation management at policy and institutional levels to achieve the intended policy objectives.

The first part of this report presents the overall policy framework for innovation and tertiary education policy, drawing on the second chapter that Mary-Louise Kearney has developed in the full report (Kearney, forthcoming).

The second part of the report provides an overview of a typology of research and innovation management at policy and institutional levels. This section presents key thematic areas that are important for analysing the level of effectiveness of research and innovation systems, which was developed in the main report by Alan Pettigrew, Molly Lee, Lynn Meek, and Fabiana Barros de Barros (Olsson, Meek 2013).

Thereafter a comparative analysis is presented including key features of research and innovation management at policy and institutional levels derived from the typology and from the individual case studies in the full report Dy, Lee et al., Ly, Suwanwela (Olsson, Meek 2013).

Finally, the report provides an account of current obstacles to achieving efficient research and innovation management based on the case studies and the typology. It suggests ways of how to address these gaps based on the results of Martin Hayden´s analysis in report on Effectiveness of research and innovation management at policy and institutional levels in Cambodia, Malaysia, Thailand and Vietnam (Olsson, Meek, forthcoming) and the Expert Meeting held in Kuala Lumpur 27 February – 1 March 2013, which was organised in partnership with LH Martin Institute and Higher Education Academy (AKEPT). At the Expert Meeting, 42 key policy makers, research managers and leaders from the region identified gaps in countries' research management capacity and suggested how these gaps could be addressed.

2. Research and innovation management in a global context

Global trends in research and innovation management

Policy makers have increasingly employed scientific research to address contemporary society's most pressing global economical and societal problems, such as climate change; the increasing world demand for food, water and energy driven by population increases; rising incomes; and urbanisation in a context where recovery from the global financial and economic crisis remains fragile. Research capacity is an important prerequisite for developing countries to be able to use their human capital to the best advantage to achieve sustainable development in the context of the knowledge economy.

The accelerating importance of the global knowledge economy has had qualitative implications for the way in which countries pursue economic development planning. One of the more significant consequences has been the attempts to integrate higher education and research systems into macroeconomic policies for stimulating technological renewal (research and innovation policy). Research and innovation policy differs radically from previous generations of science and technology (S&T) policy in three key respects that resonate well with the needs of low and middle income countries. It: a) emphasises the need for universities and other public research providers to pursue research agendas that are anchored in the needs of the society which they inhabit; b) promotes public-private partnerships as a key mechanism for achieving linkages between the economy and higher education and research; and c) embraces a system perspective.

The last has proven challenging since it brought into sharp focus the need for policymakers to understand the prerequisites and context in which policies for innovation are being implemented. The connection between higher education and innovation is a critical linkage about which there is little knowledge and understanding. This area has traditionally been a "black box" where it was thought that funders needed to know little of the details of the organisational practices and conditions under which research was produced. The shift from a linear to a system perspective and the corollary interest in effective sector coordination and institutional management has meant that research funding principals need to know more about the organisations they fund in order to design effective funding mechanisms.

Against the backdrop of these major changes in research and innovation policy and the tertiary education sector as a whole, the management of research and development (R&D) and innovation has emerged as a specialised area within both funding agencies and higher education institutions. Key areas include managing funds, liaising with funding bodies, project planning, implementation, monitoring and evaluation, as well as publications, research dissemination and, in some cases, commercialisation. Training in these areas is offered by a number of different actors, including specialised professional organisations, academic programmes and programmes related to specific funding instruments or dealing with specific development areas such as for example the EU framework programme.

3. Policy frameworks for innovation and tertiary education

Globalisation, which rolls on with unprecedented speed and scale, is characterised by increased international trade, deeper economic integration among high and middle-income economies, and widespread geographical fragmentation of production processes resulting in more complex global value chains. The motors of economic growth are changing as well. To date, whether economies are driven by manufacturing and industry (Germany), resources (energy in the Central Asia Republics; agriculture in Denmark and New Zealand; and minerals and commodities in Australia, Chile and Africa) or by services and investment (tourism in small island states or the financial sector in Switzerland and Luxembourg), efficiency has been the common watchword to ensure growth. Now, innovation is the preferred terminology because each and every source of growth needs to be constantly scrutinised to identify how new approaches, including vital information communications technology (ICT) applications, can modernise production processes, thus realising hitherto untapped potential. In brief, invention must become innovation which, with the contribution of multiple stakeholders, translates into economic growth.

Recent and current policy documents related to science, technology and innovation (STI) from the OECD and similar organisations now outline the "new geography of growth" where established players are being increasingly challenged by new trends and actors. These are complemented by the reforms recommended for tertiary/higher education so that a modernised academy may educate and train people, equipping them with the range of knowledge and skills required for tomorrow's world. The OECD STI Scoreboard (OECD, 2011) and OECD STI Outlook, OECD, 2012) Given that the IHERD project links directly to the OECD mandate, it is worth taking a brief look at its policy guidelines.

Today, there is significant interaction between STI and higher education and this is well documented in The OECD STI Scoreboard (OECD, 2011) which lists current trends and indicators to help countries assess their progress in utilising innovation. This report alternates with The OECD STI Outlook, 2012 illustrating how countries juggle austerity measures with measures to stimulate growth. The OECD STI Scoreboard attests to the breadth of the innovation landscape, its multiple stakeholders and actors, and the constantly changing factors which influence this activity. Although specific policies will still exist for each sector, their closer interaction is now crucial for sustained socio-economic wellbeing. To map impact, countries will need a data infrastructure capable of monitoring linkages between actors, outputs and outcomes.

These indicators are:

- ***Knowledge economies***: gross national product (GNP) and new sources of growth such as intangible assets; the new geography of growth such as foreign direct investment (FDI) in Asia; the changing landscape of innovation (notably high impact universities); innovation including science for green innovation and international collaboration in STI fields; and the main global issues ahead which will shape society such as the environment, ageing populations and the dominance of women in education and the workforce.

- ***Building knowledge:*** new doctorate graduates and their career paths; S&T occupations, the research community and international mobility; R&D expenditure (including in business); higher education and basic research; and investment in ICT.

- ***Connecting to knowledge:*** funding for R&D (public, private and international); science/technology linkages; labour market mobility; innovation, technology and knowledge flows; and national and international collaboration for innovation.

- ***Targeting new growth areas:*** government funding of R&D; health and environment technologies (including biotechnology R&D); and ICT access, services and costs.

- ***Unleashing innovation in firms:*** mixed modes of innovation; trademarks; tax incentives; access to capital; creating a facilitating policy environment; and nurturing an entrepreneurial culture with talented people (including the role of education – especially tertiary/higher education – in this process).

- ***Competing in the global economy***: employment; the balance between services and manufacturing; firm sizes and dynamics; trade openness, R&D and technology specialisation; E-commerce; patenting advances; innovative sectors (including education and training); and the quality and impact of technology performance.

4. Typology of research and innovation manegement

This typology of research and innovation management is built on a literature review of existing evolving programmes in leadership and the management of research and innovation. The typology has been further elaborated and validated using case study data from four countries in South East Asia: Cambodia, Malaysia, Thailand and Vietnam.

The typology was developed both as a methodological tool to assisting the country studies, and as an analytical tool providing guidance about strategic options for addressing current policy gaps in research and innovation management. It was used as the basis for discussions at the Expert Meeting in Kuala Lumpur.

The typology starts from the logic that understanding the overarching policy goals of the national government is the fundamental requirement for effective leadership and management of research and innovation at an institutional level. The typology is developed from this top-down perspective since improved performance generally needs to be judged through the prism of overall research and innovation policy, at the institutional and ultimately the national level.

The typology is presented in six broad themes or areas of activity. The information provided here has been drawn from many primary sources as well as reports from surveys of leadership and management practices in different groups of institutions. (Association of Commonwealth of Universities, 2006)

Each of these themes has many elements that together comprise the requirements for strong leadership and achievement. The **leadership** themes are directed towards understanding the cultural and personal influences on the research creativity of individuals and groups within institutions. These influences are applicable to leaders in government as well as in institutions. **Management** themes deal with the extensive procedural, financial, legal, compliance and reporting requirements that underpin the proper conduct of research and innovation. The final theme deals with the personal behaviours and qualities that leaders and managers of research and innovation must demonstrate so that the staff for whom they are responsible and who conduct these activities can maximise their productivity and creativity.

The typology assumes that leaders and managers who pay attention to these factors will have the potential to improve their policies and practice, which will in turn ensure that the future development of their societies and countries can benefit from the intellectual and imaginative efforts of their populations.

Themes of the typology

Theme 1: Leadership in R&I by government. Key elements are:

> ➢ *national policies on research and innovation*
>
> ➢ *governance structure of research and innovation*
>
> ➢ *approaches for human resource development in research and innovation*

➢ *funding allocations and instruments applied and communicated to public research organisations*

➢ *legal frameworks for research ethics.*

Theme 2: leadership of research in institutions. Key elements are:

➢ **Institutional governance,** including developing a vision and a timeframe, designing feasible and achievable strategies, designing a performance framework for the institution, and establishing a process for reviewing the plan over time. Other areas include the development of a critical mass of researchers, research infrastructure, delegation to senior members of the management team and risk management.

➢ **Awareness of the R&I setting** including analysing the external environment and the role of the institution, taking account of key matters such as global research trends, policy settings and funding sources, the institutions comparative advantage and communication with staff and governments

➢ **Establishing a research culture and ethos,** including the development of a strong research culture, hosting leading researchers from other countries, providing support staff, and developing and implementing incentives and rewards for positive performance consistent with the goals of the institution.

Theme 3: management to support leadership of research in institutions. Key elements are:

➢ **Organisational structure,** including creating a critical mass of researchers, interdisciplinary support, practical issues such as space, infrastructure and other academic obligations, provision of effective management and administrative support to the research groups, and support for colleagues in positions of responsibility.

➢ **Executive and management operations,** including ensuring roles are clearly defined and without duplication, and ensuring co-ordination in support for the implementation of the institutional plan.

➢ **Committee operations,** including the balance between purpose, frequency and effectiveness of the group.

➢ **Research management and administration,** including research support, research translation/commercialisation, financial management, asset management and performance data recording and analysis.

Theme 4: leadership of researchers in institutions. Key elements are:

- ➢ **_Research students, postdoctoral and newly independent researchers,_** including staff appointments, staff developments, conditions of employment and performance management, assurance of the relevance and the quality of the research training and the research environment, and understanding the attitudes of younger generations.

- ➢ **_Development of research leadership_** including co-ordination of activities, selection of people, assembling teams, motivating workers, resolving problems, creating a supportive environment, communication, and providing focus and leadership reward systems that are both fair and capable of motivating excellence, and of attracting and retaining the best people, resource management and identification and support for emerging areas of strength and advantages,

Theme 5: management to support leadership of researchers. Key elements are:

- ➢ **_Research student management,_** including ensuring the relevance of their contribution to external policy settings, establishment of enrolment requirements, student induction, supervision arrangements and training, research methods and intellectual property (IP) management, training programmes for research methods, support for travel and conference attendance, support for secondments to industry, monitoring progress and support, examination process, and graduation confirmation.

- ➢ **_Staff management,_** including position descriptions, setting performance expectations, responsibilities and accountabilities, process for recruitment, selection and appointment of staff, contract arrangements, advising on research integrity, staff development, assisting and management conflict resolution, data analysis for trends in personnel profiles, supporting and managing staff surveys and feedback options, strategy, and management support for workplace change.

Theme 6: personal behaviours and qualities of research leaders and managers.

- ➢ **_Behaviour of leaders,_** including clear performance expectations, transparent and rigorous incentive systems, recognition and reward, provision of feedback, transparent and consistent decision making, dealing effectively with misconduct, provision of development opportunities, rewarding and celebrating individual and team successes, delegation, communication, and being available to provide advice and assistance.

- ➢ **_Personal qualities of leaders,_** including acceptance of the responsibility and accountability that comes with the role of being a leader, recognition and appreciation of teamwork in leadership and management, soliciting and accepting personal feedback on personal performance and the performance of the senior team, communicating with empathy, adapting to changing circumstances, advocating with passion, and demonstrating honesty and integrity.

5. Comparative analyses of country cases

Research and innovation profiles of Cambodia, Malaysia, Thailand and Vietnam
These four countries are all developing economies located in an economically dynamic region. They form part of the Association of Southeast Asian Nations (ASEAN), which also includes Brunei, Indonesia, Lao PDR, Myanmar, the Philippines and Singapore. Each is experiencing long-term and reasonably sustained economic growth; each is at a slightly different stage of economic development; and each aspires to develop a stronger capacity in R&I.

Table 1 presents details that relate to their R&I profiles. Economic prosperity is indicated by their gross national incomes (GNI) per capita adjusted for purchasing price parity.

Table 1. Selected indicators for Cambodia, Malaysia, Thailand and Vietnam				
Indicators	**Countries (year)**			
	Cambodia	**Malaysia**	**Thailand**	**Vietnam**
GNI per capita	USD 820 (2011)	USD 8 770 (2011)	USD 4 440 (2011)	USD 1 070 (2011)
Researchers per million inhabitants (full-time equivalent)	17 (2002)	365 (2006)	316 (2007)	116 (2002)
Percentage employed by business enterprises	15.7% (2002)	36.4% (2006)	23.3% (2007)	10.4% (2002)
Percentage employed in higher education	12.5% (2002)	52.6% (2006)	60.5% (2007)	32.4% (2002)
Percentage employed by government	50.7% (2002)	11.0% (2006)		56.5% (2002)
Gross domestic expenditure on R&D (GERD) as a % of GDP	0.05% (2002)	0.63%[1] (2006)	0.21% (2007)	0.19% (2002)
Population (millions)	14.3 (2011)	29 (2011)	69.5 (2011)	87.8 (2011)

Source: UNESCO Institute of Statistics and World Bank

Malaysia is the leader in many of the indicators shown in Table 1. As well as having the highest level of GNI per capita, it also has the highest level of gross domestic expenditure on research and development (GERD) as a proportion of gross domestic product (GDP). This measure is a standard indicator of an economy's willingness and capacity to invest in research and development.

In terms of overall global competitiveness, the *Global Competitiveness Report* for 2012-13 ranked Malaysia 25th, Thailand 38th, Vietnam 75th and Cambodia 85th out of 144 countries (World Economic Forum, 2011). Malaysia's economy is described as "*being in transition from being "efficiency-driven" to being "innovation-driven*", that is, its national economic prosperity relies less on simply improving the efficiency of production and more on being able to utilise new technologies and more sophisticated production processes and business models. In contrast, Thailand's economy is said to remain "efficiency-driven" and the economies of Vietnam and Cambodia are described as being

"factor-driven", that is, they continue to rely significantly on the availability of low-skilled labour and natural resources.

Comparative analyses of effective management at policy and institutional levels
This section summarises the main findings for each of the first four themes from the typology, presenting the key points for each theme from each of the four country reports. There were not enough appropriate data to cover the final two themes. Given the richness of detail in the individual country reports, the process of summarising the main findings has been challenging. Many important details have had to be overlooked.

Theme 1: leadership in R&I by government

National policies on R&I. Across all four countries, governments have expressed a strong commitment to the importance of R&I. Cambodia's *Education Law of 2007*, for example, requires the state to "promote and support research, development, invention and production, which are scientific and technological for education to meet the needs of the labor markets and globalization to promote human resource capacity and to enhance the development of the country" (Article 28). Malaysia's *National Science, Technology and Innovation Policy 2012-2020* states a commitment to invest in new technologies, to concentrate on the utilisation of research in strategic areas, to develop capabilities and strengthen the nation's capacity for scientific and technological development, to achieve collaboration between research institutions, universities and industries, and to commercialise research outputs. Thailand and Vietnam have similar official expressions of commitment to the importance of R&I.

Governance of R&I. The effectiveness of their arrangements for implementing their policies differ across the four countries. Malaysia has a single body providing co-ordination of the R&I system, the National Science and Research Council, comprised of 20 experts from academia, the private sector and the public research institutes. The Council seeks to ensure that national research efforts are aligned with national priorities. In contrast, Thailand has various layers of co-ordinating agencies, resulting in a lack of strong and sustained leadership for R&I. In Vietnam, co-ordination of the R&I system is largely shared between two ministries, the Ministry of Science and Technology, which is primarily responsible for the distribution of funds, and the Ministry of Planning and Investment, which is primarily responsible for determining national investment priorities. In practice, however, the process of allocating research funds in Vietnam is much more complicated – various ministries and other government bodies, together with a large number of local governments, are involved. The government has not been successful in stemming significant and readily identifiable inefficiencies in the way funds are allocated to support national R&I priorities. For example, a sizable proportion of all research funds allocated in one year are refunded in the next because of misallocation and the impact of excessive levels of regulatory control. In Cambodia, the Ministry of Education, Youth and Sport co-ordinates the R&I system, but other agencies including the Supreme National Economic Council, the Royal Academy of Cambodia and the Ministry of Planning all play additional and significant roles. The country report for Cambodia describes the arrangements for funding of R&I as being "blurred and bureaucratic".

Human resource development in R&I. National policy statements from each of the four countries espouse the importance of human resource development, but again the effectiveness of their policy implementation varies between them. Malaysia's approach is the most systematic. It has targets and implementation programmes for improving the quality of science, technology, engineering and mathematics teaching in schools; increasing the proportion of science and technology students enrolling at first-degree levels; expanding the pool of teachers in science and technology areas through the provision of postgraduate awards and scholarships; and supporting brain-gain initiatives. Thailand has similar initiatives, but they may not to be as well co-ordinated – the diversity of co-ordinating agencies contributes to some confusion and fragmentation of effort. Human resource development initiatives for R&I are least well developed in Vietnam and Cambodia. Vietnam's system of strategic planning, which requires an elaborate cycle of national, institutional and faculty-level five-year plans, should in theory mean that human resource development issues for R&I are routinely addressed. As noted in Vietnam's country paper, however, these documents are often produced simply because they have to be, and may not necessarily lead to decisive action. In Cambodia, a lack of funds severely restricts human resource development opportunities.

Funding mechanisms for R&I. Though details of the funding mechanisms for R&I support across each of the four countries are perhaps not of critical importance to this report, a notable common theme is the desire for the private sector to play a more significant role. The area of greatest need for private sector engagement would appear to be the commercialisation of new research products. To encourage the private sector in this regard, tax and other incentives are provided. In Malaysia, for example, the government allows venture capital companies a five-year tax exemption if they invest at least 30% of their funds in the form of seed capital, start-up and/or early-stage financing. In Thailand, private-sector participation in R&I is encouraged in similar ways. The impact is not as great as might be expected. One reason is that the research community itself does not have sufficient understanding of how the commercialisation of new research products works. Underdeveloped industrial enterprises and their lack of trust in local innovations may also be responsible. In Vietnam, the state funds more than 70% of all R&I expenditure. The private sector is mainly comprised of small enterprises with limited opportunities to raise venture capital, which severely restricts commercialisation. In Cambodia, private-sector investment in R&I is also reported to be negligible.

Forms of communication: Standard forms of communication between governments and R&I providers are reported across all four countries. There are, however, some qualitative differences. In Malaysia, policy makers seem to be more collaborative in their communication with research leaders than is generally the case in the other three countries. The National Science and Research Council for example, is comprised entirely of persons from the research community. In Thailand, similar open communication is encouraged, but because there are multiple co-ordinating and funding agencies involved, the task of achieving effective communication between policy makers and the research community is more complex. In Vietnam, communication by policy makers tends to be "top down", reflecting Vietnam's legacy of a Soviet-style "command and control" system of higher education governance. Similar top-down forms of communication are also reported for

Cambodia although the size of its R&I sector is small, and informal avenues of communication between policy makers and the research community are also common.

Research ethics. Malaysia and Thailand show commitment to the importance of a national research ethics framework, with their governments developing national frameworks for research ethics. In Vietnam there is no national framework, but the Ministry of Health does have a research ethics policy to be followed by researchers in all universities, hospitals and related institutions under its direct control. In Cambodia, a national research ethics framework is under development.

Theme 2: leadership of research in institutions

Institutional governance. The four countries differ in terms of the distinctiveness and strength of the research mandate given by government to different institutions. Malaysia and Thailand both designate particular public universities to be research intensive – Malaysia has five designated research universities, and Thailand has nine. These universities have been given access to significantly larger amounts of public funding to support their research-intensive status. The designated Malaysian universities have also been given more institutional and financial autonomy than other universities in Malaysia. In Thailand, there are 16 "autonomous" higher education institutions, but some of the designated national research universities are not recognised as being "autonomous". With more freedom, and particularly with additional funds, the research-intensive universities in Malaysia and Thailand have been able to develop internal management structures to drive and support a research agenda. The designated research universities in Malaysia, for example, typically appoint a Deputy Vice-Chancellor with research management responsibilities. A research management office supports this position, and there is also a network of research sub-deans across schools and faculties. In Thailand, the national research universities appoint a Vice-President for Research Affairs. In Vietnam, there are no designated research-intensive universities, though the government has signalled its intention to move in that direction and trials are under way within the two national universities and with several small "new model" universities (established through international collaborations). In Cambodia, there are no designated research-intensive universities.

Awareness of the R&I setting: There is no proper basis for comparing the extent to which leaders within research institutions have a sound awareness of the R&I context – concerning global research trends, policy settings and funding sources. There are, however, differences between the four countries in the ways in which policy makers and institutional leaders engage with one another in developing an understanding of these settings. From the country reports for Malaysia and Thailand, it is evident that policy makers and institutional leaders engage collaboratively with the task of assessing trends, reviewing policies and determining funding allocations. There is an emphasis on the use of committees through which multiple stakeholders can contribute to the discussion of R&I settings. The Vietnam country report does not show a similar level of collaboration. There, policy is determined more in a top-down fashion, and institutional leaders rely more on their own informal networks to find out about R&I settings. In both Vietnam and Cambodia, there is a lack of emphasis on the importance of training programmes for research leaders. One consequence is that, as noted in the country report for Cambodia, "policy decisions are more often based on assumptions, values and personal experiences, than on systematically

collected data." Vietnam does have some policy researchers to provide advice to the state, but the extent to which their voices are heard is uncertain.

Implementing institutional change. With greater institutional autonomy and with better research funding, research-intensive universities in Malaysia and Thailand are able to establish institutional governance and management systems that enable them to engage meaningfully in long-term planning, make staffing appointments that support a research culture, reward research achievements, and implement policies and processes in support of a research culture and ethos. In Vietnam and Cambodia, progress in this direction is taking place much more slowly, if at all.

Strategic planning for R&I. Malaysia, Thailand and Vietnam all report strategic planning for R&I. As noted earlier, Malaysia and Thailand have more of a collaborative approach to planning, whereas in Vietnam the planning culture is more top down. Of note is Malaysia's strategic plan to assist the Science University of Malaysia (USM) to secure "world-class" status. In Vietnam, similar aspirations have been expressed for the two "new-model" universities being supported by with funds from consortiums in Germany, Russia and France, but to date these universities appear to be falling well short of official expectations.

Establishing a research culture and ethos. The four countries differ in their commitment to and ability to support the development of a research culture and ethos in public universities. Again, the situation in Malaysia and Thailand contrasts with that in Vietnam and Cambodia. The country reports for Malaysia and Thailand indicate that a research culture and ethos is established in the research-intensive universities. The challenge now is to boost this culture in all public universities. The country reports for Vietnam and Cambodia present a different picture – neither country has public universities with a well-developed research culture and ethos. A significant obstacle to the development of such a culture is the relatively low level of salaries paid to university lecturers. To supplement their income, academic staff members from public universities often take second jobs teaching at private universities, or teaching in in-service and other non-regular programmes, or undertaking paid after-hours tutoring for students. There is little or no time for research, which is much less financially rewarding.

Theme 3: management support for leadership of research in public institutions

Organisational structure. Public universities across all four countries have organisational structures to support the leadership of research. Typically, these involve the appointment of a member of the institution's executive team to provide leadership of the research agenda. This position is supported structurally with other appointments across faculties and schools, and administratively with functional departments. In Malaysia and Thailand, for example, universities typically appoint a Deputy Vice-Chancellor (Research) or a Vice-President for Research Affairs to develop the research priorities for the institution and to ensure the delivery of appropriate support for academic staff members and students undertaking research. This position is supported by the appointment of research sub-deans (or similar positions) across schools or faculties, and by the establishment of a research management office that helps to formulate policies and create processes for the management and advancement of research. Universities that are more research intensive may also have an innovation and commercialisation office. In Thailand, for example, a

University Institute for Intellectual Property Management operates under a foundation agreement. Arrangements of this nature also exist in universities in Vietnam and Cambodia, but it is clear that limited funds significantly constrain the capacity of universities in Vietnam and especially in Cambodia to support these structures.

Executive and management operations The research management and administration systems in universities in Malaysia and Thailand, especially the research-intensive universities, are much better resourced than in universities in Vietnam or Cambodia.

Research management and administration. The research-intensive universities in Malaysia and Thailand have well established structures and processes for the management of research personnel. The models being developed in these universities are having an effect on other universities in those countries. A distinctive characteristic of these models is the emphasis they place on research publications and success in obtaining research grants as foundations for career progression. In some universities in Vietnam, a research culture is slowly becoming established, and management processes are placing more emphasis on research productivity. In Cambodia, the research culture in universities is not yet strong enough for these developments.

Mechanisms for supporting research students are broadly similar across all four countries, but Vietnam and Cambodia are more restricted by limited research budgets. Across all four countries, universities have research student support offices that, to varying degrees, provide administrative, mentoring and training support. The country report for Malaysia documents a highly sophisticated level of support provided for research students at USM – which, as has previously been mentioned, the government is supporting to become a "world class" university. The country report for Vietnam shows the more limited range of support provided by public universities for research students in that country.

Governments are increasingly pressurising public universities and research institutes in Malaysia, Thailand and Vietnam to commercialise their research products. Many universities are establishing offices for the commercialisation of research products, and the commercialisation of research products and processes has become a mainstream activity for larger public research institutes, especially in Malaysia and Thailand. Country reports for Malaysia and Thailand suggest, however, that the process of commercialisation is not yet as well supported as it might be. In universities, in particular, there is a need for academic staff members to improve their skills so that they become aware of the possibilities for commercialisation and are better able to master the relevant procedures. The country report for Malaysia notes also the need for more skills and knowledge regarding international collaborations and the sourcing of international venture capital.

Theme 4: leadership skills of researchers in institutions

Research students, postdoctoral and newly independent researchers. The extent of the induction provided to research students, postdoctoral and newly independent researchers, varies greatly across the four countries. In Cambodia, it is reported to be negligible – because there are relatively few full-time doctoral students and few, if any, full-time research staff in public universities. In Vietnam, the larger universities provide training programmes, but gaps exist,

particularly in relation to writing skills, ethical issues and intellectual property issues. In Thailand and Malaysia, a culture is developing whereby younger researchers are mentored by more experienced researchers, and experienced researchers are expected to demonstrate research leadership. Research leadership skills are also developed by such activities as sending younger researchers to conferences and by arranging for their participation in specialised training programmes, such as the training programs conducted by the Higher Education Training Academy (AKEPT) in Malaysia. Public research institutes may also provide extended induction training programs for new employees, and they may invest significantly in developing the skills of more senior researchers in commercialising research outputs.

Development of research leadership. The development of research leadership also varies across the four countries. The pathways to research leadership in Malaysia and Thailand are similar to those in most developed countries: the accumulation of research experience, publishing success and success in obtaining research funds. In addition, attendance at high-level training programmes may be important as a basis for ensuring a better understanding of research policy settings and research trends. The pathway to senior research leadership in Vietnam is different. As documented in the country report for Vietnam, the requirements for institutional leadership are the same across all areas of university life: nomination by the institutional Communist Party Committee to attend an advanced political theory programme conducted by the Party, followed by successful completion of a public administration programme conducted by a National Institute of Politics and Public Administration, followed by success in obtaining a passing grade in a Senior Staff Testing Programme. Vietnam's Confucian legacy is evident in its attachment to the importance of an examination to attain high office, but so too is the extent of political control exercised by the Party. There may therefore be research managers in Vietnam who have never undertaken any formal research management training, and who may not even have been screened for the personal qualities and behaviours that effective research managers usually require. In Cambodia, the very concept of research leadership is in its infancy.

6. Issues with research and innovation management

Each of the country reports identified gaps in knowledge and skills for effective R&I management for higher education institutions and for funding agencies and policy makers.

Issues with policy makers at national level

Commitment of national leaders to the importance of research and innovation. All four countries are concerned to improve their performance in translating policy aspirations into practice. They all need to improve the capacity of their universities to support research and to provide research opportunities for trained researchers. The implication is that policy makers need to become better informed about the national importance of making a stronger commitment to R&I by investing more heavily in capacity building and the expansion of opportunities for research in universities. They also need to be encouraged to develop skills in translating the sort of expressions of support for R&I found in official documents across all four countries into focused plans of action.

Designing evidence-based research and innovation policies. All the countries, but particularly Vietnam and Cambodia, are concerned to improve their understanding of global trends, policy settings and funding arrangements. The country reports for Cambodia, Thailand and Vietnam also identified the related need to improve national leadership capacity for the development of strategic and evidence-based R&I policies. Policy makers lack knowledge about trends, settings and institutional arrangements that relate to the national advancement of R&I. They need to improve their skills in developing R&I policies based on evidence and informed by strategic considerations – as opposed to being based on "assumptions, values and personal experiences", as was reported to be a basis for some policy making in Cambodia.

Development of adequately funded autonomous research universities. Cambodia and Vietnam need to develop adequately funded research universities that have more institutional autonomy in their governance and management.

Both Thailand and Vietnam need to reform their national research system with a view to removing imbalances, fragmentation and redundancies in the way the system is managed and administered. Thailand also needs to provide better co-ordination between the national agencies providing support for R&I and to improve the effectiveness of its national funding, budgeting and accountability mechanisms. The research systems in these two countries are markedly different from one another in terms of how they function and in their developmental stage.

The country report for Malaysia identifies additional needs that may well relate to its more advanced research status. Malaysia needs to shift the focus of its research funding to ensure more funds are being spent on basic research. It also needs to make the awarding of public funds for research more competitive, and attach more importance to medium-sized research projects and to require increased participation by international experts on review panels for funding applications, especially in emerging fields of research.

The country report for Vietnam also identifies needs that relate particularly to its national setting. Policy makers should provide far more training opportunities for research leaders and establish a national framework for research ethics. Policy makers lack knowledge about the kind of training opportunities that would be appropriate for research leaders and about other national research ethics frameworks that could be used as a model.

Gaps in knowledge and skills at an institutional level
Research institutions in Malaysia need to reduce the extent of wastage of researcher capacity and improve the work ethic of researchers. They should do more to assist researchers to expand their international networks and improve their writing skills in English and increase the number of trained researchers. There are gaps in knowledge about the extent of resource wastage at an institutional level, and institutions need to improve the performance management of academic staff members at an institutional level, develop international networks at an institutional level, and improve the use of English for academic purposes. They also need to improve their knowledge about what their future need for trained researchers will be.

In Vietnam, institutions need to provide opportunities for trained researchers to pursue research at an international standard and to appraise researchers and appoint research managers solely on the basis of their research achievements and merits. At an institutional level, academic managers do not appreciate sufficiently the value of capitalising on the skills of trained researchers, and they need to develop a better understanding of international practices in the appraisal of researchers and the appointment of research managers. The support of researchers in Thailand is variable amongst institutions, while in Cambodia all resources available to support research are extremely limited.

Recommendations:

Cambodia:

➢ Increase the extent of institutional co-operation in support of research.
➢ Develop and implement mechanisms to support routine university-industry linkages.
➢ Develop a career structure for researchers in universities.

Malaysia

➢ Provide more training for research managers and administrators in vetting research proposals; managing finance, staff and assets; and monitoring and evaluating research projects.
➢ Reduce the extent of wastage of researcher capacity and improve the work ethic of researchers.
➢ Assist researchers to expand their international networks and improve their writing skills in English.
➢ Increase the number of trained researchers.

Thailand

➢ Provide more training for research managers and administrators in vetting research proposals; managing finance, staff and assets; and monitoring and evaluating research projects.
➢ Develop and implement mechanisms to support routine university-industry linkages.

Vietnam

➢ Provide opportunities for trained researchers to perform research that is at an international standard.
➢ Develop a career structure for researchers in universities.
➢ Provide more training for research managers and administrators in vetting research proposals; managing finance, staff and assets; and monitoring and evaluating research projects.
➢ Appraise researchers and appoint research managers solely on the basis of their research achievements and merits.

7. Strategic options for addressing gaps in research and innovation management

Before presenting strategic options that actors in research and innovation can adopt at policy and institutional levels, some words of caution are in order. First, while the countries on which this report are based appear generally to be committed to developing their R&I capacity, it is not clear to what extent they have explicitly investigated the foundations for such a commitment. If they have not, then there is a significant gap in their policy-related information. There may be a tendency for developing countries in the region to follow the examples of the more economically advanced countries of the region, such as Singapore and Australia, without examining carefully the social rates of return from significant investments in R&D. However, where these have been investigated, and are found to be worthwhile, then the lack of political commitment referred to in some of the country reports, and the instances of misallocation of resources referred to directly or indirectly in all of them, become inexcusable.

Second, globalisation, increasing international mobility and rapid technological change, while creating significant social benefits on a worldwide scale, also present significant challenges for developing economies. For example, the costs of commercialisation of research products can be prohibitive in situations where an expensive bureaucracy is required to protect patents and to fend off counter-claims of ownership by well-funded global rivals. Similarly, "brain drain" can quickly whittle away many of the benefits of years of public investment in building a reserve of highly trained researchers. Rapid technological change means that even keeping up with contemporary research in laboratory-based and technological fields requires ongoing and ever-increasing expenditure on new items of equipment. These costs are difficult to sustain for developing economies.

Third, developing economies often have legacies of political and social instability. The countries selected for examination in this report are cases in point. These legacies may mean that there are "sensitive topics on which research is not generally encouraged" (as the Cambodian country report puts it). The identification of knowledge and skill gaps for R&I management by universities, funding agencies and policy makers in developing countries cannot be completely de-contextualised from the political and social reality of the developing countries concerned.

Key matters to address:

- Policy makers in general need to become better informed about the national importance of making a stronger commitment to R&I by investing more heavily in capacity building and the expansion of opportunities for research in universities.
- Policy makers and institutional leaders need to become much better informed about global research trends, policy settings and funding arrangements affecting R&I management.
- Policy makers need assistance to develop skills in developing R&I policies that are based on evidence and informed by strategic considerations.

- Policy makers need to develop an appreciation of the training needs of researchers in universities and research institutes concerning the processes of commercialisation.
- Policy makers need to develop a better appreciation of the importance of institutional autonomy to universities if universities are to be expected to make a significant contribution to R&I.
- Research managers and administrators within universities and research institutes need more support with the development of knowledge and skills related to their responsibilities.

Despite these gaps there are many setting-specific achievements in R&I management being recorded by each of the countries reviewed. More time would be necessary to record these properly.

Concluding remarks

Developing a critical mass of researchers is a long-term commitment for nations and requires investments over a considerable period of time.

Due to the need to improve skills at policy and institutional levels and the fact that there are relatively few actors at the national level it was suggested at the Expert Meeting in Kuala Lumpur and in Hayden's final summary report of the country case studies that collaboration across the four countries in terms of initiative to improve R&I management should be explored further, particularly but not limited to the ASEAN framework of co-operation.

Furthermore, it was suggested that certified executive training courses should be established with the objective to provide a structured overview of STI policy (theory and practice) and provide a structured forum for policy learning and exchange of ideas. These would target professionals in charge of research funding at the policy level and research leaders and managers at institutional levels. The courses would be comprised of a mix of lectures and exercises designed to put the course participants' experiences, challenges and interests at the centre of the learning experience. So as to enhance accessibility and flexibility, a mixed mode of online and face-to-face delivery approached should be explored. In this fashion countries would develop their own expertise and it would give the research leaders and managers access to a regional network of professionals in similar positions.

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[1] In the country paper on Malaysia, the figure for 2008 for Malaysia is reported as being 0.82%.