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National E-strategies for Research and Development

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Graphical abstract
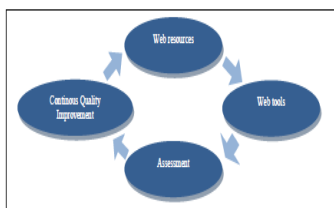
Abstract

This paper investigates empirically different ways to organize e-strategies of Research and Development (R&D) among Malaysian ministries. This study examines the dynamic cycle of e-strategies namely Web resources, Web tools, Assessment and Continual Quality Assessments through the content analyses of the Ministries' websites. All the strategies support the mission and objectives of the organizations. As universities are seen as the catalysts for the development of R&D, the national policies support them by a means of investment of grants and other strategies which assist the growth of the economy. The Ministries are yet to adequately reflect truly comprehensive and integrated strategies for harnessing and exploiting these potentials in order to gear for internationalization and collaboration across countries. The flaws in the assessment and CQI should be heeded to provide a better system of monitoring. This paper provides interesting insights into the trend of e-strategies of R&D employed by Ministry of Higher Education and Ministry of Science, Technology and Innovation in Malaysia. The model of e-strategies utilized in the study will provide guidelines for policy makers within the Ministries in improving their e-strategies to realize their visions and missions. Further research should focus on the e-strategies of universities in Malaysia to ascertain the trends adopted in realizing the vision and mission of Ministries in R&D agenda.

Keywords: Research, development, e-strategies, Malaysia, ministries

1.0 INTRODUCTION

Research and development (R&D) are crucial for the growth of a nation. Research and development are interrelated with research and innovation activities in an organization. Universities are not only involved in R&D activities but they are also expected to commercialize their research output as well as generate start-up or spin-out companies. An increasing trend at present is towards the inclusion of commercialization activities [1]. While research is defined as activities undertaken on a systematic basis to enhance knowledge of human beings, culture and society, and to invent new applications [2], innovation is also defined as the development and application of a new product, process or service which include the use of an existing type of product in a new application or the development of a new device for an existing application [3]. Reference [4] asserts that innovation is the adoption and conversion of new ideas into a commercial market success. Commercialization is to profit from innovation through the sale or use of new products, processes or services [3]. It is a process of developing new research products and placing them on the market [4].

Universities and governments rely on each other in the R&D agenda. Most governments assist universities to become competitive and to exploit their innovations through patenting or licensing, contracting research, and creating university spinout

(USOs) companies [5]. A number of studies have found key initiatives towards enhancing success rates in commercializing research output and creating USOs which include technology incubators, science and technology parks, entrepreneurship centres which have technology licensing office, commercialization office, incentive structures, royalty regimes, and equity investments [6-13]. These studies have been conducted mostly in the developed nations. The scenarios in the developing countries are still under researched.

Meanwhile, e-strategies are plans based on the selection of scenarios and options for developing R&D through ICT to enhance national development [2]. E-strategies comprise various instruments. The present instrument is derived from several sources [2, 14, 15, and 16]. Hence, the present study investigates the dynamic factors utilized by the Malaysian government through the e-strategies of R&D in the websites.

2.0 METHODOLOGY

The study adopts a content analysis method to analyze the strategies based on the projection of the Web Content (the background , the services offered, the News and Events , Program Activities, Resources, Publication and others) and the tools to disseminate the information (Interactivity, Navigation style and Design features). Then, the instrument for assessments is determined in order to evaluate the effectiveness of the strategies. Evaluation results are disseminated well in order to improve the whole e-strategy components. The continuous quality improvement includes the process of identifying weaknesses and filling the loops for the next cycle. Figure 1 illustrates the model of e-strategies.
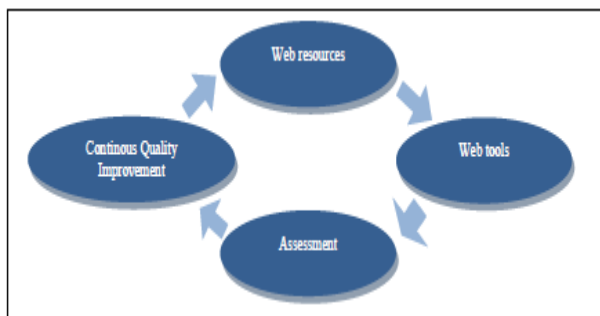

Figure 1 Model of e-strategies

3.0 CASE STUDIES OF MALAYSIAN MINITRIES

Two Ministries which oversee the realms of R&D in Malaysia are the Ministry of Higher Education Malaysia and Ministry of Science, Technology and Innovation (MOSTI). The content analysis was performed on the websites to ascertain the projection of R&D strategies.

3.1 Ministry of Higher Education Malaysia (MOHE)

3.1.1 Web Resources

The mission of the Ministry of Higher Education (MOHE) is "to establish and develop higher education environments that lead to the establishment of a distinguished centre for the quest of knowledge, and to produce competent, innovative and noble individuals to meet the needs of the nation and the world". The Department of Higher Education (DOHE) oversees R&D in Malaysian universities. The Ministry's mission is aligned to strengthen Higher Education Institutions as eminent centres of excellence which will generate competent, innovative and responsible individuals who can fulfill national and international aspirations. Hence, "innovative individuals" reflect the intention to promote innovation and creativity for the economic, social and cultural development of the nation.

Within the website, the corporate profile detailing the vision, mission, objectives, functions of the department, client's charter, organizational chart and input on various divisions is projected. Next, the policy section comprises the philosophy of the nation, the development and implementation plans of Malaysia for developing R&D in Malaysian universities. The Ministry of Higher Education Malaysia (MOHE) offers four main grant schemes to intensify the research efforts of the universities: Fundamental Research Grant Scheme (FRGS), Exploratory Research Grant Scheme (ERGS), Long-Term Research Grant Scheme (LRGS) and Prototype Research Grant Scheme (PRGS), worth a total of RM170.47 million.

Another feature is MyRA, an online system which enables the institutes of higher learning to self-evaluate their achievements in R&D. The utilization of MyRA shows that the Malaysian Government is focusing highly on research and development activities in order to develop the economy. MYRA is devised to enable universities evaluate their achievements in the area of R &D. The objectives of MYRA are as follows:

- Self-evaluation of Higher Education institutes in the area of R&I&C.
- Compilation of data by the Ministry of Higher Education.
- Pre-requirement for the Private Higher Education Institutes to apply for a special research Grant.
- Endorsement for the status of Research University.
- Evaluation scheme for existing Research universities.
- Monitoring device for the development and evaluation of yearly research activities.

3.1.2 Web Tools

The interactivity aspects feature correspondence, forum, search tool, online applications, feedback,

video webcast and directory of experts. Navigation style is using left-side navigation bar with the drop-down method. This method easily saves space and lends a neat organization of the page. Design features illustrates the aspects which ease navigation like location icon, site map, helpful links, relevant graphics, organized information and links, and consistent format. However, several broken links are detected which affect the professionalism of the site. Moreover, while links to national websites are projected, the links to the international sites are not present. Upon browsing, the researcher has found that the links to international sites are embedded in the NAHERI's site, one of the institutes under the purview of the MOHE. The links should be transparent on the main layer of the site to reflect the international agenda of the organization.

A unique program illustrated in the website is NAHERI, a research institute which conducts a policy research for the MOHE and acts as a think-tank group.

3.1.3 Assessment and CQI

The assessment and CQI are absent from the site. While these exercises are vital to ensure the continuous improvement of the system, the strategies are not projected in the site.

3.2 Ministry of Science, Technology and Innovation (MOSTI)

3.2.1 Web Resources

The mission of the MOSTI is "To drive and manage Science, technology and Innovation for socioeconomic growth by intensifying creativity and innovation; strengthening market driven R&D; sourcing and diffusing new technology; developing and attracting talent; deepening STI awareness; and strengthening collaborations and partnerships"(MOSTI). Hence, creativity, innovation and collaboration are essential to the promotion of innovation and creativity for the economic, social and cultural development of all countries.

The MOSTI embraces 9 strategic thrusts for organization and the MOSTI OBB Programs. The former consists of the following elements: development of human capital in STI toward generating and enhancing knowledge/innovation-led economy; harnessing and intensifying home-grown R&D, acquiring technology and innovation for markets; mainstreaming of STI, nurturing and instilling creative and innovative thinking; enhancing and strengthening strategic alliances (collaboration, cooperation and partnerships); strengthening RDC funding; harnessing commercialization and intellectual property for wealth creation and societal well-being; empowering society through innovation for sustainable development; gearing toward internationalization and strengthening the ability and capacity of the MOSTI support services. In order to reflect the above thrust, the MOSTI OBB Programs are created to focus on the phases like the STI Development Program, STI Services Program, STI Acculturation Program, Ministry Management and Policy Evaluation and Performance Management.

Offering of grants like Sciencefund, Technofund, Innofund and Nanofund is another strategy employed by the MOSTI to enhance innovation and commercialization sectors. The funds are to support research for the innovation of products and commercialization.

The MOSTI is strategically guided by several policies projected in the websites, namely National Biotechnology Policy, National Cyber Security, National Science and Technology Policy, National ICT Roadmaps, IP Commercialization Policy and ICT Security Policy.

In line with the National Mission, Human Capital Development (HCD) is another main strategy which is aimed at increasing the critical mass of researchers, scientists and engineers (RSE) in the country to the ratio of 50 RSE: 10,000 labor force in areas of priority by 2015, and to increase skills in conducting high quality and market driven research to meet global standards as well as to increase competitiveness and R&D management skills. Among the unique programs initiated to enhance the HCD are:

Invitation of Training Expert in R&D Scheme (EXPT) which aims to train researchers in Public Research Institutions or Public Institutions of Higher Education.

- Overseas Advanced Research Fellowship Scheme (ATTH) which enables researchers to undergo hands-on training through attachment program in renowned or selected scientific research centre, locally or abroad.
- Overseas R&D Management Training Scheme (MGT) for R&D managers to undergo training or short courses (less than 3 months) abroad to increase knowledge in managing the local R&D effectively.
- Technical Expertise Training Scheme (LKT) for RSEs (researchers, scientists and engineers) in the MOSTI to build technical expertise in the fields that are related to science, technology and innovation (STI).

Source: MOSTI[18]

3.2.2 Web Tools

The Web tools include the interactivity aspects which offer correspondence, online transaction report, Media centre, online applications for a fund, feedback form and gallery. The search tool is missing which creates a sense of loss for users as they cannot search for specific information. However, the site map may assist although the organization is a bit overwhelming due to the excessive input. The navigation bar is at the top right hand side. The top bar employs the drop-down menus which save space and provide easy access to information. Design

features illustrates the aspects which ease navigation like location icon, site map, helpful links, relevant graphics, organized information and links, and consistent format. Moreover, while links to national websites are projected, the links to the international sites are not present. Upon browsing, the researcher has found that the links to international sites are embedded in the MyIPO site, the Malaysian Intellectual Property organization which offers link to the World Intellectual Property Organization. As the MOSTI is responsible for the innovation and commercialization efforts, the WIPO links should be visible on the home page to offer easy access to researchers and to reflect the international agenda of the organization. A unique program illustrated in the website is Human Development Programs. The research publications are highlighted, yet the statistics on the innovation and commercialization are not portrayed on the page. Instead, it is located in the MyIPO website which is located under 'links'.

3.2.3 Assessment and CQI

The assessment is under the purview of The Internal Audit Unit in the Ministry of Science, Technology and Innovation. The unit audits the management, financial system and procedures, and programs carried out by the MOSTI and its agencies in order to assist the Ministry to realize its goal by evaluating the effectiveness and governance of the operation.

4.0 DISCUSSION

In terms of Web resources, both ministries have the same keyword in their mission statements: Innovative Individuals. They aim to promote innovation and creativity for the economic, social and cultural development of the nation. While the scope of the Ministry of Higher Education is within the universities, the MOSTI covers the areas of universities and industries. While the MOHE assigns a department to oversee the development of R & D within universities, the MOSTI takes a holistic approach by embracing the universities and industry under its umbrella, and thereby gears for a mass monitoring of both worlds. Hence, the role of the MOHE is narrower than the MOSTI. The MOSTI, then, has an organized and systematic strategy through the thrusts, and policies which provide guidelines for individuals. The MOHE and MOSTI offer several grants to promote R & D. Although the research articles are highlighted in the site of the MOHE, the commercialization aspects are not present in the site. The justification is that the grants offered by the Ministry are fundamental in nature. The innovation and commercialization aspects are mostly highlighted by the MOSTI.

In terms of Web tools, both sites have an adequate projection of the web tools to bridge the gap between clients and the ministries. Yet, the level of interactivity has yet to be discovered. The navigation style differs in terms of the area of navigation bar.

While the MOHE prefers the left side, the MOSTI favors the right hand side.

Design features are almost similar to both sites. The aspects which ease navigation like location icon, site map, helpful links, relevant graphics, organized information and links, and consistent format are projected. However, as the ministries are trying to spread their wings into the international realms, some hindrance factors are apparent. Although innovation and commercialization are the main agendas, the reflection is not visible in the sites. Several international links are found in the deep layers of the site. To gear for internationalization, the main page should be the platform to represent the portrayal.

Assessment and Continuous Quality Assessment are found in the MOSTI website but absent in the MOHE website. These two features are vital to the eco-system of e-strategies. The MOHE, being a role model for the universities, should take these matters into account in monitoring the flaws of the system, continuously upgrading the system and making them visible to the stakeholders.

In summary, all the elements of e-strategies are essential to the balancing of the whole eco-system of research and development.

5.0 CONCLUSION

In conclusion, the study has analyzed the e-strategies based on the projection of the web content, the utilization of tools to disseminate information, assessment and CQI in the Malaysian Ministries which reflect their efforts in promoting R & D. All the strategies support the mission and objectives of the organizations. Today, universities are seen as the catalysts of R & D, and as a result national policies should be geared to support them via grants and other strategies which will asset the growth of the economy. The Ministries have yet to reflect adequately a comprehensive and integrated strategy for harnessing and exploiting university R & D potentials for internationalization and collaboration with other countries. The flaws in the assessment and CQI should be heeded to provide a better system of monitoring. This paper provides interesting insights into the trend of e-strategies of R & D employed by the Ministry of Higher Education and Ministry of Science, Technology and Innovation in Malaysia. The model of e-stratetgies utilized in this study will provide guidelines for policy makers to improve their e-strategies which in turn will help them realize their visions and missions.

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