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# Policy Transformation from Public Sector Agency to Business Entity: Lessons Learnt in Implementing Corporatisation Policy by Government Linked Research & Technology Organisations in Malaysia

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## Abstract

Early 1990 under the 9th Malaysia Government of Malaysia (GoM) emphasised on wealth creation in order to increase the economic growth of the country. One wayis through a Corporatisation initiative, where a Public Sector Agency is transformed into business entity. As a Corporatised Business Entity, new management leadership styles and management systems need to be changed accordingly in order to implement and deliver the Corporatisation Policy effectively.

In the past, majority of Public Research Institutes have been successfulin delivering their roles in developing new knowledge and technologies, solving various technicalproblems and assisting local industry to be competitive. Due to their excellence in performance, a few selected Public Research Institute have been corporatised in mid the 1990s namely MIMOS, SIRIM Berhad, MPOB etc. These new knowledge and technology based organisations have been entrusted to extend their services to stimulate market-oriented R&D and facilitate the commercialisation of new technologies.

The aim of this paper is to share lessons learnt in implementing the Corporatisation Policy. In addition this paper offers a solution to overcome those shortcomings by adopting Innovation Management approaches. This innovation management approach can be adopted and implemented by the Public Sector as well. This paper can be used as a reference for other Government; mainly those from developing nations should they decide to adopt the principles of the Corporatisation initiative.

**Keywords:** Corporatisation, Government Linked Research &Technology Organisations, Governance, Implementation, Barriers, Technology Commercialisation and Innovation

# 1. Introduction

As part of the National Innovation Initiatives to becomea developed nation by the year 2020, the Government of Malaysia (GoM) aggressively emphasised on wealth creation for economic growth of the country. One of the ways employedwas through transforming selected and potential public research institutes and turning them into business entities or becoming corporate entitiesTraditionally the role of government research organisations was mainly to develop new knowledge and technology through R&D and eventually transferred this technology to industries which less emphasised on innovation, market needs, technology commercialisation and wealth creation. As business entities, one of their key performance indicators is to increase the return of investment (ROI) through technology development, commercialisation, innovation and providing technical services. In other words, these knowledge and technology based organisations have been entrusted to extend their services to stimulate market-oriented R&D and facilitate the commercialisation of new technologies. hence, management leadership styles, management culture and management system of these new entities should be readjusted or changed accordingly in order to achieve their business objectives as well as to deliver shareholder's expectation (Ariffin A.S 2011).

In the past, somepublic research institutes have been successful in delivering their roles by developing new knowledge and technologies, solved various technical problems and assisted local industry to be competitive. Due to their excellence in performance, GoM selected few public research institutes and statutory bodies to be transformed into corporate entity in the mid 1990s.These include MIMOS Berhad, SIRIM Berhad, Malaysia Rubber Board, Malaysia Palm Oil Board and many more.

Referring to Bakker (2005) Corporatisation and Commercialisation are two processes that have similarities but which must be kept separate. Both can occur in the context of public ownership without the service being transferred to a private company. In addition Corporatisation involves hiving off the service to a business unit or separate company which is responsible for service provision (Smith 2004).The objectives of thecorporatisation is aimed at relieving the Government of its financial and administrative burdens; with the expectation to promote competition, improved efficiency and increased productivity of services, and with a predictable increase in economic growth through commercialisation of research findings, innovation and technical services offered; they were intended to reduce the size of the public sector; and aimed primarily at instilling a commercial mode of operation. In other words these companies are managed on a more commercial basis by their Board of Directors and the management team is responsible for the policies and the running of the corporation. In addition their senior management members are paid based on the financial performance and are recruited on contract basis (Ariffin A.S, 2011).

All these new entities are wholly-owned by the GoM where there is no intention to divest their assets and equity. The GoM allocates an annual budget for these newly corporatized entities to cover their capital development and operations which are based on potential market demand. Therefore, it is crucial for these newly corporatized entities to develop an appropriate governance and management systems as well as to establish strong linkages with industries, companies and consumers in order to gauge the demand and supply of the local and international markets.

## 1.1. Roles of Government Research Organisations in Developed Country and Malaysia

Whilst Globalisation is progressing rapidly, requiring these newly corporatized entities to face challenges from the industrialised and developed and developing nations. Thurow (1997) emphasised that if any organisation or a country wants to stay at the leading edge of technology and continue to generate high disequilibrium in wages and profits, it must be a participant in the evolutionary process of man-made brainpower industries so that it is in the right position to take advantage of the technical and economic revolutions that occasionally arise. Chesbrough (2003 and 2006) stressed that a nation that depends on others for its new basic scientific knowledge will be slow in its industrial progress and weak in its competitive position in world trade, regardless of its mechanical skill.

As Knowledge based organizations, Government Research and Technology Organizations (GR&TOs) are the key enablers for knowledge creation, technology commercialisation and innovation of the country. Commercialisation can be defined as the process of transferring new technology into a

new product or means of production and bringing it to market. In other words, this conversion transforms invention into technology innovation and is expected to generate commercial returns through income and capital gains, income from licences, and revenue from the sale of the new knowledge or technology created by the research conducted.

Innovation is the key driver for productivity, quality, economic growth, competitiveness and internationalisation and it has become a demanding and persistent issue in the academic literature, in policy development, in the business community as well as in society (see Freeman, 1987; Dosi, 1988; Pavitt, 1984; Nelson, 1993; Porter, 1990; Patel, 1995; Pavitt, 1984; Lundvall, 1998 and many more). Since innovation is the key driver for productivity and economic growth, it is important that everyone involved in the process of knowledge and technology development has the same understanding of innovation and its approach. This will benefit organisations because everyone will move towards achieving the organisation's goals and national aspirations.

Through the literature review process, it became clear that there are as many definitions of innovation as the number of experts worldwide. The word 'innovation' originates from Latin where 'nova' means new; as an introduction to new things or methods. The classic definitions of innovation derived from various sources; it includes the act of introduction, a new idea, method or device, changes that create a new dimension of performance and the process of making improvements by introducing something new. The founder of Innovation, Schumpeter (1930) defined innovation in five different aspects:

- The introduction of a product which is new to consumers
- The introduction to a new method of production
- The opening of new markets
- The use of new sources of supply
- New forms of competition which lead to new industry creation

Rapid changes in the international economic environment and the growing scientific basis for contemporary technologies make GR&TOs more important in the future. They play an important role in technology development and innovation aimed at boosting the economic growth of a country.(Nelson and Mazzoleni 2007). The R&D performed by GR&TOstypically can have a greater impact on economic performance than that carried out by business (Griffith 2000). Owing to the importance of new knowledge and new technology, the majority of governments have established many research organisations, research institutes and research universities based on industry needs. Table 1 summarises the reasons for establishment, role/mission and expectations of GR&TOsin developed countries.

**Table-1.** Reason for Establishment, Expectation and Roles of GR&TOs

| **Country** | **Year of formation** | **Reasons for establishment &expectations** | **Roles/mission of the GLR&TOs** |
|---|---|---|---|
| Germany | 1949<br>(63 years)<br>Fraunhofer-Gesellschaft | To undertake applied research to drive economic development and serve the industry, service sectors and public administration<br>To promote innovation, strengthen the technology base, improve the acceptance of new technologies and train future generations of scientists and engineers | To conduct the following for industry, the government and society:<br>R&D, mainly contract research, support and advice, training, inspection, certification technology promotion |

| **Country** | **Year of formation** | **Reasons for establishment &expectations** | **Roles/mission of the GLR&TOs** |
|---|---|---|---|
| Netherland | 1932 (81 years) TNO (Netherlands Organisation for Applied Scientific Research ) | To transform its agricultural economy to an industrial economy and to support companies and government with innovative, practicable knowledge | To provide contract research and specialist consultancy<br>To provide grants licences for patents and specialist software<br>To test and certify products and services, and issues an independent Assessment of quality<br>To set up new companies to market innovations |
| Taiwan | 1973 (40 years) ITRI (Industrial Technology Research Institute) | To develop higher-added-value technology to reach sustainable development | To expedite the development of new industrial technology<br>To aid in the process of upgrading industrial technology techniques<br>To establish future industrial technology<br>To transform Taiwan's research capability from a 'follower' to a 'pioneer' in order to provide major advantages and opportunities for domestic industries |
| France | 1939 (74 years) CNRS (National Centre for Scientific Research) | To address the weakness of its industry and achieve sustainable economic growth as well as to strengthen the scientific and engineering base through the combination of multiple technologies | To evaluate and carry out all research capable of advancing knowledge and bringing social, cultural, and economic benefits for society<br>To contribute to the application and promotion of research results<br>To develop scientific information and support research training<br>To participate in the analysis of the national and international scientific climate and its potential for evolution in order to develop a national policy |
| Finland | 1942 (71 years) VTT (Technical Research Centre of Finland) | To conduct technical research for the benefit of science and society and to test materials and structures at the request of the authorities, private citizens, companies and other organisations | To produce research services to enhance the international competitiveness of companies, society and other customers<br>To promote the realisation of innovative solutions and new businesses<br>To creatively combine its multidisciplinary expertise with the know-how of its partners<br>To exploit global networking and the basic research results of universities in its services |

| Country | Year of formation | Reasons for establishment &expectations | Roles/mission of the GLR&TOs |
|---|---|---|---|
| ı Korea | 1966<br>(47 years)<br>KIST<br>(Korea Institute of Science and Technology) | To move its economy from being imitation-oriented to innovation-oriented with the capability to create new technologies and new products | To take the lead in efforts to build a science and technology-based society<br>To conduct research and develop creative original technologies<br>To disseminate the results and accomplishments of its research throughout society. The strategies include:<br>To become a base for the national R&D system<br>To develop fund-based innovative R&D models<br>To lead fusion research in the national educational system, and<br>To challenge frontier and emerging technologies |
| USA | 1901<br>(112 years)<br>NIST (National Institute of Standards and Technology) | To promote industrial competitiveness by advancing measurement science, standards, and technology to enhance economic security and improve quality of life | To conduct research that advances the nation's technology infrastructure<br>To promote performance excellence among USA manufacturers, service companies, educational institutions, healthcare providers, and non-profit organisations<br>To offer technical and business assistance to smaller manufacturers<br>To manage the Technology Innovation Program which provides cost-shared awards to industry, universities, and consortia<br>To manage the Advanced Technology Program and the Annual National Quality Award |

Compiled by Ariffin A.S.(2010)

It is noticeable that the main reasons for the establishment of GR&TOs were to help to solve economic and social problems, to generate new knowledge and technology for wealth creation and enhance international competitiveness. Since GR&TOs play such an important role, it became incumbent upon governments to provide grants to support the R&D projects. However, this caused governments to expect to see clear contributions from them to which they had allocated such substantial funds. The majority of GR&TOs in developed countries have supported and contributed tremendously to their National Innovation Policies.

Realising the important of Research and Technology (R&T) and Innovation for economic growth and quality of life, relevant ministries in Malaysia have played their part in developing appropriate policies, promoting policies and master plans, providing sufficient funds for infrastructure and facilities, providing guidelines for the protection of intellectual property (IP) and providing incentives for small to medium companies (SMEs). The Ministry of Science, Technology and Innovation (MOSTI) facilitate and coordinate the management and implementation of R&T and innovation. Since 1975, the Government has established the National Council for Scientific Research and Development (NCSRD) to synchronise, coordinate and monitor the implementation of R&D and Science, Technology and Innovation (ST&I) among the ministries and stakeholders.

Other important ministries are also involved in promoting ST&I and R&D. The Ministry of International Trade and Industry (MITI) plans, formulates and implements policies relating to industrial and technological development, as well as international trade and investment promotion. The Ministry of Domestic Trade and Consumer Affairs handles the application and approval of patents, trademarks and industrial design. The Ministry of Higher Education (MoHE) provides suitable Science and Technology (S&T) programmes in order to support the industry's needs. The Ministry of Finance (MoF) provides fiscal and monetary incentives for ST&I and R&D programmes. The national Gross Expenditure on R&D (GERD) has increased consistently for the last 10 years. In 2009 it increased to RM 7.4 billion and in 2011, total spending across all sectors of the economy was estimated at RM 9.4 billion and recorded a GERD/GDP of 1.07 %. (Malaysia National R&D Survey 2012)

Since the middle of the 1990s, GoM has aggressively established new research and technology organisations or transformed few public research institutes to become business entities. Government Linked Research & Technology Organisations (GLR&TOs) are defined as research and technology organisations that have commercial aims where the government has direct control of the equity, the ability to appoint board members and senior management, and makes major decisions. In the organisational structure of most GLR&TOs members of the Board comprise a Chairman and representatives from the government and industry. The Chief Executive Officer (CEO) or Director General (DG) is appointed by their respective Minister. The Board plays a leadership role in giving direction to the organisation. The CEO or DG reports directly to the Board. Research activities in GLR&TOs focus more on applied research to cater to immediate industry and market needs. Senior management members report directly to the CEO and they are given responsibility and accountability for financial and business effectiveness, and profitability. (Ariffin A.S. 2011, World Bank 2006).

A survey was conducted to determine the roles of GLR&TOs in delivering their new mandate. GLR&TOs are a part of the nation's educational and S&T system, focusing on fundamental, experimental and applied research. Based on the survey findings, the GLR&TOs in Malaysia perform a variety of innovation-related roles as listed below.
(Ariffin A.S. 2009).

- developers of new technologies and long-term R&D and strategic technologies to increase technological innovation as well revenue.
- providers of technical solutions and promoters of S&T
- providers of national S&T infrastructure, facilities and programmes
- trainers and recruiters of researchers and a highly-skilled workforce
- coordinators and collaborators in cooperative R&T&C with local companies, to nurture new industry
- promoters and facilitators of technology transfer and diffusion
- organisers and catalysts for state and community-based innovation
- intermediaries or brokers of technology and scientific equipment
- developers of incubation programmes for SMEs/start-up companies
- trainers for technical and technology programmes
- advisors to policy makers and the GoM
- consultants for new technology and process development
- facilitators for technical standards development and conformity
- testers of existing products and new product development
- calibrators for technical compliance and regulators for enforcement
- managers of IP and knowledge content
- publishers of S&T journals

It can be concluded that the role of GLR&TOsisvery challenging where the GoM expectsthem to be innovative in balancing profit and non-profit contributions. They need to generate profit for their sustainability and support non-profit activities as part of the government's obligation to society. This research attempted to determine how these new entities implement and deliver their roles as stipulated in the Corporatisation agreement.

## 1.2. Transformation Process and Implementation of Corporatisation Policy by GLR&TOs

According to Meter and Van Horn (1974) Policy implementation encompasses those actions by public and private individuals and groups that are directed at achieving goals and objectives set forth in prior policy decisions. The founders of implementation, Pressman and Wildavsky (1973) define it in terms of a relationship to policy as laid down in official documents where policy implementation may be viewed as aprocess of interaction between the setting of goals and actions geared to achieve them, It was also found that implementationin some cases were triggered off by a policy decision, involving the translation of policy into operational tasks that were carried out by a variety of actors and agencies equally required substantial coordinating activity to ensure that resources are available and thatthings happen as intended (Barrett and Fudge 1981).

In addition Implementation inevitably takes different shapes and forms in different cultures and institutional settings. This point is particularly important in an era in which processes of 'government' have been seen as transformed into those of 'governance' (Hill and Hupe, 2002,) With the new key performance indicator set by the shareholders, majority of newly appointed Chief Executives and Director-Generals had introduced and developed new management systems in order to expedite the transformation process. Majority of GLR&TOs have successfully introduced and implemented various management systems, dealing with annual and long-term strategic business plans, budgets and financial management, key performance indicators and balanced scorecards, human resources management including career development and performance appraisals) procurement system, project management and customer relationship management. At the same time some of them have made a significant contribution to the dynamism of the national economy of Malaysia, enabling some of the country's products and services to be recognised for their quality and innovativeness particularly in IT, Oil and Gas, Rubber and Palm Oil products.

As research time decreases, a faster market entry of R&D products and services is demanded (OECD, 1998). Due to financial constraints and the rising costs of performing research, there has been greater pressure on GLR&TOs generate revenue, increase their contribution to innovation, economic performance and fulfilment of customers' requirements.

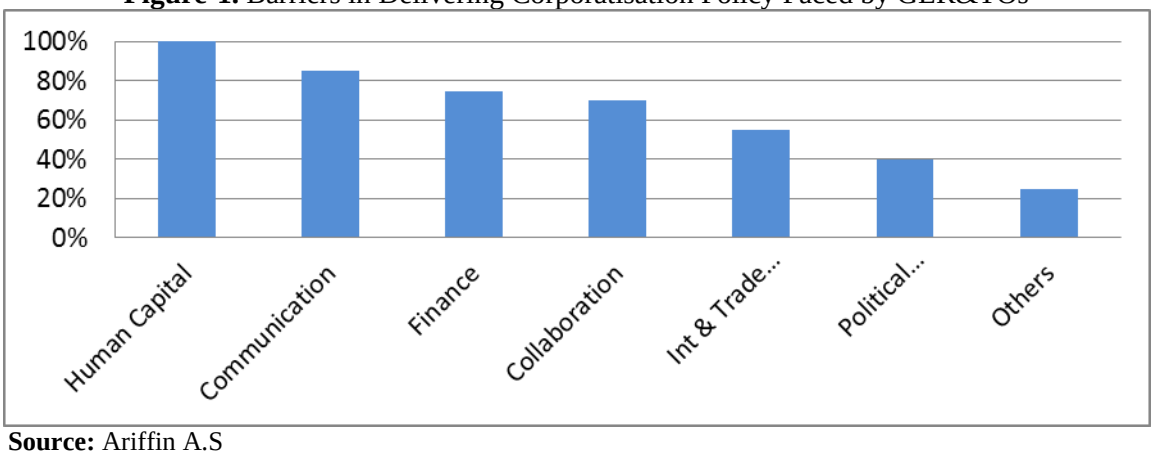
As competition increases, the market becomes a less attractive investment because it provides lower profit and greater uncertainty in returns. It can be said that GLR&TOs need to be more careful in defining and controlling research, technology and innovation programmes and some of these issues need to be considered when developing strategy, the areas of technology that need to be focused upon; the resource requirement for achieving particular types of innovation; the overall complexity of innovation; the management demands of achieving planned levels of performance and the acceptance of the overall level of success and failure to change (West, 1992). In addition the business sector and the community are making demands for greater transparency and involvement in the setting of research priorities. ( Ariffin A.S. 2011) As a result, the government is being led to develop more outcome-oriented approaches to the governance of the science system.

Despite some success, and a huge investment in research and technology management as well as new management systems, there are a surprisingly large number of weaknesses affecting GLR&TOs business performance, particularly in generating new source of income. Whilst a majority of GLR&TOs have successfully developed many new research findings, it must be noted that only a few new technologies have been commercialised. According to interviewswith senior management members and survey feedback from heads of R&T Division as well as the management's business reports, there are too many barriers or impediments faced by GLR&TOs in delivering their Corporatisation Policy. The barriers based particularly on the implementation of R&T&C and technological innovation in each GLR&TOs are summarised in Figure 1 and Table 2. Their inputs gathered were coded and analysed using a content analysis method.

There are 68 different variables that have been identified and ranked based on the frequency of response. All respondents admitted that either shortage of or inadequate availability of human capital, particularly concerning technological innovation capability and market assessment was a major barrier to their day-to-day operations, mainly those involved in new and emerging technologies. Communication, Financing and Fund; Collaboration, fund, managing ideas, intellectual properties, policy implementation, creativity whilst attempting to develop innovation culture, research and design,

technology commercialisation are the more common barriers faced by the majority of respondents, regardless of how long their organisation had been established.

**Figure-1.** Barriers in Delivering Corporatisation Policy Faced by GLR&TOs




**Source:** Ariffin A.S

**Table-2.** Challenges Faced in Implementing Government R&T&Cand Innovation

| No. | Themes | Barriers to R&T&C and Technological Innovation |
|---|---|---|
| 1 | Number of qualified staff (researcher, lecturer, marketing and commercial) | Insufficient researchers, engineers and lecturers in new technology<br>Insufficient number of researcher to carry approved project<br>Insufficient number of staff in marketing and commercialisation<br>Insufficient number of qualified lecturers with PhD qualification<br>Slow recruitment process because decision made by centre<br>Inappropriate placement of researcher<br>Under utilisation of R&D fund allocated by government |
| 2 | Idea and creativity management | Lack of creativity<br>Lack of knowledge and competency in innovation management R&D, research design, strategic business, IP management and utilisation, commercialisation, negotiation, market assessment, writing, project mgmt.<br>Lack of skill to bring research to development<br>Lack of talents to acts as 'broker' to match technology and market<br>Lack of IT skills to cope with rapid technology change |
| 3 | Insufficient funds | Insufficient funds to implement R&D project<br>Insufficient funds for maintenance<br>ITC business required high capital investment<br>Insufficient fund to invest in major project and facility<br>Insufficient fund to proceed with spin-off programme |
| 4 | Collaboration | Lack of collaboration with local company, university and industry<br>Lack of collaboration with international research university<br>Insufficient number of successful entrepreneurs<br>Lack of cooperation and support from international university<br>Slow technology transfer process<br>Lack of demand from industry |
| 5 | Communication | Poor policy sharing<br>NIP and ICT policy not cascaded to all levels for implementation<br>Lack of writing skills to publish in local and international journals<br>Large digital gap between urban and rural area |

| No. | Themes | Barriers to R&T&C and Technological Innovation |
|---|---|---|
| 6 | Commercialisation | Slow technology transfer process to industry<br>Lack of commitment from incubators and suppliers<br>Lack of skill in bring technology to innovation<br>Lack of demand from entrepreneurs<br>Poor project management of incubators<br>Insufficient number of successful entrepreneurs<br>Manufacturing plans to adopt GMO requirements<br>Local companies, mainly SMEs, are not ready to invest in ISO requirements |
| 7 | Internationalisation | New research output not meeting trade or ISO requirements<br>No technological standards for some IT products<br>No Malaysian standards acceptance at international level<br>Local companies are not ready to invest in ISO requirements<br>Insufficient number of quality technologies produced |
| 8 | Policy implementation | Not aware of NIP<br>Poor policy sharing<br>Implementation is slow, being government agencies<br>ICT policy not cascaded to all levels for implementation<br>NIP and implementation plan not cascaded down and shared<br>Lack of support from other ministries<br>Frequent change of technology focus due to political interference<br>Political interference in operation<br>Funds approved for use on other unplanned project<br>Dependency on foreign technology |
| 9 | Culture | Resistance to change in public sector<br>Lack of innovation and research culture<br>Researcher more keen to join management or administration<br>Culture 'too much to do' and too many 'don't dos'<br>Poor change management<br>Risk-averse culture<br>Lack of incentive to take risk<br>Malaysian perception that imported products are better than local<br>Red tape – long procurement process – delays implementation<br>Digital gap between urban and rural area |
| 10 | Others | Competition from other countries<br>Imported raw material may increase R&D cause<br>Political Interference |

**Source:** Ariffin A.S. (2011)

In addition the heads of R&T Divisions briefly explained some of the challenges the team members faced during the implementation stage and these were summarized into two types: those caused by the Government and those caused by institutions. These are described below:

**Government-caused barriers**

- Lack of support in terms of limited R&D budget allocation and difficulty in getting budget approval.
- Too much red tape involved in getting research grants.
- Many current research projects involve several ministries (e.g. MOSTI and MOH – for scientific products requiring clinical trials). However, each research grant is dedicated to the particular ministry only, e.g. MOSTI for producing the product, MOH for clinical trials. Grants from a ministry can only be used by the institutions under that particular ministry.

- Lack of recognition by the Government for local researchers, technologies and products. The enthusiasm for "foreign technology acquisition" at very high costs, compared to channelling funds into local technology development and establishment, is quite demoralising.
- Lack of benefits for successful researchers, in terms of monetary gain or other perks.

**Barriers caused by institutions**

- Insufficient qualified researchers in new technology
- Majority of project leaders in R&C Division are lack of technology commercialisation skill.
- Lack of support and very slow decision making due to the fact that too many layers of approval are required. Ideas have to be presented at many different meetings, but no clear decision is made at the end of the day – the obvious reason being management avoiding accountability.
- Too much red tape (e.g. in the recruitment process, the purchasing process, getting approval, etc.). Most decisions are made by the CEO and Vice President before they can be executed. Lower management seems to be powerless. Much of the time, decisions are delayed, as the "committees" do not have sufficient quorum to proceed.
- Lack of or slow support between departments within organisation, due to the Key Performance Indicators requirements. Since the R&T unit has become a business unit, each department is busy trying to generate its own individual income, instead of collaborating with or assisting other departments in the implementation of R&D and in technology commercialisation.
- Having an IP policy but not implementing it, thus deterring successful researchers from producing successful R&D outputs for commercialisation. Without any visible direct incentives, the majority of researchers are only interested in producing "paper research" rather than commercialisablenew technology.
- Insufficient linkages with industry and stakeholders to ensure the successful implementation of technology commercialisation plans.

The findings indicated that there were several barriers and challenges faced by GLR&TOs in implementing R&T&C and delivering the Corporatisation Policy. These variables, unless addressed will remain impediments to a way forward for GLR&TOs in their quest to enhance their research findings and creating wealth for the organisation and the country.

## 1.3. Lesson Learnin Implementing Corporatisation Policy

A comparative case study between GR&TOs in developing and developed countries was carried out to study the implementation process in developing and commercializing new technologies to be in line with corporatisation policy. The government research organisations in most developed nations have similar characteristics; they are all wholly owned by the government, not-for-profit organisations and key players in technology development, commercialisation and innovation. This research studied one of the major and important research organisations in Germany i.e. Fraunhofer-Gesellschaft. This GR&TO was established in 1949, and is one of the largest organisations conducting applied research and their core purpose is to pursue practical knowledge and its research programmes are aimed at providing direct value to private and public enterprise, in order to offer substantial benefits to society.

The organisation plays a central role in the innovation process at the national and European level, and focuses on the key technologies of the future. There are 59 Fraunhofer institutes and more than 80 research units in over 40 different locations, with 3 international offices in the USA, Austria and Italy. Through integration exercises conducted in 2001, Fraunhofer became Europe's largest provider of R&D services in ICT.

The research programmes undertaken by Fraunhofer are aimed at promoting industrial performance, and focused on application-oriented research and practical implementation. Fraunhofer's main role is to promote the transfer of know-how from scientific research into practical applications. Research into practical utility remains its focal objective in all of its activities, whether these involve contract research, preliminary research, consulting services or studies. All Fraunhofer institutes are aware of this and attach great importance to a properly functioning culture of innovation within the group. Fraunhofer are aggressively involved in R&D, technology development and training to foster a long-term knowledge edge and to translate this into commercial success. The Fraunhofer group achieves commercial success by developing, implementing and optimising processes, products and

facilities until they are perfectly balanced for deployment and market launch. As stated by the Head of International Business Unit; *"Innovation is one of the keys to achieving commercial success for the Fraunhofer group. Therefore, maintaining an edge in a competitive global market means we must understand our customers' current needs, deploying the very latest technologies and responding quickly to market development".*

SIRIM Berhadwhich the first government research institute being corporatized in 1996 was selected for this case study.. SIRIM's role is to carry out industrial research for the manufacturing sector and also responsible to assist in developing Malaysian Standards, and calibrating, testing and validating products to ensure quality maintenance and productivity The corporatisation has spurred achievements in research, testing and measurement facilities, provided good networking with government agencies, local industry and international organisations and created a diversity of services in the technology and standards area. Together with the management committee members, the CEO is working hard to create an environment conducive to innovation with the aim of driving innovation as part of its culture and of being able to support its vision and mission, as well as contribute to the NIPs. Since fully operating as a business entity and corporatisation agency in 1996, SIRIM has managed to increase its revenue from RM 17 million (£3.4 million) in 1996 to RM 317 million (£64 million) in 2008, an increase of RM 300 million over a period of twelve years. In order to support this growth, the number of employees has increased from 1,200 in 1996 to 1,800 in 2000, a 50% increase. SIRIM also has successfully introduced and implemented various management systems, dealing with annual and long-term strategic business planning, budgets and financial management, key performance indicators and balanced scorecards, human resources management procurement system, project management and customer relationship management.

Comparative case study between SIRIM Berhad, one of the largest GLR&TOs in Malaysia and Fraunhoferwas conducted to determine their implementation process by adopting the Integrated Technological Innovation Capability Value Chain -ITIC-VC conceptual framework comprising the main elements of technological innovation capabilities namely Strategic Planning, Technology Foresight, Market Leading, Idea Management, R&D and Design, Commercialisation, Collaboration and InternationalisationThis permitted the investigation how their innovation concepts and strategies become widely diffused throughout the organisation and group of companies. A better understanding on the implementation process could help both the GR&TOs and the policy makers to develop specific policy and strategies to exploit the full potential of new innovation patterns.After analysing, the data of their best practices in delivering national policies particularly in implementing technological innovation are summarised in Table 3.

**Table-3.** Key Activities of SIRIM Bhd&Fraunhofer across the ITIC-VC Framework

| **Fraunhofer** | **SIRIM Berhad** |
|---|---|
| **Strategic Planning** | |
| Two approaches: the top-down corporate strategy approach and the bottom-up approach.The bottom-up approach includes 60 individual strategies at the institutional level and seven group strategies. | Mainly top-down corporate strategy approach. The bottom-up approach includes six group strategies and four flagship programmes. |
| Develop Annual Business Plan, a Long-term Master Plan and engage in technology planning. CEO is accountable for whole operation. Head Office interferes when it involves capital injection or when the organisation is under performing and not making a profit. | The Technology Plan is part of Annual Business Plan and the Five-Year Master Plan. Decisions made by CEO and endorsed by the board. Ministry does interfere in research, technology and operations. |
| **Technology Planning & Foresight** | Due to lack of competency, focus on Incremental Innovation |
| Focus on Radical Innovation development. | Lacks champions and experts in new technologies.Has engaged consultants to conduct technology foresight for existing and new technologies.This activity is conducted based on need because it is expensive and time |
| There are many technology champions and experts. | |
| Establish strong linkages and cooperation with | |

| **Fraunhofer** | **SIRIM Berhad** |
|---|---|
| local industry and EU countries. Staff members help to come up with high quality technology forecasting. Conduct technology foresight and technology planning in-house regularly.<br><br>Offer services to customers, locally and internationally. | consuming.<br>Some technology foresight is conducted by MIGHT<br>Offer services to customers mainly local. |
| **Market Leading** | |
| Customer-driven and market-oriented.<br><br>The Fraunhofer marketing network provides specific market and technological research. Supported by a huge number of experts.<br><br>Market assessment is conduct internally and frequently. Each technology centre provides market information for planning purposes.<br><br>Have established a reliable and integrated market information system. | Have adopted a market-driven approach.<br><br>The Group Sales and Marketing Department provides information on market trends and needs. Inadequate market information, particularly for emerging technology.<br>Sometimes depend on a consultant firm to conduct market assessments and this is based on need.<br><br>No systematic market data and information system. |
| **Execution and monitoring of business plan** | |
| The majority of R&D projects are executed immediately once approved.<br><br>Monitor the project progress frequently according to project management schedules.<br><br>Project head is responsible for implementation.<br><br>Have developed a technology development procedure, SOPs, technology dissemination and an implementation procedure for existing and new technologies and available online to be shared. | Only a few R&D projects are executed immediately once approved. Many administrative matters have to be resolved before implementation.<br>Monitor the project progress frequently according to project management schedules.<br><br>Project head is responsible for implementation and monitoring.<br>Not all existing and new technologies have SOPs or TORs. This depends on individual efforts and is not available online. |
| **Ideas and creativity management** | |
| Majority of researchers are creative and innovative. They are risk taker and take full responsibility and accountability of their decision made.<br><br>Have developed high quality and industry driven research proposals.<br><br>Strong leadership in each technology and are provided with clear direction on the application of technology.<br><br>Many high quality research proposals have been developed and are ready to be implemented by local and international companies.<br><br>Frequently develop new processes and services for industry, to use to solve technical problems and | Researchers lack creativity and are less innovative. Not a risk taker and most of major decisions made by the Board<br>.<br>Developed few high quality research proposal. Insufficient number of quality research proposals compared to the number of researchers.<br>Lack leadership and champions in new technology.<br>No direction and limited information on the application of technology.<br>Have only developed a few new technologies and processes and improved a few existing products/processes.<br><br>Have managed to create new market opportunities in bio-materials and cosmetics for local industries. |

| **Fraunhofer** | **SIRIM Berhad** |
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| increase productivity.<br>Creative in developing new market opportunities locally and internationally. | Have introduced an idea generation and suggestion box to promote an innovation culture across the group. |
| **Collaboration** | |
| Facilitate customer access to the services and research results. Participates in Fraunhofer innovation clusters. Work closely with local companies and industries. Often companies provide inputs for research project especially when it involving environment and society.<br>Establish effective collaboration local and international research organisation and university, and research community. Joint projects with universities and other non-university research organisations. The range of customers is very broad from very small companies to big, international companies, but the typical client would be a SME. | Lack of effective collaboration with local companies and private research organisations. Companies seldom participated or invited in initial planning of research project. Act as the Secretariat of WAITRO and a member of Global Research Alliances<br>Sometime treated universities and private companies as competitors. |
| **Research and Design Development** | |
| Strong in research and design development. Recognised by local companies and European research community.<br>Using systematic project management system.<br>Good teamwork across Group organisations.<br>Effectiveness of training programme and each staff performance been measured the impact. | Engineers lack of creativity, skill and competency in design development of new technology and application.<br>Project Monitoring System is under utilise because not a user flexible and friendly system.<br>Poor in project management. Majority of research projects are delayed in completion. Sometimes difficult to link R&D project to business planning and projection.<br>Established cross-disciplinary team in implementing research project but poor in teamwork.<br>Developed training programme for existing and new researchers. Effectiveness of training programme had yet been measured the impact. |
| **Commercialisation** | |
| Commercialisation model is flexible and modify based on customers requirement.<br>Good facilities of science park and incubator centres to assist SMEs.<br>Developed and applied 5,459 patents and 2,700 granted and 2,100 patents utilised by companies.<br>Many local companies being created using technology developed. | Based on the model introduced by MOSTI; market driven and adopted Open Innovation Model developed by H. Chesbrough.<br>Established good facility for spin-off or incubator programme<br>Filed 43 patents and only 2 granted.<br>Only few companies being created through licensing technology developed. |
| **Internationalisation** | |
| Majority of product developed meeting the trade and ISO requirements.<br>Developed global strategies and adopting by the institutes<br>Many technologies developed in house have penetrated international market.<br>Established many joint-venture with foreign companies overseas | Majority of technologies developed have yet to meet international standards or trade requirement.<br>Yet to develop global strategies or international business model.<br>Majority of researchers are slow in adopting international business culture<br>Have yet to establish joint venture with foreign |

| Fraunhofer | SIRIM Berhad |
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| Many Memorandum of Agreements. Generated more than 45 million pound revenue annually from overseas ventures<br>Majority of researchers adopting international business practices and culture | organisation overseas<br>Concluded many Memorandum of Understanding (MoU) but only few Memorandum of Agreement (MoA with international research organisations or universities<br>R&T business has yet to generate income or revenue from international business venture. |

**Source:** Ariffin A.S. (2011)

From these comparative study findings, it was shown that some of the respondents were competent in managing internal processes such as project management, selecting potential R&D projects, allocating qualified researchers to manage such projects, and executing the projects on time, but the research output failed to be commercialised due to weak demand from local companies. With this dilemma in mind, a comparative case study was conducted to investigate the implementation issues in depth by looking at two key GR&TOs, one from a developed country and one from a developing country.

This comparative study supported the research objective of determining whether GLR&TOs in developing countries, particularly SIRIM Berhad aredelivering their corporatisation mandate mainly in generating revenue from the new technologies developed in house. It is evident that, due to a lack of competence in technological innovation, particularly collaboration with industry and commercialising new technology, SIRIM Berhad is less successful at implementing and delivering the new policy as expected by the shareholder.

### 1.4. Recommendations to Implement Corporatisation Policy Effectively

The empirical evidence highlighted the roles, technological capabilities and performance of GLR&TOs in implementing and delivering Corporatisation Policy which focused particularly on technology commercialisation and innovation activities. The barriers and challenges in delivering their roles were also highlighted. As GLR&TOs today are trying to increase the return on their investment as mandated in the Corporatisation Policy, append below are some of the major recommendations.

## 2. Integrated Research, Technology Commercialisation and Innovation Plan

It is common for employees in any given area to neglect the use of innovation process as the very employees live within a comfort zone based on an old, accepted and tried system.

Innovation failure can be attributed to the lack of Implementation Plan. Innovation can find its success if the innovation result is revenue driven. Being a revenue driven innovation; this innovation can find its market provided there is a marketing or implementation plan. Implementation can have a uniform approach where there is a National Innovation Implementation Plan (NIIP) which should be designed to support a National Innovation Policy.

A plan, model, idea or design can be easily implemented by any GLR&TOs as with the NIIP, it acts as the national guide that can realise wealth creation, innovation and human capital development. Where there is the NIIP all GLR&TOs will be required to achieve the national objective and the process of implementation can realise the objective it was created

### 2.1. Implementation outline

Those who are tasked to implement an idea that can generate wealth and productivity will be confronted with some obvious questions;

- How does this idea help me enhance my performance?
- By the time I get to know how to use this plan I could have already executed the plan using the old methodology.
- Will I get the cooperation of my colleagues to implement the new plan/and idea

- How much of training would I have to provide for the plan to be executed?
- Do I need more or less staff to implement this new plan/idea?

### 2.2. Implementation Design

a. This plan/idea that has been devised will enhance performance
b. Will my plan/idea make it easier for all to perform their duties?
c. Does my plan/idea require multi layers of staff for execution?
d. How much training in man hours do I have to provide?
e. Does my plan/idea require additional staff or does it scale down staff requirement and if so what happens to the redundant staff?

On the basis of the implementation outline the need to have a mix of expertise and critical staff cannot be understated. Adequate training must be provided to the staff levels that are required by the experts to exercise the implementation process.

## 3. Inculcate Innovation Culture

A paradigm shift in the thinking amongst the GLR&TOs in Malaysia should be to create an Innovation Culture that must be cascaded to the nation's commerce and industry that can largely contribute to national development and in the process helping the nation to be competitive in the global economy. Nations across the globe are constantly in search of advanced technology to have that competitive edge for national economic development..

The GLR&TOs fraternity within the nation should be aligned to being competitive, innovative and result oriented where the government can provide incentives to express and enhance its performance to world class standards can be the first step in the right direction. Employee orientation and training in thinking innovation within an organisation in the national corporate sector can provide an impetus to energise the innovation process to be effective and result oriented. Where commerce and industry as a result of incentives push in the direction of being innovative it can be safely concluded the knowledge based economy can transform itself to be a knowledge resulted economy. This approach can turn GLR&TOs into regional/localised innovation centres to stay ahead of the competition. Employees will realise a sense of excitement and be reenergised.

An organisation that thrives on innovation shall realise efficiency and a healthy work and productivity culture. Herein, it can be recommended that at a national level, the government's initiative must be to push for a national innovation agenda that should help the nation to become a developed nation. With GLR&TOs it is necessary for this fraternity to understand the national innovation agenda and for the GLR&TOs to direct their energies to help realise the national innovation agenda. Through this assimilation of directions, to achieve developed status by 2020 can be a reality.

## 4. To Adopt the Integrated Innovation Management which address Corporate Governance and the ITIC-VC conceptual framework

GLR&TOs are encourage to adopt the Integrated Innovation Management approach where is emphasise on Corporate Governance and ITIC-VC framework. For example establishment of Level of Authority is very crucial in any business entity. It clearly states the responsibility, accountability and delegation of duties of each employee. The ITIC-VC conceptual framework describes the key innovation capabilities needed to implement corporatisation policy.

## 5. Establish and Adopt Effective Collaboration Model

As collaboration benefits GLR&TOsin terms of revenue, licensing, equity,sponsored research, grant, technology development and the sharing ofresources and facilities, GLR&TOs need to establish systematic collaborations and enhance synergy with the relevant stakeholders, including governmentagencies, local and multinational organisations, industry, suppliers, universities, the research community and society in general.

## 6. Identify a Technology Champion

In order for any Innovation Plan to be successfully implemented the need to identify a key group of individuals that is committed to furthering the cause and directing an implementation process flow that has the ability to overcome obstacles and hurdles should be given the authority to complement the NIIP. This group of individuals shall be identified as Innovation Champions who are experts in their given disciplines.

It is recommended that each sector within a GLR&TOs must be headed by a technology champion. The champion should be an individual who has complete knowledge of the sector, its thrust, its goal and have the ability to use these three elements to energise the sector with direction, leadership, guidance, management and most of all be result oriented.

## 7. Awareness of Innovation Initiatives and Information Dissemination

The technology champions must ensure resources such as knowledge and capable team members are available and ready to disseminate important information. Malaysia does not have an adequate culture of communication to reach their target audience. To overcome this barrier, more champions within each GLR&TOs need to be appointed to motivate staff to be more innovative and, at the same time, hire communication experts to better communicate and distribute the knowledge to everyone.

## 8. Create a Risk-taking Culture to Encourage Creativity and Innovativeness

Encourage individuals to be more creative and ready to take higher risks. Positive failures, with full evidence of good practices and implementation, should be promoted. This would help encourage creativity and innovativeness among individuals and entrepreneurs. GLR&TOs need to focus on radical innovation instead of incremental innovation.

## 9. Facilitate Start-ups Companies to Increase Technology Commercialisation

In order to facilitate SME start-ups, several key issues should be emphasised. For example the GoM needs to take responsibility for the central coordination of such activities by preparing an institutional framework that creates a more favourable environment for SME start-ups particularly pre-commercialisation fund/grant.

## 10. Develop National Communications System and National Innovation Database

Recognising the lack of inter and intra GLR&TOs communication on research and development, there is an overlapping of equipment procurement, overlapping of research activity, GLR&TOshaving a top heavy expertise and experts, and the status of research and development; its position and future. All of these use grants that could otherwise be channelled to more effective use. When a National Innovation Database is created, it would be easy to track expenditure, progress of research, experts, scientists and technologists that are involved in the research and development initiative, information that can be used by GLR&TOsinstead of researching already existing technical information and much more.

## 11. Lessons need to be learnt in Order to Avoid Repeating Mistakes in Implementation of Corporatisation Policy.

GLR&TOsmust conduct benchmarking processes and/or determine best practices for formulating, executing and implementing technology development and commercialisation programmes, based on GLR&TOsfrom developed countries.

## 12. Conclusion

In understanding the role of GLR&TOs in delivering the Corporatisation Policy it can be said that their initiative is still focus more on R&D activities and less on commercialisation and innovation as expected by shareholder. Most GLR&TOs in Malaysia support the Ministry or Agency that provide the funding. This approach may or may not be directed to the corporatisation agenda in creating wealth, knowledge and human capital development.

It was also noticed that all GLR&TOs act independent of the other and remain very guarded in their research findings which does not help the dissemination of information.

It is fair to conclude that Malaysia has one of the most remarkable records of economic growth in this global era, reflecting strong macroeconomic management and political stability. For Malaysia to continue its growth in the long term, the country will need to maintain its competitiveness in scientific fields and move up the technology chain by producing higher value-added technology-intensive products. This is the main role that needs to be performed and delivered successfully by all GLR&TOs in Malaysia. Where all of the GLR&TOs are required to follow the Governments agenda in Corporatisation policy, this can create a class of GLR&TOs that are committed to integration and collaboration to reach a common goal; the national agenda.

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