Chapter 1

BACKGROUND OF THE STUDY

1.0 INTRODUCTION

Advances in science, engineering and technology S&T have unearthed new frontiers for discovery, learning and innovation. As such, growing economies of the world are struggling with each other to capitalize on the incredible technological advancements. It is believed that this growth will continue to intensify in rapidly developing countries where S&T has been the focal point in generating wealth and improving the quality of life.

The role of Government is vital in the effort to move from a production-based economy into a knowledge-based economy. The Malaysian Government, for example, has been promoting R&D through various grant schemes. Furthermore, under the Seventh Malaysian Plan, the Government has allocated RM1 billion for the Intensification of Research in Priority Areas Program. The past few years have also seen the establishment of more local institutions of higher learning with research facilities to encourage more R&D to be undertaken.[1] The progress on S&T makes the link between R&D and economic development generally acknowledged.[2]

A good example of a success story would be the United States. US successes in industries were due to their strength in science. It is revealed in Challenge (1996) that the successes are due to increased Government support for science development by having private and public monies flowing into industrial R&D, which has increased greatly.

Hence, while our country increasingly identify the role of S&T as a strategy to generate sustainable economic growth, the need for Government support in S&T research and development has never been more apparent. Thus this support especially in the public sector is more evidenced when there is one entire ministry i.e. the Ministry of Science, Technology and the Environment, looking into efforts to promote and popularize science in the country. The ministry has been very supportive in encouraging R&D in the country.

However, while several research institutions have been established and the various funding programs have been designed, it is important that the interest in S&T is nurtured and inculcated. This is to encourage more R&D to be attempted.

Economic and environmental concerns, fundamentally, are closely interlaced, requiring an S&T innovation system, which also propagates sustainable development goals. For Malaysia to also attain high value addition, she needs to have superior knowledge contents in areas of R&D, product design, distribution and marketing. For all these to be achieved, Malaysia would need a strong S&T system that would:

[1] Sreerema, Banoo. “Interest in S&T still low.” Business Times, Malaysia. (May 30, 1999).
[2] Nelson, op. cit.,p.1.

- overcome the technology dependency trap which limits future economic growth potential
- exploit the opportunities generated by the emerging knowledge-driven economy to accelerate economic growth
- fulfill the demands of "Vision 2020" which projects Malaysia to be a developed country by 2020.

To prosper economically and be secure environmentally, we need to utilize technologies to our maximum advantage. Although serious effort to ensure environmental balance is still lacking in some ways, public concern toward environmental problems, including decreasing bio-diversity, climate change and pollution has received attention for quite sometime. Malaysian Science and Technology Information Center (MASTIC), which conducted the study in 1998, revealed that the highest level of knowledge and interest among Malaysians is regarding issues of environmental pollution and computer technology applications.[3]

Nonetheless, the scores on issues such as new medical discoveries, new scientific discoveries and environmental pollution, used to gauge the level of interest, are among the lowest compared to their counterparts from other industrialized countries.

As a developing country, Malaysia is facing an uphill task in achieving S&T competencies. This is in accordance with national S&T indicators which show that globalization of market economies has done little to alter the control and distribution of scientific knowledge and technological expertise. Developed countries produce the bulk of scientific knowledge and creative expression that are subject to the protection of intellectual property law. They also produce over 94 percent of the world's research and development expenditure and 95 percent of the world scientific papers. Human resource capabilities in terms of scientific and engineering skills are also concentrated within industrially developed countries.[4]

As a developing nation, Malaysians are lagging scientific knowledge; thus more needs to be done in order to improve this situation. In MASTIC's 1998 survey of 5000 respondents admitted that they were not well - informed about S&T issues. Their mean knowledge level was below average. This is a rather alarming finding.

Nevertheless, MASTIC also reported some positive findings about Malaysians:
- They have a high regard for the role of science in improving the quality of life
- They strongly support scientific research
- They have a clear understanding of basic scientific ideas

This shows that Malaysians have positive perceptions toward science, although they may not be exposed to the means to further enhance it. For Malaysia to increase her share of S&T advancement; she must increase public awareness of the importance of S&T, by enhancing her citizen's S&T literacy. Public awareness of S&T is a prerequisite for public participation in decision making, especially in the process of devising the national S&T innovation policy that will become the engine to propel sustainable economic development. Accordingly, any country that aspires towards economic growth and environmental security requires a national S&T policy that adequately supports a vibrant S&T community.

[3] 'The Public Awareness of S&T, Malaysia 1998' MASTIC (1998)
[4] Turpin, T.(Dec 1999). "Supporting the Diffusion of Knowledge for International Competitiveness: some policy implications". In International Seminar on Challenges and Issues in SET on a Knowledge-Driven Economy, KL

The two previous studies done in 1994 and 1996 were to identify Malaysians' level of awareness, perceptions and acceptance of S&T. The subsequent study in 1998, probed the magnitude of Malaysians' growing awareness, change of attitudes and understandings of S&T, given the growth of S&T sectors. As a continuation to those previous studies, this study hopes to investigate and discover if there is any broadened or improved interest and understanding of S&T among the public during and after the rapid growth of S&T sectors.

1.1 STUDY OBJECTIVES

The objectives of this study are:

1. to compile and analyze data on the public awareness, interest in and understanding of S&T;

2. to determine whether there has been an appreciable difference in the Malaysian attitude and understanding towards S&T in relation to the findings of the researches conducted in 1994, 1996 and 1998;

3. to formulate new strategies and a plan of action to enhance and promote interest in S&T amongst Malaysians; and

4. to develop S&T indicators (for Malaysia) for international comparison.

1.2 OVERVIEW AND BACKGROUND OF STUDY

Public perception of S&T has direct bearing on social progress and national prosperity. The level of development of S&T determines the influence of S&T on the society on one hand, and the extent of public understanding of S&T on the other. As an example, it is through the popularization of science that all scientific achievements without exception produce an enormous impact on the society. The power of science lies in its popularization, which in a certain sense, is the end result and the ultimate aim of all scientific pursuits.[5]

Economic prosperity, social progress and the welfare of all individuals are dependent upon how the publics perceive S&T because S&T affects the daily lives of people. However, science is becoming more sophisticated each day, hence more difficult to be digested by the lay person. It is of prime importance to know whether the public can make sense of what is really happening and where the world is heading. It is difficult even for those with the richest imaginative power to get, merely by means of their experiences and instincts, an exact understanding of modern science and the changes brought about by it.

The contradiction between functions of science and the lack of knowledge has aroused attention and concern among more and more people, who consider it to be a new challenge to the world today. Hence, continuous studies to determine the level of understanding and attitude towards S&T are very important in helping drive the country into the future.

[5] Kaixun, Zhang. (June 26 – July 1, 1999). "Public Perception of Science: Essentials and its Practice in China." In World Conference on Science, Budapest, Hungary.

It is undeniable that, while the tremendous progress made in science and technology has brought mankind happiness, it must also not be forgotten that very often it also produces new problems and negative influence on the society. Therefore, the effort to look at people's attitudes and understandings towards S&T should continue to be made.

Our daily lives are influenced to a high degree by scientific technological knowledge and many of the results of S&T have been beneficial. For instance, we have fewer diseases, more food to eat, and more time to engage in leisure activities. Most of the time, technologies have proven to be very useful.

At the same time, there is also a down side to scientific advancement. Scientific influence is increasingly regarded as risky or even dangerous. Think of crowded cities, addiction to television, over dependence on drugs, nuclear power or genetic engineering. People feel apprehensive of certain technologies have resulted in a culture of drugs and violence among adolescents.

The public need to be informed and educated on those and other issues as they are expected to make value-laden decisions on that kind of science. This is vital for survival purposes. The public also should be critical and wise in accepting or even denying certain technologies. If we mindlessly and sometimes foolishly adopt S&T breakthroughs, we are bound to have these symptoms of living in a "Technologically Intoxicated Zone" as listed by a Business management guru, John Naisbitt[6].

- Favor the quick fix, from religion to nutrition
- Fear and worship technology
- Blur the distinction between the fake and the real
- Accept violence as normal
- Love technology as a toy
- Live our lives distanced and distracted

Science education must be as concerned with the interaction of science, technology and society as it is with the results of scientific investigations.

However, the implementation of this ideal arrangement may not be as manageable as it sounds as there are occurrences where science and society are in conflict, as a result of different perspectives.[7]

- Conflicts between information science and protection of privacy

  In this high-tech era, computers are, unequivocally, parts of our lives. Information sciences are an indispensable part of modern life. Computers are vital in formal as well as informal education. These privileges and others notwithstanding have diminished our privacy. For example, any data kept may easily be accessed and retrieved by interested parties.

- Conflicts between the good and bad roles of science

  The science of developing weapons is commonly associated with destroying life rather than enhancing it. Scientific knowledge in this area has long presented moral dilemmas and on-going debates. A country that possessed the knowledge and skills in this science tend to feel superior over the others and sometimes use them to exercise their power.

[6] "Don't get intoxicated with technology" (Sunbiz). The Sun (Malaysia), February 4, 2000: p.5.
[7] Simpson, R.D & Anderson, W.W, "Science Education and the Common Good." National Forum, vol.72 Issue 1, (Winter 1992)

- Conflicts between genetic research studies and concerns about releasing genetically engineered organisms into the environment

  Even though people are aware of the benefits that this technology brings, they also worry about its effects, say the effects of cloning. There are some societies, which disapproves of this kind of study as it goes against their religions or beliefs. Theologians, for example, are concerned with genetic determinism and the act of people controlling their own evolution by playing God is just not acceptable.

- Conflicts between people in a pluralistic society who come from diverse backgrounds, learning styles, races, religions, political beliefs and cultural values

  In Malaysia, this is especially true as we have different sets of cultures based on different ethnic groups. These influence the degree of acceptable norms and colors attitudes towards S&T. MASTIC (1998) reported "Malaysia being young in the tradition of S&T is facing a hard battle in embedding scientific thoughts and way of doing things as part of its culture".

  Some scientific issues are rather sensitive to some people, which provoke the clashing of views and interpretations with other cultures. All these and more have triggered the burning question "How best to nurture pluralistic public interest and understanding of S&T, given the pluralistic set-ups?"

- Conflicts between fatalistic attitudes in Science with issues that have cultural implications

  In science, everything is to be unveiled and explored. However, some cultures or societies have certain rules and limitations in messing with nature. This undoubtedly has triggered the circumstances of fatalistic attitudes, such as the ever popular "whatever will be will be" and "we are not the controller of nature, so why bother?"

- Conflicts between advances in science with values and belief systems

  All in all, the public needs to be re-educated on science as the implications of science cannot be separated from the science itself. The values and belief systems are actually playing roles in the basic principle of ethics involving science. Nevertheless, the conflict between concepts of evolution of science and the literal interpretation of 'creation' as stated in the Quran and Bible still continues until today. In addition, in many countries, the proposal to teach sex education in schools to control teen-age pregnancies and AIDS that have imposed a huge and growing cost to the society, has met strong opposition. Parents objected on moral grounds to their kids being taught about reproductive biology.

In order to resolve these conflicts and to remain competitive, the public need to be science literate.

So, what is "science literacy?" Science literacy is very much related to the role of the citizens, especially the young citizens as tomorrow's consumers, users and producers of science.[8]

[8] Ibid., p.2

The public who are intelligent consumers should know how to interpret basic knowledge in science. They should be able to follow reports in the newspaper on scientific discoveries or social issues relating to science. They should be able to vote intelligently on matters of national interest that involve science-based issues.

The second level of literacy reflects the intelligent users of science and technology, such as the ability to use computers, record data, interpret research outcomes, or to engage in other technological functions that are common place in business, industry, education and government.

Finally, the highest level of science literacy refers to the ability of any country to come up with producers of science for the future, for example, scientists, engineers, physicists, science educators and technologists of high caliber. As people in different countries are competing for higher standards of living, the victors will be those who have the human skills to utilize and build on the products of science and technology.

To summarize, science literacy consists of knowledge of certain important scientific facts, concepts and theories; the exercise of scientific habits of minds; an understanding of the nature of science; its connections to mathematics and technologies; its impacts on individuals; and its role in society.[9]

Thus, it is crucial that the public become more reflective and has conscious awareness to be able to select technologies, which preserve humanness and reject those that destroys it. People with science literacy should be able to examine the consequences of technologies critically.

Formal education exclusively cannot cope with the rapidly changing science, therefore media and informal channels have to play important roles in all these areas to popularize and communicate scientific knowledge. In cases where scientific knowledge is of use for everyone, media and all other channels have to disseminate the knowledge (that is the service- function media often have to play). In situations where science may provide new insights on how the world is functioning, media should deliver these discoveries in special sections or magazines. In addition, when science itself comes under scrutiny, media have to provide arguments and space or time for discussion. This also means that scientists continuously need to be involved in popularizing their work and the issues. Those are the democratic argument for science communication.[10]

According to Frederico Mayor, the Director General of UNESCO, both the scientific community and the media have a duty to communicate the issues to the general public. The scientific community should be in closer contact with the public, in order to spread messages to the people, so that the people can use them.[11]

Awareness studies toward S&T have been carried out in Western countries. At the forefront in carrying out such studies is the United States. For example, through its National Science Foundation, the groundwork for S&T studies was laid as early as 1952. Many indicators that were developed from that time are still viewed as essential ways of measuring national S&T capabilities and economic strength. The first study of public attitude and understanding towards S&T in the United States, entitled "Science Indicators – 1972", was reported by the National Science Board. These studies are currently called the Science and Engineering Indicators. To date the "Science and Engineering Indicators – 1998" report is the 13th in the series.

[9] Nelson, George D, "Science Literacy for all in the 21st Century." Educational Leadership, vol. 57 Issue 2, (Oct 1999): p.14.
[10] Goepfert, Sinfried. (June 26 – July 1, 1999). "Communicating and Popularizing Science". In World Conference on Science, Budapest, Hungary.
[11] UNESCO Feature. (June 26 – July 1, 1999), "Sharing Knowledge". In World Conference on Science, Budapest, Hungary.

"The Science and Engineering Indicators – 1998" reported that, American adults have a high level of interest in new scientific discoveries and in the use of new inventions and technologies. Their mean level of interest, meanwhile, has increased over the years. Despite this, Americans were reported to have limited vocabularies of scientific and technical concepts. On the other hand, their attitudes toward S&T are very positive as they continue to hold the scientific community in high regard.

Noting the increase in the globalization of S&T and the increased interdependence of the world's economies, "The Science and Engineering Indicators – 1998" made international comparisons and global trends as its major theme. Internationally, comparable data was obtained from several multinational organizations such as OECD, UNESCO, EU and APEC. For example, in comparison to 13 other industrial nations, the mean score for American adults on the Index of Scientific Construct Understanding was tied for first with Denmark, closely followed by the Netherlands and Great Britain.

In Malaysia, similar studies have also been carried out. For example, The Public Awareness of S&T, Malaysia (1998) study highlighted the following findings:

- In the 1996 study, Malaysians perceived their general and S&T knowledge as generally poor, although there were slight variations according to subject matter. The 1998 study also indicated that Malaysians still considered their perceived level of knowledge in general and in S&T as rather poor.

- In the 1998 study, interest in general and S&T issues among Malaysians showed a decline over 1996.

- The 1996 study reported that Malaysians held positive views on S&T and a majority maintained that S&T had improved working conditions, and upgraded standards of living and public health. In 1998, the number of Malaysians who held positive views on S&T had improved in most of the cases.

- There was an increase of 3% in the level of understanding of S&T among the Malaysian public when comparisons were made between 1998 and 1996's results.

- Similar to the findings in the 1996 study, the 1998 study showed that TV and newspapers continue to be the most popular sources of information respectively.

The results of the research were also compared to similar studies from the United States, the European Community, Japan and South Africa where appropriate findings were reported:

- The sense of informedness (knowledge) of the Malaysian adults of S&T on two (out of three) issues measured, i.e. 'new medical discoveries' and 'new scientific discoveries', was poor and seemed to be declining over the years.

- The interest of the Malaysian adults in three S&T issues measured, i.e. new medical discoveries, new scientific discoveries and environmental pollution also showed that the Malaysians' scores (which are also declining over the years) were among the lowest.

- The attitude of Malaysian adults towards S&T on the whole was very positive in comparison to that of their counterparts from South Africa and the industrialized countries. In addition, Malaysian adults held strong beliefs in the promise and benefits of S&T, and they had relatively low levels of reservation about their possible harms.

- Malaysian adults occupied a commendable sixth position in the understanding of basic S&T terms and concepts, when a comparison was made with industrialized nations.

A similar study, which was also commissioned by the Ministry of Science, Technology and the Environment, Malaysia, to the University Technology MARA (UiTM) in 1994[12], reported the following findings:

- Most Malaysians were receptive toward S&T in general, in spite of the fact that they were more interested in sports and entertainment, rather than in S&T.

- Interest in S&T varied with age, reaching a peak during adolescent years, and subsequently, diminishing with advancing age.

- With the exception of health matters, knowledge of S&T among Malaysians may be described as generally low, with slight variations according to the subject matter.

- An exception would be the case of the environment, where the majority of respondents expressed concern for the protection or preservation of the environment.

- The same study reported that most Malaysians relied heavily on television for S&T information, but no study was made on the trust level of this source of information.

A parallel study by MASTIC in 1994 to measure S&T awareness among secondary school students reported that:

- Only two thirds of pure science students said that they would follow a career in S&T, and the proportion was likely to fall as they entered the workforce.

- Students were interested in S&T topics compared to politics, economics or business, in spite of lacking in information in S&T areas (with the exception of pollution and environment control).

- Students had highly positive attitudes about scientific practice and concerns. In terms of science literacy, Malaysian students were comparable with survey respondents in developed nations.

Therefore, it should be clear that a follow-up study on the public's attitudes and understandings toward S&T in Malaysia, as a continuum for the master preparation of technological competitiveness, would be of prime importance. This fourth phase study will attempt to determine the attitude and continuous growth of the level of understanding on S&T among Malaysians in its various dimensions. Furthermore, since S&T have affected the daily lives of people, it would also be important to find out the extent of the inculcation of S&T culture among Malaysians. To ensure a consistent and systematic index, in terms of international comparisons between Malaysia and other countries, similar studies in other parts of the world would be referred to.

[12] 'A Study on the Level of Awareness, Perception and Acceptance of Science and Technology among Malaysians'. (Malaysia: MOSTE. 1994).