UNIVERSITI PUTRA MALAYSIA

TECHNOLOGY PARK MALAYSIA
THE QUALITY OF RESEARCH & DEVELOPMENT
IN BIOTECHNOLOGY

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THE QUALITY OF RESEARCH &DEVELOPMENT IN BIOTECHNOLOGY

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PREFACE

My interests to know what is research and development in biotechnology is all about and its importance do give me good opportunities to realize that quality work means everything. Any goals can be achieved excellently if the planning and execution systems are well planned. Long term goals then deserve thorough plans.

Through this paper I had managed to reveal some setbacks in research and development work in biotechnology as well as suggesting ways to overcome such problems. Many people think research and development work is simple and thus expecting a short-term return out of it. *It is not!* Research and development work deserves long term planning systems for peculiar return. *Quality inputs like sufficient personnel, capital and technology to name a few will digest for quality outputs!*

Acknowledgement

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CHAPTER 1: INTRODUCTION

1.1 What is Research and Development?

Research and development is an area that guarantees the development of products and services of companies. With research, company will be able to explore the possible potential opportunities to be better off in future days and with development, companies that equipped with research activities will go through the possible growth.

The word 'research', which comes from two (2) words; ***re*** and ***search*** can be defined as continuous and explore. The searches for new things are never ends. The explore must be in continuos form. Explore means find and gather for solutions. While continuous means progressively involved in sustaining or maintaining such exploration.

Research and development is a base for growth. It is a root where an extensive, unique and useful philosophy of doing things lie.

"Research usually is considered to be studious inquiry or examination, especially investigation or experimentation aimed at the discovery and interpretation of facts and the revision of accepted theories or laws in the light of new facts." (George, 1992,p27)

Research is categorized into two (2) categories; basic research and applied research. Basic research is a research conducted to understand the nature of the

matter while applied research is concerned with the real output of products and services for the ultimate is the customer satisfaction. According to George, development is the conversion of scientific information into such things as hard wares, materials rules or procedures. (1992, p28)

1.2 Why research and Development is important

Research and development is one of vital factors in a success of an institution or organization. Amongst the importance of research and development are;

1. It enables a company to explore the possible opportunities in enhancing its products and services through such development.
2. It pursuits a useful of learning process to the company to become independent.
3. It initiates the development of quality products and services.
4. It integrates the process of production and the real output
5. It generates high level of satisfactions to the companies and the customers.

The learning process that each company goes through the integration of both research and production is an essential tip to the company to become independent. Foreign companies like Hyundai, Honda, Microsoft, Motorola, Guess for example are well known for their established research and development team to study the kind of demand and taste of people and draft their products based on the output of research.

With extensive research and development, companies will be able to analyze the needs of customers and will possibly design the products and services according to their needs. Customers' satisfaction boosts as a result of extensive research and development stressed one of the Japanese companies.

1.3 Malaysian's contribution in Research and Development.

Research and development is regards as something new in Malaysia. Malaysia, through these years has begun initiated some work in research and development. The latest development is the MSC, the abbreviation for Multimedia Super Corridor is one of many efforts by the Malaysian government towards research and development. Other than information technology and multimedia advancement, which aimed to border less trade, Malaysia is then expected to grow with the development in research.

Malaysian's current expenditure for Research and Development is ***at 1% of its GNP***. Most of developed countries maintain an ***expenditure of 4 to 5%*** of its GNP. Malaysian's work in Research and Development have been so far concentrated at problem solving rather than experimentation or exploration (Zakri, 1995)

In 1997, ***the allocation budgets for Research and Development*** has decreased of about 12% from the previous year of 1996 that is ***RM41 million*** from a total of RM47 million in previous year.

Transfer- technology is one of many processes in the development of R&D in Malaysia.
Most of the companies import experts, software or hardware from abroad and locate in Malaysia and called them as their research and development. Though this is seen as artificial R&D, transfer technology has been helping nation to improve in many areas. The following institutions, to name a few, have been established for the purpose of promoting and supporting the growth of research and development in Malaysia.

1	INTENSIFICATIONS OF RESEARCH PRIOROTIES FUND(1988) - to provide fund for financing Research and Development.
2	MALAYSIAN TECHNOLOGY DEVELOPMENT CENTRE (MTDC) - current administrator for MSC
3	KULIM HIGH TECH PARK -industrial high tech park
4	MALAYSIAN INDUSTRIES OF GOVERNMENT HIGH TECH - Government body to look after the growth of R&D.
5	SIRIM

Governments and universities are still playing the major roles in Research and Development. Only small amount of contributions come from private organizations.(Zakri, 1995)

Joint ventures and partnerships are among of the famous coalitions formed in Malaysia to simplify the cycle of Research and Development efforts. Proton and Lotus for instance is an example of a merger, which among other reasons has looked for the benefits of research and development. The latest models produced by Proton depict the real research and development that both companies had went through.

This transfer technology is part of making the work and life cycle of research and development short thus customization, joint venture and partnerships between local and foreign companies are seen growing.

1.4 What is Biotechnology?

Biotechnology is a field of studying and analyzing the ways of producing food, feed and health care products through natural processes.

There a lot of fine natural plants and herbs that can give maximum benefits to our health and life. Thus, this technology evolves around to analyze the contents and ingredients of such nature and to avoid any chemical substances in the contents.

" Biotechnology is a multidisciplinary science that conglomerates under one roof the fields of biochemistry, chemistry, engineering and different of biological sciences and medicines."(SIRIM, p36)

According to John Smith, Biotechnology is composed of a few main studies such as fermentation, enzyme, waste products, environment and energy (1997,pg2)

1.41 Biotechnology in USA

Biotechnology is widely dominated by USA firms. It has begun there during late 1980s.
Today, there are about top 10 (ten) publicly owned biotech companies in USA. The companies are as follows;

1	AMGEN INCORPORATION
2	CHIRON CORPORATION
3	GENETECH INCORPORATION
4	GENZYME CORPORATION
5	BIOGEN INCORPORATION
6	NABI
7	CENCOTAR INCORPORATION
8	IMUNEX CORPORATION
9	AUGOURAN PHARMACEUTICALS
10	NEXSTAR PHARMACEUTICALS

1.41 Biotechnology in Developing Countries

The famous areas of biotechnology in developing countries are on plant (oil palm and cutflowers), industrial (fermentation and agriculture) and animal.

a. The Philippines

Philippines is one of the active members in Asia. It has participated in the ASEAN Committee on Science and Technology (COST since 1982). The first institute was founded in 1979 at the University of Philippines at Las Bonos.Amongst its favorite activities are Cassava Starch and Fermentation. (Zakri, 1995, p108-109)

a. Indonesia

One of the pioneer's institutions is called as Agency and Agricultural Research and Development (AARD). Fermentation which include beer brewing, soy sauce and MSG (monosodium glutamate) by small manufacturer are amongst its activities (Zakri, 1995,p107).

b. Thailand

Thailand has been promoting biotechnology since late 1970s. The government has been heavily involved and participated in biotechnology programs since then. Among its activities in biotechnology are in aquaculture, feeds, seeds, darry , ornamental plants and organic acid (Zakri, 1995,p110)

1.5 Biotechnology in Malaysia

In Malaysia, biotechnology offers important opportunities for both genetic improvement and treatment of agricultural waste particularly palm oil. National Biotech Committee was formed in 1985. The activities in Malaysia are mostly conducted by government or semi government organizations. (Zakri, 1995, p108)

Though a lot of institutions and schools have initiated some research and development work, less has been done for biotechnology.

Other than palm oil and fermentation, honey and gamat are among of the favorite items being experimented in pharmaceuticals industry in Malaysia. These two items are normally converted to some medications without killing its naturalness.

1.6 Biotechnology in Technology Park Malaysia

Technology Park Malaysia (TPM) was known as Taman Teknologi Malaysia has been established in 1988 under the control of Ministry of Science, Technology and the Environment. TPM then was incorporated in September 1996.

TPM has been charged with the task of stimulating indigenous technology development to spur Malaysia's drive towards industrialization. TPM, therefore is established to promote, stimulate, support and commercialize innovative concepts drawn from the Research and Development activities.

Company's Main Activities

The main activities of TPM are;

i. To provide office space and lands for rental and lease for the purpose of research and development activities.

ii. To provide support facilities such as machines, warehouse and engineering services to the tenant companies and SMIs (small and medium industries) which are involved in technical and production activities.

iii. To provide IT support facilities such as leased line, bandwidth and IT and Multi-media labs for tenant companies.

iv. To joint venture with potential and weak companies by injecting funds through government grant schemes, priority is given to the tenant companies.

v. To provide IT training to the government servants in line with the electronic government concepts.

vi. To provide robotics training to industrial companies and students.

Rental and leasing of building and lands for research and development has become the main contributor to TPM. TPM has becoming one of the best locations within the MSC area due to its establishment. Besides TPM's infrastructure such as intelligent building and support facilities have made TPM the finest place to be compared to other places like Cyberjaya and Twin Tower.

Besides, TPM has been conducted computer lessons training to the government servants and also robotics training to industrial employees.

High –tech machines are also available for rental to tenant companies and outsiders to produce their products. Small and medium industries (SMIs) are most of the customers of TPM.

Mission and Objectives

Missions of TPM:

- To promote the growth and development of high-tech industries
- To enable these industries to compete effectively in the international market through the promotion of technological and development.

Objectives of TPM are:

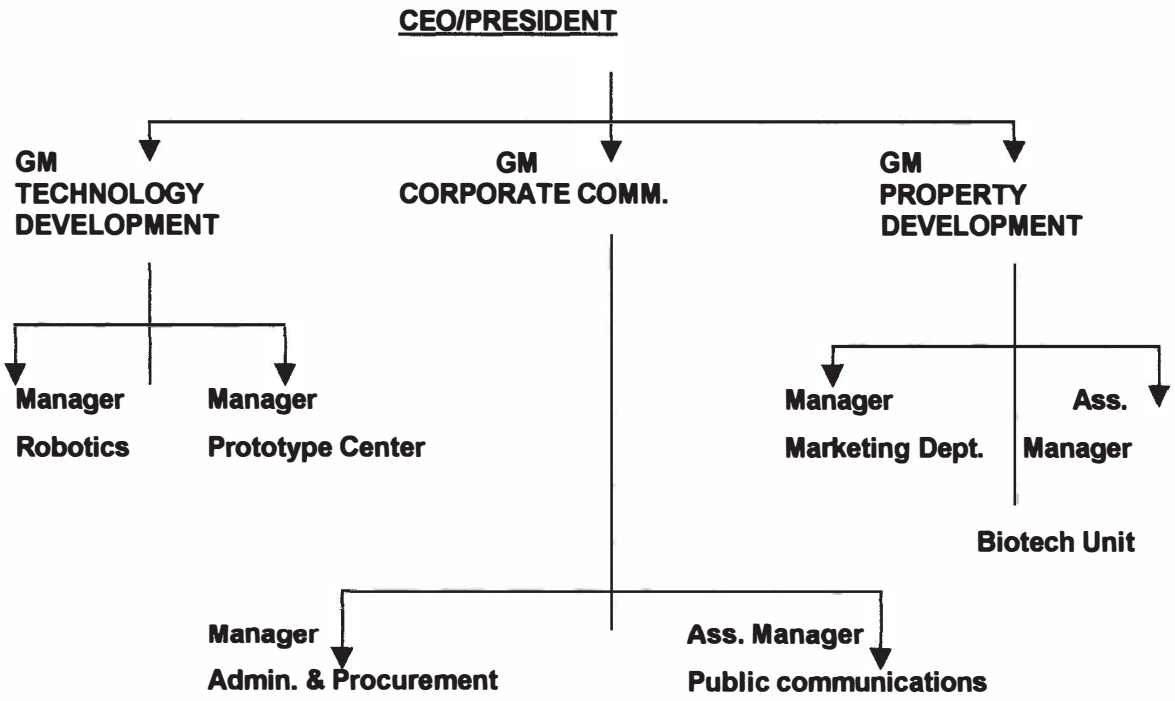
- To promote private sector involvement in research and development
- To promote the commercialization of research and innovation from the both private and public sectors
- To assist government and private sector collaboration
- To provide support in marketing, management and technical fields
- To support innovation
- To help create a knowledge-based society

Since January 1998, Biotechnology Department has been formed headed by one manager and one clerk. The first project that Biotechnology department engaged was agro-biotech ***joint venture with the tenant company M- Gen.***

Two staff from IT Department had been pulled to the Biotechnology Department. They were assigned to do extensive study and research in ***Honeybee and sago.***

Other departments involved in this biotechnology are property division, marketing department, venture capital and corporate communications. Marketing manager is responsible to apply and acquire lands for biotech –city. Corporate communications was responsible for the preparations of text and proposals to Cabinet or related authorities on behalf of CEO. Venture capital department is responsible to study the viability and cost-analysis of the certain projects and also possible joint ventures with other companies.

Figure 1: TPM Organizational Chart



1.7 Biotechnology Activities in Technology Park Malaysia

1.7.1 Joint Venture with M-Gen Technology

The first project anchored by Biotechnology division is the integrated agro-biotechnology project with emphasis on the utilization of local raw ingredients for animal feed. The objectives of the project are;

1.to develop and commercialize chicken and fish feed utilizing high percentage local raw material content

2.to develop a commercially protein source (tilapia fish) as a source of protein to replace imported soya bean

3.to develop a commercially viable integrated farm with three approach namely small, medium and large-scale projects.

The project was trying to obtain the results of the use of local ingredients in poultry diet. Due to the current economic downturn, the industrial poultry producers are beginning to think ways to reduce the imported ingredients in favour of locally available material.

Other than reducing the imported cost and purchases from foreign sources, the product, the animal feed from tilapia meant to create additional source of income to the local farmers. Besides the research and finding will introduce the device or equipment for harvesting and processing of tilapia for protein.

The service, the availability of integrated Agro- biotech farm will be further introduced.

1.7.2 Joint venture with Kawalan Cecair Sdn Bhd

The joint venture project between TPM and Kawalan Cecair Sdn Bhd is to design, develop and test automated high-density Poly Culture systems for the production of Freshwater fish. The objectives of the project are to; develop automated systems designed for high density polyculture and to design and develop ponds for testing of automated systems.

This initial research of polyculture farming of 6,428 square feet pond in TPM has currently shown positive result. With a total population of more than 200,000 fishes of various species at the TPM pilot scale pond, an annual income of RM500, 000 per acre per year is expected to be achieved.

Further research for the automation of high-density polyculture systems such as mechanical automation, on line water quality monitoring, filtration, aeration and harvesting is part of this project.

This research focuses on the automation and decision supports systems from Telemetry and SCADA systems for the implementation of the system.

1.7.3 Joint Venture with Danau Ribuan Sdn Bhd

TPM's joint venture with Danau Rimba Sdn Bhd is on the production of freshwater fish as protein source for animal feed as to replace the imported soya bean. The objectives of the project are to;

1.to produce fish for animal feed

2.to develop technology in order to enable feed formulation utilizing high percentage of fish for protein and to produce fish on commercial scale at below price of soya bean

3.to design and develop a fully automated and computerized feed mill for animal feed

4.to design a technology in harvesting, handling, transporting and mixing a large quantity of rich for protein.

The project with Danau Ribuan Sdn Bhd is therefore an attempt to replace an imported Soya bean with freshwater fish as a source of protein at 0% salt content and no fish smell feed formulation.

The effort is made due to the economic downturn, which sees an increasing manner of import on animal feed which is about RM4.75 billion in 1998. TPM's joint venture with anau Rimba is with the intention to embrace some concept of integrated farming in the project.

2.0 Problem Statement

Technology Park Malaysia Corporation Sdn Bhd (TPM) has been established with a mission to support and boost the growth of entreprenuership in research and development. Bio – Technology; a venture into food, feed and neautraceautical technology is another mission of TPM. Since January 1998, TPM has started concentrating efforts to venture in Biotechnology. TPM has been working with a few parties in making biotechnology successful. Joint ventures with tenant companies and some established companies are among of the famous effort initiated by TPM.

Realizing the need for cheaper and sufficient food which can be outsource locally, TPM is actually exhort its task force to concentrate in bio-technology than the Information Technology (IT). This is seen as one of dynamic mission initiated by TPM. Among initial activities started through this project is the integrated farming and honeybee farming?

The issue evolves now is the diversion of the one mission which TPM holds. Instead of giving optimum concentration in the growth of research and development, TPM instead now embarks on becoming the commercialized suppliers for food, feed and neautraceutical industries. Biotech- CITY is one of the biggest agenda to boost the biotechnology. TPM has applied to acquire lands in Pahang, Perak and Kelantan. With these acres of lands, TPM will lease the lands to individuals and companies for biotechnology activities. This commercialization thought has dragged the bio-technologies activities are done with lack of planning.

" You should concentrate on research and development; new techniques of doing these things rather than involving in large scales. " commented YB Tenpaku Razaleigh Hamzah during his visits to TPM on the 5th October 1998 to TPM to the CEO of TPM.

3.0 Objectives of the paper;

1. To provide an overview on Biotechnology activities in TPM

2. To provide details on the organizational structure and divisional activities of Biotechnology.

3. To determine factors that influences the successful of development in Research and Development in biotechnology.

4. To provide some comparisons with other similar institutions.

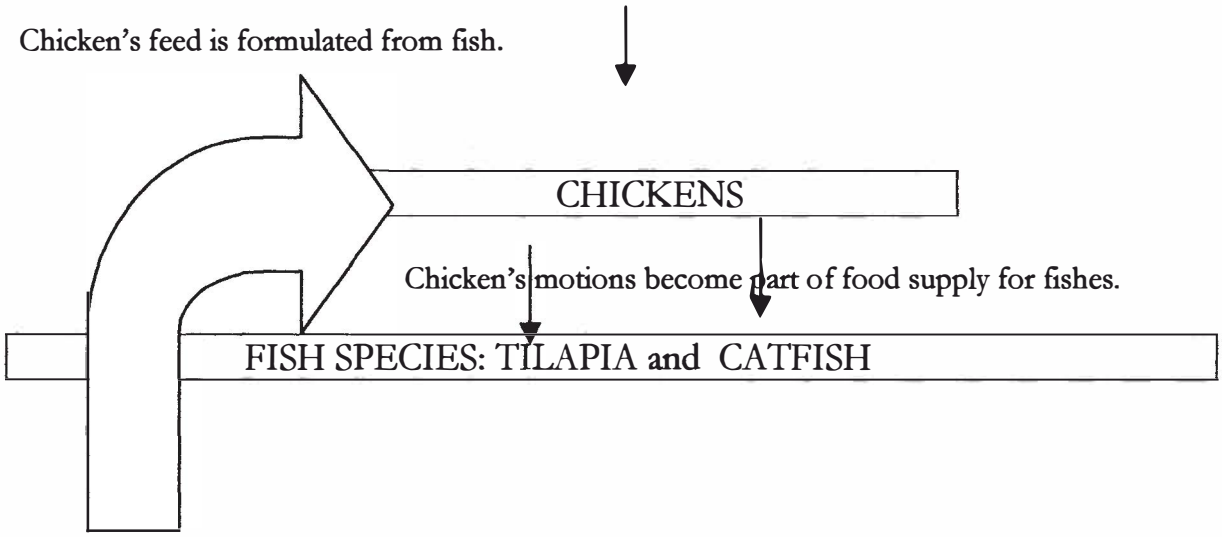
4.0 Implementation – Integrated Farming Concept

Objectives:

1. To create substitutes for protein as the feed sources to the chickens which Malaysia has spent for about 1 million of amount of import today.
2. To formulate the ideal specifications of feed sources for chickens.
3. To produce healthy and fresh source of foods.
4. To create double income for farmers.

Integrated Farming Concept

Beginning September '98, TPM started its first biotech project called as the Integrated Biotech Farm. This project which concentrated on the elements of feed and food concept where fish and chickens are the two main species reared to benefit the lifecycle of the integrated farming. The details of the integrated farming are as follows;



- In this life cycle, fish is the feed sources for the chicken, which is formulated according to standard specifications.
- Chicken, then pass motions to the pond, which will be eaten by the fishes.

One acre of land located within TPM's area is now running the project in which about 400 hundreds of chickens together with a total number of 500,000,000 of fishes are rare in the ponds. At the moment, a total of 2000 pieces of eggs are produced daily. Kawalan Cecair is the alliance who has provided service in terms of techniques.

CHAPTER TWO (2): LITERATURE REVIEW

George J. Kidd in his book has discussed some good factors, which will contribute to the development of quality at work in Research and Development. Quality, according to him, is the activities that deal with some preparations, execution, evaluation, improvement and correction of goods and services. (1992, p 19)

There are six (6) parameters that need to be analyzed the quality of a research and development work. The parameters are system, process, input, output, provider and receiver.

"System is an assemble of people, time, money, information, energy and things that causes inputs to be transformed by a process into outputs."(1992, p57-58)

In accomplishing a project, inputs such as people, time, money, information, and energy are the inputs, which are processed to make the outputs possible.

People are the appropriate staff or experts to handle the project. While enough preparations such as time line, capital and information are expected to make the research accomplished.

The complete Quality Model for Research and Development

The quality model for research and development introduced by George consists of a set system that are identified as preparation, execution, evaluation, correction and improvement systems (1992, p57-p58).

In the preparation system, providers must ensure that the project must be equipped with enough manpower, capital or funds, time, energy, information or knowledge.

The execution process is therefore the process of implementing the project once the preparation system is in order.

Once it is implemented, the project must be evaluated as per expected standard.
Correction system is the stage where the work will be rework, to scrap or to be delivered as non-conforming output.

Improvement on certain parts of work will be going back to the preparation systems for further implementations.