CHAPTER THREE

3.0 METHODOLOGY

This chapter outlines the methodologies used to achieve the objectives of this study. The rationale for selecting the respective methodologies is also stated here. Both quantitative and qualitative approaches are undertaken as these methods offer both breadth and depth towards better understanding of biotechnology communication in Malaysia. As this research seeks to better understand the entire biotechnology communication matrix in Malaysia, and to propose a framework for national biotechnology communication strategy, this requires an understanding of current biotechnology communication activities, its players; the publics and their needs and attitudes; and international comparisons. Deeper analysis of each component (communicators, public, media) could be explored by other researchers in the future, more interested in the individual components than this holistic approach.

3.1 OBJECTIVE 1: TO IDENTIFY EXISTING BIOTECHNOLOGY COMMUNICATION ACTIVITIES IN MALAYSIA IN TERMS OF PLAYERS INVOLVED, THEIR OBJECTIVES, TARGET AUDIENCE, SUCCESS, CHALLENGES AND SHORTCOMINGS.

Biotechnology Communicators

Biotechnology communicators in Malaysia have been identified as:

i) scientists,

ii) media,

iii) policy makers,

iv) public affairs officers at research institutes,

v) non-research organizations, and

vi) religious scholars

The communicators were identified after consultation with MABIC and BiotechCorp and also based on their involvement in biotechnology communication and public engagement. Among these groups, some carry out biotechnology communication activities in their own capacity and others as part of the organisation mandate. While it is a very heterogeneous group, they do not necessarily operate in isolation of each other. Some members, particularly the religious scholars receive biotechnology information from others that enable them to be biotechnology communicators to their specific audiences.

The biotechnology communication efforts and activities carried out by these communicators are identified in this study in terms of their target audience, objectives, areas covered, impact and success of the activities, challenges and constraints faced, and how these are overcome. This information has been gathered by conducting in-depth interviews with the officers in-charge in each organisation and from reports available on their websites. Discussions during the in-depth interview used a semi-structured interview schedule (Davies, 2008) with focus on participants' ideas for public communication on biotechnology as well as the purposes of biotechnology communication. All interviews were conducted either face-to-face or via email. Email interviews required follow up questions which were sent to respondents. Face-to-face interviews were scheduled to last between 20-30 minutes. This approach is similar to the study conducted by Office of Science and Technology and the Wellcome Trust (2000).

A qualitative method of approach was selected to gather information from the biotechnology communicators as open-ended questions can provide more in-depth information than could be achieved through a quantitative method. Furthermore,

scientists, media, policy makers, public affairs officers at research institutes, non-research organisations, and religious authorities that were selected for this study have past experience and involvement in biotechnology communication, and they are a relatively small population. The selection of the respondents from universities and research institutes were based on their past involvement in biotechnology communication activities. Respondents with some experience in this area were selected so that they could share their thoughts and experiences on this subject. Public affairs officers from research institutes were selected as respondents to supplement the information given by scientists working at these research institutes. Representatives from NROs were selected based on their job scope, thus, those in-charge of science and technology, biotechnology and public engagement were chosen. Journalists and editors from the media were chosen from mainstream newspapers to understand media practitioners' attitude towards science and biotechnology coverage. As for the religious scholars, representatives from six major religions in Malaysia were selected; Islam, Buddhism, Hindu, Christianity, Taoism and Sikhism. Table 3.0 lists the various organisations represented by the communicators. Interview questions for respondents are listed in Appendix I.

Information gathered from these communicators was then compared to the needs of the publics obtained from a medium-scale survey. This provided crucial information to gauge if the current biotechnology communication activities in Malaysia were effective and how the existing activities could be improved, as well as providing information on how to develop the framework for national biotechnology communication framework.

Table 3.0: Biotechnology Communicators and the Organisations

Communicators	Organisations	Organisation type
Scientists	• Universiti Sains Malaysia • Universiti Kebangsaan Malaysia • Universiti Putra Malaysia • Malaysian Agricultural Research & Development Institute (MARDI) • Forest Research Institute Malaysia (FRIM) • Malaysian Palm Oil Board (MPOB) • Malaysian Rubber Board (MRB)	Research Universities Research Institutes
Media	• New Straits Times • The Star • Utusan Malaysia • Berita Harian • Tamil Nesan • Makkal Osai	Newspapers
Public Affairs Officers	• Malaysian Agricultural Research & Development Institute (MARDI) • Forest Research Institute Malaysia (FRIM) • Malaysian Rubber Board (MRB)	Research Institutes
Non-research organization (NROs)	Malaysian Academy of Sciences (ASM) • National Science Centre (NSC) • Malaysian Biotechnology Corporation (BiotechCorp) • Malaysian Biotechnology Information Centre (MABIC) • Institute for Islamic Understanding (IKIM) • Department of Biosafety, Ministry of Natural Resources & Environment (NRE) • National Biotechnology Division, Ministry of Science, Technology and Innovation (BIOTEK)	Government agency Government agency Government linked agency Non governmental organization Government linked agency Ministry Ministry
Religious scholars	• Institute for Islamic Understanding (IKIM) • Malaysian Hindu Sangam • Leaders from Malaysian Consultative Council of Buddhism, Christianity, Hinduism, Sikhism and Taoism	

Media Monitoring

Six mainstream newspapers were monitored for a period of three months to understand media attitude towards science and biotechnology reporting. The frequency of science news based on different categories (biotechnology, agriculture, medical & health, space, biodiversity, environment, nutrition, and others), journalists' source of news, and personnel interviewed were recorded. A three-month period is sufficient to represent the trend of science coverage in Malaysia which was supported by of two editors whose views were sought to test the reliability of the three-month period. Theresa Manavalan

(Editor, *The New Straits Times*) with 28 years of experience says media coverage on science is issue-centric. Science news only becomes prominent when there is a major event such as a major research breakthrough (which is rarely the case in Malaysia) or when there is an incident which can be related to science such as use of DNA fingerprinting in identifying bodies recovered in a major landslide. Joseph Masilamany (editor, *The Sun*) with more than 30 years of experience as a journalist and editor says the trend of science coverage in Malaysian newspaper is stable with no major fluctuations over the past three decades, therefore a three-month period is sufficient. This is also supported by previous literature, such as Wilkins (1987) who has stated that news coverage of science is often event driven. Other studies found a similar trend of science coverage focusing on dramatic considerations of scientific issues (Greenberg et. al., 1989; McMomas and Shanahan, 1999). The issue-cycle perspective explained by Brossard and Shanahan (2007), also agrees with the above studies, where news coverage is triggered by public issues, concerns and alarm. Commercialisation of genetically modified crops (like in the Philippines), intensive research on stem cells (South Korea and USA), and cloning (the case of Dolly in the UK) are some examples that will cause major peaks in science news. Since breakthrough news from Malaysian research institutes and universities is rare, appearance of science news throughout the year tend to follow a constant pattern without major peaks. Furthermore, this research does not attempt to study media framing which tends to change with time. Thus, a three-month period is sufficient to provide the trend of science news in Malaysian newspapers.

The newspapers studied were two English newspapers; *New Straits Times*, and *The Sta*r; two Bahasa Malaysia newspapers; *Berita Harian* and *Utusan Malaysia*; and two Tamil newspapers; *Tamil Nesan* and *Makkal Osai*. *The Star* is the leading English Daily in Malaysia with a readership of 1,292,095; *New Straits Times*, 399,195; *Utusan Malaysia*, 789,155; *Berita Harian*, 652,805; *Tamil Nesan*, 135,000; *Makkal Osai*, 190,000 (AC Nielsen Media Index, 2010; Audit Bureau of Circulation, 2010). These newspapers were chosen based on the number of circulation. A separate study by Samani et. al. (2011) proved that these newspapers were preferred by the majority of Malaysians.

Numerous studies have investigated the coverage of science news in mass media (Ten Eyck and Williment, 2004; Nisbet and Lewenstein, 2002; Lewenstein, 1995; Berkowitz, 1992; Ramanathan, 1984), and have used slightly different methods of study. Berkowitz (1992) compared source of information with media coverage outcomes, tallying the proportion of news releases or other information subsidy efforts that are either covered or discarded by the media. Nisbet and Lewenstein (2002) studied media coverage in elite presses spanning thirty years, which covered *The New York Times* and *Newsweek* and the authors investigated only final press coverage. Ten Eyck and Williment (2004) monitored *The New York Times* and *The Washington Post* for the period of 1977-2001 to study media framing of biotechnology news. The closest to the current study is the work conducted by Ramanathan (1984) where the author covered six mainstream newspapers for the period of two weeks. However, two weeks is a short period of time and may not be as representative of the trend of media coverage, over three months.

The period of study for the newspapers was from 1st Jan 2009 – 31st March 2009. All the science news that appeared during the study period was coded using multiple coders, and "Science news" was defined as articles that make reference to scientific activities and knowledge (Bauer et. al., 2006). These science articles have to be educational in nature which enhances public understanding of science, and articles that simply mention science events were are not included, for example, launching of events by ministers. Textual analysis was carried out on all science news articles in this period and the following coding frames were used by the coders:

1. The different fields of science covered: agriculture, medical & health, space, biodiversity, environment, nutrition, and biotechnology. News that did not fall into any of these categories was coded as 'others'. This is similar to previous studies that categorised science appearance in television news into health, environment and science and technology (Leon, 2008; Bauer et. al., 1995).
2. The source of the news: foreign wire service, journalist, and external contributors.
3. Persons interviewed or quoted: foreign scientists, local scientists, medical personnel, NGO, industry and farmers.

Coding the articles according to these categories was done based on the textual analysis of the articles, and was conducted by five coders with degrees in life science. To generate inter-coder reliability, Holsti's method was used, which is one of the simplest method of assessing agreement (Holsti, 1969 and Hayes, 2005). This method counts up the number of judgments that are the same and divides this sum by the total number of judgments made. F_a is defined as the number of units (in this case, news articles) coded as the same by all coders, n_1 is the number of units judged by coder 1, n_2, n_3, n_4 and n_5 are the number of units judged by coder 2, 3, 4 and 5 respectively.

Holsti's Method is

$$\text{Holsti's agreement} = \frac{5\,F_a}{n_1+n_2+n_3+n_4+n_5}$$

Coders worked independently but used the coding sheet with the same format and the results were compared using the above method yielding a reliability coefficient between 0.00 (totally unreliable) to 1.00 (totally reliable).

To study the above parameters, data on textual analysis of the newspapers was supplemented with in-depth interview with journalists, editors and producers. Data from in-depth interview provided explanations for the trend in media coverage of biotechnology news, reasons for decisions made in the choice of biotechnology news, persons interviewed and sources of the news, the frequency of biotechnology news or articles, and the fields favoured by media. This offers a clear picture of the mechanism at work behind the results of the media monitoring (Hijmans et. al., 2003).

3.2 OBJECTIVE 2: TO IDENTIFY THE COMPONENTS OR ELEMENTS OF PUBLIC ATTITUDE AND INTEREST TOWARDS BIOTECHNOLOGY

A medium-scale close-ended survey involving 1524 number of people was conducted between June 2010 and July 2011. A close-ended survey was used for the following reasons, which concurs with study carried out by Brossard and Shanahan (2006):

- Open-ended questions might be misinterpreted by the respondents, which would lead to responses unrelated to the study's intent.
- Open-ended responses would generate lengthy responses that would be hard to interpret.

- Furthermore, close-ended questions are easier to analyse when the number of respondents is large.

The population studied consisted of the defined target audiences of secondary school students, undergraduates, teachers, and the general public. These groups were chosen as they represent the key different segments of the publics who seek information on biotechnology. These groups are also the key target groups that need to be engaged in biotechnology communication. Thus, the input from these groups is crucial to develop a biotechnology communication framework and strategies. In order to represent the actual population, there are variables within each group in terms of region, gender and race.

The variables in each of the above groups are as below:

1. Secondary schools students: (N=519) (Malays=238, Chinese=146, Indians=135; Males=209, Females: 310). Schools included were from different States: Selangor, Melaka, Pahang, Penang, Perak, Kelantan, Terengganu and Johor, which comprise both urban and rural states.
2. Undergraduates: (N=398) (University of Malaya=100, Universiti Kebangsaan Malaysia=100, Monash University=98, AIMST=100; Male=160, Female=238). Two public (Universiti Kebangsaan Malaysia and University of Malaya) and two private universities (Monash University and AIMST) were chosen.
3. Teachers: (N=257) Teachers in this survey were from different States: Selangor, Perak, Pahang, Terengganu, Kelantan, Johor, Melaka, Penang, Negeri Sembilan, and Kedah, and from both rural and urban schools. This was done to make their representation more reflective of the entire teachers' population nationwide.

4. General public: Attempts were made to include attentive public, i.e. the part of the general community already interested and reasonably well-informed about science and scientific activities; interested public who are comprised of people who are interested in but not necessarily well-informed about science and technology (Burns, et. al., 2003); and lay persons with little or no interest in science. To achieve this heterogeneity, surveys were conducted at biotechnology carnivals, science centres, and at public places such as train stations and malls. (N=350) (Male=184, Female=166)

The following information was gathered from the medium-scale survey:

1. Level of understanding of biotechnology
2. Areas of interest
3. Source of information and its credibility
4. Satisfaction on coverage of biotechnology news in newspaper, television and radio
5. The motivation for public understanding of biotechnology

Understanding public attitudes, levels of knowledge, interest, and sources of information is important to propose a framework to ensure an effective biotechnology communication strategy is in place in Malaysia. This information is also important to gauge the effectiveness of the current communication strategies employed by biotechnology communicators.

The survey questionnaire is in Appendix II. The results from the above were analysed using SPSS where descriptive analysis and ANOVA was carried out.

3.3 OBJECTIVE 3: TO IDENTIFY SUITABLE BIOTECHNOLOGY COMMUNICATION FOR MALAYSIA BASED ON THE PRACTICES IN SINGAPORE, USA, UK, PHILIPPINES, AND AUSTRALIA

The USA, UK, Australia, Singapore and the Philippines were chosen as models due to their status as global biotechnology players, or in the case of the Philippines due to its successful commercialisation of GM crop after years of engaging with the public to create public awareness of biotechnology. The UK and Australia are also known to have good public understanding of science strategies (Bodmer, 1985; Wellcome Trust, 2000; and Inspiring Australia, 2010). In-depth interviews were conducted with active biotechnology communicators from these countries. Information was also gathered from literature reviews and reports to help benchmark Malaysia's biotechnology communication efforts currently practiced and also provide an insight into what could be adopted and adapted for Malaysia.

3.4 OBJECTIVE 4: TO PROPOSE A FRAMEWORK FOR NATIONAL BIOTECHNOLOGY COMMUNICATION STRATEGY FOR MALAYSIA

A biotechnology communication strategy needs to be devised that will spur the various biotechnology communicators to take responsibility to work in a coherent manner and build a network that will maximise resources and impact, and minimise duplications. Public perception of science is one of the main background elements of science communication (Gouthier, 2005), thus, a survey on public attitudes and interests becomes fundamental in developing both the biotechnology communication framework and strategy. To gather sufficient information to develop the biotechnology communication framework and strategy, in-depth interviews were conducted with biotechnology communicators in the United States of America, United Kingdom, Australia, Singapore, and the Philippines. Australia and the United Kingdom were chosen as they have national policies and strategies for science communication.

Australia also has a number of well-trained and active science communicators and science communication is offered as a module in almost all its universities' science programmes. The United States of America was chosen as it is the leader in biotechnology developments. The Philippines is the only country in Southeast Asia that has commercialised genetically modified (GM) crops and Filipina scientists have vast experience in reaching out to various stakeholders such as politicians, policy makers, churches, regulators, media and the member of the public, before GM crops were approved and received public acceptance. Singapore is another leader in biotechnology in this region and its strategies for engaging the public with biotechnology provide useful comparison for Malaysia.

The in-depth interviews were conducted via email and follow up questions were posed based on the responses of the respondents. The list of questions is listed in Appendix III. Respondents were chosen based on their expertise in this area and their involvement in biotechnology communication and engagement with the public. Another source of data to achieve the two objectives stated above was through a literature review. There are a good number of literatures on science communication strategies employed in other countries such as UK (Wolfendale, 1995), Latin America (Massarani, 2004), Spain (Martin-Sempere et. al., 2008), Germany (Schnabel, 2003; and Jasanoff, 2005), and Denmark (The University Act, 2003). These offer excellent strategies that could be adapted for Malaysia.

To complement the results from all the above studies, a case study on the impact of MyBio Carnival 2010 and 2011 was carried out. Surveys were conducted among visitors to the carnival as mentioned under section 3.2. MyBio Carnival is a non-traditional method of biotechnology communication which involved fashion show that

was based on biotechnology motifs and a number of school competitions (quiz, poster drawing, essay writing, spelling and debates), exhibitions, and hands-on experiments. The details of the carnival are discussed in Chapter 6.

All the methods employed provided the baseline information on current biotechnology communication; public attitude, level of interest, desired source of information, and needs, that will be used to develop a framework for national biotechnology communication strategy.

Signatures were obtained from all the respondents where face-to-face interviews were conducted and this is appended in Appendix IV. As for interviews conducted via email, the first page of the email is appended in Appendix V as proof of the interviews.