

ANALYSIS OF TECHNOLOGICAL INNOVATIONS AND COMPETITIONS AMONG SMALL- AND MEDIUM-SIZED FOOD AND BEVERAGE ENTERPRISES IN SOUTHWEST OF NIGERIA

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Abstract

Food and beverage industrial sector is one of the largest employers of labour in Nigeria. Studies have established the existence of some innovations in the industry. This paper focuses on the link between technological innovations and competitions of food and beverage companies. Multistage sampling technique was employed to elicit information from one hundred and fifty firms in Lagos, Ogun and Oyo States, Southwestern Nigeria with a response rate of 64%. Both descriptive and appropriate inferential statistical analyses were used for the data. Using a standard framework, results revealed the existence of five types of innovations (product, process, market, strategic and behavioural) in the firms. The companies reached a moderate level of innovation (3.20) on a 5-point Likert scale. Process innovation was found to be highest (3.45), followed by product innovation (3.21), and the lowest for market innovation (3.02). The analysis of the data further revealed a high (3.95) level of competitions among the enterprises. Product quality (4.21) and firm's flexibility (3.82) respectively contributed the highest and lowest levels of competitions of the industry. A Pearson correlation coefficient value of 0.55 indicated a positive correlation of medium intensity, statistically significant at the 0.01 ($\alpha = 0.44$, $\rho \neq 0$) confidence level ($0 \leq r \leq 1$). This shows that the higher the overall innovations, the higher the level of competitions of the companies. The paper concludes that the technological innovations in the food and beverage firms generated high competitions among the companies. Strategies should therefore be geared towards continuous expansion of innovations in the industry.

Keywords: Technological innovations, Competitions, SMEs, Food and Beverage Companies

1. Introduction

Among small and medium scale enterprises (SMEs), the concept of technological innovations in attaining competitive advantage has recently emerged as one of the most important subjects in the context of the common marketplace (Adeoti and Adeoti, 2010; Adeoti, Odekunle and Adeyinka, 2010; Dada, Siyanbola, Ilori and Olamide, 2011; Siyanbola, 2012a; Dada and Oyebisi, 2016). Technological innovation is the first commercial introduction of a new technology, which may take the form of a product, process or service. It is the successful exploitation of new ideas and a continuous process, involving not only research and development (R&D) and new technology, but also all business functions (DTI, 1996; Malerba and Nelson, 2011; Akinwale, Dada, Oluwadare, Jesuleye, and Siyanbola, 2012; Dada, 2014). Technological innovation has become the most important driver of competitive success in many industries. Firm's competitiveness is the ability to provide products and services more effectively and efficiently than relevant competitors. At the firm level, technological innovations which contribute to technology development,

market orientation, cost reduction and quality improvement enables firms to compete effectively in national and international markets. Indeed, technological innovation has increased in relevance to become a topical issue in policy and economic debates (Adewoye and Momoh, 2007; Adeoti *et al.*, 2010). In recent years, technological innovation in SMEs has been increasingly recognised as the engine for economic growth (Vertinsky, 2003; Yeh and Chang, 2003). The development of new or improved products, processes or business systems through technological innovation can help SMEs better satisfy consumer needs, stay ahead of the competition, explore new markets and grow. As market competition increases, innovation is viewed as vital to firm survival (Hult, Thomas, Robert, Hurley and Gary, 2004). This paper therefore, presents the link between technological innovations and firms' competitions in Nigeria food and beverage industrial sector in Southwest of Nigeria. The choice of this region was informed by the facts that about 70% of the firms are located therein which makes it convenient to have fair representative of the firms in Nigeria (Oyedoyin, 2006; Dada, *et al.*, 2011). Section two of this paper presented the statement of the problem which dovetails into section three where relevant literatures were reviewed. In section four, research methodology for the study was highlighted. The paper presented the results and discussion in section five while section six concluded and made some policy recommendations for enhanced performance of the industry.

2. Problem Analysis

The Nigerian economy remains largely dependent on natural resources, primary processing as well as imported technologies in spite of the research and development (R&D) activities in a broad range of fields (Siyanbola, 2012b). Consequently, government and industries had recognised the importance of technological innovation and its capability in economic progress (Adewoye and Momoh, 2007; Dada, *et al.*, 2011; Siyanbola, 2012a). Innovation capability involves broad scientific and technological skills, linkages and structures which focus on using these skills to produce knowledge and putting that knowledge to social and economic use (Hall, Mytelka and Oyelaran-Oyeyinka, 2006; World Bank, 2006; CTA, 2009). Such innovations transform R&D outputs into useful products or processes which are diffused through to the end-users (Siyanbola, 2012b; Siyanbola, 2014). In Nigeria, SMEs suffer technological innovations related disadvantages as a result of a number of factors. The major obstacle to technological innovations in the Nigerian industry is inadequate fund (Dada, 2014). Oyelaran-Oyeyinka (2006); Dada, Ali, Afolabi and Siyanbola (2010) and NACETEM (2010) also reported that production environment in Nigeria, especially for SMEs was not conducive mainly because of inadequate fund for production activities. Oyefuga, Siyanbola, Afolabi, Dada and Egbetokun (2008) and Adegbite (2010) also claimed that lack of access to finance by SMEs could be due to unwillingness of formal lending institutions to extend credits to the operators who mainly lack collateral security needed for such credit. Other confirmed impediments to the technological innovation of the Nigerian industry included poor infrastructure (road networks, electricity, water supply) as well as poor business technical support services and limited internal ability to develop and manage technology (Oyelaran-Oyeyinka, 2002; Dada, 2014). There is thus, limited adoption and application of technology for product and process innovation by the SMEs. It is evident that there are only few new generation of SMEs with relatively high technology intensity called New Technology Based Firms (NTBFs) in the food and beverage industry in Nigeria. This is evident in the low exploitation of local raw materials in production as a result of high importation of raw materials and finished goods in this sector (Dada, *et al.*, 2011). Previous studies have however, established the existence of incremental innovations in the food and

beverage industry in Nigeria (Ilori, Adeniyi, Oyewale, Sanni and Irefin, 2002; Dada *et al.*, 2011). However, the effects of these innovations on business competitions and their performances in the industry have not been ascertained. This study therefore investigated the technological innovations in the food and beverage industry in Nigeria with the aim of developing technological strategies to improve their national and international competitions.

3. Review of Literature

3.1 Technological Innovations

Science, technology and innovation (STI) are crucial to economic and social development (Chataway, Chaturvedi, Hanlin, Mugwagwa, Smith and Wield, 2009; Siyanbola *et al.*, 2012a; Camisón and Villar-López, 2014). Technological innovation has increased in relevance to become a topical issue in policy and economic debates (Ilori, 2006; Adewoye and Momoh, 2007; Siyanbola, 2012a). The benefits derivable from S&T are not actually realised in an economy until innovation and diffusion occur. It is innovation that transforms research and development (R&D) results into useful products or processes which are then diffused through to the end-user (Siyanbola, 2007; 2014; 2016). Innovation can be better understood as a process in which an organization/nation creates and defines problems and then actively develops new knowledge to solve them. Innovation process represents the long wave of value creation and it is the main driver of future economic results. Therefore, if a firm will compete successfully in the long run, the firm must innovate and this entails building new competencies, new capabilities and new knowledge (Vertinsky, 2003). It is obvious therefore that firm cannot survive without being able to continuously renew and innovate (Dada, 2007; 2014). Product innovation and process innovation have been used to characterise the occurrence of new or improved goods and services and the improvements in the ways they are produced. Organisational innovativeness characterises an organization by being supportive and permeable to innovation in terms of developing new products or processes, opening new markets, or simply developing a new strategic direction (Wang and Ahmed, 2004). Organisational innovativeness can be motivated by pre-emptive action to influence the environment or by a reaction to an environmental impetus. The predominant motivation of organisational innovativeness in the SME context is suggested to be the reaction to environmental impetus. This implies the necessity for leveraging the existing resource base particularly for smaller firms.

3.2 The Process of Technological Innovations and Competition among SMEs

SMEs have been fully recognised by governments and development experts as the main engine of economic growth and a major factor in promoting private sector development and partnership (Ogbo and Nwachukwu, 2012; Jones, 2016). They are seen to be characterised by dynamism, sharp innovations, efficiency; and their small size allows for faster decision-making process. SMEs constitute the real fabric of a nation's economy. For instance, in the United States, small businesses create two-thirds of the new jobs, produce 39.0% of the Gross National Product (GNP), and generate more than half of the technological innovations. In Europe, 99.8% of the firms are SMEs, responsible for two-thirds of the turnover and business employment (Carayannis and Gonzalez, 2003). In Southern Europe, the importance of SMEs in the total employment is even higher. For instance, SMEs generate 70% of the employment in Spain (Carayannis and Gonzalez, 2003). However, to survive in the intensive global competition, SMEs must be innovative in technological changes. SMEs that are internationally competitive are better able to survive as well as grow in their domestic

markets. Technological innovations may vary not only between different industries but also between enterprises within the same industry due to causal factors, objectives, sources, nature and dimensions and their outcomes. The important characteristic of the technological innovations of small firms is that they are carried out informally based on in-house technological capability (University of Cambridge, 1996; Freeman and Soete, 1997; Siyanbola, 2012b). Innovations enable small firms to enhance their competitiveness for survival and/or growth. Previous research has shown innovation to be a driver of firm growth. It is widely recognised that market performance of an enterprise (a competitive phenomenon) is affected by a set of interrelated technological factors (Kim, 1997; Malerba and Nelson, 2011). In turn, poor product quality could be related to a lack of precision and inadequate equipment (product or process technology) or a lack of skilled personnel (management of human resources).

3.3 Characteristics of Food and Beverage Industry in Nigeria

The food and beverage sector holds the key to sustainable economic development of any country. The sector has the potential to alleviate poverty, hunger, unemployment and disease (RMRDC, 2003). However, inconsistent policy formulation and implementation affecting the sourcing and processing of raw materials remained the major factors against sustained growth of the food and beverage sector in Nigeria. The sector however recorded increase in capacity utilisation between 2001 and 2002, capacity utilisation in the sector rose from 42.9% to 63.1% (World Bank, 2002). In the same vein, employment in the sector in the same period rose from 274,286 to 372,209. The improved performance in the sector was largely due to the contribution of the multi-national companies and some large national enterprises in the sector. In addition, some of the fiscal policy measures taken by the government, especially tariff concessions on key raw materials, plants and machinery, have had a positive impact on the industries (RMRDC, 2003). The research and development activities that would have contributed to the innovativeness of the sector have been low. According to Ilori, Oke and Sanni (2000), the food companies in Nigeria invested between zero and 2.5% of their annual turnover on R&D between 1991 and 1996. However, an increase in the mean in-house R&D firms' turnover investments up to 5% was recorded in the sector by Dada *et al.* (2011).

Some innovations were generated from the R&D activities which were found to be incremental in nature. The profitable operation and competitiveness of these SMEs are however, required for their profitability and sustainability. This however, cannot occur in the context of increasing globalisation unless small and medium-scale food and beverage enterprises are competitive enough in product quality and price for their products to be attractive in both local and international markets. The role of technological innovation in this context has been recognised over the years and well documented in literature. Considering the strategic position of food and beverage industry in Nigeria, a great deal of major technological innovation activities now and in the future is expected from the sector to reduce income leakages, pursuing technological innovations can be an important strategy of acquiring competitiveness for the survival as well as the growth of SMEs targeting both domestic and international markets. The contributions of food and beverage companies to economic growth and development in Nigeria cannot be overemphasised. The contributions have been made through excise duties, import duties, company tax, employment opportunities and other developmental activities. As quoted by Oyedoyin (2006), the food and beverage industry contributes about 13% of gross manufacturing output, and accounts for almost 20% of the total number of manufacturing firms in Nigeria.

4. Research Methods

4.1 Conceptual Framework

The descriptive model for this study was adopted from the framework and 20-item measurement instrument (questionnaire) developed by Wang and Ahmed (2004), measuring the organisational innovations (product, process, market, behavioural and strategic) through the five dimensions. The research instrument was adapted to the Nigeria small and medium – sized food and beverage enterprises and socio-economic environment. Also, the firms' level of competition was evaluated through the five factors contributing to competitiveness. These are speed, dependability, flexibility, price and quality.

4.2 Research Design

Likert close-ended answer scales were used ranging from "1 limited extent "to" 5 very large extents". The same Likert close-ended answer scale was used ranging from 1 to 5. The research is a survey employing structured questionnaire and personal interview techniques designed for the survey. This study therefore delved into the processes of technological innovations and competitions by suggesting how managers in small and medium –scale food and beverage firms can improve on their technological innovation process with a view to favourably compete in the food and beverage industrial sector in Nigeria.

4.3 Study Area

The study was conducted among the randomly selected SMEs food and beverage firms in Southwestern region of Nigeria. The choice of this region was informed by the large number of these firms within the region. However, out of the six States that make up this region, only three were purposively selected for the survey, these are Lagos, Ogun and Oyo States (Figure 1). The three States contain more than 70% of food and beverage firms in Nigeria (Oyedoyin, 2006; Dada, *et al.*, 2011).

4.4 Sampling Techniques

From the Manufacturers' Association of Nigeria (MAN), food, beverage and tobacco industry is sub-divided into 15 sub-sectors. The study population comprised of all SMEs food and beverage companies that are registered with the National Agency for Food and Drug Administration and Control (NAFDAC). NAFDAC established by Decree No. 15 of 1993 as amended is a Parastatal of the Federal Ministry of Health, with the mandate to regulate and control quality standards for Foods, Drugs, Cosmetics, Medical Devices, Chemicals, Detergents and packaged water imported, manufactured locally and distributed in Nigeria. The choice of NAFDAC registered firm is premised on the fact that no processed food should be manufactured, imported, exported, advertised, sold or distributed in Nigeria unless it has been registered in accordance with Provisions of Decree 19 of 1993 as amended by Food, Drugs and Related Products (Registration) Decree No. 20 of 1999 through NAFDAC. Again, it needs to be emphasized that it is unlawful to import into Nigeria any regulated product not duly registered by NAFDAC.

Agents of foreign manufacturers are to take the necessary steps to ensure that regulated products intended for the Nigeria market are registered before consignments of such products are imported into the country. However, within the food and beverage sector, five sub-

sectors were selected for this study; these include: dairy products, soft drinks and carbonated water, biscuits and bakery products, flavouring and beer.

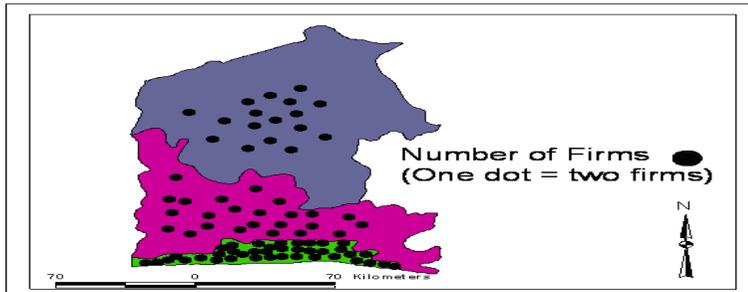


Figure 1: Geographical Distribution of Selected Firms and States
Source:Field Survey, 2014

A multi-stage sampling technique was employed. The first stage was strata sampling whereby five strata (sub-sectors) were identified, this was followed by the random sampling method whereby respondents were selected randomly from each stratum. Primary and secondary data were used for the study. Primary data was collected with the aid of two research instruments: questionnaire and an interview schedule where necessary. Two sets of questionnaire were designed for this study. The questionnaire elicited information on the objectives of the research. The questionnaire was validated in pre-test using two companies from the food and beverage industrial sector and one knowledge institution in Southwestern Nigeria. Secondary data were obtained from the publications of the Bureau of Statistics (BOS), Central Bank of Nigeria (CBN), Manufacturers Association of Nigeria (MAN), Research and Annual reports/publications of the firms and R&D institutions. Thirty copies of questionnaire were administered in each of the five selected sub-sectoral firms making a total of 150 copies of questionnaire administered in the selected firms. The study recorded a response rate of 62 percent.

4.5 Data Analytical Tools

Both qualitative and quantitative techniques were employed for data analysis. The statistical analysis of the collected data was carried out using specifically frequency counts, percentages and charts. These were used to describe the bio-data-section, technological innovativeness and competitiveness activities in the selected firms. Correlation matrix analysis was employed to make comparison in the means of technological innovativeness and competitiveness in the selected firms with the aid of statistical package for social science (SPSS) version 17.0.

5. Results and Discussions

5.1 Firms' Overall Technological Innovativeness Degree (OTID)

The result of the data analysis showed that all the companies surveyed reached a moderate (3.20) level in all investigated areas of organisational overall innovativeness, the highest values (3.45) being registered for process innovation followed by product innovation (3.21), and the lowest for market innovation (3.02) (Figure 2). The result of this study conform to

the findings of Ilori *et al.* (2000) where process innovation was found to be high in Nigerian food and beverage firms.

5.2 Firms' Engagement in R&D Activities

In order to determine the source (s) of the technological innovations in the selected firms, the R&D activities of the firms, investment in R&D; and the new products/processes development in the last 3 years were assessed (Table 1). The result revealed that 67% of the firms do engage in R&D activities. Most (58%) of the firms that are involved in R&D invested certain percentage of their profits in the activities. Interestingly, over 70% of these companies had developed either new product (s) or/and process (es) in the last 3 years.

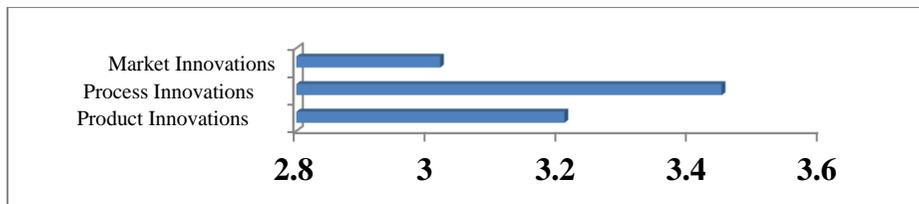


Figure 2: Extent of Major Innovations in the selected enterprises

Source: Field Survey, 2014

5.3 Firms' Competitive Dynamics

The level of companies competitiveness was evaluated based on the five factors (quality, speed, price, dependability and flexibility) contributing to firms' competition (Figure 3). The result of data analysis revealed a relatively high (3.95) level of competition among the companies.

Table 1: Respondents' Firms Engagement in R&D Activities

Activities R&D Engagement	Frequency	Percentage
Yes	63	67
No	31	33
Total	94	100
Investment in R&D Activities		
Certain percentage of profit	34	58
Certain percentage of turnover	18	31
Fixed Annual Amount	7	11
Total	59	100
New Products/Processes Developed by Firms in the Last 3 years		
Yes	42	71.2
No	17	28.8
Total	59	100

Source: Field Survey

The highest (4.21) variable that contributed to competition was quality showing that the firms' products fit the customers' needs and the companies are able to deliver them consistently. The companies also excel (3.94) to the dependability factors showing how well the companies keep their promises. The result of the data analysis for speed factors also showed that the organisations averagely (3.92) respond to their customers and their needs quickly and transforming that into a competitive advantage. The factor that weakens the

companies' competitive level is mainly flexibility (3.82) showing that the companies do not normally cope with accommodating short-time notice changes.

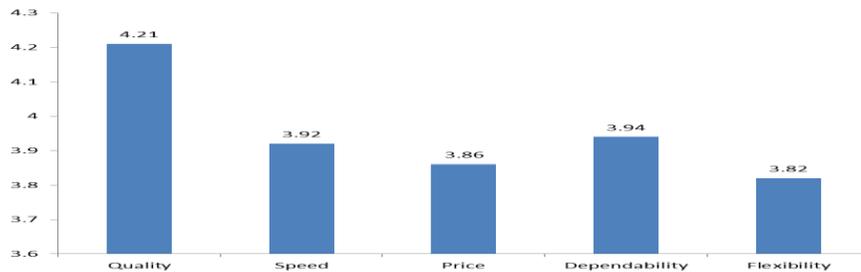


Figure 3: Firms' Competitive Factors
Source: Field Survey, 2014

The results showed that the price (3.86) of products is a relatively good competitive advantage for the companies when it is compared against other suppliers in the market, but it is not the main advantage the company possesses.

5.4 Technological Innovations and Firms' Competition

The effects of the existing technological innovations were further determined using a correlation analysis in two stages: correlation coefficient analysis and correlation matrix. Result showed the existence of various inter-determinations between some of the five main factors that determined companies overall innovativeness, and some of the five variables contributing to competitiveness of the Nigeria food and beverage SMEs as earlier discussed. A Pearson Correlation Coefficient value of 0.55 indicated a positive correlation of medium intensity, statistically significant at the 0.01 ($\alpha = 0.44$, $\rho \neq 0$) confidence level ($0 \leq r \leq 1$). This shows that the higher the overall innovativeness degree, the higher the level of competitiveness of the companies. The correlation coefficient analysis also showed that there exist various inter-determinations between some of the five main factors that determine companies overall innovativeness, and some of the five variables contributing to competitiveness of the Nigerian food and beverage SMEs (Table 2). For instance, a positive correlation of medium intensity, statistically significant at the 0.05 confidence level (2-tailed) between product innovation and quality ($r = 0.315$) and strategic innovation and quality ($r = 0.376$), indicating that the greater the degree of product innovation and strategic innovation in the companies, the higher the quality of the products is likely to be achieved.

As succinctly put forward by Fischmann (2009), innovative companies that grow at a two-digit rate are the most powerful engine to overcome crisis and lead their countries towards development. An entrepreneur can be successful doing more of the same in an efficient way.

An innovator, however, must do not only this, but also create new solutions. Globalisation requires that innovators compete with the world, which makes innovation more demanding. Moreover, rapid economic catch-up depends on countries' entrepreneurs being able to absorb and creatively adapt international technological knowledge through innovations (UNU, 2011).

Table 2: Correlation of Technological Innovations and Firms' Competitions

Main Areas of Innovation	Statistical Indicators	Quality	Speed	Price	Dependability	Flexibility
Product Innovation	Correlation coefficient	.315	.424	.483	.049	.384
	Sig. (2 tailed)	.005***	.023	.021	.705	.030
Process Innovation	Correlation co-efficient	.336	.573	.354	.226	.137
	Sig. (2 tailed)	.122	.004***	.234	.123	.028
Market Innovation	Correlation coefficient	.353	.642	.413	.239	.712
	Sig. (2 tailed)	.224	.132	.343	.164	.001**
Strategic Innovation	Correlation coefficient	.376	.427	.415	.539	.530
	Sig. (2 tailed)	.003***	.289	.034	.053	.453
Behavioural Innovation	Correlation coefficient	.245	.340	.394	.442	.687
	Sig. (2 tailed)	.151	.154	.322	.116	.282

*** Significant at 5% ($p \leq 0.05$) **Significant at 1% ($p \leq 0.01$)

Source: Statistical Analysis of Study, 2014

6. Conclusion and Policy Recommendations

Based on the analysis of the issues examined in this paper, some general conclusions are offered regarding technological innovations' role in increasing enterprise competition. The study's results confirm the theoretical and practical principle that innovation is a prime factor in achieving organisational performance and success, especially those related to the intricate and extensive process involved in becoming competitive on the global market. A strong innovation process is required for improving products and services, adapting organisational processes, instilling a supportive culture of innovation, creating new and innovative marketing approaches; and developing novel strategies in a continuously changing environment.

The influence of the overall innovation of the Nigeria small and medium scale food and beverage enterprises on the level of competition was confirmed by the statistical analysis of the data, revealing that the higher the overall innovativeness, the higher the level of competitiveness of the companies. The five main areas that determine an organisation's overall innovativeness and some of the five factors contributing to competitiveness of the Nigerian food and beverage SMEs were established in the paper. The study also confirmed the non-adequacy of R&D activities among the firms. To further improve the existing technological innovations in food and beverage industrial sector in Nigeria, the findings of this study raises some important policy issues for the food and beverage SMEs and the Nigerian governments. Companies should engage more in R&D activities. There is also the need for the Nigerian governments at all levels to promote the creation of venture capital (VC) and encourage the emergence of business angels to finance technological innovations. There is the need for the government to use policy to urgently upgrade the capabilities of the knowledge institutions to assist SMEs, especially in their ability to identify, develop and disseminate best practices to support food and beverage SMEs performances. The tertiary education institutions have critical roles to play in building technology-based entrepreneurs needed to commercialise R&D outputs. Moreover, promotion of collaboration among food and beverage industry, knowledge institutions and government with the aim of creating new industries should be encouraged. Clear policies and strategies to establish university–industry-government linkages in Nigeria are imperative for technical progress especially in the manufacturing technology. To build innovation-based enterprises, and become increasingly globally competitive, Nigeria food and beverage industry needs to harness the

technology entrepreneurial potential and opportunities within the national innovation system for economic growth and development. Historically, there has been poor interaction between knowledge institutions and industrial sector with respect to research and innovation. The exploitation of R&D outputs of the tertiary institutions and research institutes could be utilised by existing food and beverage industrial firms.

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