



Review

# Sustainability of SMEs in the Competition: A Systemic Review on Technological Challenges and SME Performance

RPIR Prasanna <sup>1,\*</sup>, JMSB Jayasundara <sup>2</sup>, Sisira Kumara Naradda Gamage <sup>1</sup> , EMS Ekanayake <sup>1</sup>,  
PSK Rajapakshe <sup>2</sup> and GAKNJ Abeyrathne <sup>1</sup>

<sup>1</sup> Department of Social Sciences, Rajarata University of Sri Lanka, Mihintale 50300, Sri Lanka;  
naraddagamage@ssh.rjt.ac.lk (S.K.N.G.); emsekanayake@ssh.rjt.ac.lk (E.E.);  
abeyrathne.rjt@ssh.rjt.ac.lk (G.A.)

<sup>2</sup> Department of Environmental Management, Rajarata University of Sri Lanka, Mihintale 50300, Sri Lanka;  
jmsb1610@ssh.rjt.ac.lk (J.J.); pskr75@ssh.rjt.ac.lk (P.R.)

\* Correspondence: prasannarjt@ssh.rjt.ac.lk

Received: 29 October 2019; Accepted: 6 December 2019; Published: 12 December 2019



**Abstract:** In the era of economic globalization, small and medium enterprises (SMEs) are recognized as an engine of sustainable economic development in both the developed and developing world. In literature, three competitive challenges—the sustainability challenge, the global challenge and the technological challenge—faced by industrial entities in the current globalized economy, are categorized. Of them, this paper undertakes a systemic review of the literature covering the theme of SMEs and technology in order to identify how technological progress in the SMEs, correlates with SMEs survival improvement in the global competition. The review identified six driving forces—social capital, link with Multi-National Corporations (MNCs) and Transnational Corporations (TNCs), innovation, sharing and networking, information technology, and adoption of productivity-enhancing technology—influencing technological upgrade in the SMEs. The review also identified two conditions for successful technological adaptation in the SME sector—availability of technologically skillful workforce in the economy, and identification of opportunities of new technologies in the competition. These conditions could be viewed in the macro environment and emphasize the need for the economies' readiness towards SMEs' success.

**Keywords:** competitive challenges; economic globalization; SMEs; SME performance; Sri Lanka; technological challenge

## 1. Introduction

Economic globalization is recognized as an opportunity for both developed and developing countries to enhance their economic prosperity through improving their participation in the global trade [1]. The degree of economic gains for the involvement in the global trade or survival of the industries in the globalization era is mainly dependent upon the competitiveness of each economy in the global market.

The World Trade Report published by the World Trade Organization [1] in 2016 on the theme 'Levelling the Trading Field for SMEs' emphasizes the need of participation of small and medium enterprises (SMEs) in international trade, by looking at trends of change of international setting for the SMEs and role of multilateral trading system can play to encourage more dynamic and inclusive SME participation in the global market [1]. The World Development Report in 2005 [2] emphasizes the dominant role of SMEs in economic development. The SMEs are also recognized as an engine of sustainable economic development in both developed and developing world [1,2] a tool

to address various development issues, particularly in developing countries—the issue of poverty, inequality, and unemployment, particularly among women and youth, limited industrial capacity, lack of innovativeness of the economy, sluggish nature of rural economic growth, and limited but primary product items in the export basket in the developing countries [3], an instrument to make more balanced, vibrant, and stable growth, particularly in developing economies [4], and critical sector for social inclusion [1]. According to the International Finance Cooperation [5], women own 8 to 10 million SMEs in developing countries, which indicates that SMEs are a critical sector to generate income for women and social inclusion in developing countries.

The SMEs employ about 50% of workers in developing countries [6] and two-thirds of formal non-agricultural private employment [1]. One belief is that SMEs, which is a critical driving force of economies of developing countries, is one of the vulnerable sectors to economic globalization due to the competitiveness of the challenges [1,3,7]. The influence of large-scale companies—Multi-National Corporations (MNCs) and Transnational Corporations (TNCs) in particular—to the SMEs is critical because of the growing role of the MNCs and TNCs in the economies of developing countries with a high potential to face competitive challenges in the global market, as those companies produce mainly the price commander commodities to the global market [3]. The elimination of barriers to global trade and promotion of the concept of free trade under the WTO trade regime has also made a series of challenges to the sustainability of SMEs in developing countries, mainly due to the less ability the SMEs to face the competitive challenges [1], though it theoretically addresses the issue of limited market. The studies cited that a considerable percentage of micro and small industries in developing countries have closed down within a very shorter period of commencement [1,7]. The literature also cited numerous social, economic, technological, cultural, environmental, and management-related causes that affect the failure of SMEs' businesses within a shorter period [3,7,8]. Such reasons are the impeding causes of competitiveness of the SMEs in the globalized economy.

According to [9], the competitive challenges faced by industrial entities in the current globalized economy are classified into three, i.e., the sustainability challenge, the global challenge, and the technological challenge. Of them, this paper critically reviews the existing lessons of SMEs learning from technological challenges since many studies emphasize the low level of utilization of improved technologies by the SMEs as a critical challenge confronting the SMEs in the developing countries in enhancing their opportunities and participation in the world trade [1,3,10–14]. The improved technology or technological progress/advances refers to discovering new techniques or methods, or extension/improvement of existing techniques or methods used in the production of a firm, sector, and economy [9]. As indicated in neoclassical and endogenous growth theories, technological progress is the necessary condition for the growth of a specific sector of the economy or the whole economy and generate social benefits of the economic activities [15].

Globally, many experiences prevail at the country level, which recommended the technological improvements or adaptations in the SME sector to move the economy to the next structural cycle of the economy. The Economic Committee, set up by the Singapore government just after the economic crisis in 1985, emphasized the need for accelerating the growth of local enterprises, recommending five strategic trusts for growth of SMEs. Among them, technology adoption, application, and innovation were the top priority areas recommended to face competitive challenges in the global economy and make a more balanced, vibrant, and resilient economy [4]. Surveying among 4000 SMEs in the United States, Germany, China, India, and Brazil, Microsoft commissioned Boston Consulting Group (BCG) [16] demonstrated the power of technology in making a big difference in the success of small businesses. Providing a technical report on Enhancing Competitiveness in Sri Lanka, IBRD [17] emphasizes the need for focusing on export-oriented SMEs, and reintroducing incentives for technology adoption was a priority among the recommendations.

Noe et al. [9] noted three aspects of a firm which affect better interaction between employee and technology—human resource and their capabilities, new technology, and its opportunities, and efficient work structure and policies. As Segarra and Callejon [18] emphasized, technology is the

critical factor influencing the survivability of the SMEs in the globalized era. Given these facts, technological challenges facing SMEs in both developed and developing countries have gained a growing area of interest in academics in the economic globalization era. Thus, the review of literature in technology challenges in the SME sector will help SMEs to recognize their growth challenges and remain competitive in the global market.

### 1.1. Defining the SMEs and Their Specific Features

In literature, the lower and upper levels of threshold of definitions of small and medium enterprises have been differently defined by the countries and international organizations based on the number of employees, annual turnover, capital assets, input usage, production capacity, level of technology adoption, management practices, and concerning the characteristics specific to the sector, region, and the country. By considering 132 economies' definitions on SMEs, the IFC [5] noted that the majority of selected countries define lower and upper levels of thresholds of SMEs as the enterprises with many employees ranging between 10 to 50 and 50 to 250, respectively. The World Bank defines the SMEs and large firms in their recent Enterprise Survey using the employment size of the firm—5–19, 20–99, and 100+ as small, medium, and large, respectively [19].

The SMEs can be separated between formal and informal, based on whether firms are registered or non-registered, at least in relevant government authority. As evident in literature, features of the SMEs in formal and informal sectors differ in terms of productivity, wages, and product quality. According to IFC [5], 72%, 20%, and 8% of SMEs operate in the trade and service sector, manufacturing sector, and agriculture and other sectors, respectively. Further, the SMEs are highly concentrated in the labor-intensive sectors, characterized by low entry barriers, relatively low fixed costs of production, and mainly produce price-taker goods. In developing countries, women entrepreneurship in the SMEs is sizeable—for instance, the IFC [5] reveals that women own 31% to 38% of SMEs. The literature on characteristics of a labor market in the SMEs denotes that job quality, stability, and security of employees in the SMEs are less compared to large firms and often report a wage gap between the SMEs and the major firms. The lower productivity is frequently reported in the literature due to less capability in obtaining scale merits in production operation and various other reasons [20].

### 1.2. Technology and Growth of SMEs—Neoclassical and Modern Economic Views

Technological progress is one of the theoretically accepted measures applied to eliminate the frontier barrier of an economy because it helps to increase the productivity and efficiency of factors of production of the economy—labor, capital, and other resources, and increase the production input usage in the production. The technological progress is the process of invention and innovation in the economy. The invention means the scientific discoveries required to upgrade the production system of the economy, while innovation implies the utilization of new scientific breakthroughs for the commercial purpose of the output. Freeman and Soete [21] recognized technical innovation as a critical parameter in economic growth. According to Schumpeter [22], innovation needs entrepreneurial skills to manage existing or new resources to match with new scientific discoveries in the production process and organize the output.

One way of presenting the effects of technological progress on the growth of economies is the shift of production possibility frontier (PPF). As Kumara [23] expresses, technological progress leads to shifting the entire frontier right with a given level of production inputs and without bothering about finding a new resource base. Developed countries such as the United Kingdom, the United States of America, Netherlands, Japan, Singapore, and South Korea reached up to the current level of economic progress through technological progress.

In neoclassical economic theories, technological change was recognized as a critical exogenous character of economic growth in the mid-twentieth century [24]. Solow [24] first defined the production function as:

$$Y = T(L, K) \quad (1)$$

where  $Y$  represents the output,  $T$  represents the technology,  $L$  is the labor, and  $K$  is the capital. By dividing both sides of Equation (2) by  $L$ , we can derive per capita gross domestic product  $y$ .  $k$  is the capital to labor ratio. The model assumes a diminishing marginal factor of production, and therefore, if there is no change in technology, the economy may not have long-run economic growth.

$$\frac{Y}{L} = \frac{T(L, K)}{L} = y = T(k) \quad (2)$$

The depreciation of capital ( $d$ ) and an increase in the workforce ( $n$ ) leads to a decrease in capital per worker ( $k$ ). In order to maintain the capital-labor ratio ( $k$ ) at the same level, the economy must attract new investment. When the investment ( $i$ ) is higher than a new investment per worker  $(n + d)k$ , capital to labor ratio increases and vice-versa. The rise in savings also affects to increase capital to labor ratio, and thereby, per worker output. However, this leads to move the economy from one steady-state point to another steady-state point, and in the long-run, stagnates the economic growth.

Alternatively, the Solow growth model demonstrates the importance of technological progress to achieve sustained economic growth and explains how technological progress translates into more output through increased factor productivity [25]. In terms of labor, this progress leads to improve the efficiency of labor or translate labor into productive labor. Entrepreneurship development is especially critical in this regard [26]. Thus, the economy can produce the same output by reducing the number of workers or can increase the output by using the same number of workers. As the Solow growth model considers technical progress as a simple time trend, the new growth models consider it as endogenous factors in determining growth. Romer [27] explains technological innovation as a source of growth in economies. New growth theories consider the strength of physical, human, public capital, and research and development (R&D) in the growth process.

### 1.3. SME Performance and Issues

The literature identifies different tools in defining the performance of SMEs. A majority of the studies consider the degree of innovation in the product, process, and management systems, and the survival and competitiveness of SMEs as critical indicators [28–30]. Duygulu et al. [31] noted three mission components in assessing the SMEs' performance: (1) survival, growth, and profit, (2) philosophy and value, and (3) public image. The outcomes of better performance of SMEs could be visualized in the economy through the upgrade of industrial revenue, creation of employment, an increase of export growth, and productivity enhancement [32]. The studies also reveal better organizational culture and management practices, and education and training as to driving forces of SME performance [3,29].

Literature highlights many issues facing SMEs in the competition, and the nature of the issues varies according to the type of SMEs. The low survival chance is the most highlighted issue related to the SMEs in the competition [33,34]. Various factors are associated with low survival chance of the SMEs, and among them, low adoption of innovative strategies in production and marketing is noted [8,32,35,36]. Particularly, gradual change in SME business models, along with changing consumer preferences and competitor behavior, is needed to improve the survival chance [33]. The rest of the issues, such as lack of capital, inadequate technical know-how, basic utilities, and suitable or improved technology, and low training and skill development, could be viewed as issues that retard the growth performance of the SMEs [3,14,37–39].

## 2. Coverage and Methodology

The central aim of this systematic review of literature is to explore the existing knowledge on technological challenges faced by the SMEs worldwide. The macro picture of the methodology adopted by the study is presented as follows: First, an extensive web search on SMEs-related journal publications

produced over one million web publications, and second, the review two key terms—Technology and Technological Challenge—were considered as inclusion criteria of the papers for this review.

Further, the study limited the selected papers at the second stage by considering the three criteria: (1) Journal publishing company, (2) impact factor of the journal, and (3) many Google citations. Emerald, Elsevier, Taylor Francis, and MDPI were leading publishing companies of the journals considered in selecting the papers. By considering these four criteria, the study chose 256 documents at the second stage, from which, 86 research articles were finally designated for this review. This selection was based on the relevance of the papers with the central theme of this review identified as per the research problem. Published working papers and reports by the World Bank, WTO, IMF, and other multilateral organizations were also considered for this review.

Steps adopted in building a literature bank on the central theme of the paper—technological challenges:

1. Extensive web search on SMEs—over 1 million web publications.
2. Exclusion and inclusion criteria—the Publishing company, journal impact factor, and number of citations.
3. Filtering the papers to a central theme—Research problem.

### 3. Analysis

#### 3.1. Driving Forces Influencing the Technological Progress in the SMEs to Face Competitive Challenges

##### 3.1.1. Innovation—Utilization of New Scientific Discoveries

As Romer [27] indicates, the technological innovation is among the key determinants of growth sources, thus, growth is primarily dependent on the allocation devoted to research and development (R&D). The SMEs significantly contribute to technological innovation in the economy, because the technological innovation is necessary for the SMEs to gain competitive advantage or survive in the globalized market as the term is mainly based on the perception of new markets (consumers). Various researchers [7,8,40–43] indicate, technologically innovative activities are among influential factors that affect the SMEs' to gain sustainable competitive advantage and improve market survivability due to rapid technological changes and shorter product and technology lifecycles in the globalized era. As explained theoretically, technological innovation leads to shift the production function upward and increase the economic output. It also leads to postponing the negative growth impact of declining marginal products of resources—labor and capital in particular- and improve the efficiency and productivity of factors of production. Innovation is categorized into four categories—product innovation, process innovation, market innovation, and organizational innovation. In this connection, the technology is defined as the medium to innovate via social networking, free access to information (internet), and machines and technology tools in business operation.

SMEs' ability to adopt innovation in business technology is limited mainly due to the lack of financial capital, human capital, and marketing knowledge or skills [44]. Thus, advances in technological innovations in the sector may result in boosting economic growth at a faster rate. As Choi and Lim (2017) [45] investigated, a positive relationship exists between SMEs' innovation capacity and technological innovation performance.

By analyzing the database of 605 innovative SMEs in Netherland, De Vrande et al. [46] operationalized two types of open technology innovations—technology exploitation and technology exploration. The technology exploitation indicates a gain of benefits from initiatives and knowledge of their (non-R&D) workers. It leads to spillover existing technological capacities of firms outside its boundaries. Innovation in the modern business world is mostly explained by technological acquisition [47]. In technological exploration, the SMEs could use their customers in innovation processes by using their views on product modifications [7,46]. It can also be recognized as the process of knowledge acquisition, which is among the causes to improve the quality and change the shape of

the product, which is primarily based on technological innovations. Thus, the process of technological exploration results to encourage product technology research in the SME sector [41].

The concept of Kaizen, derived from two Japanese words 'Kai' (change) and 'Zen' (better), also indicates both technology exploitation and technology exploration in the firms' innovation process. According to this philosophy, small improvements could be achieved by a firm through the participation of everyone in the organization [48]. It leads to exploring new required areas of technological improvements in an innovative way to minimize waste and optimize efficiencies in the production process. Introducing an improvement suggestion system to make effective communication between top management and workers at the bottom level can be recognized as a management approach, applied for technological exploitation and exploration. This fulfills the prerequisites for firms' innovation—creating new knowledge or combining existing knowledge in a new entrepreneurial way [7,41], and studying the cluster approach for innovation process in the SME confirmed the appropriateness of managing the SME-based cluster approach to the transfer of knowledge and technology to the SME sector, which eventually leads for innovation in technology.

According to Soon [4], Choy [49], and Soon and Huat [50] at the early stage of Singapore's development, the SMEs supplied items to the MNCs, being part of MNCs led value chain. Later, those SMEs exploited the technological know-how from the MNCs and developed their own SME culture through an innovative approach in technology. As a result, Singapore could strengthen its technological foundation in the industrial sector through SMEs-led technological innovations. The experience of the Sri Lankan garment industry also shows that SMEs in the garment sector was mostly the sub-contractors of the large-scale companies at the early stage of economic liberalization (the 1980s and early 1990s) or before phasing out the Multi-fibre Arrangement (MFA) [51]. With the rising competition along with the elimination of restriction in global trade in textiles and clothing, the industry attempted to equalize the technologies from the large firms and later develop their own brands for global market-making.

Lack of financial capital is the SMEs' main limitation in acquiring technical skills and introducing new and useful technologies to promote innovations. Doh and Kim [32], Lee et al. [52], and Baldacchino [53] emphasize the need to establish the Technology Development Assistant Fund (TDAF) in terms of Korea to promote innovations in the SME sector. By reviewing SME literature in the UK, Hoffman et al. [44] argue the Research and Development in the SMEs are concentrated mainly on a narrow set of technology-intensive and new technology-based sectors such as biotechnology.

### 3.1.2. Information Technology

Adoption of information technology (IT) is one of the areas recommended to the SMEs to face competitive challenges [11]. IT generates numerous benefits to the business growth of the SMEs. As studied by Quayle and Christiansen [54] and Terence and Soufani [55], the adoption of web-based technologies reduce operational cost, improve service to customers, increase response speed between producer and customer, producer and input supplier, improve market intelligence, and enhance the relationship with trading partners. These benefits of web-based technologies are the motives for SMEs to adopt those facilities. Conducting a study on SMEs in Bulgaria, Ahmedova [7] revealed the increasing trend of application information communication technology—web pages, electronic signatures, online ordering facility, and management information system—by the SMEs. Based on the US-based SME-related research findings, Webb and Schlemmer [56] emphasize that the adoption of web-based technologies has mutual benefits with business resources and dynamic capabilities. However, the study does not confirm the complementarity of IT assets with business resources and dynamic capabilities and notes the threat of over-investment by the SMEs in IT assets.

The IT adoption by the SMEs results in improving the innovation ability of the sector [57]. Based on 85 small manufacturers in the US, Li et al. [58] confirm the positive relationship between SMEs' product innovation strategies and business process digitalization, particularly in matured firms. Hall [59], as quoted by Bilal and Al Mqbali [39], the information system of the SMEs provides owners or managers of the firms the opportunity to get adequate and detailed information required for making

business decisions. Mainly the information related to accounts, stocks, cash flow, and sales of the business is vital to make business decisions.

Conducting a study in Indonesia, Nugroho et al. [11] reveals that the information system of the SMEs is still primarily limited to the usage of emails as a communication tool in marketing, management, and accounts. In gaining the benefits from IT adaptation in the SMEs, the capabilities of human resources and knowledge on opportunities of IT in the business field in an environment of competition are the essentials [39,60], while the availability of funds to invest in IT is also a prime necessity [11]. Eikebrokk and Olsen [60] emphasize that workforce competence in IT is a critical determinant of SMEs' success in the globalized market, particularly in the field of e-business.

### 3.1.3. Technology Transfer between SMEs, and MNCs and TNCs

The role of MNCs and TNCs has widely recognized as a means of technology transfer to the local firms, particularly to the SME sector, enabling them to upgrade the business to face global competitiveness [61]. The transfer of technology and business expertise mostly results in enhancing the competitiveness of the SMEs, as those technologies are market-tested and cost-effective [62].

A technological difference exists between the SMEs and large firms, and thereby a dissimilarity in competitiveness [63]. Thus, absorption of Foreign Direct Investment (FDI) provides the opportunity to the new technology-lacking countries to upgrade their technological status of domestic firms via technology transfer from large foreign firms, particularly in the MNCs and TNCs led value chain, to domestic firms. The growth of economies that receive foreign direct investment (FDI) will sustain if the FDI stimulates the local firms, particularly the SMEs, or theoretically crowding-in domestic investment via absorbing modern managerial and technological capabilities of the MNCs and the TNCs [61]. The heavy dependence on the FDI may lead to slow down the economic growth in the long-run owing to the nature of capital mobility—high-cost region to low-cost region. Specifically, the MNCs and the TNCs generate technological externalities to local firms [64]. This finally leads to improve the productivity or efficiency of the factors of production of local firms—labor and capital in particular. Alternatively, the MNCs and the TNCs increase the product competition in the market as their production system is mainly characterized by monopolistic practices and under strong economies of scale [61,65]. As a result, local firms must be more competitive and innovative to take part in the MNCs, and TNCs led the global value chain.

Countries provide different strategic evidence to become more competitive by upgrading the technological status of domestic firms. In this connection, first, exploitation of managerial and technological experiences from the MNCs and TNCs led value chain at the early stage of SMEs development is essential. The experience of Singapore could be the best case for learning about the technological externalities of the MNCs and the TNCs. The SMEs played a role in supplying and supporting the MNCs at the early stage of Singapore's economic development [4,49,50]. After the economic crisis in 1985, the role of SMEs in the economy was redefined in addition to supporting firms of the MNCs and TNCs. The first Singapore SME Master Plan, formulated after the economic recession in 1985, recognized the importance of establishing local entrepreneurial culture aiming to develop Singapore's world-class enterprises [4]. At that stage, Singapore had earned or exploited managerial and technological experiences being as partners or sub-contractors, and the service provider of MNCs and TNCs. Similarly, the local SMEs in Malaysia are now the suppliers of the MNCs led global value chain [66].

Second, the development of country-specific own brands by learning managerial and technical know-how from MNCs and TNCs led the value chain in mid- and long-terms. Sri Lankan apparel industry offers the best experience on how they faced competitive challenges after phasing out of the Multi-Fibre Arrangement (MFA) under four stages, starting from 1995 to 2005. One of the recommendations made by the Joint Apparel Association Forum (JAAF) in 2002 is developing the local brands in the industry by gradually learning managerial and technical know-how from MNCs led value chain [51]. This recommendation was mainly made to confront competitive challenges predicted

after entirely phasing out the MFA under the Agreement on Textiles and Clothing (ATC) of the WTO in 2005. As a result, Sri Lanka managed to maintain the industry growth status adequately in the free-market era of global textiles and clothing trade. Today, a few leading manufacturers handle a significant portion of industry exports [67].

Literature also provides evidence on conditions required to attract the MNCs and TNCs led investment by the countries. One of the requirements to attract the MNCs led investment is the availability of a technically skilled workforce. Thus, training workforce to make them to work with modern and innovative technologies is an essential part to attract MNCs led investment to the countries, and thereby transfer innovative and technological capabilities of them to the local SMEs, which expects to be a supplier of part of their product [68] or aim to develop own entrepreneurial culture in future.

The second requirement is the flexibility of product supply by the SMEs to large-scale firms taking part in the MNCs led value chain. The SMEs are more technologically flexible in supplying products to large-scale firms. In the 1980s and 1990s, most Indian SMEs got opportunities to participate in the MNCs led value chain, and innovation took place in the technology to fill the global market requirements [69]. In the garment industry in Sri Lanka, many SMEs integrated with the MNCs' value chain having the advantage of the technically skilled workforce and technological flexibility of the industry [51,70,71]. Third, strong supplier-buyer linkages or subcontracting processes are required to sustain the technology transfer process from MNCs and TNCs to SMEs and vice-versa. In this connection, both fractions should have incentives to transfer and/or exchange their technical know-how between them [63].

#### 3.1.4. Social Capital Approach

The social capital approach to SMEs in the competition is vital to address the technological challenges in different ways. The effects of the structural, relational, and cognitive dimension of social capital on SMEs performance is mostly documented in the literature [72–77].

One of the assets that SMEs have is the strength of social relationships necessary to upgrade the business performance in terms of new technology adaptation, marketing, and resource sharing [63,78]. The link between social capital and the technology challenges of SMEs is mainly established through the term innovation.

As social capital theories outlines, rather than the tangible capital (physical and financial), intangible forms capital, such as social capital, is vital for invention and innovation in SMEs [32]. There is a flexibility of sharing the technological knowledge and skills among the SMEs due to the social relationship [46,79–81].

De Vrande et al. [46] recognized that external networking is an essential determinant of the constant upgrade of innovation activities in the SME sector. As studied by Kuruppuge and Gregar [82] strength of a family business is the collaboration of business ideas, including the technology, by the family members involved in the business. As family members are the partners of the business, they meet and discuss the matters related to business challenges. Further, Gamba [83] noted that participation in business and technology associations by the SMEs increase their market value because it provides opportunities with the SMEs to learn lessons on business and technological challenges, and find new business techniques and new and adaptable technologies, which eventually lead to minimize the cost and increase production efficiency, improve the quality, and increase the production quantity. Moreover, the making relationship among the SMEs through clustering provide opportunities to the SMEs to make entry barriers if vital business information and techniques are available only for the SMEs in the cluster [84]. Meng et al. [85] noted that network relationship or close ties among the SMEs is significant to address the adverse effects of MNCs on the SMEs survival in the competition, particularly in the transitional economies. Technology adaptation through network relationship leads to generate benefits in the SMEs such as economies of scale, bargaining power, product differentiation, traditional and cultural identities, and input use efficiencies.



Thus, in discovering the new scientific technologies which required the SMEs to remain competitive in the market and in identifying the existing technologies which suit the SMEs to be competitive in the market, the social networking is one of the strengths that the SMEs have in a competitive market environment. These recognized technologies could be mainly produced or adopted at a relatively low cost compared to available technological equipment in the market and maybe better adaptable to human resource capabilities and the base of the input of the sector.

### 3.1.5. Business Collaboration through Networking

The SMEs in most parts of the world lack economies of scale in terms of technology, raw materials, markets, quality labor, and transport [86]. Notably, the SMEs are limited in resources and less capable of absorbing cost and risk associated with in-house technology development. One of the possible potential approaches adopted by the SMEs to address the issue of diseconomies of scale is to make business collaboration with similar firms. For this purpose, many-kinds of business organizations, forums, and societies have formed worldwide.

It also helps SMEs to address the issue of scarcity in technological competencies. Through business collaboration, firms could obtain scale merits in technology usage through networking but would be careful using alter or sharing technological recourses as its effects on their survival chances [33,87]. This is because choosing the wrong technologies or sharing technological resources with competitors will make a negative impact on the survival chances of the SMEs. Mainly, the network approach is mostly utilized in IT-based business fields. The literature cites that technological acquisition through a collaborative approach leads to product development and adaptation through innovation, and support firms to enter into new or diverse markets. It also influences on reducing the cost of production and improve the efficiency and productivity of factors of production of the business [88]. Notably, the SMEs lack in accessing more sophisticated technology required to upgrade the productivity of production factors, thus, collaboration provides the SMEs with the opportunity to acquire the information and knowledge on the importance of adopting sophisticated technologies in the business.

### 3.1.6. Technology to Improve Efficiency and Productivity

One of the measures that the economy adapts to move the production possibility frontier to upward is the improvement of overall efficiency and productivity of economic activities. In a globalized economy, firms' competitiveness and sustained growth are highly dependent upon the efficiency and productivity levels of their business activities [7,11], and those are among the indicators which reflect the sustainable profitability of the firms.

As theories explain, technological upgrade in the firm leads to an increase in the productivity of factors of production. Unnikrishnan et al. [89] state that the use of safe technology positively correlates with workers' productivity. Based on empirical investigation among SMEs in Ghana, Asare et al. [3] provide evidence on positive mindedness of SMEs in business expansion but emphasize the need for productivity improvement technologies. They find education, the scale of business operations, usage of banks to transact business, and training in business support services as the determinants of productivity and business growth. Kuruppuge and Gregar [82] noted the barriers to access to better technology as growth and productivity hindering factors of the SMEs other than the access to labor, markets, and finance.

During the economic crisis in Singapore in 1985, a critical point at the discussion was how to enhance the SMEs competitiveness and productivity [4], and the adaptation of modern technology was recognized as a significant solution to upgrade the productivity of the SME sector and address the competitive challenges that the firms have to face in the 21st century economy.

Many studies cited the low productivity level of SMEs and a pivotal challenge for remaining competitive in the global market [32,39,66,90]. Thus, linking with the value chain of large-scale companies, particularly the MNCs, provide an opportunity to learn the productivity-enhancing technologies in addition to other gains [4,50]. Further, technological progress in large-scale companies

could generate positive externalities to the local firms, particularly to SMEs [61,91]. It is also suggested that new technology and knowledge could spill over to local firms, enabling them to enhance their productivity. The entrance of MNCs or attraction of FDI results to transfer the business and technical know-how, and thereby gain the productivity benefits [61].

As Chau and Deng's [92] investigation on Vietnamese SMEs, M-commerce is recognized as a powerful technology in improving the efficiency and productivity of the SMEs. Herliana [41] and Unnikrishnan et al. [89] point out the importance of innovation-based product technology research in sustainably enhancing SMEs' productivity. The innovation-based literature further cites the importance of energy efficiency techniques, e-commerce, information and communication technology, and environmental management systems in business growth via productivity improvements [93]. China established more than 500 productivity promotion centers in the economy to ensure their firms remain competitive in the global market [65,81].

The studies also emphasize the validity of a social capital approach in SMEs growth in reducing the firms' cost of production and improving efficiency [88]. These studies suggest SMEs' participation in business and technology associations. As most of SMEs lack in accessing more sophisticated technology as required to upgrade productivity, it is essential to provide opportunities with the SMEs to acquire the information and knowledge on the importance of adopting such technologies in the business. There is much evidence on the link between better technology and productivity improvements in the SMEs [94].

### 3.2. Development Conditions for a Sustainable Technological Upgrade in the SME Sector

#### 3.2.1. Human Resources and Their Capabilities

One of the conditions that should exist in the economy for sustainable technology adaptation in SMEs is the country's human resource base and its capabilities [29], which has a strong correlation with the SMEs' competitiveness [7,95]. The strength of the human resource base of the economy helps SMEs to adopt quality management techniques as people are critical elements of the production and distributional operations, strategy development to cater to the rapidly updating markets and face the challenges of competitors [95]. In this connection, updating and improving knowledge and skills on new technologies and their advantages of the employees and employers is essential. Conducting a study in Canada, Eravia et al. [94] ranked human-resource-related issues as second of their ordered top ten challenges of SMEs' success.

Fewer abilities or fewer skills of both employees and employers in adopting new technologies or the use of existing technologies affect the SMEs' performance adversely, particularly in the competitive business environment [41]. Thus, specific training and education programs for the workers, designed on technology usage and adaptation, is essential for the success of SMEs [29,96]. By recognizing the need for this condition for better performance of the SMEs, Malaysia supports SMEs to identify their training needs and help them to conduct identified training programs to upgrade skills of employees, mainly technology-related skills, in line with operational and business requirements [97]. Malaysia has established the Human Resource Development Fund (HRDF) in this connection. China also uses the same strategy by accumulating human resources specific to the technological up-gradation and innovation in the industrial entities, and they have established technology development centers, creating opportunities for the scholars in the firms, particularly in the field of research and development, to upgrade the technological status of their firms further.

The innovation and technology upgrade in the SMEs have a bidirectional causation. Sung et al. [98] noted that improved human resource structure is among the factors that influence the build-up of the innovation competence of SMEs. Further to this, Lesakova [99] emphasizes the requirement of professionally trained, educated, and creative human resources for innovations. Here, innovation-based business incubation activities are one way of improving quality human resources [41]. Burlea-Schiopoiu and Mihai [100], studying the 200 SMEs in the South-West Region of Romania, emphasizes the need

for training and innovation in the SME sector to improve the impact of corporate social responsibility (CSR) on the sustainability of the SMEs in the competition. The study proved the association of training and innovation with financial indicators of the SMEs. Thus, the role of higher education systems and vocational training institute of the countries have a specific role in stimulating the innovative activities in the production sector to face competitive challenges.

Human resource readiness concerns the adaptation of information technology. Rapid technological change induces human resources to adopt information technology [11]. Zeeshan et al. [101] identified human resource as a critical determinant for the successful implementation of m-commerce, and Soomro et al. [102] reported human resource management as a factor that makes a significant impact on the quality of information security management. These facts indicate that the economy with better human resource structure could support sustainable technology upgrade in the SMEs, and thereby improve the competitiveness of the firms in the market.

### 3.2.2. New Technology and Its Opportunities

Technological resources are essential to SMEs as they allow businesses to expand quickly and efficiently, catering to the changing consumer preferences by working as an enabler of production and service functions [103]. People in the SMEs are with different views on new technology adaptation—some are positive in the dimensions of optimism and innovativeness, and some are negative in the dimensions of discomfort and insecurity [104].

The literature identified several limitations in adopting new technologies in SMEs. Among them, lack of initial capital required in acquiring new technology, lack of skilled labor, and suitable strategies to utilize the technology, lack of information, and uncertainty are noted [33,43,86]. According to Acheampong and Hinson [33], even if SMEs could find required capital for the adaptation of new technologies, they are unsure about the possible benefits. Thus, adoption becomes problematic. Therefore, institutional readiness is significant to be aware of the SMEs on the possible advantages of new technology adoption in the rapidly changing global economy. One method used by the SMEs in the adaptation of new technology is the imitation or copying other firms in the specific industry [10]. For SMEs with a limited range of technology, acquiring new technology from universities, research institutes, governments, and firms can compensate for a limited capacity that absorbs the new technology [45].

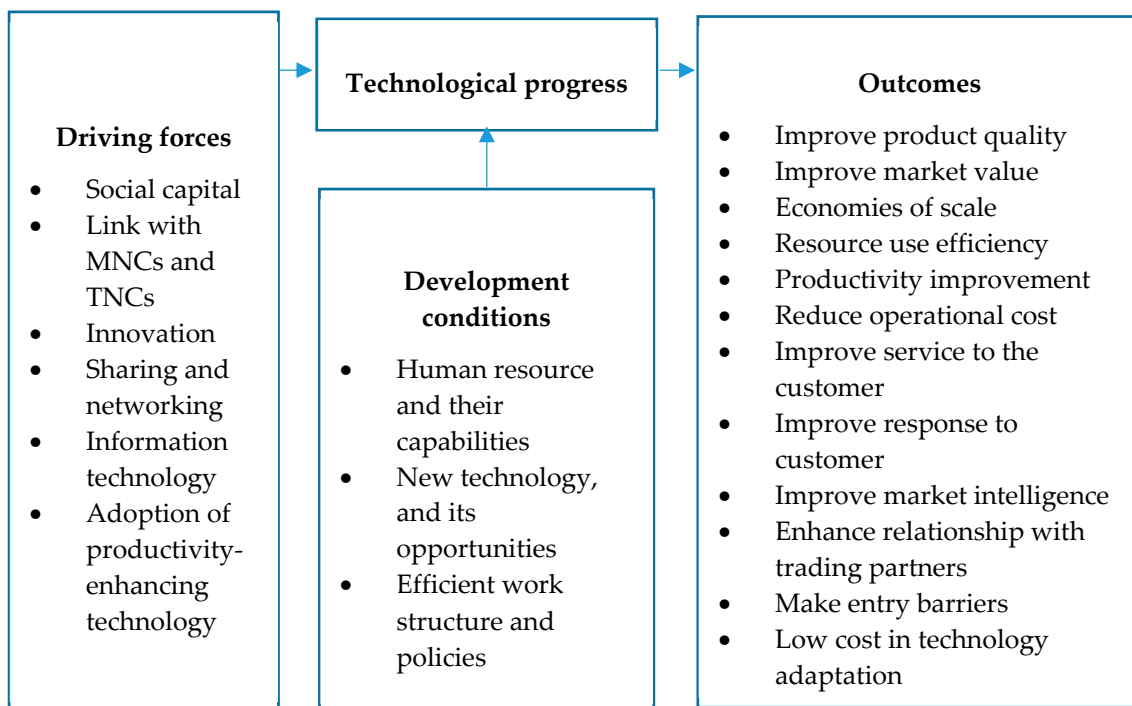
As revealed by Tuluce and Dogan [61], FDI promotes the transfer of new technology and know-how between countries and exchange technological ideas among the firms. Doh and Kim [32] stated that SMEs benefit from large firms in several ways, including technology transfer. Chew and Yeung [63] noted that the large firms exceed the SMEs in innovative capacity and the complementarity between SMEs, and they can enhance the process of technology transfer in supplier-buyer linkages. Thus, the development of linkages between firms is increasingly identified as a factor that promotes technology transfer [63]. Wong [105] classified technology transfers as follows:

1. Hardware (e.g., Plants, capital equipment and machinery, materials, and suppliers).
2. Codified knowledge (e.g., Computer programs, design, operations, systems, and procedures).
3. Unmodified knowledge (e.g., Human experience, organizational culture).

The conventional flow of transformation of knowledge is expected from giant TNCs to SMEs through supplier-buyer linkages or subcontracting process. However, in the “reverse transfer” process, expert knowledge is transferred from SMEs to TNCs [63]. TNCs may have no incentives to transfer their knowledge to SMEs if such transfer incurs substantial cost to the TNC or if many suppliers supply the goods without any technical assistant from TNC. That can be concluded as TNCs may not transfer their expertise knowledge or expertise without any reciprocal transformation from SMEs that helps to enhance their competitive advantages [63].

Rosenfeld [106] identified the role of intermediary in SMEs. The intermediary can help to network construction by supporting technology transfer to improve strategic technology management.

As revealed by Ankrah et al. [107], firms should be encouraged to establish close ties with academic institutions to get some benefits, including technology transfer. Zeng et al. [80] also recommended promoting technology transfer between firms and research institutions. The governments in both developed and developing countries have involved in the process, which inspires the technology transfer. The government of Singapore provides venture capital to boost technology transfer and induce foreign investment companies that have higher technology to start business operations in Singapore [50]. Figure 1 shows the framework for technological progress in the Small and Medium Enterprises (SMEs) in the competition.



**Figure 1.** Framework for technological progress in the small and medium enterprises (SMEs) in the competition.

#### 4. Concluding Remarks

This paper aims to provide a review of the literature covering the theme of SMEs and technology. The central theme focused on identifying how technological progress in SMEs correlates with SMEs’ survival improvement in the global competition. The need for this review arose due to the recently released report of the WTO—the leading body of governing world trade—on ‘Levelling the Trading Field for SMEs.’ The theoretical discussion of the study subject showed how the technology factor was accounted for in the growth process. Theoretically, the technological progress in the economy or specific sector must address the growth retarding issue, which economies or specific sectors have to face due to the declining marginal product of factors of production. Based on this theoretical argument, the study critically reviewed the existing literature related to central theme—the SMEs and technology—to identify the driving forces influencing the technological progress in the SMEs, to recognize the development conditions for sustainable technology upgrade in the SMEs, and to reveal potential outcomes of technological upgrade in the SMEs.

The review identified six driving forces—social capital, link with MNCs and TNCs, innovation, sharing and networking, information technology, and adoption of productivity-enhancing technology—influencing technological upgrade in SMEs. Technological innovations in the SMEs are recognized as new scientific discoveries in the techniques which influence the SMEs for constant upgrade of its production. As it is based on the perceptions of new markets or consumers, innovation

leads to improve survival chances of SMEs in the competition. The literature provides information on two approaches in technological innovation in SMEs—technology exploitation and technology exploration. The exploitation is the process of acquisition of new scientific ideas related to the business upgrade from their initiatives and non-RND workers. The exploration refers to the use of consumers or end-users' ideas for product modification. It could be considered as a way of the constant upgrade of products to cater to the changing consumer preferences along with a shorter product life cycle. The concept of 'Kaizen' could be an approach to apply in both technology exploitation and technology exploration in the firms' technology upgrade process. The clustering method, social capital approach, and linking with large firm value chains could be viewed as other options that the SMEs can apply for technological innovation in their firms. Information technology is also highlighted in the literature as a tool to upgrade the business growth, and thereby, the competitiveness of the SMEs. Specifically, the adaptation of web-based technologies could generate various benefits for SMEs. IT also has mutual benefits with business resources and dynamic capabilities. Particularly, IT adaptation in the SMEs leads to improve the innovation of the ability of the firm and improve business decision-making.

The ability of technology transfer from SMEs to MNCs and TNCs is another driving force that influences SMEs' survival in the competition. Mainly, technologies adopted by the large firms are market-tested and generate economies of scale. Furthermore, the large firms generate technological externalities to the local firms, enabling them for speed adjustment towards rapidly changing market conditions and undertake innovative approach in the production and marketing process. The best-cited experience in the literature is the Singapore experience—learning from the MNCs at the early stage and taking part in the value chain, and later creating their own entrepreneurial culture based on absorbed technical knowledge and experiences in the value chain. The availability of a technologically skillful workforce is a critical determinant in absorbing technical know-how and managerial techniques of the MNCs and TNCs. The literature provides further evidence on transferring specific techniques (traditional or indigenous) from long-survived local firms to the MNCs or TNCs, which required them for technological upgrade and thereby product innovation.

The literature in the SME field further highlighted the importance of social capital and business collaboration with networking to improve the survival chance of SMEs in the competition. Notably, one of the cost-effective ways of adopting new innovative technologies in the business process is to discuss business obstacles and challenges. This approach is viable for family firms, firms in the specific product-based business society, firms in the specific business value chain, and firms in the specific business forums. These social capital and business collaboration approach could generate technological innovativeness and economies of scale among the SMEs, and thereby improve competencies in their businesses. Specifically, the form of the specific product-based technological association is vital for the emergence of a globally recognized brand. As cited in theory, the efficiency and productivity of production factors are essential to upgrade production, and in this connection, technology adaptation is recognized as the best option the SMEs have, in the literature. The availability of a skilled workforce is economical and taking part with the value chain of large firm create opportunities to adopt efficiency and productivity-enhancing technologies in the SMEs.

The review identified three conditions for successful technological adaptation in the SME sector—availability of technologically skillful workforce in the economy, identification of opportunities of new technologies in the competition, and supporting working and policy culture. These conditions could be viewed in the macro environment and emphasize the need for the economies' readiness towards SMEs' success. Thus, the structural adjustment of the economies, particularly the developing economies, is essential to establish the above three conditions.

The added value of this study is the contribution of review to develop the framework for SMEs' technological progress in the competition. The main limitation of this study is the isolation of technology-related factors from the other two competitive challenges—sustainability challenges and global challenges. Also, knowledge of the theme of this paper can further be strengthened by undertaking a critical review of existing literature in the field. Thus, the survival chance of the SMEs

in the competition should further be viewed by critically reviewing the association of technological factors with the other two competitive challenges recognized in the global literature in the subject.

**Author Contributions:** Conceptualization, R.P.; methodology, J.J.; investigation, E.E.; resources, P.R.; writing—original draft preparation, R.P.; editing, S.K.N.G. and G.A.

**Funding:** This research was supported by the Accelerating Higher Education Expansion and Development (AHEAD) Operation of the Ministry of Higher Education funded by the World Bank.

**Conflicts of Interest:** The authors declare no conflict of interest. The funders had no role in the design of the study; in the collection, analyses, or interpretation of data; in the writing of the manuscript, or in the decision to publish the results.

## References

1. *World Trade Report 2016*; World Trade Organization: Geneva, Switzerland, 2016.
2. IBRD. *A Better Investment Climate for Everyone*; The World Bank: Washington, DC, USA, 2005.
3. Asare, R.; Akuffofoea, M.; Quaye, W.; Atta-Antwi, K. Characteristics of Micro, Small, and Medium Enterprises in Ghana: Gender and Implications for Economic Growth. *Afr. J. Sci. Technol. Innov. Dev.* **2015**, *7*, 26–35. [[CrossRef](#)]
4. Soon, T.T. A Pragmatic Approach to SME Development in Singapore. *J. Small Bus. Entrep.* **1994**, *11*, 38–45. [[CrossRef](#)]
5. IFC. *Financials and Projects*; International Finance Corporation: Washington, DC, USA, 2011.
6. Ayyagari, M.; Kunt, A.D.; Maksimovic, V. Who Creates Jobs in Developing Countries? *Small Bus. Econ.* **2014**, *43*, 75–99. [[CrossRef](#)]
7. Ahmedova, S. Factors for Increasing the Competitiveness of Small and Medium-Sized Enterprises (SMEs) in Bulgaria. *Procedia Soc. Behav. Sci.* **2015**, *195*, 1104–1112. [[CrossRef](#)]
8. Atalay, M.; Anafarta, N.; Sarvan, F. The Relationship between Innovation and Firm Performance: An Empirical Evidence from the Turkish Automotive Supplier Industry. *Procedia Soc. Behav. Sci.* **2013**, *75*, 226–235. [[CrossRef](#)]
9. Noe, R.; Hollenbeck, J.; Gerhart, B.; Wright, P. *Human Resource Management: Gaining a Competitive Advantage*, 9th ed.; McGraw-Hill: New York, NY, USA, 2017.
10. Ntwoku, H.; Negash, S.; Meso, P. ICT Adoption in Cameroon SME: Application of Bass Diffusion Model. *Inf. Technol. Dev.* **2017**, *23*, 296–317. [[CrossRef](#)]
11. Nugroho, M.A.; Susilo, A.Z.; Fajar, M.A.; Rahmawati, D. Exploratory Study of SMEs Technology Adoption Readiness Factors. *Procedia Comput. Sci.* **2017**, *124*, 329–336. [[CrossRef](#)]
12. IBRD. *Annual Report 2015*; The World Bank Group: Washington, DC, USA, 2015.
13. Sceulovs, D.; Sarkar, E.G. Impact of e-Environment on SMEs Business Development. *Procedia Soc. Behav. Sci.* **2014**, *156*, 409–413. [[CrossRef](#)]
14. Martin, F.M.; Ciofica, L.; Cristescu, M.P. The implication of Human Capital in the Development of SMEs Through ICT Adoption. *Procedia Econ. Financ.* **2013**, *6*, 748–753. [[CrossRef](#)]
15. Guan, J.C.; Yam, R.C.M.; Mok, C.K.; Ma, N. A Study of the Relationship between Competitiveness and Technological Innovation Capability Based on DEA Models. *Eur. J. Oper. Res.* **2006**, *170*, 971–986. [[CrossRef](#)]
16. BCG. *Introducing The BCG 2013 Global Challenges*; The Boston Consulting Group: Boston, MA, USA, 2013.
17. IBRD. *Annual Report 2016*; The World Bank Group: Washington, DC, USA, 2016.
18. Segarra, A.; Callejon, M. New Firms' Survival and Market Turbulence: New Evidence from Spain. *Rev. Ind. Organ.* **2002**, *20*, 1–14. [[CrossRef](#)]
19. World Bank. *Enterprise Surveys*; World Bank Group: Washinton, DC, USA, 2017.
20. Alvarez, R.; Crespi, G. Determinants of Technical Efficiency in Small Firms. *Small Bus. Econ.* **2003**, *20*, 233–244. [[CrossRef](#)]
21. Freeman, C.; Soete, L. *The Economics of Industrial Innovation*; A Casess Imprint: London, UK, 1997.
22. Schumpeter, J. *The Theory of Economic Development*; Harvard University Press: Cambridge, MA, USA, 1934.
23. Kumara, P. Expanding the Production Possibility Frontier of Sri Lanka: A Historical Economic Perspective on Technological Progress. *Sri Lanka J. Econ. Res.* **2019**, *6*, 83–90.
24. Solow, R.M. A Contribution to the Theory of Economic Growth. *Q. J. Econ.* **1956**, *70*, 65–94. [[CrossRef](#)]
25. Todaro, M.; Smith, S. *Economic Development*, 12th ed.; Pearson: Washinton, DC, USA, 2015.

26. Cravo, T.; Gourlay, A.; Becker, B. SMEs and regional economic growth in Brazil. *Small Bus. Econ.* **2012**, *38*, 217–230. [[CrossRef](#)]
27. Romer, P.M. Increasing Returns and Long-Run Growth. *J. Political Econ.* **1986**, *94*, 1002–1037. [[CrossRef](#)]
28. Florido, J.S.V.; Adame, M.G.; Tagle, M.A.O. Financial Strategies, the Professional Development of Employers and Performance of SME's (AGUASCALIENTES Case). *Procedia Soc. Behav. Sci.* **2015**, *174*, 768–775. [[CrossRef](#)]
29. Singh, R.K.; Garg, S.K.; Deshmukh, S.G. Strategy Development by SMEs for Competitiveness: A Review. *Benchmarking Int. J.* **2008**, *15*, 525–547. [[CrossRef](#)]
30. Hogeforster, M. Future Challenges for Innovations in SME in the Baltic Sea Region. *Procedia Soc. Behav. Sci.* **2014**, *110*, 241–250. [[CrossRef](#)]
31. Duygulu, E.; Ozeren, E.; Isildar, P.; Appolloni, A. The Sustainable Strategy for Small and Medium Sized Enterprises: The Relationship between Mission Statements and Performance. *J. Sustain.* **2016**, *8*, 698. [[CrossRef](#)]
32. Doh, S.; Kim, B. Government Support for SME Innovations in the Regional Industries: The Case of Government Financial Support Programme in South Korea. *Res. Policy* **2014**, *43*, 1557–1569. [[CrossRef](#)]
33. Acheampong, G.; Hinson, R.E. Benefitting from Alter Resources: Network Diffusion and SME Survival. *J. Small Bus. Entrep.* **2018**, *31*, 141–158. [[CrossRef](#)]
34. Perren, L.; Berry, B.; Partridge, M. The Evaluation of Management Information, Control and Decision-making Process in Small Growth-oriented Service Sector Businesses. *J. Small Bus. Entrep. Dev.* **1999**, *5*, 351–361. [[CrossRef](#)]
35. Edwards, T.; Delbridge, R.; Munday, M. Understanding Innovation in Small and Medium-Sized Enterprises: A Process Manifest. *Technovation* **2005**, *25*, 1119–1127. [[CrossRef](#)]
36. Ioanid, A.; Deselnicu, D.C.; Militaru, G. The Impact of Social Networks on SMEs' Innovation Potential. *Procedia Manuf.* **2018**, *22*, 936–941. [[CrossRef](#)]
37. McAdam, M.; McAdam, R.; Dunn, A.; McCall, C. Regional Horizontal Networks within the SME Agri-Food Sector: An Innovative and Social Network Perspective. *Reg. Stud.* **2016**, *50*, 1316–1329. [[CrossRef](#)]
38. González-Cruz, T.F.; Cruz-Ros, S. When Does Family Involvement Produce Superior Performance in SME Family Business? *J. Bus. Res.* **2015**, *69*, 1452–1457. [[CrossRef](#)]
39. Bilal, Z.O.; Al Mqbali, N.S. Challenges, and Constraints Faced by Small and Medium Enterprises (SMEs) in AL Batinah Governorate of Oman. *World J. Entrep. Manag. Sustain. Dev.* **2015**, *11*, 120–130. [[CrossRef](#)]
40. Bonito, A.; Pais, C. The Macroeconomic Determinants of the Adoption of IFRS for SMEs. *Span. Account. Rev.* **2018**, *21*, 116–127. [[CrossRef](#)]
41. Herliana, S. Regional Innovation Cluster for Small and Medium Enterprises (SME): A Triple Helix Concept. *Procedia Soc. Behav. Sci.* **2015**, *169*, 151–160. [[CrossRef](#)]
42. Bayarcelok, E.B.; Tasel, F.; Apak, S. Research on Determining Innovation Factors for SMEs. *Procedia Soc. Behav. Sci.* **2014**, *150*, 202–211. [[CrossRef](#)]
43. Rogers, E. *Diffusion of Innovations*; Simson and Schuster: New York, NY, USA, 2010.
44. Hoffman, K.; Parejo, M.; Bessant, J.; Perren, L. Small Firms, R&D, Technology, and Innovation in the UK: A Literature Review. *Technovation* **1998**, *18*, 39–55. [[CrossRef](#)]
45. Choi, Y.S.; Lim, U. Contextual Factors Affecting the Innovation Performance of Manufacturing SMEs in Korea: A Structural Equation Modeling Approach. *Sustainability* **2017**, *9*, 1193. [[CrossRef](#)]
46. De Vrande, V.V.; de Jong, J.P.; Vanhaverbeke, W.; de Rochemont, M. Open Innovation in SMEs: Trends, Motives, and Management Challenges. *Technovation* **2009**, *29*, 423–437. [[CrossRef](#)]
47. Lichtenthaler, U. Open Innovation in Practice: An Analysis of Strategic Approaches to Technology Transactions. *IEEE Trans. Eng. Manag.* **2008**, *55*, 148–157. [[CrossRef](#)]
48. Maarof, M.G.; Mahmud, F. A Review of Contributing Factors and Challenges in Implementing Kaizen in Small and Medium Enterprises. *Procedia Econ. Financ.* **2016**, *35*, 522–531. [[CrossRef](#)]
49. Choy, C.L. The Globalization of SMEs in Singapore: Strategic Options. *J. Small Bus. Entrep.* **1995**, *12*, 78–83. [[CrossRef](#)]
50. Soon, T.T.; Huat, T.C. Economic Policy and the Development of Small Industries—Comparison Among Five South East Asian Countries. *J. Small Bus. Entrep.* **1990**, *7*, 46–55. [[CrossRef](#)]
51. Prasanna, R. Sri Lankan Apparel Industry in Post Quota World: Trends and Issues. *Econ. Rev.* **2008**, 52–56.

52. Lee, S.; Park, G.; Yoon, B.; Park, J. Open Innovation in SMEs—An Intermediated Network Model. *Res. Policy* **2010**, *39*, 290–300. [[CrossRef](#)]
53. Baldacchino, G. Successful Small-Scale Manufacturing from Small Islands: Comparing Firms Benefiting from Locally-available Raw Material Input. *J. Small Bus. Entrep.* **2005**, *18*, 21–37. [[CrossRef](#)]
54. Quayle, M.; Christiansen, J.K. Business Issues in the 21st Century: An Empirical Study of E-Commerce Adoption in UK and Denmark SMEs. *Electron. Commer. Small Medium Sized Enterp.* **2004**, 53–68. [[CrossRef](#)]
55. Terence, T.; Soufani, K. Business Strategies for Small Firms in the New Economy. *J. Small Bus. Entrep. Dev.* **2003**, *10*, 306–320. [[CrossRef](#)]
56. Webb, B.; Schlemmer, F. *Information Technology and Competitive Advantage in Small Firms*; Taylor Francis: London, UK, 2008.
57. Lefebvre, E.; Lefebvre, L. Competitive Position and Innovative Efforts in SMEs. *Small Bus. Econ.* **1993**, *5*, 297–306. [[CrossRef](#)]
58. Li, J.; Merenda, M.; Venkatachalam, A.R. Business Process Digitalization and New Product Development: An Empirical Study of Small and Medium-Sized Manufacturers. *IJEBR* **2009**, *5*, 49–64. [[CrossRef](#)]
59. Hall, G. *Surviving and Prospering in the Small Firm Sector*; Routledge: London, UK, 1995.
60. Eikebrokk, T.R.; Olsen, D.H. Co-operation and e-Business Success in SMEs: An Empirical Investigation. In Proceedings of the 38th Hawaii International Conference on System Sciences, Hawaii, HI, USA, 3–6 January 2005.
61. Nadide, S.; Doğan, I. The Impact of Foreign Direct Investments on SMEs' Development. *Soc. Behav. Sci.* **2014**, *150*, 107–115. [[CrossRef](#)]
62. Aldaba, R.; Aldaba, F. *Assessing the Spillover Effects of FDI to the Philippines*; Philippine Institute for Development Studies: Makati, Philippine, 2010.
63. Chew, Y.T.; Yeung, H.W.C. The SME Advantage: Adding Local Touch to Foreign Transnational Corporations in Singapore. *Reg. Stud.* **2001**, *35*, 431–448. [[CrossRef](#)]
64. Taymaz, E.; Yilmaz, K. *Integration with the Global Economy: The Case of Turkish Automobile and Consumer Electronics Industries*; Elsevier: Amsterdam, The Netherlands, 2008.
65. Salvatore, D. *International Economics: Trade and Finance*, 11th ed.; John Wiley and Sons Inc.: Hoboken, NJ, USA, 2013.
66. Musa, H.; Chinniah, M. Malaysian SMEs Development: Future and Challenges on Going Green. *Procedia Soc. Behav. Sci.* **2016**, *224*, 254–262. [[CrossRef](#)]
67. Prasanna, R.P.I.R. *Impact of GSP + Scheme on Sri Lankan Apparel Industry*; Saga University: Saga, Japan, 2009.
68. Whah, C.Y. Penang, Small, and Medium Enterprises: Struggle, Accommodation, and Challenges. *Akademika* **2006**, *69*, 17–35.
69. Sahoo, S.; Yadav, S. Total Quality Management in Indian Manufacturing SMEs. *Procedia Manuf.* **2018**, *21*, 541–548. [[CrossRef](#)]
70. Prasanna, R.P.I.R.; Kuruppuge, R. An Assessment of Sector-Specific Living Wage for Sri Lankan Apparel Industry Workers. *Sri Lanka Mod. Stud.* **2013**, *4*, 72–99.
71. Prasanna, R.P.I.R.; Gowthaman, P. *Sector-Specific Living Wage for Sri Lankan Apparel Industry Workers*; Oxfam Australia: Melbourne, Australia, 2006.
72. Rickne, A. Connectivity and Performance of Science-based Firms. *Small Bus. Econ.* **2006**, *26*, 393–407. [[CrossRef](#)]
73. Neergaard, H.; Shaw, E.; Carter, S. The Impact of Gender, Social Capital, and Networks on Business Ownership: A Research Agenda. *Int. J. Entrep. Behav. Res.* **2005**, *11*, 338–357. [[CrossRef](#)]
74. Lipparini, A.; Sobrero, M. The Glue and the Pieces: Entrepreneurship and Innovation in Small-firm Networks. *J. Bus. Ventur.* **1994**, *4*, 125–140. [[CrossRef](#)]
75. Acs, Z.J.; Audretsh, D.B. *Innovation and Small Firms*; The University of Illinois at Urbana-Champaign: Champaign, IL, USA, 1990.
76. Jarillo, J.C. Entrepreneurship, and Growth: The Strategic Use of External Resources. *J. Bus. Ventur.* **1989**, *4*, 133–147. [[CrossRef](#)]
77. Bound, J.; Cummins, C.; Griliches, Z.; Hall, B.H.; Jeffe, A.B. Who Does R&D and Who Patents? *Econ. Pap.* **1984**, *1*, 21–54.
78. Prasanna, R.P.I.R.; Shiratake, Y. Base and Condition of Stable Regional Economy in Sri Lanka: A Case Study of Diversified Traditional Coconut Industry in teh Kurunegala District. *Jpn. J. Ind. Sci. Rev.* **2013**, *18*, 45–49.



79. Khan, K.U.; Xuehe, Z.; Atlas, F.; Khan, F. The Impact of Dominant Logic and Competitive Intensity on SMEs Performance: A Case from Canada. *J. Innov. Knowl.* **2018**, *4*, 1–11. [[CrossRef](#)]
80. Zeng, S.X.; Xie, X.M.; Tam, C.M. Relationship between Cooperation Networks and Innovation Performance of SMEs. *Technovation* **2010**, *30*, 181–194. [[CrossRef](#)]
81. Srebrnik, H.F. Identity, Culture, and Confidence in the Global Economy. *Lessons Political Econ. Small Isl.* **2000**, 56–71. [[CrossRef](#)]
82. Kuruppuge, R.; Gregar, A. Family involvement, employee engagement, and employee performance in enterprising family firms. *Acta Univ. Agric. Silv. Mendel. Brun.* **2017**, *65*, 1695–1707. [[CrossRef](#)]
83. Gamba, F.J. Social Capital in Selected Business Associations of Food Processing SMEs in Tanzania and Rwanda: A Synthetic Based Approach. *Int. J. Asian Soc. Sci.* **2017**, *7*, 63–84. [[CrossRef](#)]
84. Portes, A.; Landolt, P. The Downside of Social Capital. *Am. Prospect* **1996**, *111*, 18407–18408. [[CrossRef](#)] [[PubMed](#)]
85. Meng, F.; Rieckmann, J.M.; Li, C. Empirical Evidence How Social Capital Effects the Internationalization Process of SME in Zhejiang. *Transnatl. Corp. Rev.* **2016**, *8*, 196–206. [[CrossRef](#)]
86. Kayanula, D.; Quartey, P. *The Policy Environment for Promoting Small, Medium Enterprises in Ghana and Malawi*; Institute of Development Policy Management (IDPM), University of Manchester: Manchester, UK, 2000.
87. Lin, F.J.; Lin, Y.H. The Effect of Network Relationship on the Performance of SMEs. *J. Bus. Res.* **2015**, *69*, 1780–1784. [[CrossRef](#)]
88. Qiao, P.H.; Ju, X.F.; Fung, H.G. Industry Association Networks, Innovations, and Firm Performance in Chinese Small and Medium-Sized Enterprises. *China Econ. Rev.* **2014**, *29*, 213–228. [[CrossRef](#)]
89. Unnikrishnan, S.; Iqbal, R.; Singh, A.; Nimkar, I.M. Safety Management Practices in Small and Medium Enterprises in India. *Saf. Health Work* **2015**, *6*, 46–55. [[CrossRef](#)]
90. Auwal, A.M.; Mohamed, Z.; Shamsudin, M.N.; Sharifuddin, J.; Ali, F. External Pressure Influence on Entrepreneurship Performances of SMEs: A Case Study of Malaysian Herbal Industry. *J. Small Bus. Entrep.* **2018**, 1–22. [[CrossRef](#)]
91. Love, J.H.; Roper, S.; Zhou, Y. Experience, Age, and Exporting Performance in UK SMEs. *Int. Bus. Rev.* **2016**, *25*, 806–819. [[CrossRef](#)]
92. Chau, N.T.; Deng, H. Critical Determinants for Mobile Commerce Adoption in Vietnamese SMEs: A Conceptual Framework. *Procedia Comput. Sci.* **2018**, *138*, 433–440. [[CrossRef](#)]
93. Meath, C.; Linnenluecke, M.; Griffiths, A. Barriers and Motivators to the Adoption of Energy Savings Measures for Small and Medium-Sized Enterprises (SMEs): The Case of the Climate Smart Business Cluster Programme. *J. Clean. Prod.* **2016**, *112*, 3597–3604. [[CrossRef](#)]
94. Eravia, D.; Handayani, T. The Opportunities and Threats of Small and Medium Enterprises in Pekanbaru: Comparison between SMEs in Food and Restaurant Industries. *Procedia Soc. Behav. Sci.* **2015**, *169*, 88–97. [[CrossRef](#)]
95. Singh, R.K.; Garg, S.K.; Deshmukh, S.G. The Competitiveness of SMEs in Globalized Economy, Observations from China and India. *Manag. Res. Rev.* **2009**, *33*, 54–65. [[CrossRef](#)]
96. Hosseininia, G.; Ramezani, A. Factors Influencing Sustainable Entrepreneurship in Small and Medium-Sized Enterprises in Iran: A Case Study of Food Industry. *Sustainability* **2016**, *8*, 1010. [[CrossRef](#)]
97. Ndiaye, N.; Razak, L.A.; Nagayev, R.; Ng, A. Demystifying Small and Medium Enterprises' (SMEs) Performance in Emerging and Developing Economies. *Borsa Istanbul. Rev.* **2018**, *18*, 269–281. [[CrossRef](#)]
98. Sung, C.Y.; Kim, K.C.; In, S. Small and Medium-Sized Enterprises Policy in Korea from the 1960s to the 2000s and Beyond. *Small Enterp. Res.* **2016**, *23*, 262–275. [[CrossRef](#)]
99. Lesakova, L. Evaluating Innovations in Small and Medium Enterprises in Slovakia. *Procedia Soc. Behav. Sci.* **2014**, *110*, 74–81. [[CrossRef](#)]
100. Burlea-Schiopoiu, A.; Mihai, L.S. An Integrated Framework on the Sustainability of SMEs. *Sustainability* **2019**, *11*, 6026. [[CrossRef](#)]
101. Zeeshan, S.A.; Cheung, Y.; Scheepers, H. Developing a collaborative organizational mobile commerce model. In Proceedings of the International Conference on Business and Information, Tokyo, Japan, 1 January 2007.
102. Soomro, Z.A.; Shah, M.H.; Ahmed, J. Information Security Management Needs More Holistic Approach: A Literature Review. *Int. J. Inf. Manag.* **2016**, *36*, 215–225. [[CrossRef](#)]
103. Aa, V.D.; Elfring, T. Realizing Innovation in Services. *Scand. J. Manag.* **2002**, *18*, 155–171. [[CrossRef](#)]

104. Parasuraman, A. Technology Readiness Index (TRI): A Multiple Item Scale to Measure Readiness to Embrace New Technologies. *J. Serv. Res.* **2000**, *2*, 307–320. [[CrossRef](#)]
105. Wong, P.K. *Technology Development through Subcontracting Linkages: Lessons from Singapore, in Enhancing Intra-Industry Linkages*; Institute of Strategic and International Studies: Kuala Lumpur, Malaysia, 1991.
106. Rosenfeld, S. Does co-operation enhance competitiveness? ASSESSING the impacts of inter-firm collaboration. *Res. Policy* **1996**, *25*, 247–263. [[CrossRef](#)]
107. Ankrah, S.N.; Burgess, T.F.; Grimshaw, P.; Shaw, N.E. Asking both University and Industry Actors about Their Engagement in Knowledge Transfer: What Single Group Studies of Motive Omit. *Technovation* **2013**, *33*, 50–65. [[CrossRef](#)]



© 2019 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<http://creativecommons.org/licenses/by/4.0/>).