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Determinants of Sales Growth in the South African Automotive Industry

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Abstract

An exploratory survey of factors that affect sales growth in used car dealerships in the Tshwane region of Gauteng Province in South Africa was conducted based on a stratified random sample of 126 small and medium automotive enterprises operating in three South African provinces (Gauteng, Eastern Cape and KwaZulu-Natal). The purpose of study was to identify and quantify key predictors of sustained growth in sales. Data was collected on a large number of socioeconomic variables that are known to affect sales growth in the South African automotive industry. Data was gathered from each one of the 126 enterprises by using a structured, pre-tested and validated questionnaire. Frequency tables, cross-tab analyses and binary logistic regression analysis were used for performing data analyses. The results showed that sustained growth in used car sales was influenced by long duration of operation, utilization of innovative techniques of production, the capacity for improving technical skills of employees, the capacity for producing new products and process development, and the level of skills of employees, in a decreasing order of strength.

Keywords: South Africa; Automotive industry; Sales growth; Technical skills; Logit analysis

Introduction

A survey was conducted based on a stratified random sample of 126 small and medium automotive enterprises operating in three provinces of South Africa (Gauteng, Eastern Cape and KwaZulu-Natal) in order to identify and quantify key predictors of sales growth in the South African automotive industry. Data was gathered from each of the 126 enterprises on factors that are known to affect sustained growth and development in the automotive industry. The enterprises selected for the study were mostly engaged with manufacturing automotive components for the automotive industry, were in business for 5 years or more, and were utilized fairly modern technological methods of manufacturing, production, computer-aided designs and advanced applications of engineering. Most of the enterprises in the study utilized conventional research and development techniques for ensuring efficiency and operational viability on a sustainable basis. The study aims to identify key factors that contribute for sustained growth in sales in the South African automotive industry.

The South African automotive industry is the third largest economic sector of the South African economy next to mining and financial services. The sector contributes over 29% of the country's manufacturing output. The South African automotive industry accounts for only 0.7% of the global automotive market share, and ranks 18th by size. However, it accounts for about 85% of the African continent's vehicle output [1]. In spite of their stated importance to economic growth, the South African automotive industry is not being provided with adequate support (Sawers, Pretorius and Oerlemans) as a result of internal barriers such as shortage of technical skills, shortage of capital or labor related issues. It could also be a result of external barriers such as high barriers to entry or industrial dominance by a few players. Other challenges to the automotive industry include difficulties in acquiring and exploiting appropriate technology and innovations, constrained managerial capabilities, limited internal capacity in terms of well trained personnel, low productivity and regulatory issues [2]. According to the South African National Association of Automobile Manufacturers [3], there are 21 full automotive assembling members in South Africa. Eight of the 21 members are major motor vehicle manufacturers. The SANAAM constitutes an important part of the industry's value chain in terms of local sourcing and content. Furthermore, the majority of component suppliers serve as a bellwether industry for other manufacturing industries such as steel and aluminum processing, rubber, textiles, precious metal beneficiation such as platinum in catalytic converters, plastics, textiles, paints and other chemicals. In addition to meeting the needs of local customers, some of their production outputs are exported to destinations such as the European Union and the rest of Africa. Inflexible labor laws and excessively aggressive trade unions are portraying South Africa as a less attractive destination for foreign investors and partners in advanced technological applications that are essential for realizing sustained growth and development in the local automotive industry. Although small and medium sized enterprises operating in the South African automotive industry are known to utilize high technology applications such as Computer Aided Design (CAD), Computer Aided Manufacturing (CAM), Computer Numerical Control (CNC), Joint Investigation Team (JIT) and Total Quality Control (TQC), the degree to which these advanced applications promote radical and incremental innovation in the automotive sector has never been quantified. Not enough is known about challenges that affect innovation related activities in the South African automotive industry. The study aims to identify key predictors of sales growth in the South African automotive industry based on a representative sample of 126 enterprises operating in three of the nine provinces of South Africa (Gauteng, Eastern Cape and KwaZulu-Natal).

Objective

The overall objective of study was to identify and quantify key predictors of sales growth in the South African automotive industry. The study aims to determine the degree to which innovative activities affect sustained growth and development in the South African automotive industry. As such, the study will lead to the identification of influential factors so that possible remedial actions could be taken. Data was gathered from each of the enterprises that took part in the study on sales growth, exporting products, level of technical skills, cost of production, barriers to technological innovation, radical and incremental innovation, patents, commercialization of products, technological input from suppliers, use of computer aided designs, use of computer aided manufacturing, use of total quality management, use of computer numerical control, use of joint investigation team, employment growth, export growth, percentage export and financial constraints experienced in the past.

Literature Review

Innovation and its importance to firm growth is widely covered in the literature and is often cited as one of the most important avenues through which small and medium size enterprises can grow and gain competitive advantage, when innovation programs are implemented effectively. The centrality of innovation to international competitiveness, productivity as well as employment creation in most countries has been fairly well documented. The role of innovation and technology in the economy has its roots in classical economics where people like Schumpeter raised the concept of creative destruction. The focus was on how successful innovations can displace or replace old and inefficient technologies in favor of new, more effective technologies, products and services [4].

Innovativeness can either be in terms of new products, processes or services or the improvements of already existing products, processes or services as well as designs. As a result, innovation can be incremental (improving existing product, process or service) or radical (new to existing market products, processes or services). A review of the literature shows that there is no commonly accepted definition of innovation. Innovativeness is thought to encompass the following: creativity, imagination, inventiveness, enterprise, originality, resourcefulness and farsightedness. Innovation is described as a continuous improvement in product design and quality, changes in organizational and management routines, creativity in marketing as well as modifications of production processes that bring costs down, increase efficiency and ensure environmental sustainability [5] defines innovation as a firm's pursuit of novel solutions to challenges that confront the firm, including the creation of new products and new markets. Innovation is based on research and development activities that are used for the development of new products or processes or the improvement of existing products or processes underpin a firm's competitive advantage, especially in an increasingly globalized economy. Innovative enterprises are often described as those that identify, interpret and apply knowledge effectively and appropriately throughout the organization [6]. Patents are widely seen as a measure of innovation process activity and output [7,8] have reported a positive correlation between a firm's innovative capabilities, and the presence of university trained engineers in the workforce. According to the authors, research and development activities are a proxy for innovation. The amount of resources allocated for research and development activities by firms is significantly associated with the degree of innovation carried out by firms that produce several patents [9]. Technical collaborations and partnerships with tertiary level and research institutions have the potential for promoting innovative activities and skills transfer [10]. According to Bandyopadhyay [11], successful, innovative firms are distinguished by their ability to connect with different systems of innovation as a source of competitive advantage. Barnes [12] has found that there is a positive relationship between external linkages and innovation in small and medium enterprises.

Amara et al. [13] had found that process innovation at firm level is directly associated with commitment to meet the needs and requirements of customers, adopting competitive prices, the promotion of service excellence, and commitment to support research and development activities. According to Radas and Božić [8], radical innovations and overall competitiveness require a higher level of advanced knowledge and expertise that could only be realized by collaborating with advanced academic and research institutions. By collaborating with well-resourced academic and research institutions, it is possible to improve overall efficiency and competitiveness as a result of benefits derived from advanced theoretical knowledge, specialized equipment and findings from research and development activities. In the automotive industry, external linkages are critically important as an important source of knowledge for strengthening technological base, high growth and competitiveness. Experience from countries such as Germany, Japan and South Korea shows that small and medium size enterprises in the automotive industry generally do not necessarily innovate, and often exploit benefits derived from external linkages [14]. According to Amara et al. [13] and Santamaria et al. [15], the use of advanced technologies such as CAD, CAM, CNC and JIT has the potential for improving process innovation, research and development, overall efficiency and competitiveness in small and medium sized enterprises in the automotive industry. Du and Ouyang [16] have pointed out that the auto industry needs to be more innovative than ever as a means of ensuring continued survival.

According to Naude [17], there are more than 450 automotive component manufacturers in the automotive industry of South Africa. Gauteng (20%), the Eastern Cape (20%), KwaZulu-Natal (20%) and the Western Cape (10%) account for about 70% of outputs produced in South Africa [18]. International vehicle manufacturers have shown deep-rooted interest in the weather condition of South Africa and the strategic location of South Africa for global production of vehicles [19]. According to Nansai et al. [20], although the variety of metals mined and produced in South Africa are a major attraction to global vehicle manufacturers, lack of specialized skills, labor unrest and labor cost constitute a significant risk to the South African automotive industry. According to Giunta et al. [21], the South African automotive industry has the potential for growing at more than 10% per year if risk factors such as labor unrest, labor cost and lack of specialized skills could be overcome. Barnes and Morris [4] have reported that the automotive industry of South Africa could be used for producing most of the vehicles needed in the entire African continent as a means of creating millions of jobs for the unemployed youth, and for increasing its current degree of contribution to the Gross Domestic Product (GDP) of South Africa. According to George et al. [22], the ability to innovate and use modern and advanced technological methods of design and manufacturing are critically needed in the South African automotive industry. The study by Yang shows that the mining industry of South Africa provides a competitive advantage to the automotive industry of South African. According to the study conducted by George, McGehan and Prabhu [22], the global automotive industry is highly motivated to exploit the numerous

strategic benefits of South Africa in the manufacturing of vehicles for the global market. The South African automotive industry uses a variety of modern technological methods of vehicle manufacturing and design as a means of optimizing operation. In this regard, the key leaders are Mercedes Benz, BMW, Toyota, Ford, Volkswagen, Hyundai and Land rover. Studies conducted by Stanton [23] and Sarcar et al. [24] show the most commonly used computer aided designs that are used in the South African automotive industry for optimization of production, distribution and supply.

The study conducted by Wu et al. [25] indicates that the capacity to use modern technological methods of production is a key requirement for ensuring quality in the global automotive industry. The South African automotive industry is regulated strictly by the South African Government as a means of ensuring product quality in the production and supply of vehicles to local and global markets. The South African National Department of Science and Technology [26] regularly runs projects as a means of promoting innovation in the automotive industry. The Thumisano Project was conducted as a comprehensive survey in order to assess the degree of utilization of modern production and manufacturing technologies in the South African automotive industry. The survey found that there was a significant and positive association between sales growth and utilization of advanced and innovative computer-aided technological methods of production and manufacturing.

The South African automotive industry is the third largest economic sector of the South African economy next to mining and financial services. The sector contributes over 29% of the country's manufacturing output. The South African automotive industry accounts for only 0.7% of the global automotive market share, and ranks 18th by size. However, it accounts for about 85% of the African continent's vehicle output [27]. In spite of their stated importance to economic growth, the South African automotive industry is not being provided with adequate support as a result of internal barriers such as shortage of technical skills, shortage of capital or labor related issues. It could also be a result of external barriers such as high barriers to entry or industrial dominance by a few players. Other challenges to the automotive industry include difficulties in acquiring and exploiting appropriate technology and innovations, constrained managerial capabilities, limited internal capacity in terms of well trained personnel, low productivity and regulatory issues [1].

According to the South African Automotive Industry Export Council [28] there are 21 full automotive assembling members on their registry. Included in the list are eight of the world's major motor vehicle manufacturers with their automotive assembly plants concentrated on three of the country's nine provinces. South African automotive manufacturers depend upon the South African mining industry for the supply of steel, platinum, aluminum and iron. The automotive industry imports rubber, textiles, catalytic converters, plastics, paints and other chemicals. The South African automotive industry exports products to the rest of Africa as well as Europe. Inflexible labor laws and excessively aggressive trade unions are portraying South Africa as a less attractive destination for foreign investors and partners in advanced technological applications that are essential for realizing sustained growth and development in the local automotive industry. Although small and medium sized enterprises operating in the South African automotive industry are known to utilize high technology applications such as Computer Aided Design (CAD), Computer Aided Manufacturing (CAM), Computer Numerical Control (CNC), Joint Investigation Team (JIT) and Total Quality Control (TQC), the degree to which these advanced applications promote radical and incremental innovation in the automotive sector has never been quantified.

Not enough is known about challenges that affect innovation related activities in the South African automotive industry. This research article aims to identify key predictors of innovation based on a representative sample of 126 enterprises operating in South Africa. Innovation and its importance to firm growth is widely covered in the literature and is often cited as one of the most important avenues through which small and medium size enterprises can grow and gain competitive advantage, when innovation programs are implemented effectively. The centrality of innovation to international competitiveness, productivity as well as employment creation in most countries has been fairly well documented. The role of innovation and technology in the economy has its roots in classical economics where people like Schumpeter raised the concept of creative destruction. The focus was on how successful innovations can displace or replace old and inefficient technologies in favor of new, more effective technologies, products and services [13].

Innovativeness can either be in terms of new products, processes or services or the improvements of already existing products, processes or services as well as designs. As a result, innovation can be incremental (improving existing product, process or service) or radical (new to existing market products, processes or services). A review of the literature shows that there is no commonly accepted definition of innovation. Innovativeness is thought to encompass the following: creativity, imagination, inventiveness, enterprise, originality, resourcefulness and farsightedness. Innovation is described as a continuous improvement in product design and quality, changes in organizational and management routines, creativity in marketing as well as modifications of production processes that bring costs down, increase efficiency and ensure environmental sustainability or as fresh thinking that creates value (Vaitheeswaran). Wu et al. [25] describe innovation as a firm's pursuit of novel solutions to challenges that confront the firm, including the creation of new products and new markets. Innovation is based on research and development activities that are used for the development of new products or processes or the improvement of existing products or processes underpin a firm's competitive advantage, especially in an increasingly globalized economy. Innovative enterprises are often described as those that identify, interpret and apply knowledge effectively and appropriately throughout the organization. According to the authors, patents are widely seen as a measure of innovation process activity and output.

Becheikh et al. [13] have shown that there is a positive correlation between a firm's innovative capabilities, and the presence of university trained engineers in the workforce. According to the authors, research and development activities are a proxy for innovation. The amount of resources allocated for research and development activities by firms is significantly associated with the degree of innovation carried out by firms that produce several patents. Technical collaborations and partnerships with tertiary level and research institutions have the potential for promoting innovative activities and skills transfer. Successful, innovative firms are distinguished by their ability to connect with different systems of innovation as a source of competitive advantage. It has been shown that there is a positive relationship between external linkages and innovation in small and medium enterprises (Stevenson [29]; Szwejczewski et al. [30].

Amara, Landry et al. [13] had found that process innovation at firm level is directly associated with commitment to meet the needs and

requirements of customers, adopting competitive prices, the promotion of service excellence, and commitment to support research and development activities. According to Radas and Božić [8], radical innovations and overall competitiveness require a higher level of advanced knowledge and expertise that could only be realized by collaborating with advanced academic and research institutions. By collaborating with well-resourced academic and research institutions, it is possible to improve overall efficiency and competitiveness as a result of benefits derived from advanced theoretical knowledge, specialized equipment and findings from research and development activities. External linkages are critically important as an important source of knowledge for strengthening technological base, high growth and competitiveness. Experience from countries such as Germany, Japan and South Korea shows that small and medium size enterprises in the automotive industry generally do not necessarily innovate, and often exploit benefits derived from external linkages [14]. According to Amara, Landry, Becheikh and Ouimet [13] and Santamaria, Nieto and Barge-Gil [15], the use of advanced technologies such as CAD, CAM, CNC and JIT has the potential for improving process innovation, research and development, overall efficiency and competitiveness in small and medium sized enterprises in the automotive industry.

According to Bandyopadhyay [11], the automotive industry has grown to become the leading manufacturing sector in South Africa. The industry contributed 6.2% to gross domestic product and employed a total of 93, 100 people in 2010. In terms of its international contribution, South Africa was responsible for approximately 73% of vehicle output in the African continent and 0.61% of vehicles globally in 2009 [17]. According to Ambe and Badenhorst Weiss [31], 35% of vehicles in South Africa are locally manufactured. Globally, the industry is very competitive, and world-class management philosophies and practices such as just-in-time production (JIT), total quality management (TQM) and continuous improvement (CI) are already in use in these supply chains, and have been for many decades [17]. Despite the use of these management practices, the industry's supply chains face realities and challenges that have an impact on delivery in terms of components being delivered at the right place and time, and higher inventory holding at every stage of the supply chain if logistical services are unreliable and irregular The South African automotive industry compares favorably with similar industries in developing countries with regard to infrastructure, raw material availability, emerging market cost advantages, flexible production capability and government support. However, despite these positive aspects, the South African automotive industry's competitiveness is under severe pressure [4], as it experiences challenges such as high labor costs, poor infrastructure and dated technology. This is particularly true with regard to South African ACMs that compete against cheap imported parts and, in some cases, counterfeit parts (Ambe et al. [31]; Moodley et al. [4]). As a result, increasingly demanding customers are squeezing component manufacturers on both price and non-price factors (Barnes [12]). The survival and growth of these ACMs in an increasingly competitive global market are vital for the South African economy. ACMs will only grow if they are able to compete globally. Given the above context, this article explores the supply chain challenges South African ACMs face. It provides insight into whether the ACMs' geographical location, size with regard to the number of employees, and age have a bearing on whether they face common challenges. Studies conducted by Madhani [32] and Fahy [33] have shown that the location of large enterprises is a key factor in ensuring optimal service delivery and performance.

Most South African automotive enterprises are located around Pretoria, Johannesburg, Port Elizabeth, East London and Durban. Newly established automotive enterprises are often heavily reliant on modern technological methods of product design and manufacturing in comparison with old automotive enterprises. Old enterprises have wider customer base in comparison with newly established enterprises. For example, Volkswagen is a German automotive company that operates in various African countries including South Africa with an extensive operation and customer base. The company has a production facility in the Eastern Cape, and has been producing vehicles for local and export markets for over 60 years. The company has created employment opportunities for more than 5, 000 South Africans. The company has a production capacity of over 130, 000 units per year. The company controls about 23% of the South African local market. Likewise, BMW is also a German company that produces vehicles out of a plant at Rosslyn, outside Pretoria. The company employs 5, 123 employees and produces about 60, 000 vehicles per year for local and export markets. Mercedes-Benz is a German vehicle manufacturer that has been producing vehicles in the Eastern Cape for more than 60 years. The company produces about 65, 000 vehicles per year for local and export markets. MAN and Nissan are well known for manufacturing trucks for local and export markets in South Africa. According to Pillay and Buys [34], the South African automotive industry currently creates over half a million jobs in South Africa. It exports vehicles to 54 countries globally. According to Naude [17], the automotive industry contributes about 8% to GDP. South African vehicle manufacturers are provided with incentives such as tax rebates for producing vehicle components locally.

Methods and Materials

The study was based on a stratified random sample of size 126 automotive enterprises operating in Gauteng, the Eastern Cape and KwaZulu-Natal. The design of the study was cross-sectional and descriptive as data was collected from the enterprises that took part in the study only once during the period of study. Data was collected by using a structured, pre-tested and validated questionnaire of study. Data analyses were performed by using methods such as frequency tables, cross-tab analyses and binary logistic regression analysis [35]. Odds ratios obtained from logistic regression analysis were adjusted for potential confounding variables. The reliability of estimated models was assessed based on standard diagnostic procedures. The statistical package STATA version 14 (STATA Corporation [36]) was used for data entry and analysis.

Results

The study showed that 66% of the firms had research and development units, 44.21% of them experienced growth of 1% to 20% between 2003 and 2015, the average percentage export by the firms in the study was 19%, and that there was a statistically significant association between radical or incremental innovative techniques and rapid growth (annual growth of 50% or more). Only 28.4% of firms were involved in patent activities. In terms of deriving any commercial value from these intellectual property initiatives, 7.41% reported commercialization and 3.22% licensed their patents to a third party. Forty five percentage of firms reported partnerships with larger firms while 24.2% reported collaborations with larger firms in the form of mutually beneficial agreements, supply contracts for specific products, services or processes. The study showed that that 36.87% of firms were fairly highly rated in terms of conducting innovative activities.

Table 1 shows the general characteristics of 126 firms in the study. The table shows that 94.97% of firms supplied their products to the automotive industry, while 83.43% of firms were involved in the production of specialized machine tools for the automotive industry. 82.11% of firms owned their own engineers and technicians. Incremental innovation (84.21%) and radical innovation (41.05%) were widely practiced by the firms. It can be seen from the table that 66.32% of firms conducted their own research and development activities (Table 1).

Characteristics of firms	Frequency	Percent
Production of metal products	66	52.63%
Production of plastic components	31	24.21%
Production of tooling products	105	83.43%
Production of rubber products	11	8.42%
Production of automotive products	50	40.00%
Supply to automotive industry	119	94.74%
Supply to mining industry	20	15.79%
Supply to aerospace industry	8	6.32%
Supply to engineering or manufacturing firms	38	30.53%
Supply to other industries	24	18.95%
Conducting regular audit	117	92.63%
ISO or TS audits conducted	60	47.69%
Innovation from internal staff	86	68.42%
Innovation from universities or research institutions	25	20.00%
Innovation from customers	70	55.79%
Innovation from suppliers	24	18.95%
Innovation from competitors	20	15.79%
Innovation from journals, fairs, conferences, seminars and the internet	46	36.84%
Innovation from other sources	9	7.37%
Incremental innovation	106	84.21%
Radical innovation	52	41.05%
Own research and development initiatives at firm	84	66.32%
Own engineers, technicians and scientists	103	82.11%

Table 1: General characteristics of automotive firms (n=126).

Table 2 shows that the majority of firms in the study (54%) focus on manufacturing, and that they rely on partnerships and technical collaborations with a view to achieve sustained growth. More than half of firms (55.79%) identified lack of capital funding as a barrier to sustained growth and development. The fact that 71.58% of firms use CAD technology for production shows that the manufacturing and industrial base of South Africa is comparable to countries such as Brazil, Mexico and India. The study showed that 28.42% of firms were involved in patent activities. Growth in sales is a reliable economic measure of expansion. The study showed that 44.21% of all firms experienced moderate growth in sales (1% to 20%) between 2006 and 2008. The proportion of firms that experienced decline in sales between 2006 and 2008 was 13.68% (Table 2).

Characteristics of automotive firms	Frequency	Percent
Focus on manufacturing	72	56.84
Focus on process improvement	88	69.47
Focus on new product development	60	47.37
Specialist skills available within firm	64	50.53
Lack of capital as barrier to growth	70	55.79
Lack of staff as barrier to growth	58	46.32
Incompatible technology as barrier	16	12.63
Current technology is adequate	11	8.42
Lack of knowledge as barrier	37	29.41
Use of CNC technology	74	58.95
Use of CAD technology	90	71.58
Use of CAM technology	37	29.47
Use of TQM technology	66	52.63
Use of JIT technology	46	36.84
Use of other advanced softwares	29	23.16
Involvement in patent activities	36	28.42
Patents filed	13	10.53
Patents commercialized	9	7.37
Patents licensed	4	3.16
Partnerships with large firms	57	45.26
Technological collaboration with large firms	31	24.21
Partnerships with sub-contractors	7	5.26
Partnerships with product suppliers	23	17.89
Commercialization of products	33	26.32
Agreement with rivals or competitors	4	3.16
Agreement with larger local companies	7	5.26
Agreement with larger international companies	27	21.05

Table 2: Production technologies used by automotive firms (n=126).

Results obtained from cross-tab analyses

Results obtained from cross-tab analyses (Hair, Black, Babin and Anderson [37]) were used for performing a preliminary screening of influential factors. In this study, the test was used in order to identify variables that were significantly associated with growth in sales over the past 3 years. The test was performed between growth in sales and

several socioeconomic variables in the questionnaire of study. Seven of the associations were highly significant at the 1% level of significance. Table 1 shows the list of seven factors that are significantly associated with sales growth in the South African automotive industry.

Factor significantly associated with sales growth in automotive firms	Observed chi-square value	P-value
Long duration of operation	19.0215	0.0000***
Capacity for utilising innovative techniques	18.2165	0.0000***
Level of technical skills of employees	16.4501	0.0000***
Capacity for producing new products and process development	14.2239	0.0000***
Capacity for production of automotive parts	9.2315	0.0000***
Use of advanced technological software	7.2309	0.0000***
Partnership with subcontractors	5.2782	0.0000***

Table 3: Factors significantly associated with sales growth in automotive firms (n=95). Legend: Significance levels at * P<0.05; ** P<0.01; *** P<0.001

Results obtained from binary logistic regression analysis

Binary logistic regression analysis (Hosmer and Lemeshow [35]) was used in order to identify key predictors of sales growth. In binary logistic regression analysis, the measure of effect is the odds ratio. At the 5% level of significance, significant predictor variables are characterized by odds ratios that differ from 1 significantly, P-values that are smaller than 0.05, and 95% confidence intervals that do not contain 1. The odds ratios presented in Table 4 show that the key predictors of sales growth in the South African automotive industry are long duration of operation, capacity for utilizing innovative techniques, level of technical skills of employees, capacity for producing new products and process development, capacity for production of automotive parts, use of advanced technological softwares, and partnership with subcontractors, in a decreasing order of strength.

Factor significantly associated with sales growth in automotive firms	Odds Ratio	P-value	95% C. I. for OR
Long duration of operation	4.37	0	(2.36, 6.99)
Capacity for utilizing innovative techniques of production	4.02	0	(2.33, 6.88)
Improving technical skills of employees	3.59	0	(2.27, 5.97)
Capacity for producing new products and process development	2.76	0	(1.94, 4.66)
Level of technical skills	2.48	0	(1.76, 4.31)

Table 4: Odds ratios estimated from binary logistic regression analysis (n=126).

Interpretation of odds ratios

The odds ratio of the variable "Long duration of operation" is equal to 4.37. This indicates that a firm that has been in operation for 5 years or more is 4.37 times as likely to experience sustained growth in sales in comparison with another firm that has been in operation for less than 5 years.

The odds ratio of the variable "Improving technical skills of employees" is equal to 3.59. This indicates that a firm that improves the technical skills of its employees on a regular basis is 3.59 times as likely to experience sustained growth in sales in comparison with another firm that fails to improve the technical skills of its employees on a regular basis.

The odds ratio of the variable "Capacity for producing new products and process development" is equal to 2.76. This indicates that a firm that has the capacity for producing new products and process development is 2.76 times as likely to experience sustained growth in sales in comparison with another firm that does not have the capacity for producing new products and process development.

The odds ratio of the variable "Level of technical skills" is equal to 2.48. This indicates that a firm in which employees have adequate technical skills is 2.48 times as likely to experience sustained growth in sales in comparison with another firm in which employees lack adequate technical skills.

Based on estimates obtained from binary logistic regression analysis, sales growth was significantly influenced by 5 predictor variables. These predictor variables were long duration of operation, capacity for utilizing innovative techniques of production, improving technical skills of employees, capacity for producing new products and process development, and the level of skills on technical aspects of job, in a decreasing order of strength. The percentage of overall correct classification for this procedure was equal to 80.49%. The P-value obtained from the Hosmer-Lemeshow goodness-of-fit test was equal to

0.1209>0.05. This shows that the fitted logistic regression model is fairly well reliable (Hosmer & Lemeshow [35]).

Discussion

The study shows that sustained growth in sales in the South African automotive industry was influenced by long duration of operation, capacity for utilizing innovative techniques of production, improving technical skills of employees, capacity for producing new products and process development, and the level of skills on technical aspects of job, in a decreasing order of strength. Based on the findings of the study, it is highly recommended that the South African automotive industry should actively promote technical and strategic collaboration and partnerships with tertiary level academic institutions such as universities and advanced research centers [38]. This could be done by way of encouraging young students to get involved with internship programs in which students acquire theoretical knowledge from tertiary level institutions, and are subsequently exposed to practical applications of theoretical knowledge by acquiring skills based training opportunities from the key players in the South African automotive industry [32]. The South African government has placed a key priority on training and innovation programs in which technical skills are transferred to young South Africans in areas such as manufacturing, automotive engineering, product development and design, process engineering and the like. The South African Department of Science and Technology actively supports training programs by providing financial and administrative support to young scientists and university students. Investing adequately in technological innovation and skills development in the local automotive industry has the potential for enabling South African companies to compete favorably with their competitors effectively. One highly contested area that requires massive investment in technological skills and innovation is auto assembly as has been pointed out by de Almeida et al. [39] and Kompalla et al. [40].

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