The Impact of Business Process Re-engineering (BPR) on Labour Productivity in the Automotive Assembly Organisation in South Africa

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Abstract

Companies develop strategies of promoting innovativeness relating to productivity improvements in their production processes. These may require radical changes aimed at improving short-to long-term growth in productivity. This sentiment describes the concept of business process re-engineering (BPR).

South Africa has, over the years, been experiencing low productivity growth in its manufacturing industry. Its labour productivity level is low when compared with BRICS countries like Russia, India and China. Hence, this study focuses on BPR, given low productivity levels in the South African automotive and manufacturing industries. The automotive company that has adopted a BPR strategy participated in the study. The collection of data was carried out in two phases. This includes the collection of pre- and post-BPR quarterly data from company records on overtime and spoilage rates. The pre-BPR results were quarterly data of the company's performance over a three-year period prior to BPR implementation. The post-BPR data reflect the company's performance for three years after BPR was implemented. Hence, the study examined the production and related experiences of the automotive assembly organisation that has adopted a BPR strategy. The company operates in the eThekwini District Municipality in KwaZulu-Natal.

The results established that BPR has a positive relationship with labour productivity. It has an influence on the levels of overtime and spoilage rates. Hence, the automotive companies in South Africa should assess their performance and implement structural changes that help achieve new business goals. These include the job structure, as well as the administrative procedures. The implementation of such changes must be based on an understanding of the economic factors affecting labour productivity.

Keywords: *automotive assembly organisation; business process re-engineering; labour productivity; overtime; spoilage.*

1. Introduction

The drive to improve productivity has heightened international interest in the techniques associated with business process re-engineering (BPR). Hence, many large manufacturing companies are undertaking major BPR programmes on their operations (Childe, Maull & Benett, 1994). Since 1990, there has been an increased use of BRP (Hammer & Champy, 2006), as well as business restructuring to improve profitability and return on capital employed.

Emanating from a widespread interest of BPR among manufacturing and service sector companies, the importance of its use has been recognised by many United Kingdom consultancy organisations. Their work, in this area, was initially presented at the 1993 British Production and Inventory Control Society (BPICS) conference (Childe et al., 1994). Hence, Foster and Ganguly (2013) define BPR as a method of making rapid, radical changes to a company's organisation and processes. Similarly, Martin and Cheung (2005) indicate that restructuring and downsizing take place in many organisations to reduce costs and management layers. The aim is to structure for a leaner, more customer-focused and flexible organisation thus meeting the competitive challenges in the global economy.

While many different views of BPR and related approaches have been presented, a unifying theme is the focus upon the sequence of activities that form various processes involved in doing business (Dekker, 2018). This is quite different from existing improvement schemes that generally fail to go beyond the functional boundaries that exist in organisations structured along traditional lines. The ideas underpinning the concepts of "time-based competition" and "lean production" are of considerable importance to BPR. Tang, Pee and Lijima (2013) claim that time is the contemporary company's most important competitive weapon. The exploitation of time in the manner suggested by Tang et al. (2013) requires organisations to slash the elapsed time involved in the performance of each of their key business processes. Time-based competition is, by its very nature, process oriented in that it aims to reduce radically the time required for an entire process to be carried out. Concomitant benefits include increased productivity and price, reduced risks and increased market share (Chai, 2014). The movement towards lean production cannot be made without understanding how processes operate. In the absence of such an understanding, no attempt can be made to identify added value.

BPR is also related to Kaizen, a process-oriented philosophy of continuous improvement from Japan (Pedraza-Acosta, Pilkinton & Barnes, 2016). Dekker (2018) contrasts radical and innovative change, which is often associated with Western management, and Kaizen, which focuses on managerial, group and individual continuous improvement. Kaizen does not replace or fundamentally change the status quo, however, Dekker (2018) asserts that organisations should consider the radical change option as soon as Kaizen's marginal value begins to decline. In turn, continuous improvement efforts should follow as soon as any programme for radical change has been initiated. One consequence of the widespread interest in BPR and related approaches has been the emergence of a number of BPR "gurus" (Tang et al., 2013). Despite the existence of a growing body of work in this field, very little have assessed the impact of BRP on labour productivity in the automotive assembly organisation in South Africa.

The remaining sections of this study discusses the problem statement, as well as the literature review. It elaborates on the methodology employed in the study, the results, summary of results and the related discussion. The implications of results for policy and practice, study limitations, conclusion, as well as future research required concludes the study.

2. Problem Statement: Low Labour Productivity Level in South Africa

South Africa's productivity at the shop-floor level is low and companies are faced with competitive challenges of promoting innovativeness relating to productivity improvement amongst employees (Zondo, 2018). It has a low labour productivity level in its manufacturing sector when compared with its BRICS counterpart countries like Russia, India and China (CEIC, 2020). Brazil, Russia, India, China and South Africa (BRICS) are five major countries with emerging national economies. The South African manufacturing industry achieved only -0.65 per cent as compared with 1.79 per cent for Russia, 3.64 per cent for India and 6.27 per cent for China in 2019 (CEIC, 2020). It is against this background that the study focuses on the BPR approach, given a low labour productivity level in the South African manufacturing industries. Hence, this study investigates whether a BPR has the ability to improve labour productivity in the selected automotive assembly organisation in South Africa.

3. Literature Review

This section presents an overview of the historical perspective of BPR. It elaborates on the BPR as a radical change, as well as business performance during BRP. The participative BPR concludes the theoretical framework of the study.

3.1. Overview of the historical perspective of BPR

The BPR advocates radical change to the ways in which business is currently conducted in order to create performance and economic improvement. Foster and Ganguly (2013) define it as a fundamental rethinking and redesign of business processes. It was made popular by Michael Hammer and James Champy with their book, Reengineering the Corporation (Verdouw, Beulens, Trienekens & van der Vorst, 2011) and their management theories have been referenced as the model for "business revolution". Although BPR has gained popularity in business management as an innovative approach, many of its premises are similar to previous management theories that have failed (Verdouw et al., 2011). Specifically, BPR relies on the process and not the people that will make businesses successful. However, there is a contrary view that proven success of any business is getting people to perform efficiently together. The true benefit of BPR, if implemented successfully, will be in the human element (or the people) and not solely processes (Foster & Ganguly, 2013).

Frederick Taylor, in the 1880s, suggested that management use process engineering techniques to discover the most efficient methods for performing work (Tang et al., 2013). They suggested that such processes be continually improved to increase the productivity of workers. Taylor's work with business process led to dramatic increases in the productivity of workers by focusing on efficiency. If there were shortcomings of the work done by Taylor and other management scientists (who followed) was that their methods, like BPR, focused too much on the theoretical process of work in an organisation (Pedraza-Acosta et al., 2016). Very little attention was given to the human element of the business process. The human factor plays a critical role in the long-term success and productivity of any business. It was not until the work of Marry Follett (1868-1933), Elton Mayo (1880-1949), Fritz J. and Chester Barnard (1886-1961) that management scientists realised that the true success of an organisation depends fundamentally on the human resource. BPR may seem to be a new methodology for change in a world where fast change is a requirement to maintain global competitiveness. It is the human element of any change that will act as a catalyst to promote successful and sustained performance improvements in the long term (Curatolo, Lamouri, Huet & Rieutord, 2015). Consequently, this study assesses the impact of BPR on labour productivity.

3.2. BPR as radical change

BPR is a radical change, rather than an incremental change. Suárez-Barraza and Smith (2014) explain that re-engineering is about rejecting the conventional wisdom and receive assumptions of the past. It is the search for new models of organising work. Similarly, Dekker (2018) advocates that the radical change objectives of 5% or 10% improvement in all business processes each year must give way to efforts to achieve 50%, 100%, or even higher improvement levels in a few key processes. It is the only means of obtaining the order-of-magnitude improvements necessary in today's global marketplace. The existing approaches to meeting customer needs are so functionally based that incremental change will never yield the requisite interdependence (Curatolo et al., 2015). One reason the change in BPR is radical rather than incremental is "to avoid being trapped by the way things are currently done" (Lemańska-Majdzik & Okręglicka, 2015). Dr Robinson of IBM in United Kingdom highlights rapid Information Technology (IT) innovation and increasingly intensive global competition as two main reasons organisations have had to consider the introduction of radical change (Sundberg, 2013). Chai (2014) concludes that the radically re-visioned processes do drive the *shape* of the organisation, rather than current *structures*. Even though such radical changes are not limited to internal processes, one organisation can forge with other organisations that generate new views of an organisation (Lemańska-Majdzik & Okręglicka, 2015).

The radical changes facilitated using the BPR methodologies in the organisation are not limited to internal re-orderings (Sundberg, 2013). Links can be forged with other organisations even though they are competitors. This leads to a view of the organisation as a *fluid mix of interests* rather than a fixed entity. It is recognised in BPR literatures that advances in technology bring opportunities that were difficult to imagine before the technology has been created (Chai, 2014). There is a sense of innovatory solutions looking for problems and the exploitation of unexpected consequences that cannot be predicted by a purely conceptual approach. At its best, BPR can be seen as a mix of *conceptual thinking* and *practical experience* gained through creative experimentation (Dekker, 2018).

3.3. Business performance during BPR

Managing performance of a re-engineered organisation plays an important role for two main reasons (Chai, 2014). First, the new value systems and the new roles of people will translate into new skills and changed accountabilities. A new system to measure employee contribution can be used as a driver to motivate employees and encourage high levels of performance from employees. Secondly, in a re-engineered organisation there will not be the same typical boss and subordinate relationship, but the employee will be a member of teams or workgroups made up of peers from inside (and occasionally outside) the organisation (Tang et al., 2013). In designing a new system to measure all aspects of employee performance, management must be aware of the limitations of human performance (Verdouw et al., 2011). Humans react to changes in organisation structure with high levels of stress. The fear of personal loss, uncertainty and loss of control are the specific factors that contribute to these stresses. The fact that BPR will cause dramatic changes to organisational structure, the human reaction towards these changes must be carefully planned and monitored (Smart, Maddern & Maull, 2009). Management must be sensitive to the range in stress and performance for each job classification and individual, so that performance at all levels of employees can be maximised without unnecessary levels of job stress during BPR. Consequently, the following sub sections discuss variables that play a role in BPR. These include the human element and process improvement.

3.3.1. The human element

People should be the focus of any successful business change (Curatolo et al., 2015). Thus, BPR is not a recipe for successful business transformation if it concentrates only on computer technology and process redesign. In fact, many BPR projects have failed because they did not recognise the importance of the human element in implementing BPR. The re-engineering business processes should be more efficient and cost-effective in order to compete in today's global marketplace leading to the survival of most companies (Pedraza-Acosta et al., 2016). However, understanding the people in organisations, the current company culture, motivation, leadership and past performance is essential to recognise, understand and integrate into the vision and implementation of BPR. If the human element is given equal or greater emphasis in BPR, the odds of successful business transformation increase substantially (Tang et al., 2013).

BPR aims at the change in the organisation that is for the best. However, as BPR is a radical rather than incremental change, it is not surprising that 'resistance to change' has been identified as a major barrier to the success of BPR (Sundberg, 2013). Dekker (2018) indicates that to avoid this situation, many companies try to introduce Total Quality Management (TQM) prior to BPR for the reason of less resistance to change. Consequently, Suárez-Barraza and Smith (2014) indicate that "you cannot do re-engineering without an environment of continuous improvement or TQM". BPR can only work when those in the company who have to work with the new design have a role in creating it, and thus support such changes.

3.3.2. Process improvement

Process improvement involves the analysis of existing processes and suggestions for change. Dekker (2018) believes that process improvement need not be radical. A process can be corrected, simplified or re-engineered. Typically, all three factors are used along the path of a process. Smallest in scope is process correction. Correction involves returning the process to traditional levels of performance. Simplification involves streamlining the existing process (Dekker, 2018). If analysis of the process calls for removal of one or more steps, simplification is being used. Thus, re-engineering involves radical changes to the existing process. It forces a change in the team's thought processes. They have to rethink the way a job is currently done. The use of brainstorming techniques are key to successful process improvement (Curatolo et al., 2015). Hence, the next section discusses the participative BPR.

3.4. Participative BPR

BPR will not be successful without the support and active participation of the people (Curatolo et al., 2015). Even after all persons agree to go with BPR, it is still a hard task for everyone to carry on. According to Sundberg (2013), the BPR process is a 'walk in the fog' because of the difficulty involved in reaching agreement among many stakeholders about the current situation and future needs. Suárez-Barraza and Smith (2014) indicate that an important question in all programmes for change is "what is required to bring about changes on how people relate to each other?" This suggests a reason for the high rate of failure of BPR, as it is not possible to change relationships without working within them. The IT tools and techniques chosen for BPR can only be the starting point. However, the change will not be successful without people's learning, participation and adaptation in order to understand the requirements and processes and then take responsibilities for such change (Chai, 2014). According to Tang et al. (2013), business processes are purposeful processes, in the sense that they are people-controlled and subject to human behaviour. Dekker (2018) has a similar viewpoint. Each business process has some inputs and outputs. They identify the outputs as a combination of people and task outcomes. The inputs are the combination of people and task preconditions. Thus, business processes rely on the interaction of their participants. Hence, BPR is people-centred and driven by business needs since people have the ability to decide the value of the redesigned process according to their understanding and objectives. As Chai (2014) advocates, administrative systems involving people should not be re-engineered but participatively re-designed. Such a participative approach respects the culture and social context of an organisation. This is due to the fact that BPR should ensure that the redesigned processes fit the organisational context and are acceptable to their people. This demands a high degree of communication and evaluation. Participative BPR is similar to one main theme of TQM: *employee involvement* (Pedraza-Acosta et al., 2016). This aims to involve persons from all levels of an organisation in problem-solving techniques. The difference is that the improvements of TQM are generated bottom-up whereas BPR is commonly viewed as a top-down solution imposed by management. However, the participative BPR, which combines both top-down and bottom-up, provide a comprehensive and shared understanding of current processes. It is a method that allows progress from the present situation to meet the demands of the future. As a result, this study explores the suitability of BPR as an appropriate strategy for labour productivity improvement in the automotive assembly organisation in South Africa.

Hypothesis

The study is based on the following assumption:
H1: The implementation of the BPR leads to labour productivity improvement in the automotive assembly organisation.
H1o: The implementation of BPR does not lead to labour productivity improvement in the automotive assembly organisation.

The following are sub-hypotheses:
H2: An increase in the overtime rate increases labour productivity in the automotive assembly organisation.
H2o: An increase in the overtime rate decreases labour productivity in the automotive assembly organisation.
H3: An increase in the spoilage rate increases labour productivity in the automotive assembly organisation.
H3o: An increase in the spoilage rate decreases labour productivity in the automotive assembly organisation.

4. Methodology

The method for this research will be discussed under the following headings, namely: research design and approach, the company that participated in the study, data collection, as well as the measurements and data analysis.

4.1. Research design and approach

This study was quantitative in nature. It examines the relationship of labour productivity as a dependent variable to overtime and the spoilage rates. Bryman and Bell (2007) explain that the quantitative approach involves the use of statistical procedures to analyse the data collected. Consequently, after the measurements of the relevant variables, the scores were transformed using statistical methods. In addition, the study adopted a panel data analysis. According to Curwin and Slater (2002), panel data analysis is the statistical analysis of data sets consisting of multiple observations on each sampling unit. It contains more degrees of freedom and less multicollinearity than cross sectional data thus improving the efficiency of econometric estimates (Bryman & Bell, 2007). For this study, the pre-and post-BPR data that were collected overtime from the automotive assembly organisation were analysed using the regression model. The study was also conclusive in design. Conclusive studies are meant to provide information that is useful in decision-making (Yin, 2008).

4.2. Company that participated in the study

A convenience sample from one large automotive company situated within the eThekwini District Municipality in the province of KwaZulu-Natal in South Africa was used. The company that made radical changes on its processes, agreed to participate in the study. During the period prior to the radical change, 19.7% of the total vehicle units per week were bypassing the production process into the assembly repair division. This resulted to an increase in units with defects. This includes scratches, electric defects, poor paintwork, as well as the rejected parts fitted on them. Other vehicle units that ranged from 17.3% to 37.9% per week entered into the assembly repair division with missing parts. During this period, the paint, assembly and body shop repair sections were separate areas. Considering the extent of the problem by management, these different processes were integrated. The strategy was expected to improve labour productivity on its blue-collar employees whose jobs require manual labour. Hence, the impact of radical change to labour productivity was investigated. The company has 1207 employees. It operates a three-shift system. Table 1 presents a percentage breakdown of employees in terms of their level of activities.

Level of activity		Percentage
1.	Plant management	2.3
2.	Support administration staff	7.5
3.	Team leaders	5.5
4.	Line functional employees	84.7

Table 1. Percentage breakdown of employees in terms of their level of activities
Source: author's own analysis

4.3. Data collection

The collection of data from a single company that participated in the study was carried out in two phases, that is, the collection of pre- and post-BPR results by a quality control team leader from the operational records of the assembly plant. The data for overtime and spoilage rates were kept on the System, Applications and Products (SAP) version 6.0 data management programme. The collection of such data over time provided a greater capacity for capturing the complexity of BPR changes than using the one group post-test design that involves the collection of only the post-data after the changes have been implemented resulting to threats in internal validity (Bryman & Bell, 2007). The validation of data from SAP programme were done by the researcher. This was achieved by comparing data from SAP with the documented data kept on files for accuracy.

The pre-BPR results were quarterly data reflecting the company's performance over the three-year period prior to BPR changes. This includes data from the first quarter of 2013 to the final quarter of 2015. The post-BPR data reflect the company's performance for three years after BPR was implemented. This includes data from the first quarter of 2016 to the final quarter of 2018.

4.4. Measurement and data analysis

The company's quarterly time-series data on overtime and spoilage rates were used. The measurements were based on a total of 72 observations. According to Westland (2010), there is no rule regarding the minimum number of observations for a balanced data panel. However, 50 observations are acceptable but more than 100 is recommended (Bryman & Bell, 2007). The regression model used was of the Ordinary Least Square (OLS) variety. The choice was influenced by data constraints. However, the model provided the statistical method that enabled the researcher to examine the relationship between the variables effectively.

A dummy variable which assumed the value of 0 and 1 to represent the pre- and post-BPR, respectively, was introduced into the ordinary least squares (OLS) model. The aim was to isolate the pre- and post-productivity effects. Consequently, if BPR proved to be a useful strategy in raising productivity levels, this would result in a statistically significant coefficient on the dummy variable.

The OLS model used was as follows:

Labour Productivity = B_o + B_1 *overtime* + B_2 *spoilage* + B_3 *Pre- and Post-Dummy*

where B_o *is the constant*
B = coefficient of the independent variables

The above model identifies labour productivity as a function of overtime and the spoilage rates, as well as the BPR strategy.

Data was analysed using Statistical Package for Social Sciences (SPSS) version 25. It enabled the BPR data that was obtained, quarterly, over the multiple period of time from the same company to be appropriately analysis. Hence, the results provided the unbiased estimations (Yin, 2008). Furthermore, the OLS was based on the fixed effects model. The fixed effects is a statistical model in which the model parameters are fixed (that is, non-random quantities) (Curwin & Slater, 2002). Consequently, the variables were collected, quarterly, from the first quarter of 2013 to the last quarter of 2018 from the same company. For this study to achieve its objective, the normality test was conducted using Kolmogorov-Smirnov and Shapiro-Wilk for the overall score of the constructs. Table 2 present results for normality tests for overtime and the spoilage rates.

	Kolmogorov-Smirnov[a]				Shapiro-Wilk		
	Group	Statistic	df	Sig.	Statistic	df	Sig.
Overtime rate	0	0.185	12	0.200*	0.843	12	0.082
	1	0.143	12	0.200*	0.961	12	0.814
Spoilage rate	0	0.254	12	0.200*	0.880	12	0.189
	1	0.137	12	0.200*	0.966	12	0.847

*, This is a lower bound of the true significance
a. Lilliefors Significance Correction

Table 2. Normality tests for overtime and spoilage rates
Source: author's own analysis

Statistical tests indicate that the data were normally distributed (p>0.05). Hence, the results were analysed using parametric tests, that is, the t-tests.

5. Study Results

This section presents results for pre- and post-BPR means comparison, as well as labour productivity.

5.1. Pre- and post-BPR means comparison

Table 3 compares the means (in percentages) of overtime and spoilage rates.

No.	Variable	Pre-BPR period (%)	Post-BPR period (%)	Mean difference (pre-post) %
1.	Overtime rate	24.42	22.58	+1.84
2.	Spoilage rate	54.75	53.75	+1.0

Table 3. Pre- and post-BPR percentage means comparison
Source: author's own analysis

Table 3 indicates that the percentage mean data for pre-BPR on overtime and spoilage rates are 24.42% and 54.75%; respectively. In addition, the percentage mean data for post-BPR on overtime and spoilage rates are 22.58% and 53.75%; respectively. The results shows a decrease in mean values for both variables (that is, the overtime and spoilage rates) when post-BPR is compared with pre-BPR periods. This indicates an influence of BPR on labour productivity.

5.2. Labour productivity results

Table 4 presents the results for labour productivity as a dependent variable to the overtime and spoilage rates, as well as post-BPR dummy.

Regression	Coefficient	t-statistic	Probability
constant (B_o)	19.817	5.273	0.000
Overtime rate	0.780	2.427	0.025
Spoilage rate	-1.398	-4.115	0.001
BPR dummy	-1.031	-8.896	0.000
R-squared	0.861	F-statistics	29.580
Adjusted R^2	0.861	Sum of squares	4.896
Standard Error of regression	0.235	Durbin-Watson stat.	1.381

Table 4. labour productivity results for overtime, spoilage, as well as post-BPR dummy
Source: author's own analysis

Note: Regression data: 2013–2018 for 72 observations. The following OLS estimation is based on the equation:

Labour Productivity = $B_o + B_1$ *overtime* + B_2 *spoilage* + B_3 *Pre- and Post-BPR Dummy*

5.2.1. Labour productivity as a dependent variable to overtime rate

Table 4 shows that the overtime rate has a relationship and is statistically significant to labour productivity as shown by its t-value of 2.427 and the p-value of 0.025. The t-value is above the critical t-value of 2.015 at the 5% level of significance (Curwin & Slater, 2002) and the p-value is below the 0.05 level. The positive relationship indicates that any increase in the frequency of overtime rates resulting from radical changes in business, improves labour productivity.

5.2.2. Labour productivity as a dependent variable to spoilage rate

Results show that the spoilage rate has a relationship and is statistically significant to labour productivity. This is shown by its t-value of -4.115, which is above the critical t-value of 2.015 at the 5% level of significance. The p-value is also 0.001 and is below the 0.05 level. The negative relationship indicates that any decrease in spoilage rate would result in an increase in labour productivity.

5.2.3. Labour productivity as a dependent variable to BPR dummy variable

The results in Table 4 also show that BPR has a relationship and is statistically significant to labour productivity. This is shown by its t-value of -8.896, which is above the critical t-value of 2.015 at the 5% level of significance. The p-value is 0.000 and is below the 0.05 level. The negative relationship indicates that any reduction of the BPR activities improves labour productivity. This result discourages the frequency of BPR activities in the automotive assembly organisations for labour productivity improvement. It has an adjusted R^2 of 0.861, which implies that BPR explain approximately 86% of the variance in labour productivity. Furthermore, the serial correlation is also low at 1.381 when compared to the standard value of 1.73 at the 5% level of significance (Curwin & Slater, 2002).

6. Summary of Results: Statistical Tests and Box Plots

This section analyses data using factorial designs. It incorporates box plots to determine whether the factorial ANOVA assumptions of normality and homogeneity of variance have been met. Porkess (2005) explains that the populations represented should be normally distributed (that is, the normality), making the mean an appropriate measure of central tendency. However, the homogeneity of variance indicates that the population from which the data are sampled should have the same variance.

The Bartlett's test was used to verify whether the variances were equal for all the samples (Curwin & Slater, 2002). The following Figure 1 presents a summary of the results from the Bartlett's test for homogeneity of variances.

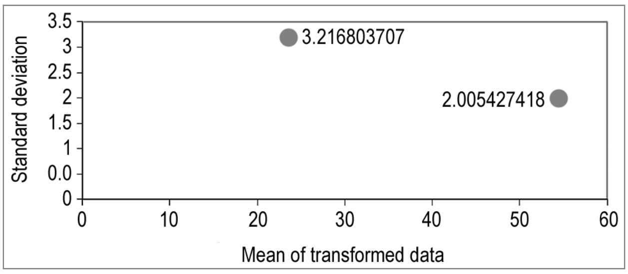

Figure 1. Bartlett's test for homogeneity of variances
Source: author's own analysis

Table 5 presents detailed results of Bartlett's test for homogeneity of variances for overtime and the spoilage rates.

Variables	Means of transformed data	Standard deviations of transformed data	P-Value
Overtime rate	23.5	3.217	0.001
Spoilage rate	54.25	2.005	

Table 5. Bartlett's test for homogeneity of variances
Source: author's own analysis

The p-value in the Bartlett's test (at $p<0.05$) shows that a homogeneity of variances has occurred thus rejecting the null hypothesis. The p-value at 0.001 is low when compared with the significant level of 0.05. It can be concluded that there are distribution changes between the two parts of time-series. This is confirmed by Levene's test of equality shown in Table 6.

F	T	Sig.
16.549	4.006	0.000

T*able 6*. Levene's test of equality
Source: author's own analysis

Note:
Fisher-Snedecor (F); t-statistics for equality of means (T); significant (sig)

Porkess (2005) defines Levene's test of equality as an inferential statistic used to assess the equality of variance on different samples. In Levene's test of equality, the statistical procedure assumes that variances of the populations from which different samples were drawn are equal. Consequently, the results in Table 5 shows that the obtained similarities between the variances in the samples for pre- and post-data at p-value 0.001 have occurred. They are below the statistical significant level of 0.05. The results are confirmed by box plots in Figure 2.

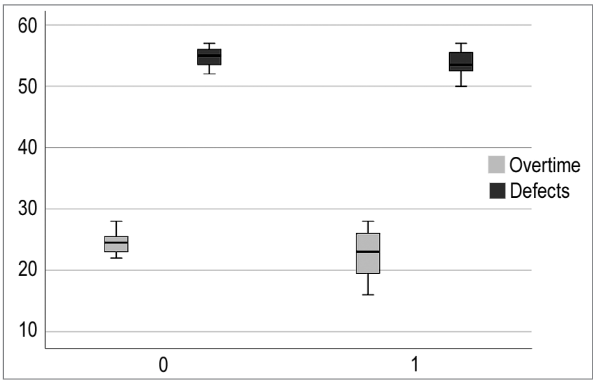

Figure 2. Box plots determining the normality and homogeneity of variance
Source: author's own analysis

Figure 2 shows that the mode of change from pre-to post-BPR period is homogeneous. Box plots indicate a similar spread of BPR results. Statistical tests suggest that the conditions for homogeneity of variances between the pre- and post-BPR have been met.

7. Discussions

This study investigates the impact of BPR on labour productivity in the automotive assembly organisation in South Africa. It examined the production and related experiences of the automotive assembly organisation that has adopted a BPR within its processes. Quarterly time-series data on overtime and spoilage rates were used to analyse data.

According to Verdouw et al. (2011), the proven success of any business is getting people to perform efficiently together. Thus, the true benefit of BPR (if implemented successfully) will be in the human element (or the people) and not solely on the processes. Hence, the results indicate that overtime and spoilage rates have a relationship to labour productivity in the automotive assembly organisation in South Africa (after the radical changes were implemented). Any increase in the frequency of overtime, results in an improvement in labour productivity. On the other hand, any decrease in spoilage rates results in an increase in labour productivity. It must also be noted that Tang et al. (2013) indicated that management use BPR strategies to increase productivity of workers.

8. Implications of Results for Policy and Practice

The automotive sector in South Africa should assess their performance and implement structural changes that help achieve new business goals (Dekker, 2018). These includes organisation's hierarchy, chain of command, job structure and the administrative procedures. Hence, BPR is people-centred and driven by business needs since people have the ability to decide the value of the redesigned process according to their understanding and objectives (Chai, 2014). Thus, the assessment of business performance must be based on an understanding of the economic factors affecting labour productivity. Besides the achievement of study objectives, the following conclusions can be made about the BPR strategy:

1) It is the strategy that discovers the most efficient methods of performing work.
2) BPR has the ability to improve labour productivity.
3) It is a people's centred approach driven by business needs (Dekker, 2018).

9. Study Limitations

The study was limited to an automotive assembly organisation situated within the eThekwini District Municipality. The investigation was conducted in a single company that has adopted the BPR strategy. As there are eight registered assembly companies in South Africa (SAinfo, 2018), the results cannot be extrapolated to other companies within the sector. Secondly, it did not examine the process followed during the BPR implementation including (amongst others) the individuals that participated in the radical change process. It only used quarterly time-series data to determine the pre- and post-labour productivity effects resulting from BPR strategy. Lastly, the econometrics model used was of the OLS variety, solely due to data constraints. Future studies ought to use the more advanced Johansen VAR methodology or panel data analysis, both of which rely on large datasets.

10. Conclusion

Business Process Reengineering (BPR) creates a working environment that encourages worker participation and commitment. Properly implemented and managed, the system results in labour productivity improvement. The fact that BPR will cause dramatic changes to organisational structure, the human reaction towards these changes must be carefully planned and monitored (Smart, et al., 2009). Management must be sensitive to the range in stress and performance for each job classification and individual, so that performance at all levels of employees can be maximised without unnecessary levels of job stress during BPR. However, BPR has the ability to create a situation where employees have the capabilities to solve organisational problems (Tang et al., 2013).

11. Future Research Required

During the course of this study, issues relating to the long-term survival of the BPR strategy were not covered. These include the applicability of BPR to a wider sector of the economic activity, including the public sector. The nature of this research did not allow these areas to be covered in depth. It is recommended that future research should examine the following issues in greater depth:

- when to use and when not to use the BPR strategy;
- the use of the BPR approach to other industrial sectors;
- the process followed during the implementation of the BPR strategy;
- a more comprehensive investigation should be carried out using a randomised sample of the registered automotive manufacturers that use BPR strategy, to see if the results can be generalised; and
- the levels of change on employee stress and the quality of work life.

This study investigated the impact of BPR for the improvement of labour productivity in the automotive assembly organisation in South Africa. The pre- and post-BPR quarterly data from company records were collected. It established that BPR has a relationship with labour productivity. It improves cost efficiency and service effectiveness.

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