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A Comparative Analysis of Two Quantitative Studies

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Abstract

The methodologies and design of two quantitative research articles were compared in terms of their adoption of parametric and non-parametric statistical approaches. The yardsticks used for the comparison were: normal distribution of data, reliability test, validity test, and method of testing hypothesis. The subject area of the articles was human resources management with focus on employee turnover intentions. In the end, it was observed that both articles have employed nonparametric statistical approach. This is because, they did not ensure normal distribution of data and test hypothesis or present findings in parametric manners. They have only ensured reliability and validity using parametric methods and these are not enough to classify their analysis as parametric. The shortcomings of the articles were also noted. Article 1 failed to use theory to guide their choice of literature, formation of hypothesis, and data analysis. In fact, there were no hypothesis to guide the study. Article 2 had enough and well-balanced data to opt for parametric analytical approach, however, it failed to do so. Some recommendations were made. It was advised that the analytical approach of Article 1 should remain nonparametric and should formulate theory and hypothesis to guide the study. It was also advised that Article 2 should adopt parametric statistical approach because it has enough and balanced data to do so. This is because non-parametric approach is not a substitute but an alternative to parametric approach.

Section 1

Introduction

This report compares the analytical approaches of two quantitative research articles chosen from the fields of Human Resources Management and Employment Studies, and the subject of focus is employee turnover intentions. The links to the articles are found in appendix 6.

Article 1 investigates how employee psychological and structural empowerment can influence turnover intentions in a mining organisation in South Africa where employers found it difficult to retain staff for long. The authors described structural empowerment as the ability of the organisation to provide growth opportunities, adequate information, enough work resources, healthy work relationship in the workplace and support for the employees. Psychological empowerment includes extrinsic motivation in forms of meaning, confidence, self-determination, and impact. Data were collected from 371 respondents in a single mine over the period of three months through paper-based questionnaires. Purposeful sampling was used to select the respondents and statistical analysis were done. In the end, it was revealed that employees who experienced formal power were less likely to leave the organisation, while those who experienced less formal power, or informal power are more likely to have turnover intentions. Article 2 explores how organisational commitment and offerings can determine employee job satisfaction which in turn determine employees' normative, affectional and continuance commitments. Data were got using questionnaires from 654 respondents in different occupations and in different hospitals in the depressed economy of India which was characterised by an unemployment rate of 194% at that time. Statistical analyses were done, including measuring the CFA fit for intrinsic and extrinsic factors of job satisfaction. The path coefficients for intrinsic and extrinsic factors revealed that both intrinsic and extrinsic factors yielded job satisfaction, but the extrinsic ones yielded more and can reduce intention to quit. It was concluded that if job contents and contexts are favourable, employees always have the moral obligation to reciprocate by remaining with the organisation.

The quantitative research features to examine in the articles are their use of parametric and nonparametric approaches. In addition, this report states the shortcomings of the articles in terms of meeting standard research practice. Section 1 introduces the focus of each section and the rationale for choosing the journal articles under investigation. Section 2 covers discussions on design and methodologies focusing on parametric/nonparametric analytical approaches. These are followed by conclusion/recommendations, bibliography, and appendixes.

Rationale for the Choice of Journal Articles

The selection of the articles was guided by the recommendations found in the Chartered Association of Business School Academic Journal Guide, 2021. From the fields of Human Resources and Employment Studies, two journals which rated 1* were selected. They were *SA Journal of Human Resources Management* from which was obtained the journal article titled ‘Investigating the Effects of Employee Empowerment on Turnover Intention in a Mining Organisation’ by Ngqeza and Dhanpat, (2021, Article 1); and *Journal of Work-Applied Management* from which was got ‘The Relationship among Job Characteristics Organisational Commitment and Employee Turnover Intention: A Reciprocation Perspective’ by Ahmad (2018, Article 2). Both journal articles were accessed through the UWTSD online library database.

Human resources management (HRM) activities include employee recruitment, training and development, motivation, and maintenance and its aspect that ensures employee retention is ‘maintenance’ which strives to create an enabling culture in the work environment for employees to remain for long and not leave (Torrington, 2020; Boon, Den Hartog and Lepak, 2019). Employee turnover is the number of employees who voluntarily leave an organisation over a period, and this has become one of the biggest challenges of human resources management in many contemporary organisations (Tews, Michel and Stafford, 2019).

It has been observed that employee turnover does not only cause reduced service quality but also loss of talents and requires a lot of funds to recruit and train new employees (Lee, 2018; Torrington, 2020). To assuage employee turnover, employers, over the years have made deliberate efforts to fathom and resolve the factors in the workplace which can make employees to develop turnover intentions (Sabharwal, et al., 2019; Coetzee and van Dyk, 2018). In addition, there has been a lot of research which investigate the factors which can influence turnover intentions in the work environments. For instances, Simha and Pandey (2021) have observed that benevolent and principled ethical work environment can enhance employees’ trust for an organisation and reduce turnover intentions. In addition, Caillier (2021) has observed that workplace aggression can increase turnover intention among employees. Moreover, Al Muharraq, Baker and Alallah (2022) have stated that workplace bullying, if not controlled, can cause turnover intentions among employees. Similarly, the authors of article 1 have observed that employee structural and psychological empowerments can determine turnover intentions and article 2 suggests that employee turnover intention is a sure response to the level of job satisfaction offered by an organisation through commitment to the overall

wellbeing of employees. The section that follows compares the quantitative features of the journal articles.

Section 2

Discussion on Quantitative Research Design and Methodologies: Parametric and Nonparametric Analysis

There are three research approaches namely qualitative, quantitative, and mixed methods (Creswell, 2014; Waters and Waters, 2011; Dawson, 2017 Maxwell, 2019). Qualitative research examines the ‘quality’ of phenomena which could be the concepts of people’s thoughts or experiences, and these are conveyed using words; quantitative research collects and analyse data which can be counted or measured in quantities and reports them numerically or graphically; mixed methods research combines some components of qualitative and quantitative methods (Byrne, 2002; Jose, 2017; Creswell, 2014; Morgan, 2018). Parametric and nonparametric are analytical approaches used as statistical testing procedures in quantitative research. Normally, to discover the truth about a population, the researcher collects data from a sample which comprises the features of the target population, as it is not always possible to go round the entire population; parametric approach makes assumptions about the normal distribution of the sample of the target population by studying and estimating parameters such as means, standard deviations and proportions to ensure that data is normally distributed while nonparametric approach does not bother to do so because it does not need assumptions and its data are usually collected from samples which does not adhere to any specific distribution strategies (Swift and Piff, 2014; Hopkins, Dettori and Chapman, 2018; Yavuz and Utku, 2021; Hoskin, 2012).

Nonparametric tests are used when the requirements for parametric tests are not met such as when the available data does not represent all the assumptions or features of the target population and when the sample size is small and where there is no clear numerical interpretations; nonparametric tests are thought to be simpler in application, more robust and less likely to give rooms for misinterpretations than parametric tests; and adopting nonparametric tests is not the absence of some parametric features. (Opote, 2021; Field, 2005; Stuart, Ord and Arnold, 1999; Pearce and Derrick, 2019). In other words, parametric approach has more statistical power than nonparametric approach. The other ways to demonstrate parametric approach, in addition to normal distribution of data are: reliability test which is presented in form of standard deviation, mean values, and Cronbach Alpha; validity test which

is achieved by using Factor Analysis; and the methods used for hypotheses testing – parametric uses methods such as T-test, Z-test, F-test, Anova and so on while nonparametric uses chi-square, Mann-Whitney U-test, Kruskal-Wallis H-test and so on (Kaur and Kumar, 2015; Hopkins, Dettori, and Chapman, 2018; Opute, 2009; 2021). Therefore, the statistical features employed to underpin the comparison of articles 1 and 2 are normal distribution of data, reliability test, validity test, and methods of hypotheses testing.

Normal Data Distribution

Normal distribution analysis can be viewed on diagrams such as histogram and box plot, QQ plot, and by checking the p-value in Kolmogorov Smirnov test, Lilliefors test, and Shapiro Wilk test bearing in mind that if the p-value is less than 5, there is no normal distribution, and if it is 5 and above, there is normal distribution (Field, 2013; Argyrous, 2011; Patel, 2021; Opute, 2009; 2012).

Article 1

Out of the 371 respondents used for this research, 276 (74.40%) are men while 282 (25.60%) are women. In this case, the ratio of men to women is not balanced. If this is plotted on a histogram, for instance, the shape of the data will not align well within the bell shape curve as it is supposed to. It can be inferred that the majority of those who could not speak English and were exempted were women. This is because, in Africa, not all women have the opportunity to be formally educated (Uduji, Okolo-Obasi, and Asongu, 2020). Therefore, it can be concluded that sample choice for this study does not represent the true characteristics of the target population, and this is acceptable in nonparametric approach as noted above.

Article 2

Like article 1, the author of article 2 has also failed to ensure normal distribution of data. This is because none of the methods of displaying normal distribution mentioned above was mentioned anywhere in the article. In addition, the author failed to state the ratio of the sex, ages, and other vital information about the respondents. Therefore, the only characteristics of the target population depicted in this study is that the respondents were hospital employees, and the author did state that he tried to make the sample represent the entire human capital employees in different hospitals. He also stated that an appropriate method was used to select the number of respondents from each hospital but failed to describe the method. All these shortcomings are also acceptable in nonparametric tests.

It is obvious that the authors of both articles did not bother to present any analyses to depict normal data distribution. Therefore, in terms of normal distribution, both articles are classified as nonparametric.

Reliability Test

As mentioned above, some of the ways an author can ensure reliability are by calculating the Cronbach's Alpha, mean value, and standard deviation.

Article 1

An acceptable Cronbach's Alpha range is 0.7 and above (Emerson, 2019; Field, 2013; Swift and Piff, 2014). A closer look at the statistical analyses of this article 1 (details in appendix 1) shows that the authors have achieved Cronbach's Alpha ranges which are above 0.7 and which shows internal consistency

Article 2

Standard deviation was used to calculate allowance error in the target population. It can be concluded, therefore, that the author of this article ensured the reliability of sample size and sample method. They could make the reliability stronger by calculating the variance and Cronbach's Alpha too.

In terms of reliability, both articles have used parametric methods.

Validity Test

As stated above, to ensure a satisfactory validity, factor analysis can be carried out to confirm factor loading, inter-item correlation coefficients, explained variance, Eigenvalue, Determinant significance and so on (George and Mallery, 2013; Huck, 2013; Pallant, 2013; Watkins, 2018).

Article 1

The authors of this article employed some inferential statistical measures among which is correlation coefficient analysis to ensure validity, and this is presented in appendix 2. The analysis clearly shows that there is a correlation between longer work experience and psychological empowerment.

Article 2

The CFA fit indices for both intrinsic and extrinsic factors of job satisfaction were calculated and reported to fall within the normal ranges. As presented in appendix 3, the factor loading of

the items tested ranged between 0.55 and 0.98 which looks satisfactory too as above 1 or below 0.4 is not satisfactory (Field, 2005; George and Mallery, 2013; Huck, 2013; Pallant, 2013). In summary, there exists a satisfactory validity test because the measuring tool fits the data perfectly.

To ensure validity, both articles have adopted the parametric means.

Hypothesis Testing

As mentioned above, the way hypotheses are tested can determine whether quantitative research is parametric or not. As also stated above, parametric uses methods such as T-test, Z-test, F-test, ANOVA and so on while nonparametric uses chi-square, Mann-Whitney U-test, Kruskal-Wallis H-test and so on. Sedgwick (2012) and Argyrous (2011) have observed that hypotheses testing can also be presented using Pearson's Correlation for parametric and Spearman's rank correlation coefficient for nonparametric tests.

Article 1

There are neither hypotheses nor research questions to guide the study in this article. This is very unusual because, hypotheses provide a link to the guiding theories and research questions (Farrugia, et al., 2010; Durbin, 2004; Cilluffo, et al., 2020; Salehi, et al., 2018). However, as a substitute for hypotheses, this report wishes to examine how the findings of this article are presented or summarised. One of the approaches used to summarise findings in this article is the Spearman's rank correlation coefficient (details in Appendix 4) which explains that though the employees of the mine accepted that there exist structural empowerment avenues, some of them do not have access. In addition, the employees who perceive formal power are less likely to leave the organisation, while those who perceive less formal power or informal power are less likely to remain.

Another way to test hypotheses or summarise findings and which is found in this article is T-test (details in appendix 5) used to compare the experiences of men and women in terms of structural empowerment and psychological empowerment as they relate to turnover intention. The test revealed that gender did not determine the employees' access to formal and informal powers; women perceived less psychological empowerment; and there is no significant difference between the scores of men and women who want to leave the organisation.

Article 2

This article has got a hypothesis to guide the study, and which is well tested at the end using structural equation model (SEM). Interestingly, SEM is not listed among the common methods of testing hypotheses in parametric statistics some of which are listed above. A forage into the literature revealed that SEM can be found in both parametric and nonparametric statistics but in different forms – while covariance SEM (CB-SEM)/full SEM is found in parametric, variance-based SEM or partial least square-SEM is found in nonparametric tests (Mohamad, et al., 2019). The researcher has failed to state the form of SEM adopted, however, whichever has been adopted cannot qualify this article as parametric as it has not adopted the parametric method of normal distribution. Therefore, in this report, this article can be regarded as nonparametric in terms of hypotheses testing, even though it did not also adopt the common nonparametric hypothesis testing methods listed above. This is because, nonparametric testing does not follow any fixed model, and this explains why Pearce and Derrik (2019) note that it is a violation of parametric tests.

Based on the explanations given above, in terms of hypotheses testing, the two articles are classified as nonparametric, even though article 1 used T-test to present finding in addition to a nonparametric method.

From the foregoing, it is obvious than none of the articles is qualified to be classified as parametric based on their statistical analytical procedures. They did not prove normal distribution of data, and this is the primary criterion in parametric approach. Secondly, they failed to solely adopt parametric methods to test hypotheses or summarise findings. They have only adopted parametric methods to ensure reliability and validity, and these have affirmed that adopting the nonparametric method does not exclude some features of parametric approach.

Shortcomings of the Articles

As it stands, the authors of both articles have adopted the nonparametric approach which is not expected to follow any fixed pattern or model as it is in parametric approach. However, article 1 has failed to formulate hypotheses or research questions to guide the study and it has been observed in literature that in both parametric and nonparametric approaches, hypotheses are needed, and which are tested though in different ways as pointed above. In addition, the fact that its data are obtained from only one organisation and the data are not normally distributed, cannot not be considered as shortcomings, instead, they qualified its statistical approach as

nonparametric. However, these issues can make it difficult for its findings to be reasonably generalised to other mining organisations or the entire mining industry in this country.

On the other hand, the statistical analyses of article 2 would have been better carried out using parametric approach. This is because, it did not only have a relatively large data, but also for the fact that data were collected from different occupations and in many hospitals in the country. In addition, it was stated that the data for this research were collected using a standard method and they represented the entire human capital. It can be inferred, therefore, that age, gender, location, and other important factors were considered. What then prevented the researcher from adopting parametric approach? Also, why did the researcher not state the ratio used to balance gender, age and other vital information about the participants? These could be due to insufficient statistical knowledge on the part of the researcher. These issues are important as nonparametric is not a substitute to parametric approach but an alternative where where normal distribution of data cannot be achieved and, not in this case.

Moreover, the author of article 2 has done well to have formulated a hypothesis to guide the study. However, although the number of hypotheses in research may depend on the nature of the study and there no fixed number of hypotheses research should have, it is advised that quantitative research should have at least, two hypotheses, one null and one alternate to ensure statistical significance. Statistical significance is needed to prove that the findings of the research is not based on mere chances but on facts and it is always achieved when the null hypothesis is rejected in favour of the alternate one, because, if the alternate one is rejected for the null one, then the research has no value (Griffiths and Needleman, 2019; Andrade, 2019).

Conclusion and Recommendation

The aim of this report was to compare the quantitative methodologies and design of two journal articles in terms of parametric and nonparametric statistical approaches. Two quantitative articles were chosen from journals which rated 1* from the field of human resources management with focus on employee turnover intentions. It was noted that employer can utilize employee turnover intentions to find out the factors in the workplace which can cause employee turnover and resolve them because, employee turnover can result in production crisis and failure of an organisation. Article 1 studied the impact of employee empowerment on turnover intention among employees in a mine in South Africa. Article 2 examined the impact of organisational commitment on employee turnover intentions in some hospitals in India.

The parametric yardsticks used to evaluate the articles were normal distribution, reliability test, validity test and method of testing hypotheses. It was observed that both articles employed nonparametric approach in their statistical analyses. This is because, they did bother to present any statistical means of ensuring normal distribution in their analyses. In addition, both articles employed nonparametric methods of testing hypotheses/summarise findings. The authors of both articles have used parametric method to ensure reliability and validity which are not enough to qualify their analytical approach as parametric. The shortcomings of the articles have been identified, and it is therefore pertinent at this juncture to recommend how their analytical approaches can be improved to meet standard research practice.

Article 1, as mentioned above, has used non-parametric analytical approach and it is advised it should not be changed to parametric. This is because, its data is relatively small, got from only one organisation and the ratio of gender is not balanced, therefore, it does not qualify for parametric analysis. In addition, hypotheses need to be formulated and tested to guide the study. Also, a theory needs to be sought to direct the study especially in the formulation of hypothesis or research questions.

Article 2 should adopt parametric approach instead of non-parametric approach. This is because, its data is large enough and it was got from many and different occupations and hospitals. It should also adopt a parametric method of testing hypothesis or state clearly the type of SEM it has adopted. Furthermore, it should formulate a null hypothesis in addition to the alternate one it has got, and state clearly whether the null one was rejected so that its readers can understand that its findings are significant and not by chance or luck but based on fact.

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Appendixes

Appendix 1: Proof of Cronbach's Alpha in article 1.

Descriptive statistics

The descriptive analysis for structural empowerment, psychological empowerment and turnover intention is presented (Table 1). The mean scores for the items within the structural empowerment sub-dimensions ranged from 3.4 to 3.74. This may indicate that the employees in this study perceived that they did receive some structural empowerment in the workplace. Acceptable Cronbach's alpha coefficient values were achieved and ranged from 0.64 to 0.83, suggesting internal consistency. Acceptable Cronbach's alpha coefficient values of 0.64 were derived. Opportunity obtained a value is under 0.70, it was essential to assess the mean inter-item correlations to confirm internal consistency. According to Pallant (2010), measures that have a small number of items (under 10) are likely to yield lower reliability scores. Upon inspection of the mean inter-item correlation, the value achieved was 0.37, below the cut-off point of 0.40. The mean scores for the items within the psychological empowerment sub-dimensions ranged from 5.04 to 6.27. This may indicate that the employees in this study perceived that they are psychologically empowered in the workplace. Acceptable Cronbach's alpha coefficient values were achieved and ranged from 0.79 to 0.88, suggesting internal consistency. The mean scores for the items within the TIS ranged from 3.50 to 3.78, with an average mean value of 3.62. This suggests that employees disagreed slightly that they intended to leave the company. An acceptable Cronbach's alpha coefficient value of 0.86 was reported, suggesting internal consistency.

Appendix 2: Proof of Correlation Coefficient Analysis in Article 1

TABLE 5: Spearman's rank correlation coefficient of tenure on structural empowerment, psychological empowerment and turnover intention.

Variable	Psychological empowerment	Structural empowerment	Turnover intention
Spearman's rho			
How many years' work experience do you have?			
Correlation Coefficient	0.140**	0.058	-0.076
Sig. (2-tailed)	0.007	0.266	0.151
<i>n</i>	365	364	362

**, $p < 0.01$.

Appendix 3: Proof of Validity Test in Article 2: Factor Loading

Measures

Questionnaire method was used to collect the data for the study. A five-point Likert type scale was used for the sake of maintaining uniformity in measuring the variables. All the variables were measured with multiple-item scales, questionnaire item used to measure different constructs in this study are derived from the previously established studies. As such, multidimensional organizational commitment construct was measured using items drawn from Meyer and Allen (1991) scale. Job characteristics and employee turnover intentions scale was adapted from the study conducted by Ali Mohammad *et al.* (2008). The instrument used for the present study has universal application. Therefore the results thus produce are of universal significance. The reliability and validity of measurement tools for the study was established by the CFA.

The fit of CFA for intrinsic facets of job satisfaction model (Figure 1) was examined. The indices were as: value of $\chi^2 = 97.99$, $df = 41$, $\chi^2/df = 2.39$, GFI = 0.934, CFI = 0.952 and RMSEA = 0.046. Collectively, the results of CFA fit indices reveal that the model fits the data well. Thus the CFA model is accepted.

Measurement model for extrinsic facets of job satisfaction yield the following fit indices (Figure 2). The fit indices are as value of $\chi^2 = 273$, $df = 268$, $\chi^2/df = 3.29$, GFI = 0.912, CFI = 0.941, RMSEA = 0.059.

The questionnaire adapted to measure organizational commitment among the hospital employees was framed and specified in a conceptual model given in Figure 3. All the items of organizational commitment are indicators of a specific sub-constructs of affective commitment, normative commitment and continuous commitment. The total of 18 items in the organizational commitment measurement model is divided into the three sub-constructs, consisting of six items in each dimension. The items of all three dimension of organizational commitment had loadings within the range of 0.55 to 0.98, and the entire factor loading were statistically significant at $p < 0.005$. The results of CFA indicate that the model fits the data. χ^2 value = 404.3, $df = 130$, $\chi^2/df = 3.11$, specifically GFI = 0.914,

Appendix 4: Prove of Spearman's rank correlation coefficient in article 1

TABLE 4: Spearman's rank correlation coefficient of structural empowerment, psychological empowerment and turnover intention.

Variable	Turnover intention	Psychological empowerment	Structural empowerment
Spearman's rho			
Turnover intention			
Correlation Coefficient	1.00	-0.15**	-0.23**
Sig. (2-tailed)	-	0.00	0.00
<i>N</i>	368	368	366
Psychological empowerment			
Correlation Coefficient	0.15**	1.00	0.48**
Sig. (2-tailed)	0.00	-	0.00
<i>n</i>	368	372	369
Structural Empowerment			
Correlation Coefficient	-0.22**	0.48**	1.00
Sig. (2-tailed)	0.00	0.00	-
<i>n</i>	366	369	369

**, $p < 0.01$ level.

Appendix 5: Proof of T-test in article 1

TABLE 7: Independent-samples t-test: Gender on structural empowerment, psychological empowerment and turnover intention.									
Variable	Levene's test for equality of variances	Sig.	t-test for equality of means	df	Sig. (2-tailed)	Mean difference	Std. error difference	95% confidence interval of the difference	
	F		T					Lower	Upper
Psychological empowerment									
Equal variances assumed	3.497	0.06	2.65	368.00	0.008	0.28	0.10	0.07	0.48
Structural empowerment									
Equal variances assumed	0.007	0.93	1.78	365.00	0.075	0.15	0.09	-0.02	0.32
Turnover intention									
Equal variances assumed	0.069	0.79	-0.42	364.00	0.675	-0.10	0.23	-0.54	0.35

Appendix 6: Links to Articles

Article 1: <https://sajhrm.co.za/index.php/sajhrm/article/view/1564/2639>

Article 2: <https://www.emerald.com/insight/content/doi/10.1108/JWAM-09-2017-0027/full/html>