THE UNIVERSITY OF
WAIKATO
Te Whare Wānanga o Waikato

MANAGEMENT SCHOOL
Te Raupapa

WMS Assignment Cover Sheet

Family Name:	Budd Cousins Eynon-Richards Grant Yeoman	**First Name:**	Cale Jenna Meghan Mary Harriet
Student ID Number:	1503470 1501566 1502758 1518389 1505151		
Paper Code:	MNMGT513- 21A (HAM)		
Tutorial/Group:	Thursday 1-3pm		
Assignment Name:	Group Project		
Due Date:	Friday 11th June 5:00pm 2021		

Introduction

The purpose of this report is to provide recommendations and advice to management of The University of Waikato (UoW) on how they can improve their overall global ranking (lower is better) to improve future profitability. Constant development of tertiary education opportunities has led to an increase in competition between universities internationally and Brankovic et al. (2018) states "competition for status is being converted from something implicit and inherently local into something explicit and globally acknowledged."

University rankings are calculated by a range of independent ranking providers based on several different determinants. This study will focus on the impact that ranking factors, from Times Higher Education, have on average global rank across our three independent ranking providers: "Times Higher Education World University Rankings" (THE), "Center for World University Rankings" (CWUR), and "QS Top Universities" (QS). The factors focused on included: citations, industry income, international outlook, research, and teaching.

Visualisation Insights

The purpose of Dashboard 1 is to provide a comparison of UoW to global averages and other universities with respect to the five attributes scored in the THE data set. This provides a view of where UoW relatively sits globally and sets a baseline for creating insights. The first dashboard immediately presents some ranking statistics (**figure 1**) for UoW including the average rank, ranks from individual sources, and the best performing category. UoW's average rank is 544 which is the average of UoW's individual source rankings of 1075, 266, and 292. These cards show that UoW's average rank is heavily impacted by the poor rank of 1075 from the CWUR rankings. It also highlights that UoW's top performing category is international outlook which makes sense being in a small, remote country.

The table in **figure 2** acts as a ranking visual but also as the primary filter on other visualisations. This enables observation of how each university performs in the different categories, which is then comparable against UoW. For UoW, it is clear from the clustered column chart seen in **figure 3** that they score below average for all categories excluding international outlook. This may suggest UoW needs to direct their focus to underperforming attributes (such as teaching) to increase their average global rank. This is supported by the radar chart in **figure 4** which more clearly visualises direct comparisons of weak and strong scores across universities. Compared to the majority of the top ten universities, UoW again scores very low in all categories other than international outlook where they surprisingly score higher than the majority of the top ten universities.

The line graph as shown in **figure 5** highlights the importance of increasing UoW's underperforming categories by showing an inverse relationship between average rank and both teaching and research scores for the top 20 universities. This again indicates these should be potential areas of focus for UoW.

The purpose of dashboard 2 is to explore how much impact the five scored categories have on average rank by filtering by category. The primary visual on dashboard 2 is the dynamic scatter plot in **figure 6** which visualises the relationships between the scored categories and average rank. This visual is supported by the cards in **figure 7** which display excel linear regression output measures. Looking at these two visuals, industry income and international outlook show weak trends indicated by the sparse scatter plots, low coefficients, and low r-squared values. Also from these visuals, the scored categories which provide the most impact on average rank are research and teaching. The research and teaching scatter plots both show a closer fit to the regression line (although both are slightly exponentially decaying), supported by the higher r-squareds of 0.56 and 0.49. This suggests that in isolation, research explains 56% of the variation in average rank while teaching explains 49%. The impact of these variables

is reinforced by the high negative coefficients of -4.81 for research and -5.34 for teaching which suggests in isolation, every one increase in research or teaching score is expected to improve average rank by 4.81 and 5.34 on average respectively.

Dashboard 2 also offers filtering capabilities by geographical location (**figure 8**). This can be used in conjunction with category filtering to gain insights about category performance in specific countries. Applying a filter to New Zealand makes it apparent that although UoW scored highly in international outlook, relative to other New Zealand universities UoW scores the lowest in this category. This suggests that a high international outlook may be a result of New Zealand's small size, remoteness, and international attractiveness as a country, rather than excess focus from UoW. This can be confirmed by comparison to other remote countries with relatively low populations like Australia who also show high international outlook scores.

Variable Insights

To better establish the relevance, significance, and effect of the five scored categories we used SPSS to conduct a multiple linear regression. The regression shown in **figure 9** shows all five categories as independent variables against the rank of average rank. In this model it is evident that research, teaching, and citations have statistically significant explanatory power of average rank shown by p- values of less than 0.001. Although these are all significant, research has the biggest impact on a university's average rank due to having the highest absolute standardised coefficient of 0.413. In a multiple regression model, some explanatory power is distributed to other ranked categories so coefficients for individual categories decrease compared to simple linear regression. The coefficient for teaching score shows that an increase in teaching by one point causes average rank to improve by 1.34 on average. The relationship between research and rank shows a one-point increase in research causes average rank to improve by 2.66 on average, ceteris paribus.

The regression also shows that citations is a statistically significant variable; however, after further investigation it is apparent that some university ranking systems represent citations as a measure of research performance (CWUR, 2021; Times Higher Education, 2019), suggesting citations and research will be highly correlated in our model. The correlation matrix in **figure 10** shows a high degree of correlation of 0.507 which means our model likely suffers from multicollinearity bias resulting in citations appearing more significant than in the population.

Although UoW scores relatively high in international-outlook score, this is shown to be an insignificant determinant of average rank by its p-value of 0.059 in **figure 9**. This insignificance is likely due to the small impact of international outlook in THE's methodology (7.5%), as well as it not being a mutual scoring category across our sources (Times Higher Education, 2019).

The overall r-squared and adjusted r-squared values in **figure 11** show the predictive power of our model, explaining how much of the change in rank can be explained by the variables in our model. Our best model has an r-squared of 0.644 and an adjusted r-squared of 0.64. This means that 64% of the variation in average global rank can be explained by research, teaching, citations, industry income and international outlook. We recognise that our best model still contains two variables (industry income and international outlook) which are statistically insignificant, however as the purpose of this model is to determine significance, they remained included. In attempt to improve this model we tried removing these variables from the regression. This resulted in a model with a reduced r-squared and adjusted r-squared, highlighting that the model in **figure 9** best shows the significance and effect of each variable in explaining average rank.

Recommendations
It is evident that UoW excels in international outlook compared to the global average but fails to deliver in categories which will significantly improve average global rank. Because of this, UoW should focus on areas with the biggest impact on average rank, which have been determined as teaching and research. To make specific, actionable recommendations supplementary data is needed to determine lower-level causes of these impact scores. Times Higher Education's methodology states that research score incorporates quality, quantity, and income generation of research; while teaching score is determined by reputation, level of qualification, and quantity of teaching staff (Times Higher Education, 2019).

Firstly, to improve research score and consequently citation score (due to high correlation), UoW should conduct in-house research to assess their current research capacity. Key identifiers could include quality of research facilities, quantity and quality of researchers, undergraduate to postgraduate ratios, and annual spending on research. Some potential solutions to the identified research challenges could be investment into research facilities and resources such as technology and reference material, offering more scholarships targeted at postgraduate study to increase the quantity of researchers, and providing financial reward for highly praised research as an incentive to improve research quality. Improving any identified research limitations will require significant monetary investment from UoW. This will likely be recouped through increased income of student fees, due to an increase in reputation, particularly with a high international outlook.

Teaching score is determined by reputation, level of qualification, and quantity of teaching staff, according to Times Higher Education (2019). Therefore, to improve in this area UoW should target increased employment of reputable, qualified staff. Some actionable steps for UoW include assessing their current staffing position such as staff to student ratio and international reputation of current staff, assessing financial resource availability for investment into future employment, and developing a plan around how to attract both domestic and international staff that satisfy identified areas of underperformance (such as having better reputations or being more qualified). Alternatively, UoW could look at ways to increase their current teaching staff's reputation and quality. This could be through further funding of teachers' research and higher qualifications, or improving staff work environments to boost productivity.

Conclusion
In conclusion, UoW's average rank of 544 is influenced primarily by relatively low research, teaching and citation scores. A relationship was established between remote countries and international outlook, providing insight into why UoW scores so highly in international outlook. For UoW to remain sustainably profitable in the foreseeable future, research is required by UoW to assess underlying causes of low scores, followed by corrective action being taken accordingly. Some specific recommendations for UoW are to investigate research resources, postgraduate ratios, staff quality and reputation, and financial resources to identify key areas and feasibility of future investment. By improving these areas UoW will increase the likelihood of climbing in average global university rank and becoming more attractive for both domestic and international students.

This study provides a basis of understanding on both the current relative positioning of UoW, and how ranked category scores contribute to average global rank. To support this study, future research into how much universities invest in each category would provide a better understanding of the effect of increased investment on category score. This would create insight into recommendations such as quantifiable spending allocations which are more specific and actionable.

Reference List

Brankovic, J., Ringel, L., & Werron, T. (2018). *How Rankings Produce Competition:* The Case of Global University Rankings. Zeitschrift Für Soziologie, *47*(4), 270-288. https:doi.org/10.1515/zfsoz-2018-0118

The World University Rankings. (2020). *World University Rankings 2020.* https://www.timeshighereducation.com

CWUR. (2021). *World University Rankings 2020-21.* https://cwur.org

Top Universities. (2021) *QS World University Rankings 2020.* https://www.topuniversities.com/

EndSly. (2015). *World Universities*. GitHub. https://github.com/

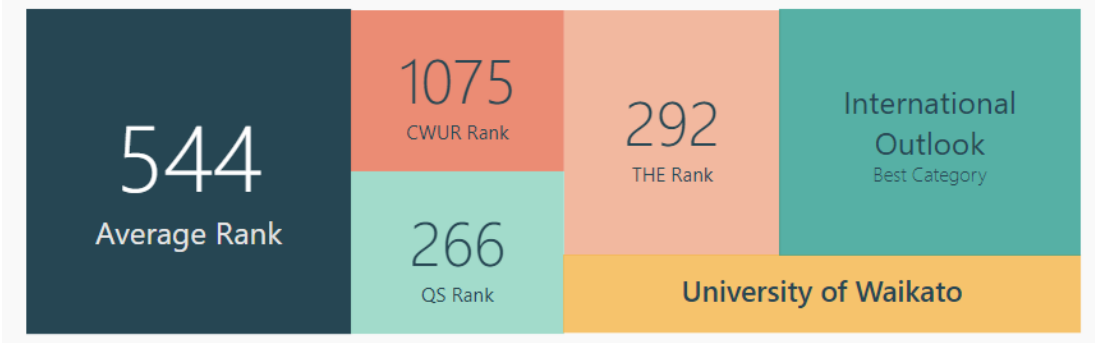Times Higher Education. (2019). *THE World University Rankings 2020: methodology.* https://www.timeshighereducation.com

Appendices

Figure 1.

Figure 2.

Rank	University
1	Massachusetts Institute of Technology
1	Stanford University
1	University of Oxford
4	Harvard University
5	University of Cambridge
6	California Institute of Technology
7	Princeton University
7	University of Chicago
9	University of Pennsylvania
10	Yale University

Figure 3.
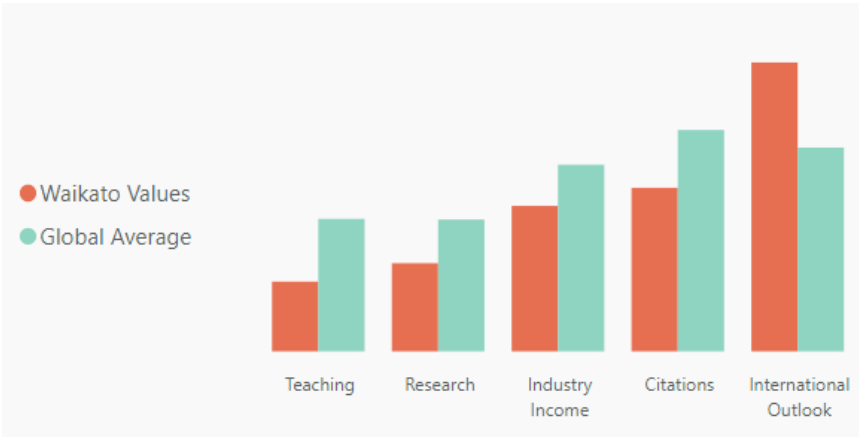
Figure 4.

Figure 5.
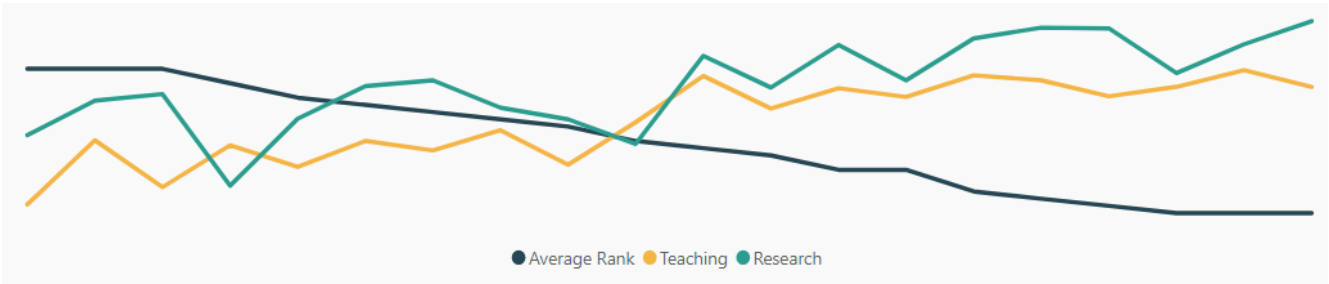
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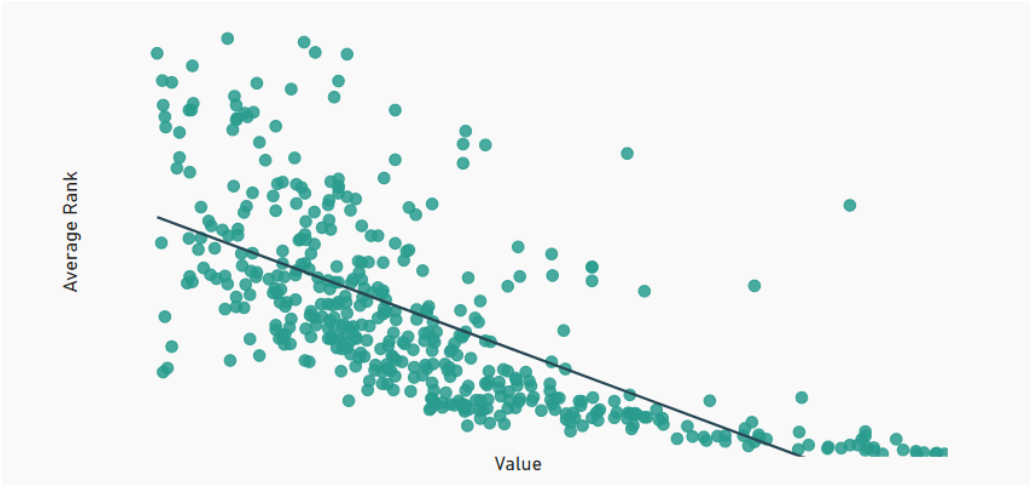
Figure 7.
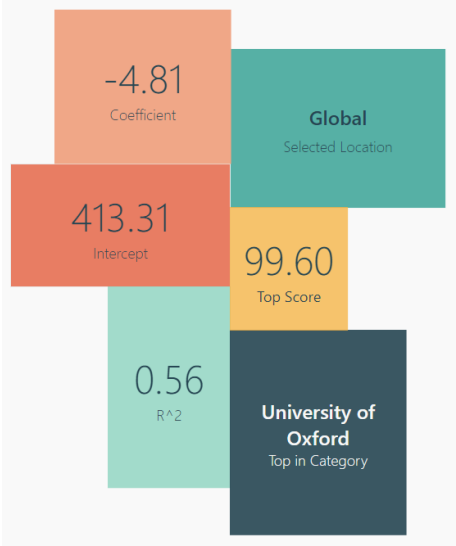
Figure 8.

Figure 9.

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	509.516	19.896		25.609	<.001
	Word_University_Rank_2020 (1).Teaching	-1.339	.599	-.176	-2.235	.026
	Word_University_Rank_2020 (1).Research	-2.658	.549	-.413	-4.841	<.001
	Word_University_Rank_2020 (1).Citations	-1.591	.209	-.295	-7.618	<.001
	Word_University_Rank_2020 (1).Industry_Income	.004	.216	.001	.017	.987
	Word_University_Rank_2020 (1). International_Outlook	-.378	.200	-.070	-1.893	.059

a. Dependent Variable: Rank of Average Rank

Figure 10.

Correlations

		Word_Univer sity_Rank_20 20 (1). Research	Word_Univer sity_Rank_20 20 (1). Citations
Word_University_Rank_2 020 (1).Research	Pearson Correlation	1	.507**
	Sig. (2-tailed)		<.001
	N	448	448
Word_University_Rank_2 020 (1).Citations	Pearson Correlation	.507**	1
	Sig. (2-tailed)	<.001	
	N	448	448

**. Correlation is significant at the 0.01 level (2-tailed).

Figure 11.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.802ᵃ	.644	.640	77.799

a. Predictors: (Constant), Word_University_Rank_2020 (1). International_Outlook, Word_University_Rank_2020 (1). Industry_Income, Word_University_Rank_2020 (1). Teaching, Word_University_Rank_2020 (1).Citations, Word_University_Rank_2020 (1).Research