Using Data Analytics and Visualization to Evaluate the Impact of University Rankings on Student Enrolment Decision in Malaysia

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Abstract
This paper addresses the understanding of how university rankings influence students to enter Malaysian universities, which until now has been a little subject explored, although such lists have been of increasing importance. This paper points out how rankings, apart from other important factors such as academic reputation, program availability, and personal preference, along with financial concerns, influence prospective students and their parents in making a choice. This study is a survey data analysis of the two target segments, prospective students and their parents, using Python for analytics and visualization of the data. This leads to a comprehensive view of the influence of rankings among other variables on university choices. Findings show that university ranking is imperative for both students and parents; however, parents are more concerned about the issue of the ranking since it deals with their child's future. On the other hand, academic reputation and the number of programs offered also emerge as a strong determinant in the decision-making process. Instead, what universities should be doing is not to compete for better ranking status but to focus efforts on the improvement of educational services and campus support. Data-driven insights and interactive visualizations emanating from this research will allow universities to derive actionable information on what drives enrolment decisions and strategically make decisions on effective marketing and development activities concerning the attraction and retention of students. As a result, the findings below have brought out the imperatives in adopting multidimensional strategies toward university choice and thus provided useful guidelines to universities in Malaysia on how to conduct the ranking and non-ranking factors in the competitive higher education landscape.
Keywords: University Rankings, Student Enrollment, Academic Reputation, Decision-Making Factors, Higher Education Marketing

Introduction

University rankings, particularly by QS World University Rankings and Times Higher Education (THE), have become a major influence in higher education (Nassa, and Arora, 2021). They are used to compare universities concerning academic reputation, research output, student-to-faculty ratio, and faculty credentials, among other criteria. These rankings do, most of the time, instigate opinions, choices, and behavior by prospective students, parents, and public policymakers. University rankings shape the perceptions of stakeholders, influencing their opinions about the quality and reputation of academic institutions (Shin, 2020). Therefore, for the students, the university rank can be influential in their perceived value and status of an institution. This may result in even more selective student bodies, having fewer students from a variety of backgrounds, given the heavy reliance on the ranking position in making the decision. Nonetheless, the choice of a university is not a one-dimensional decision based on rankings. Important factors will also include personal preferences, financial considerations, program specifics, campus environment, and career opportunities.

The research aims to understand how relevant the ranking metrics are in university decision-making and adopts a data-driven approach to answer the same. In this study, analysis of survey data will be done through data analytics and visualization to get insights into how students' enrolment decisions are influenced by university rankings. It will also develop other major factors that significantly impact these decisions amongst students and parents. This will enable an overall understanding of the trends and patterns that describe stakeholders' preferences. Visualizations shall be done to bring out the effective presentation of the findings, hence making the data more accessible to use in strategic planning and marketing by universities. This way, the model will assist higher learning institutions in tailoring strategies aimed at attracting and retaining students to eventually enhance the quality of higher education in Malaysia.

Although university rankings are becoming increasingly significant, the influence of university rankings on student enrolment decisions in Malaysian institutions remains poorly documented. Research about the relationship between rankings and enrolment choices will add to the knowledge gap. Therefore, the objectives of this paper are:

i. To explore and understand the perceptions of Malaysian prospective students and their parents on the significance of university rankings in the university selection process.
ii. To determine the key factors aside from university rankings that significantly impact student's enrolment decisions.
iii. To utilize data analytics and visualization tools to analyze survey data and visually represent the influence of university rankings and other factors on student enrolment decisions.

This paper focuses on the perceptions and factors in the decision-making processes of Malaysian prospective students and their parents in the process of choosing a university. Primarily, this study wants to find out how university rankings actually affect these decisions and further go on to determine other significant drivers beyond these rankings that lead to enrolment choices. The survey will collect insights from prospective students and their parents regarding their perceptions of the importance of the attributes of university rankings, followed by academic reputation, program offerings, tuition fees, location, and campus facilities. By using data analytic and visualization tools like Python and Power BI the research

will be able to conduct a much-needed data analysis of the data collected from the surveys. These tools will be put into service in building effective visualizations that could give the most insightful looks into the influence of university rankings and other decision-critical factors on enrolment decisions in Malaysian universities, as well as for policymakers targeting recruitment strategy enhancement.

Problem Background and Related Work

Rankings of universities are a kind of list created to rate the overall performance of a university according to diverse aspects of quality. The ranking is obtained through performance metrics on internationalization, outcomes of research, and student experience in determining the position of a university in its quality world ranking. Moreover, Ranking informs about educational quality, creates a university image, and also as a tool for stakeholders to search for educational service quality information (Ebzeeva, 2023). According to Nassa, and Arora, (2021) study, ranking assigns ordinal numbers based on performance parameters, and rankings are criticized and lauded for various reasons in academia. Ranking systems such as QS World Rankings University Rankings (QS) and Times Higher Education (THE) have been guiding young people and their families to make this important decision. The rankings include universities around the world. THE ranking system evaluates universities based on various criteria such as teaching, research, citations, international outlook, and industry income (Fauzi et al., 2020). It uses a reputational survey to gather data, which can sometimes raise concerns about the reliability and validity of the rankings. Therefore, normalization of data is done to account for variations in citation volumes across different subject areas, ensuring a fair comparison among universities. QS considers the indicators of academic reputation, employer reputation, faculty-to-student ratio, citations per faculty, international faculty ratio, and international student ratio for rating universities. It utilizes the Scopus database for data collection, providing a balance between English-speaking and non-English-speaking institutions (Osman et al.,2020). Moreover, the researcher indicates that QS rankings are widely used by various stakeholders, including students, academics, employers, and government agencies, to gauge the level of universities globally.

These universities are being judged by various parameters such as teaching, research quality, industry, research environment, international outlook, student ratio, academic reputation, citations per faculty, and many more. As this ranking system provides a list of worldwide universities, we can sort it by country and region. While rankings have been criticized for their biases and limitations, they continue to represent powerful players on the worldwide higher education landscape, which shapes the policies and strategies of higher education institutions. Overall, university rankings aim to offer a comparative assessment of academic institutions to guide choices and improvements in the education sector. There are a few criticisms and limitations of the ranking systems pointed out by Osman et al., (2020). Firstly, reputation indicators in ranking systems, such as academic and employer reputation, can be subjective and prone to biases, affecting the overall rankings. Secondly, the reliance on surveys for data collection in some ranking systems can lead to issues like low response rates, bias, and potential manipulation, impacting the accuracy of rankings. Thirdly, rankings that heavily rely on surveys or data that can change annually may lead universities to strategically alter their approaches to improve their positions, rather than focusing on long-term quality enhancement. Lastly, the methodologies and criteria used in different ranking systems are not standardized, making precise comparisons challenging and limiting inclusivity for all types of universities and their missions. Fauzi et al., (2020) mentioned that some

ranking systems may not provide a comprehensive evaluation of universities, as they may overlook certain important aspects like industry collaborations, community contributions, and innovation efforts.

University rankings are an important tool for the benefit of students, institutions, and governments in being informed about the selection of higher education institutions. They can use benchmarks to compare institutions, which help in improving areas, excellence, and culture. Rankings impact university reputation and international student recruitment strategies and rankings serve as a purpose and identity for universities and students (Soysal et al., 2022). This is agreed by Ebzeeva (2023) study that rankings provide information on the quality of educational services and help create a positive image for universities. Moreover, it is also important for other stakeholders such as parents and it will benefit the institution itself. University rankings serve as information tools for stakeholders, instill competitive spirit, and also as an indicator of quality in higher education which will guide institutions for improvement (Nassa, & Arora, 2021). A prospective student's university rankings will influence their decision-making process, for example, they will look into a high-prestige university to further their study because higher-ranked institutions are likely to have track records with a history of quality delivery in education and successful graduates.

University Rankings and Enrolment Trends

University rankings play a significant role in shaping enrolment trends. Research indicates that university rankings significantly impact enrolment trends, with higher-ranked institutions attracting more students due to their perceived quality and prestige (Soysal et al., 2022). The reputation and prestige associated with higher-ranked universities influence student enrolment decisions, leading to a preference for institutions with better rankings. However, empirical analysis suggests that rankings have a symbolic rather than a direct impact on student recruitment, with reputation playing a more crucial role in enrolment decisions (Shin, 2020). Despite criticisms of ranking methodologies, they continue to be influential in the higher education sector, guiding student choices and institutional strategies. Ultimately, while rankings may not directly dictate enrolment trends, they serve as indicators of quality that institutions can use to enhance their performance and attract students (Perdana & Budiman, 2021).

University rankings have significantly impacted institutions globally. For instance, empirical studies on university rankings impact on enrolment trends, research in the US has shown that shifts in university rankings can influence the number and characteristics of domestic applicants, indicating a correlation between rankings and enrolment patterns (Soysal et al., 2022). Same as studies in the UK found that reputational signals and rankings significantly impact decisions for studying abroad, showcasing how rankings influence international student enrolment choices. Moreover, empirical studies by the same researcher have indicated that universities with higher rankings and reputations tend to attract more international students, showcasing the influence of rankings on enrolment trends. These examples showcase how rankings have reshaped universities' strategies, structures, and priorities on a global scale, highlighting the diverse impacts of ranking systems across different countries and regions. This also concluded that rankings influence more international students when applying to universities.

Factors Influencing Enrolment Decisions

Other factors that are found to influence the student's choice of university in which to pursue their studies are the potential factors that drive students in these matter are shown to be the appropriateness of the offered courses, the locale of the university, whether the university is of good academic repute, and other factors such as location, type of university, family opinions, job prospects, quality of teaching, climate on campus, and so on. Ebzeeva (2023) stated that the quality of educational services, relations with employers, international opportunities, social aspects, information channels, university activities, and research opportunities were other factors of the decision-making. This agreed by Nassa, and Arora (2021) that reputation, location, programs offered, financial aid, campus facilities, research opportunities, faculty expertise, alumni network, and career services became other factors influencing enrolment decisions. Soysal et al. (2022) claimed that university reputation is the primary factor influencing enrolment decisions, not the university rankings as their study stated that yearly updated ranking positions have minimal impact on enrolment decisions. Farid Shamsudin et al., (2019) elaborate that the location of a university plays a role in students' enrolment decisions, although statistical evidence may not always support a significant association. Moreover, university location can be a determining factor for some students, but little evidence supports a strong influence on enrolment decisions. In addition, programmed offered is another factor influencing them as the choice of academic program is a complex consideration that impacts student decisions, with the field of study, course specifics, and the offering institution all playing a role.

The availability and quality of academic programs influence student decisions to enroll at universities, especially for international students seeking specific programs not available in their home countries (Tamimi, Mashrafi, and Thottoli, 2023). Financial aid is one of the other factors listed. In the study by Tamimi, Mashrafi, and Thottoli (2023) and Farid Shamsudin et al., (2019), the cost of education, including tuition fees and living expenses, is a significant factor influencing international student decisions to study at specific universities, with affordability being a key consideration. This is because scholarships and financial support can benefit international students studying abroad, making the cost of education a crucial aspect in enrolment decisions. Employment opportunities post-graduation have been identified as a major factor influencing students' decision-making to enroll at private higher education institutions, ranking as the top influencer in some studies. The availability of employment opportunities after completing studies can positively impact student's decisions, highlighting the importance of career prospects in enrolment choices (Cynthia and Chong, 2023)

Most prospective students and their parents regard university rankings as one of the factors to consider when selecting a higher-learning institution. Rankings are seen as an instrument for assessing the quality of educational services and image-making for the university. Moreover, prospective students' perceptions of universities are influenced by their social networks, including family, friends, and teachers, who provide information and opinions on university choices (Wut, Xu, and Lee, 2022). Gavroglu (2022) study mentioned that prospective students and parents value rankings for decision-making as the rankings influence perceptions of university quality and reputation. However, Soysal et al. (2022) research indicates that prospective students and parents view university reputation as a more influential factor compared to yearly updated ranking positions when deciding on higher education institutions. Reputation, which is socially mediated and established over the long term, plays a crucial role in international student recruitment strategies. Nassa, A. K., and Arora, J. (2021) stated that university rankings serve as an information tool for students and

parents, providing insights into the quality of education and research in higher education institutions. However, the perception of rankings as an assessment tool varies among stakeholders, with some considering it important while others may not find it as demanded.

Research Methodology

This quantitative method survey employs a quantitative research design to conduct a survey of data collection from two different groups, prospective students and their parents of Malaysian universities. Data will be collected and analyzed to understand the role of university rankings in enrolment decisions, any other influential factors, and perceptions of university rankings. Quantitative method surveys are structured research tools designed to collect numerical data that can be analyzed statistically to identify patterns, relationships, and trends among variables. These surveys typically involve large sample sizes and utilize instruments such as questionnaires or structured interviews to ensure consistency and reliability in data collection (Pilcher & Cortazzi, 2023). The quantitative approach is characterized by its top-down strategy of generalization, where findings from a sample are extrapolated to a larger population, often relying on random sampling techniques (Borgstede & Scholz, 2021). Quantitative data, collected through structured surveys, will offer measurable insights into the weight given to university rankings in decision-making.

The survey was designed for prospective students and their parents to capture information about the perceptions and decision-making processes of prospective students in choosing a university. There are five sections for the survey. The first part is background information, showing the role of the respondent, age, sex, and the highest level of education completed by the parent. This set of demographic data shall be useful in segmenting and analyzing responses based on different background characteristics. Section two focuses on the factors influencing university choice. Respondents are required to rank the importance of the presented factors such as academic reputation, university ranking, program offered, location, tuition fees, availability of scholarships, campus facilities, employment prospects, recommendations of family/friends, and extra-curricular opportunities. These ratings will give insight regarding what are the factors they consider the most while making up their mind. The third section of the survey deals with Perceptions of University Rankings. This section checks the thoughts of respondents about the significance and validity of university rankings. Questions are based on the generality of the importance of rankings, their accuracy while indicating education quality, and the influence of rankings over the perception of a university's reputation by others. The fourth part looks at the Decision-Making Process. From the respondents, practical questions will be answered about the decision-making process questions related to the most important factor for them in choosing a university. It is an attempt to understand processes and factors leading to the final decision considered.

The targeted population in this research encompasses two identified groups: prospective students and their parents in Malaysia. Each group is targeted to give a different perspective on the factors that affect university choice. Prospective students provide insight into the pre-enrolment, decision-making process, while parents offer a perspective of family and social influences. The potential students and parents belong to the sampling frame that is currently undergoing the process of choosing a university or has just made an enrolment decision. Stratified random sampling will be used, so the sample will be representative of the greater population. The strata of interest for this study are age, sex, socio-economic status, and education level. The selection of these variables is based on the perceived dependence on university enrolment decisions and university ranking perceptions. Respondents for the

strata will all be randomly picked using the only best method, as the sample is a true actual representation of the class diversity. This would enhance the representativeness of the sample and allow further detailed analyses for comparative inferences across various demographic groups. Sampling bias will be reduced through several distribution channels such as emails, social media postings, and students of other university departments, all of which will help extend the reach of the survey to more subjects.
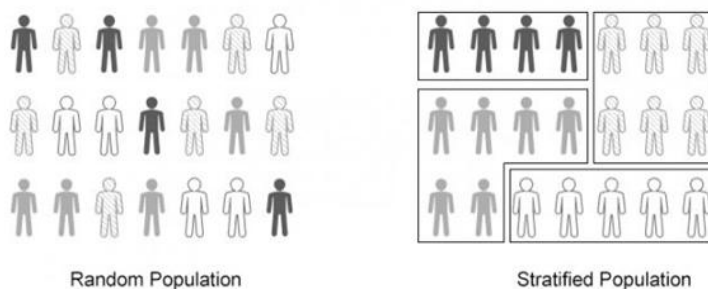

Figure 1. Stratified Random Sampling

Before analysis, the survey data collected was cleaned and prepared. Data cleaning involved checking for incomplete responses, handling missing data, and ensuring consistency in responses. The data was then coded for analysis, with categorical responses converted into numerical values where necessary to facilitate statistical analysis. Data analysis was conducted using Python, one of the most versatile programming languages supported by robust libraries for data analysis and visualization. Manipulation and pre-processing of data were done using the Pandas library, while Matplotlib and Seaborn libraries were used for visualizing all trends and patterns in the data. In addition, some consideration was given to the use of Power BI in developing interactive dashboards for effective representation of key findings.

Descriptive Statistics

Descriptive statistics will be the first step in analyzing the survey data. Additionally, descriptive statistics play a crucial role in research by providing a comprehensive overview of sample characteristics, aiding in result interpretation, and guiding clinical decision-making (Fulk, 2023). It is a summary of the basic features of the data with simple summaries of the sample and measures. Descriptive statistics to be calculated for each survey question include mean, median, mode, standard deviation, and frequency distributions. Descriptive statistics are vital in both quantitative and qualitative analyses, offering insights into the distribution and characteristics of data, ultimately supporting evidence-based practice and decision-making processes in various fields (Sepeng & Moleko, 2024). These statistics will help understand the general trends and patterns of data, summarize perceptions and importance ratings of university rankings and points of importance pulled out of various factors affecting choice of university. Overall, descriptive statistics provided a comprehensive summary of respondents' perceptions regarding university rankings and other influencing factors in their selection decisions.

Inferential Statistics

The inferential analysis conducted in this study offers a deeper understanding of how different factors influence university selection decisions among prospective students and

their parents. The use of the Chi-Square test, which revealed a significant association between respondent type (student or parent) and the prioritization of key factors such as academic reputation, scholarship availability, and location, demonstrates that these two groups have differing priorities when it comes to choosing a university. The statistically significant Chi-Square value, coupled with a low p-value, indicates that the differences observed are unlikely to be due to chance, thereby confirming the alternative hypothesis that respondent type significantly influences factor prioritization. The crosstabulation analysis provided detailed insights into how different respondent types (prospective students versus parents) prioritize various factors when selecting a university. By examining the frequency distribution of responses across categories like academic reputation, scholarships, location, program offerings, campus facilities, employment prospects, and tuition fees, the crosstabulation highlighted key differences in preferences between these two groups.

Hypothesis
The Role of University Rankings
The hypothesis is designed to explore whether different groups (parents vs. prospective students) prioritize various factors differently when selecting a university.
Null Hypothesis (H0): There is no significant association between respondent type (parent of a prospective student or prospective student) and their choice of the most important factor influencing university selection. In other words, parents and prospective students do not differ in their prioritization of various factors.
Alternative Hypothesis (H1): There is a significant association between respondent type (parent of a prospective student or prospective student) and their choice of the most important factor influencing university selection. This means that the choice of factors varies significantly between parents and prospective students.

Association between Respondent Type and University Choice Factors
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Survey Findings
Based on the descriptive statistics in Table 1, some main findings about respondent views of university rankings emerge. All the variables relating to university rankings have an average rating above 4, indicating that the respondents generally perceive these university rankings as highly important and influential. Mean scores regarding the perceived importance of rankings, the impact of rankings on perception, the accuracy of rankings in reflecting educational quality, the use of rankings in application decisions, and the reliability of the rankings as an indicator of educational quality were all around 4.2 to 4.3. It ranged from 0.76 to 0.91 standard deviations, showing that while there is agreement on the ranking

importance, some variability in the view of the respondents on its accuracy and reliability exists. The fact that the minimum and maximum values are 1.0 and 5.0, respectively, shows that the full range of the scale has been utilized by the respondents, while most of the responses were either 4 or 5. This is also reflected by the position of the p/25th, which is equal to 4.0 for that position; medians p/50th is 4.0; and the p/75th is equal to 5.0, meaning the majority of respondents consider university rankings either important or very important.

Table 1
Frequency Analysis of Perceptions on University Ranking

	How important university rankings are in general	How university rankings influence perception of a university reputation	How accurately do university rankings reflect the quality of education provided by a university	University rankings influence decision to apply to a particular university	University rankings are a reliable indicator of the quality of education
count	210.0000	210.0000	210.0000	210.0000	210.0000
mean	4.2762	4.1905	4.2714	4.2810	4.2286
std	0.7825	0.8539	0.9059	0.7591	0.7978
min	1.0000	1.0000	1.0000	1.0000	1.0000
25%	4.0000	4.0000	4.0000	4.0000	4.0000
50%	4.0000	4.0000	4.0000	4.0000	4.0000
75%	5.0000	5.0000	5.0000	5.0000	5.0000
max	5.0000	5.0000	5.0000	5.0000	5.0000

Based on the data provided in Table 2, academic reputation and the specific programs offered are the two most influential factors in university choice, each being prioritized by around 35% of respondents. This suggests that both the quality of education and the relevance of academic offerings play a critical role in shaping students' and parents' decisions. While the location of the university and the availability of scholarships are also important, accounting for 10.48% and 8.10% of responses respectively, these factors seem to be secondary considerations compared to academic quality and program availability. Tuition fees, which concern 6.67% of respondents, further highlight the importance of affordability, even though they are less emphasized than scholarships. Interestingly, campus facilities and employment prospects after graduation are less critical, with only 2.38% and 1.43% of respondents respectively highlighting these factors. This could imply that students and parents assume reputable institutions will naturally provide adequate facilities and employment opportunities, or that these concerns are less pressing than the academic and financial aspects of the decision. Overall, the data underscores the paramount importance of a university's academic standing and program offerings in influencing enrolment decisions, while also indicating that practical considerations like location and financial support play a supporting role.

Table 2

Frequency Analysis on Key Factors Influencing Enrolment Decisions

Factor	Frequency	Percentage
Academic reputation	75	35.7%
Availability of scholarships	17	8.1%
Campus facilities	5	2.4%
Employment prospects after graduation	3	1.4%
Location of the university	22	10.5%
Program offered	74	35.2%
Tuition fees	14	6.7%

The data presented in Table 3 indicates varying priorities between parents of prospective students and the students themselves when it comes to factors influencing university choice. Academic reputation is the top factor for both groups, with 48 prospective students and 27 parents citing it as the most important, making it the most influential overall with a total of 75 respondents. Interestingly, prospective students place significant emphasis on the availability of scholarships, with 17 students identifying this as a key factor, whereas no parents selected this criterion, highlighting a difference in concern about financial support. Similarly, only prospective students considered campus facilities and employment prospects after graduation as the most important factors, with 5 and 3 students, respectively, choosing these options. This suggests students may have a more immediate focus on their personal experience and future job opportunities. In contrast, none of the parents chose these factors. The location of the university was selected exclusively by students (22), indicating a preference for convenience or specific geographic preferences. When it comes to program offerings, both groups show interest, but prospective students lead with 51 respondents compared to 23 parents, underscoring the importance of course content and program diversity to students. Tuition fees were only highlighted by prospective students (14), reflecting a concern for affordability among the student group that is not mirrored by the parents. Overall, while academic reputation remains a common top priority, the divergence in other areas shows that students tend to focus more on financial support, personal convenience, and future career prospects, whereas parents may focus more on the overall academic standing and quality of the programs offered.

Table 3
Crosstabulation

Most Important Factor Respondent Type	Academic reputation	Availability of scholarships	Campus facilities	Employment prospects after graduation	Location of the university	Program offered	Tuition fees	Total
Parent of a Prospective Student	27	0	0	0	0	23	0	50

Prospective Student	48	17	5	3	22	51	14	160
Total	75	17	5	3	22	74	14	210

The significant difference, from the Chi-Square test results in Table 4, between parents and prospective students concerning the most important factors that influence university choice, is indeed a strong suggestion by these results that any observed differences are not by chance, with a Chi-Square statistic of 27.3634 and a p-value of 0.0001. Since the p-value is well below 0.05 this allows us to reject the null hypothesis. That is, there is a statistically significant relationship between respondent type and factor emphasis. The degrees of freedom are 6.0000 because we subtract one from the number of categories and do this once for each dimension of the contingency table. This test result underlines that parents and prospective students have different priorities: academic reputation, availability of scholarships, location, and the programmes offered. For instance, students value scholarships, campus facilities, and job prospects higher than parents do, while both students and parents attach very high importance to academic reputation. Understanding these differences is crucial to forming and implementing communication and marketing strategies on the part of universities that take into consideration each of these particular concerns.

Table 4
Chi-Square Test

Chi-Square Statistic	27.3634
P-value	0.0001
Degrees of Freedom	6.0000

Figure 2 shows that the use of data analytics and visualization tools has significantly enriched the analysis and presentation of how university rankings and other factors affect enrolment decisions. Data quality and preparation with Pandas were essential for ensuring the accuracy and reliability of the dataset, as it addressed missing values and data type inconsistencies, providing a solid foundation for analysis. Static visualizations created with Matplotlib effectively represented the distribution of categorical variables, such as age groups and factors influencing university choice, making it easier to identify key trends and compare categories. Seaborn's advanced plotting capabilities further enriched the analysis by offering detailed insights into response distributions through histograms and other statistical visualizations, revealing patterns and central tendencies. Additionally, interactive dashboards developed using Power BI and Tableau enabled dynamic exploration of the data, allowing users to filter and interact with visualizations in real time. This interactivity provided a deeper understanding of how factors like university rankings impact enrolment decisions, uncovering trends that static visualizations alone might miss.
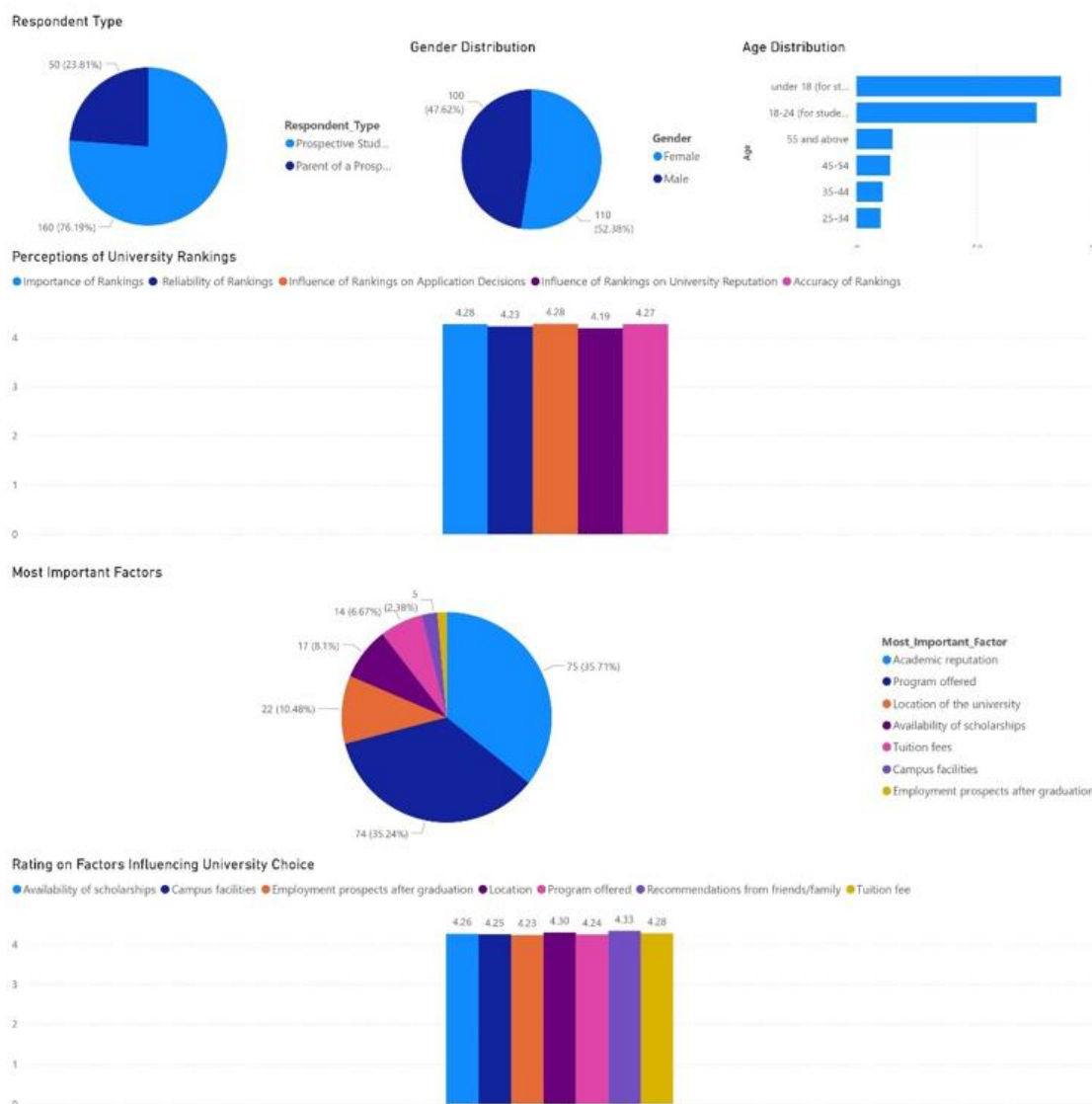
Figure 2. University Rankings and Enrollment Decision Dashboard

Conclusion

This study has focused on the perceptions of Malaysian prospective students and their parents in terms of the role that university ranking plays as regards choice decisions, identified other significant factors influencing enrolment decisions, and utilized data analytics and visualization. This study allows a few conclusions to be drawn. First, university rankings are considered by students and parents as an important and valid indicator of quality in education. However, more parents were concerned about ranking status than students were, reflecting a concern for their children's future and institutional quality based on ranking. Second, academic reputation and fields of study, aside from rankings, are perceived as significant factors in university choice for students and parents. On the other hand, students associate the ranking and tuition expenses, which do not carry priority in the parents' ranking. This contrasts in both rankings, where parents prioritize long-term academic effectiveness, while students concern themselves with practical matters that could better be addressed immediately. This greatly helped the analysis by ensuring the accuracy of the data, showed patterns in the preference of the respondents, and enabled dynamic exploration in the

utilization of data analytics and visualization tools, namely: Pandas, Matplotlib, Seaborn, and development of interactive dashboards. However, this study is not without various limitations that range from the representativeness of its sample and possible biases in survey design to the necessary narrow focus on a selected set of factors. The need for future research to address these limitations is emphasized to elevate the comprehensiveness and applicability of the findings. Future studies should go beyond influencing factors and develop their bases on more advanced analytical techniques, and they should be cross-cultural so that the insights gained may lead to a far better and more nuanced understanding of what motivates the choice of universities. Overall, therefore, the findings indicate that university entrants do an intricate balancing act between academic, financial, and personal considerations, and indeed, universities have to adopt marketing and communication strategies that would adequately respond to prospective students and their parents.

In conclusion, this study highlights key differences in the priorities of students and parents, with students placing more importance on practical factors like scholarships, campus facilities, and job prospects, while parents focus on academic reputation and long-term financial planning. The use of advanced data analytics and visualization tools plays a crucial role in enhancing the depth of analysis by enabling dynamic exploration of the data and providing a better understanding of the factors influencing enrollment decisions. This methodological approach not only enriches the insights but also showcases the value of data visualization in making complex data more accessible and actionable. Ultimately, this research provides a comprehensive understanding of how university rankings and other key factors interact in shaping the university choice decisions of prospective students and their parents, offering valuable implications for universities in refining their recruitment strategies.

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