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IDENTIFICATION OF THE TRENDS OF CANDIDATES IN UNIVERSITY PREFERENCES BY SOCIAL MEDIA ANALYSIS

Fatih GÜRCAN [1]

Abstract

In today's online social networking environments, especially in sharing ideas, Twitter plays a leading role as one of the popular social sharing and interaction platforms all over the world. In many fields (politics, education, health, etc.), social media analysis is effectively utilized in research conducted to determine social priorities and trends. The aim of this study, which was carried out in a similar context, is to determine the priorities and criteria of university candidate students in their university preferences by analyzing social media data. In our country, during university preference periods, there is an effective information sharing and guidance among university candidates through social networks. In this study, the tweets shared on the Twitter platform about university preferences were analyzed with the structural topic model algorithm and prominent themes and trends were determined. As a result of this experimental analysis, 23 topics were discovered that reveal the interests and tendencies of prospective students in their preferences. Percentage rates and keyword groups were also calculated for these topics. According to the findings, the top five topics that determine the preferences of the candidate students were identified as "Entrance Exam (YKS)", "Job Oppurtunities", "Information Services", "Educational Quality", and "Study Abroad (Erasmus, Farabi)". It is envisaged that the findings will be a guide in understanding the preference tendencies of the candidate students and determining the future strategies of the universities.

Keywords ***:*** *University Preferences, Semantic Analysis, Social Media Analysis, Twitter.*

JEL Classification ***:*** *Z00.*

[1] Assit. Prof., Fatih GÜRCAN, Karadeniz Technical University, Department of Management Information Systems, fgurcan@ktu.edu.tr, ORCID: 0000-0001-9915-6686

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ADAYLARIN ÜNİVERSİTE TERCİHLERİNDEKİ EĞİLİMLERİNİN SOSYAL MEDYA ANALİZİ İLE TESPİT EDİLMESİ

Öz

Günümüzün çevrimiçi sosyal paylaşım ortamlarında, özelikle fikir paylaşımı konusunda, Twitter tüm dünyada popüler sosyal paylaşım ve etkileşim platformdan biri olarak öncü rol üstlenmektedir. Birçok alanda (siyaset, eğitim, sağlık, vb.) toplumsal önceliklerin ve eğilimlerin belirlenmesi amacıyla yapılan araştırmalarda, sosyal medya analizlerinden etkin bir şekilde faydalanılmaktadır. Benzer kapsamda gerçekleştirilen bu çalışmanın amacı, üniversite adayı öğrencilerin, üniversite tercihlerindeki önceliklerinin ve ölçütlerinin sosyal medya verilerinin analizi ile belirlenmesine yöneliktir. Ülkemizde, üniversite tercih dönemlerinde, üniversite adayları arasında sosyal ağlar üzerinden etkin bir bilgi paylaşımı ve yönlendirme söz konusu olmaktadır. Bu çalışmada, Twitter platformu üzerinde üniversite tercihleri konusunda paylaşılan tivitler yapısal konu modeli algoritmasıyla analiz edilerek öne çıkan temalar ve eğilimler tespit edilmiştir. Gerçekleştirilen bu deneysel analizin sonucunda, aday öğrencilerin tercihlerindeki ilgi alanlarını ve eğilimlerini ortaya koyan 23 topik keşfedilmiştir. Elde edilen bu topikler için ayrıca yüzde oranları ve anahtar kelime grupları da hesaplanmıştır. Elde edilen bulgulara göre, aday öğrencilerin tercihlerini belirleyen ilk beş topik sırasıyla "Giriş Sınavı (YKS)", "İş Olanakları", "Bilgi Hizmetleri", "Eğitim Kalitesi" ve "Yurtdışında Eğitim (Erasmus, Farabi)" olarak tespit edilmiştir. Elde edilen bulguların, aday öğrencilerin tercih eğilimlerinin anlaşılmasında ve üniversitelerin gelecekteki stratejilerinin belirlenmesinde yol gösterici olabileceği öngörülmektedir.

Anahtar Kelimeler *: Üniversite Tercihleri, Semantik Analiz, Sosyal Medya Analizi, Twitter.*

JEL Sınıflandırması *: Z00.*

INTRODUCTION

The dizzying development of information and communication technologies (ICT) has opened innovative horizons to social-media environments that provide a wide variety of services and opportunities for online interaction and content sharing between individuals. Thanks to the increase in communication speed and easy accessibility of information, millions of social messages and content shared within seconds have made social platforms the most important service provider actors in the perfect interaction between millions of individuals (Zimbra, Abbasi, Zeng, & Chen, 2018). Today, social media platforms and applications have an intense usage rate for communication and social content sharing by large user communities. In this respect, the number of users, the amount and variety of shared data, and user interactions on social media platforms are increasing rapidly (Himelboim, Smith, Rainie, Shneiderman, & Espina, 2017; Karami, Lundy, Webb, & Dwivedi, 2020; Kumar & Jaiswal, 2020; Zimbra et al., 2018).

Most of the data produced in social networks consists of unstructured data and therefore it is more difficult to analyze than structured data. Social media data is analyzed by applying a number of different characteristic processes (Grandjean, 2016; Kumar & Jaiswal, 2020). Twitter enables the simultaneous presentation and management of large volumes of unstructured data generated from heterogeneous sources (Cano-Marin, Mora-Cantallops, & Sánchez-Alonso, 2023). It is a platform that allows the sharing of millions of content in real time. Commercial and public organizations use Twitter data to reveal dynamic movements and trends of different social communities (Cano-Marin et al., 2023; Zimbra et al., 2018).

Because of its general applicability, it is widely used in analyzing societal trends in fields ranging from economics and politics to tourism, education, health, and marketing. In this respect, the number of new research based on social media analysis is increasing exponentially every day (Günüç, Odabaşı, & Kuzu, 2013; Kumar & Jaiswal, 2020). In line with the above-mentioned implications, Twitter is

considered as a potential forecasting system in determining the predictions and trends of social communities against different events and actions (Sezgin & Altay, 2021).

The inferences obtained from the analysis of the data shared on social media platforms are of great importance in terms of research and applications carried out in different disciplines. Inferences about collective trends obtained from the analyzes in this context provide important contributions to decision-making processes in many areas (Grandjean, 2016). Considering the analyzes carried out on social media platforms, the most studied platform in this context is Twitter. Especially recently, the huge explosion in data sharing on Twitter attracts the attention of companies and researchers in different fields.

Research based on data analysis of different scopes on Twitter allows the analysis of social behavior and trends of large communities, and thus enables the tracking of social trends that concern different disciplines, especially education, health, safety, and marketing. Each message that provides communication and exchange of ideas on Twitter is called a "tweet" (Cano-Marin et al., 2023). After the last changes, a tweet can contain up to 4000 characters. For this reason, tweets have their own jargon, which greatly increases typos. The character limitation of tweets complicates the process of obtaining meaningful information from messages. The texts obtained from this platform require many preprocessing steps due to the fact that it has its own jargon and a lot of typos. For this reason, the semantic and morphological analysis of tweets involves more difficult processes than other structural texts (Kumar & Jaiswal, 2020; Martínez-Rojas, Pardo-Ferreira, & Rubio-Romero, 2018).

Social media research and practice focused on text analysis includes a variety of approaches, such as text classification, text clustering, opinion mining, sentiment analysis, information extraction, document summarization, identification of personal trends, and measurement of societal trends (Karami et al., 2020; Martínez-Rojas et al., 2018; Zimbra et al., 2018). Social media analysis of social events and phenomena that happen in daily life contributes to the understanding of communication and interaction between groups such as supply-demand, brand-customer, production-consumption, doctor-patient, university-student, and government-society. Furthermore, the inferences obtained from the data analyzes carried out on the Twitter platform provide important contributions to decision makers in deciding on predictive strategies and policies for the future (Sezgin & Altay, 2021).

Social networking sites have emerged as a highly efficient means of mass communication and interaction for students during the process of selecting a university. An enhanced comprehension of the preferences of university candidates, achieved through the analysis of social media, will yield significant insights for universities. These insights will enable universities to adapt their practices in accordance with prevailing candidate preferences, so equipping them to effectively address future demands (Cano-Marin et al., 2023; Doğan & Topa Çiftçi, 2019). In the contemporary era of social interaction, higher education institutions are compelled to formulate distinct social media strategies to effectively enhance their competitive edge in attracting prospective students, while concurrently safeguarding the well-being of their current student body by active engagement in these digital platforms. Hence, comprehending the interests, desires, and inclinations of potential students will serve as a crucial framework for the formulation of these methods (Himelboim et al., 2017). The perception factor or social inclination, which is a prevalent element in social media communication, emerges as the primary influential factor in candidates' preference behavior. In essence, the online presence and engagement of universities on the internet and social media platforms will shape the impressions held by potential students regarding the institution. The awareness of candidates' interests and tendencies, coupled with the information exchange, promotion, and communication activities conducted by universities on social media, will significantly influence students' perceptions and attitudes, ultimately impacting their preferences (Himelboim et al., 2017; Sezgin & Altay, 2021; Yücel & Karataş Yücel, 2022).

In our country, there is a significant exchange of information and guidance among prospective students during university preference periods. Most of this information is shared via social media platforms. Especially in sharing information and ideas, Twitter plays a leading role as a popular social networking platform all over the world. In this experimental study, which was carried out based on the

relevant scientific background, it was aimed to investigate the themes and trends in university preferences by analyzing the tweets of university candidate students during the preference period. For this purpose, firstly, tweets shared in the two-month period between July and August, which is the university preference period for 2022, were extracted. Then, an experimental dataset consisting of these tweets was created. Following this, a semantic content analysis based on the structural topic model (STM) algorithm was performed on the experimental data set. As a result of the analysis, the priorities and tendencies of the candidate students in their university preferences were identified. In this context, 23 topics were obtained by the topic modeling analysis performed on the messages shared on the Twitter platform, and the preference tendencies characterized under these topics were ranked according to their percentages. The methods and findings of this study can contribute to the decision-making strategies of universities with different characteristics in our country. The findings can be a guide for universities to improve themselves according to current demands. Moreover, the findings of our study can guide prospective students in terms of better understanding and interpretation of preference trends.

I. BACKGROUND AND RELATED WORK

Developments in ICT have provided new opportunities and horizons for mass communication and interaction activities through social media platforms. The number of users and the amount and variety of shared content on social media platforms are increasing exponentially day by day. Our country has had its share from this increase. According to the research conducted by WeAreSocial in 2023 on social media and internet usage in Turkey, there are 71.38 million active internet users in our country. 62.55 million of this number are active social media users (WeAreSocial, 2023). In the light of this information, it is accepted that 83.4% of the 85.59 million population are active internet users and 73.1% are active social media users. It is seen that users spend an average of 7 hours and 24 minutes on the Internet a day, and this time is about 2 hours and 54 minutes on social media. YouTube ranks first among the most used social networking platforms in Turkey. In social networks, YouTube is followed by Instagram with 90.6%, WhatsApp with 88.8%, Facebook with 72.6%, and Twitter with 66.5% (WeAreSocial, 2023). In the face of these developments, universities are trying to exist in social media with different strategies. Today, most users and universities prefer to share and follow their activities, promotions, events, and interactions on social media platforms such as Twitter rather than official websites. The number of Twitter followers, which is more than the number of views and reviews of websites, is an important indicator of this (Sezgin & Altay, 2021).

In this way, universities aim to be ahead of other universities in terms of attracting new students and to maintain their current student status. The most used social media platforms by universities in Turkey are Facebook, Twitter, and Instagram. When the practices of universities abroad are examined, Oxford University, one of the leading universities in the world, which believes in the effect of social media on corporate success, has created a social media center under its own roof and has continuously improved its social media strategies (Sezgin & Altay, 2021; Yücel & Karataş Yücel, 2022). Today, social media platforms have become one of the most effective tools that guide the selection of candidates during their university preferences. Universities have entered the race to develop social media strategies that will enable them to have an effective presence in these social networks in order to increase their competitiveness against other universities in gaining more qualified new students. The "university selection system" implemented in the 1960s has become "the students' choice of university" with the changes it has undergone (Sezgin & Altay, 2021; Yücel & Karataş Yücel, 2022). In order to influence these choices of students, both foundation and state universities organize various promotional activities during their preference periods. Promotions and advertisements in newspapers, magazines, radio, and television did not have a sufficient effect on young university candidates. As a natural consequence of this situation, social networks have become a very effective tool in communicating with candidates in directing university preferences. The candidates extensively use social media platforms to get information about the university and its academic staff, to be informed about dining and accommodation opportunities, to know about the social and cultural activities of the university, to follow the success

stories and experiences of graduates, and to get information about other issues (Doğan & Topa Çiftçi, 2019; Sezgin & Altay, 2021; Yücel & Karataş Yücel, 2022).

In the above-mentioned contexts, one of the most used social networks by university candidates is Twitter. Twitter allows institutions and individuals to share their content such as images, videos, and audio, as well as to make instant shares and to reach a wide range of users in real time (Martínez-Rojas et al., 2018). Due to the achievements of this social platform, institutions have started to produce appropriate content, taking into account the shares and sensitivities of users. Produced by institutions or users, these contents spread at a tremendous speed and are transmitted to large social communities. In particular, Twitter is used by universities as a mass communication and interaction tool in the conduct of many events and activities (Sezgin & Altay, 2021). Social networks such as Twitter encourage wider sharing of information. In the months when university choices are made, the interaction on this subject increases, and various hashtags related to this context (e.g., "#Üniversite", "#üniversitetercihleri", "#Eğitim", "#EkYerleştirme", "#BURS", "#YURT", "#KYK", "#YKS", "#TYT", "#AYT", "#YDT", "#yks2022", "#ykstercih", etc.) are created. By using these hashtags, more effective information sharing and interaction are provided between the candidates, universities, and other stakeholders (Cano-Marin et al., 2023).

II. MATERIAL AND METHOD

The methodology of the study consists of four basic stages that follow each other in accordance with the purpose of the study. First, a data set was created by collecting relevant tweets. In the next step, preprocessing and cleaning processes were applied on the texts that make up the data set. Then, the document-term matrix was created and finally, a semantic content analysis based on the structural issue modeling approach was performed on this matrix. Finally, 23 topics were discovered showing candidate trends in university preferences.

II.I. Data Collection and Preprocessing

The data set used in this study includes tweets between 01.07.2022 and 30.08.2022, filtered according to previously selected keywords. This data set includes tweets shared under hashtags such as "#Üniversite", "#üniversitetercihleri", "#Eğitim", "#EkYerleştirme", "#BURS", "#YURT", "#KYK", "#YKS", "#TYT", "#AYT", "#YDT", "#yks2022", "#2022yks", "#YKS", "#ykstercih", "#başarısırası", "#tercih2022", "#eğitim", "#ösym", "#doğrutercih", "#tercihzamanı", and "#ykstercih". Approximately 396,000 tweets complying with these criteria were collected using the Twitter API and a data set consisting of these tweets was created (Grandjean, 2016; Martínez-Rojas et al., 2018).

In the preprocessing stage, the collected tweets were subjected to many preprocessing procedures in order to increase the quality and accuracy of the analysis (Gurcan & Cagiltay, 2022; Gurcan & Sevik, 2019). The tweets shared on the Twitter platform have their own jargon and are limited to a maximum of 280 characters, causing users to frequently use special symbols, signs, abbreviations and links in tweets. This makes the preprocessing stage even more important in terms of increasing data quality (Gurcan, Boztas, Dalveren, & Derawi, 2023). Therefore, unnecessary punctuation, signs, numbers, web links and Twitter jargon-specific symbols (#, @, etc.) and emojis that are frequently found in tweets and have no semantic contribution were deleted, and meaningful pure texts in messages were obtained. In addition, English stop words (e.g., you, she, this, that, and, or, for, with, etc.) that don't make sense on their own were deleted from the texts (Gurcan, Dalveren, Cagiltay, & Soylu, 2022). The data cleaned at the end of the preprocessing stage is then converted into a document-term matrix to obtain the appropriate numerical matrix format required for the subject modeling analysis. In a document-term matrix, each row represents a tweet and each column represents a unique word in the data set. Each cell in the matrix shows how many times the word in the column appears in the tweet specified in the row (Ozyurt, Gurcan, Dalveren, & Derawi, 2022).

II.II. Method and Analysis

In the analysis phase, a semantic content analysis based on unsupervised machine learning was carried out on the document-term matrix by using the structural topic model (STM) algorithm (Zimbra et al., 2018). The topic modeling approach, which is widely used in multivariate data analysis, automatically divides the data into smaller clusters or subsets, allowing the data to be semantically modeled in small groups (Blei, 2012). Topic modeling is an unsupervised method of identifying hidden or explicit semantic themes in data (Blei, Ng, & Jordan, 2003; Gurcan, Dalveren, & Derawi, 2022). Because it is unsupervised, no training or labeled data is needed. It is applied directly to text documents to extract information. Topic modeling uses a set of exploratory and productive processes to find themes contained within a text dataset (Blei et al., 2003; Gurcan, Dalveren, Cagiltay, Roman, & Soylu, 2022).

Topic modeling is a text mining technique that provides probabilistic models to discover hidden semantic structures called “topics” from a collection of text documents (Gurcan, 2023). The topic modeling approach is based on the assumption that each document is represented by more than one topic and that each topic is represented by a distribution of words in the corpus. The probabilistic topic modeling approach provides more advanced analysis capabilities than traditional text mining techniques. Topic modeling enables analysis of large-scale data using less human effort in a research environment with a scalable and semi-automated algorithmic workflow without predefined tags (Blei, 2012; Uddin, Sabir, Guéhéneuc, Alam, & Khomh, 2021; Vayansky & Kumar, 2020). This model can also be applied to data sets of different types and characteristics, such as texts, scientific articles, genetic data, images, videos, forums, blogs, and social networks. STM is a general framework for topic modeling with document-level covariate information (Roberts, Stewart, & Tingley, 2019; Vayansky & Kumar, 2020). Covariates can improve inference and qualitative interpretability and are allowed to affect topical prevalence, topical content, or both.

In STM transactions, instead of using only the text content, metadata about the text is also included in the method. STM is considered a robust tool for semantic content analysis that automates the discovery of hidden topics in documents in a large-scale text corpus. In this study, STM-based topic modeling analysis was performed on the experimental dataset using an R package called “stm” (Roberts et al., 2019). Since STM is an unsupervised approach, there is a need to determine the number of topics. It may be possible to run a number of candidate models by specifying a different number of topics. Thus, we ran 21 models by adjusting the number of topics from 10 to 30. Semantic consistency calculates "how often the most likely words on a given topic occur closely together in the original texts." Exclusivity, on the other hand, calculates "the similarity and difference ratios between topics by comparing the similarity of the word distributions of different topics" (Roberts et al., 2019). Semantic consistency is higher if more probable terms on a given topic often coexist, and exclusivity is higher if there are more terms specific to a topic (Mimno, Wallach, Talley, Leenders, & McCallum, 2011; Röder, Both, & Hinneburg, 2015). The mean exclusivity and semantic consistency values of the 21 candidate models were evaluated, and as a result, the model adapted for the number of 23 topics was chosen as the most appropriate model. As a result of this analysis, 23 topics were discovered that reveal the main themes discussed by university candidates.

III. RESULTS

As a result of the experimental analysis, the priorities and tendencies of the candidate students in their university preferences were revealed. In this context, 23 topics were identified that show preference priorities and trends. The names, related keywords and percentages of these topics discovered by STM are presented in Table 1. In this table, the topics are ordered by percentage from high to low intensity. According to Table 1, the first five topics among the 23 discovered topics are “Entrance Exam (YKS)”, “Job Oppurtunities”, “Information Services”, “Educational Quality”, and

"Study Abroad (Erasmus, Farabi)", respectively. On the other hand, the topics with the least percentages representing the least discussed issues emerged as "Family Referral", "Security", "Customized Issues", "Vertical Transition", and "Alumni". Other topics are shown in the table in order of percentage. Considering their distribution percentages, the topics were grouped under three main groups as high-density, medium-density and low-density. Figure 1 shows the percentage distribution of each topic and the category in which the topics are placed in order of density.

Table 1. Discovered Topics and Keywords by STM

Topic name	Top keywords	%
Entrance Exam (YKS)	osym tyt ayt program-search preference percentile-slice department-search undergraduate associate-degree success-percent additional-quota	6.81
Job Oppurtunities	salary job public career assignment kpss points quota ranking officer-appointment employment employer company graduate	6.56
Information Services	internet wireless information-services online-systems online-registration e-government eduroam information-system mobile computer-lab tech-lab	6.44
Educational Quality	education-quality teaching experience academic-staff internship online-learning curriculum competency elective-courses double-major	6.28
Study Abroad (Erasmus, Farabi)	erasmus farabi study abroad mevlana student program-search exchange english foreign language contracted-universities visa dormitory-housing	6.12
Guidance	guidance undergraduate introductory graduate webinar orientation academic-consulting university department career-counselor life-coach	5.41
Faculty-Department	department-search faculty-department program-search university guidance candidate guideline student office undergraduate associate degree base-score	5.37
Campus Life	student campus life turkey experience social-spaces facilities sport activity vibrant friendship community housing-dining	5.25
Base Points	base-point quota student-acceptance program-search percentage-zone additional quota success-rank vertical-transition academic-grade grading	5.15
About University	university background academic-staff research reputation program-search education-quality achievement-rank employment career	5.13
Choice Robot	osym preference-wizard program-search choice-robot yok-atlas undergraduate program-selection preference-guide yks tyt success-ranking score-calculation	4.89
Academic Reputation	staff academic ranking fame respectability recognition research academic-reputation academic-success publication project tubitak	4.61
Location-City	city-location city-campus transportation campus-dormitory airport location district bus campus-location municipality-vehicles housing-dining	4.28
Housing-Dormitory	housing dormitory kyk apart guesthouse housing-dining official-guesthouse refectory quota rental application sorting application-priority	3.88
Application-Admission	application acceptance management online e-government sorting quota license required-documents online-registration	3.65
Social Oppurtunities	social campus-life student-clubs social-media activities interaction social-opportunities orientation housing-dining communities social-spaces	3.61
Scholarship	turkey government scholarship international-student full-scholarships funding undergraduate suitability application-criteria postgraduate	3.55
Foreign Language Education	language english education foreign course learn online student professional-course efl vocational language-school	3.35
Alumni	university graduate degree skill alumni career diploma experience graduation employability alumni-communication	3.13
Vertical Transition	dgs exam osym vertical transfer undergraduate program dgs-exam program-search department transition horizontal-transition associate-degree	2.07
Customized Issues	faq procedures issue personal program-search student-questions counseling help feedback helpdesk manual troubleshooting selection enrolment	1.64
Security	safety prevention student university campus personal-safety social commitment emergency city-security surveillance	1.46
Family Referral	university preferences family referral service student evaluation selection familial-priorities reputation counseling	1.34

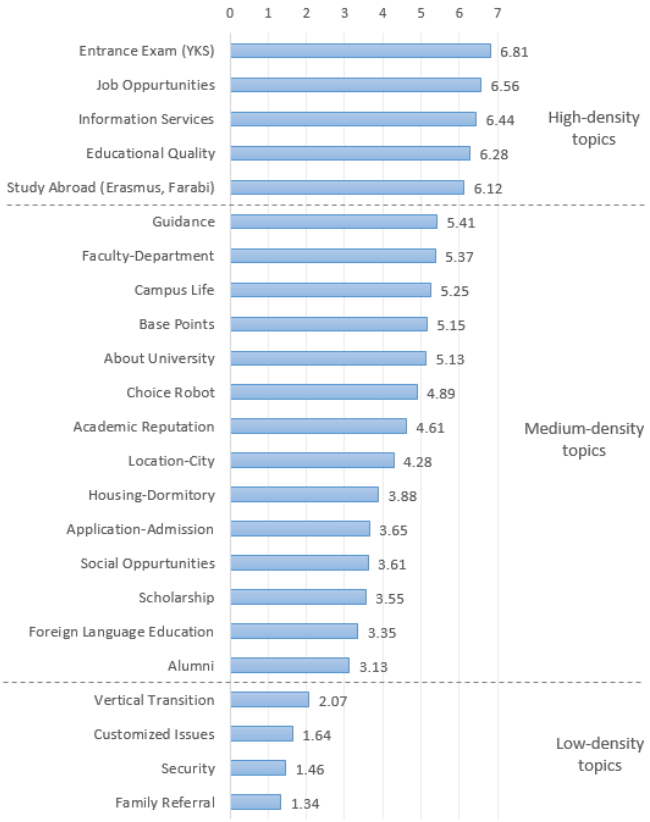

Figure 1. Density Taxonomy by Percentage of the Topics

CONCLUSION

In this experimental study, the messages shared on Twitter during the two-month period between July and August, which is the university preference period for 2022, were analyzed with the semantic subject modeling procedure based on the STM algorithm. As a result of this analysis, 23 semantic topics were obtained as output from the unstructured contents of tweet messages processed as inputs. These topics, which were obtained as a result of the analysis, quantitatively revealed the priorities and tendencies of the candidate students in their university preferences. In other words, the priorities and preference criteria taken into account by prospective students who will shape their future careers when choosing a university were determined. The percentages of preference trends characterized under these 23 topics are calculated and a quantitative perspective is presented for them. According to the findings, the top five topics determining the preferences of the candidate students emerged as “Entrance Exam (YKS)”, “Job Oppurtunities”, “Information Services”, “Educational Quality”, and “Study Abroad (Erasmus, Farabi)”, respectively. Considering these top topics, we can say that the candidates have serious problems about the university entrance exam (YKS). In this context, institutions such as OSYM and YOK can provide more informative guides to candidates about examination, scoring and placement.

Based on the findings of our study, it can be concluded that enhancing the attitudes and interactions of universities on social media platforms will have a positive impact on the visibility and endorsement of universities among prospective candidates. The utilization of social networks for communication and interaction in response to the candidates' demands is expected to yield favorable outcomes in terms of enhancing the recognition and image of the university. This research investigates attitudes and trends in university choices by analyzing social media data. The findings of this study provide valuable insights into the areas that universities should emphasize in their strategic efforts to

attract prospective students. The findings of our study can be regarded as a valuable resource for informing universities' strategic decision-making processes on their organizational structure and regeneration objectives. By adopting such an approach, it becomes possible to execute novel techniques that effectively address the expectations and desires of the candidates. It is envisaged that the methods and results of this study can provide valuable contributions and guide the universities in our country with different characteristics in better understanding the preference criteria of the candidates, renewing themselves according to current demands, and determining investment and education strategies. Using our results, universities can do a better job of figuring out what students and candidates want and what the trends are. They can also take better steps in the renewal process based on our findings. The findings of our research can provide prospective students with valuable insights to aid them in making informed decisions on their choice of university. By considering these findings, students can effectively prioritize their preferences and criteria while selecting a university.

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