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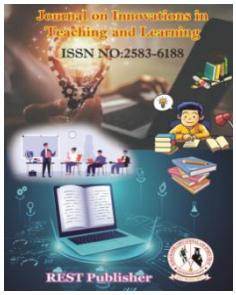

Evaluating the Websites of Academic Departments Using the GRA Method

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Abstract. *The academic world heavily relies on search engine referrals, making SEO particularly relevant in this sector. To effectively improve page rankings, SEO encompasses two primary categories of factors: 'on-page' and 'off-page. 'The on-page' factors are elements directly controlled on the website itself. These include strategic keyword usage, content quality, meta tags, URL structure, and internal linking. Conversely, 'off-page' factors involve external elements that influence a website's ranking. Examples include acquiring quality backlinks, maintaining a strong social media presence, and managing online reputation. To attain the maximum benefits from SEO, it is essential to consider relevant factors and criteria. Employing MCDM techniques allows website owners to evaluate and prioritize various SEO elements effectively, enabling a strategic and data-driven approach to improve their web content's search engine rankings. Today, with the advancement and widespread adoption of information systems, the quantity of websites has risen significantly. According to World Wide Web estimates based on the page index by search engines like Google and Bing, the total number of web pages has reached an impressive 4.48 billion. However, this sheer volume of websites makes it challenging for visitors to promptly find the information they are looking for. Thankfully, search engines play a crucial role in helping users access the relevant information they seek quickly and efficiently. The purpose of this study is to explore the challenges of multiple attribute decision-making when dealing with intuitionistic fuzzy information. In this scenario, the attribute weights are not entirely known, and the attribute values are represented by intuitionistic fuzzy numbers. To determine the attribute weights, an optimization model is constructed based on the traditional Grey Relational Analysis (GRA) method's fundamental principles. The proposed method involves calculating the Grey Relational degree between each alternative and the positive-ideal solution and negative-ideal solution. This degree is then used to define a relative relational degree, which enables the ranking of all alternatives simultaneously with respect to both the positive-ideal solution (PIS) and negative-ideal solution (NIS). Alternative taken as Performance criteria(C1), Design criteria (C2), Content criteria (C3), Meta tags criteria (C4), Backlink criteria (C5). Evaluation preference taken as Abdullah Gul University, Turkey (A1); Adana Science and Technology University, Turkey (A2); Aksaray University, Turkey (A3); Alanya Alaaddin Keykubat University, Turkey (A4); Anadolu University, Turkey (A5).*

Keywords: *Global Construction, Construction market, Gray Relational Analysis (GRA)*

1. INTRODUCTION

Search engines are software applications that create lists of documents containing specific keywords and then search those documents for the given keywords. Although the term "search engine" is a general one, it is commonly associated with popular systems like Google, Bing, and Yahoo (Gil, 2017). Crawlers are automated programs that navigate through websites across the Internet using links provided by those websites. They collect and store the contents of the visited sites. These collected contents are then indexed, transforming them into a format that allows for efficient and fast searching. The user interface enables users to conduct searches on the generated index.When a user enters keywords in the search bar of the search engine's user interface, the search engine presents a page called the Search Engine Result Page (SERP). This SERP displays websites that match the search engine's algorithms based on the entered keyword(s) The passage discusses the use of proprietary algorithms by search engines to generate indexes and provide relevant search results. These algorithms play a critical role in determining which results are shown to users based on their queries.The passage also delves into a web metric analysis of linkages, referred to as "citations," related to (LIS). The study finds that some citation

counts are unexpected and only minimally correlate with peer evaluations of research performance. Many of the citations come from unrelated pages, leading to the conclusion that citation data are not ideal for quantitatively evaluating the research status of LIS departments. Instead, hosting a diverse range of materials is suggested as the best approach to increase web visibility.Additionally, the availability of citation data has prompted interest in using them as performance indicators for evaluating academic institutions, including LIS departments. The World Wide Web's development has introduced similar methods, where web links to URLs are likened to traditional citations, forming the basis of webometric studies increasingly prevalent in the literature.Furthermore, the passage emphasizes the significance of usability in any user interface, highlighting its importance in making interfaces user-friendly and easy to use. Usability not only assesses the overall quality of a website but also offers valuable insights to managers regarding potential areas of concern. It is defined as the product's ability to be effectively, efficiently, and satisfactorily used by specified users within a specific context.While there has been an increase in usability evaluation studies for different types of websites, there is a noticeable lack of research focused on assessing the usability of educational websites specifically within the context of Arabic websites. To fill this gap, researchers have developed and employed various usability evaluation methods to identify issues related to the usability of educational websites. [3]The availability of information on departmental websites for prospective medical student applicants varies significantly between diagnostic and interventional radiology (1,2). These websites play a crucial role in helping students choose their desired programs, especially during the residency application process (4).When evaluating programs, prospective applicants consider various factors. However, in the absence of in-person interactions, the transparency of departmental websites regarding resident wellness becomes even more crucial (5). Providing information about resident well-being on these websites can significantly influence how applicants perceive and evaluate the programs they are considering. Traditionally, research output was disseminated through word of mouth, lectures, seminars, and informal discussions, and this had a substantial impact among academic economists. However, in today's context, unpublished research is unlikely to reach a broad audience and exert influence. Measuring research output is commonly done through publications, with publication-based rankings often focusing on journals and books, especially in U.S. studies, which tend to emphasize refereed journals. One crucial aspect is determining the quality of publications, and there are different approaches to this. One method is to consider only articles published in top-tier journals, but this requires defining which journals qualify as top-tier and whether they should be given equal weight. Alternatively, core journals can be used as a cut-off point, and the weight assigned to each journal can be based on its impact, measured by citations to articles within that journal, or perception-based, relying on subjective evaluations.This approach assumes that the variation in quality within a journal is smaller than the variation across journals, which is reasonable when there is a significant ranking gap between two journals. However, it becomes less plausible when the gap is small, as there may be journals of similar quality both above and below any cut-off line. It's worth noting that important articles can sometimes appear in field-specific journals rather than general "core" journals. Additionally, even top-tier journals may include some accepted papers that are below par in terms of quality. The assessment of scholars' scientific productivity using quantitative measures has become increasingly common in academia. This trend is evident in various aspects such as research project acceptance, researcher hiring, and awarding scientific accolades. In Romania, policymakers have embraced the use of quantitative metrics to evaluate research output, influencing decisions on the allocation of public funds to universities. To address the research questions, scholars examined the websites of selected departments in three distinct disciplines: history, psychology, and chemistry (8) (PSS) are gaining significant importance and popularity in the healthcare sector. Reports suggest that up to 70% of patients consider reviews when choosing healthcare providers (references 1–3). Consequently, institutions are making these metrics more accessible to attract patients (reference 4). The use of patient satisfaction surveys aims to improve healthcare quality through transparency, potentially leading to reduced healthcare costs. Some data even suggest a correlation between patient satisfaction and surgical outcomes (references 6–8), which might be due to satisfied patients being more inclined to follow providers' recommendations and adhere to follow-up care. Moreover, healthcare systems with higher overall PSS may offer comprehensive care programs, leading to better quality care.The collection and analysis of PSS have surged, with various platforms emerging for this purpose (references 2 and 9) Social media and commercial websites like Yelp, Healthgrades, and Doximity offer online platforms for patients to share their experiences with healthcare providers and systems. However, concerns have been raised about the reliability of unsolicited reviews, as they may attract patients who are either extremely satisfied or extremely dissatisfied with their care (reference 10)In the context of academic medicine, measuring productivity can be challenging. Economists define productivity as the ratio of output to input, often measured in terms of capital. One common metric to assess academic success is the amount of National Institutes of Health funding secured by a department (reference 13) The Internet's popularity is attributed to its ability to provide quick answers to various queries. This rise has posed a challenge for academic libraries, leading them to develop web-based reference services to cater to their university communities. As a result, many academic libraries have shifted their focus from physical printed materials to online information accessibility. A study revealed that 83 percent of academic libraries already offered digital reference services, resulting in a 39.1 percent reduction in received reference questions. This indicates a shift towards utilizing

Internet-based technologies over approaching library reference staff directly. Among the methods used, 78.8 percent of reference librarians surveyed used email, while web forms were used by only 46.6 percent.. Additionally, around 80 percent of ready reference questions were deemed suitable for digital reference services according to the respondents (reference 14). Researchers are greatly interested in the usability of websites, and one widely adopted approach to measure and rank website usability is fuzzy MCDM (Multi-Criteria Decision Making). Besides these measures, design dimensions and other support features that facilitate users in finding desired information within a specific time frame are also crucial and should be included in the proposed metric.Usability is a significant quality parameter that holds keen interest for website designers and researchers. Similar to any software, a website's usability depends on its functionality and its impact on the user's experience while using it. Various definitions of usability have been proposed in the literature, reflecting different authors' opinions on the matter. [15]

2. MATERIALS & METHODS

Performance criteria are specific and measurable standards or benchmarks that are used to assess or evaluate the performance of individuals, teams, or organizations. These criteria are established to define the expectations and objectives that need to be met in order to determine whether performance is meeting, exceeding, or falling short of desired goals. Performance criteria typically include both quantitative and qualitative measures that are relevant to the specific context or area being assessed. They can cover a wide range of aspects, such as productivity, quality, efficiency, customer satisfaction, financial targets, and adherence to deadlines, safety standards, and compliance with regulations. By setting clear performance criteria, organizations can effectively monitor and evaluate performance, provide feedback, identify areas for improvement, and make informed decisions regarding promotions, rewards, training, or corrective actions. Well-defined performance criteria contribute to a more objective and transparent assessment process, enabling individuals and teams to strive for excellence and align their efforts with organizational goals.

Design criteria refer to the specific requirements or guidelines that must be met during the design process of a product, system, or project. These criteria outline the essential features, performance expectations, and constraints that need to be considered in order to achieve a successful design outcome. Design criteria can vary depending on the context and the nature of the project, but they generally include factors such as functionality, aesthetics, safety, reliability, cost-effectiveness, usability, sustainability, and compliance with regulations or standards. These criteria help guide the design decisions and ensure that the final product or solution meets the desired objectives and specifications.

Content criteria refer to the specific guidelines or standards that define what is expected in a particular piece of content. These criteria outline the necessary elements, quality standards, and specifications that need to be met for the content to be considered acceptable or effective. Content criteria can vary depending on the context and purpose of the content, but they typically include factors such as accuracy, relevance, coherence, organization, tone, style, formatting, and adherence to any specific guidelines or requirements. Meeting content criteria ensures that the content meets the desired objectives and effectively communicates with the intended audience.

Meta tags :They play a crucial role in optimizing a website for search engine ranking and improving the user experience. The following are some criteria for effective meta tags:Length: Meta tags have character limits, and it's important to stay within those limits to ensure they are fully displayed in search engine results. For example, meta title tags should typically be around 50-60 characters, and meta description tags should be around 150-160 characters.Clarity and readability: Meta tags should be concise, clear, and easy to read. They should accurately summarize the content of the page in a way that is easily understandable to both search engines and users.Keyword optimization: Including relevant keywords in meta tags can help improve search engine visibility. However, it's important to use keywords naturally and avoid keyword stuffing, which could have a negative impact on search rankings.Accurate representation: Meta tags should provide an accurate representation of the webpage's content. Misleading or inaccurate meta tags can result in a poor user experience and may lead to penalties from search engines.Call to action (CTA): Meta tags, particularly meta description tags, can benefit from including a compelling call to action that encourages users to click through to the webpage.Remember that search engines may use different criteria when displaying meta tags in search results, so it's essential to stay updated on best practices and guidelines provided by search engines to optimize your meta tags effectively. The criteria for evaluating backlinks, also known as C5, refer to the factors considered when assessing the quality and relevance of a backlink to a website. These criteria help search engines determine the value and authority of a link, which can impact a site's search engine rankings. While the specific criteria may vary, common factors that are often considered include:Authority and Trustworthiness: The credibility and reputation of the linking website are important. Backlinks from authoritative and trustworthy sites are generally seen as more valuable.Relevance: The linking site should be topically relevant to the content of the linked page. Backlinks from relevant sources indicate

that the content is valuable and related to the linked topic.Link Placement: The position of the backlink within the linking page can impact its value. Ideally, the link should be placed in a prominent and relevant position, such as within the main body of the content. Diversity and Naturalness: A natural backlink profile includes a variety of sources and types of links. Having a mix of different types of backlinks, such as from different domains, referring IPs, and anchor text variations, is considered favorable.Traffic and Engagement: Backlinks from websites that generate significant traffic and user engagement can have a positive impact. Such sites indicate popularity and relevance, making their backlinks more valuable.It's important to note that search engines continuously update their algorithms, and the specific criteria and weight assigned to each factor may change over time. Therefore, it's crucial to stay updated with the latest best practices and guidelines provided by search engine authorities.

The research addresses multiple attribute decision-making problems involving intuitionistic fuzzy information, where attribute weights are not fully known, and attribute values are represented as intuitionistic fuzzy numbers. To determine the attribute weights, an optimization model is constructed based on the traditional Grey Relational Analysis (GRA) method's fundamental principles. This model allows for the determination of attribute weights. Next, the calculation steps for solving intuitionistic fuzzy multiple attribute decision-making problems with incomplete weight information are presented. The degree of Grey relation between each alternative and the positive-ideal solution and negative-ideal solution is computed. Subsequently, a relative relational degree is introduced to establish the ranking order of all alternatives by simultaneously considering their degree of Grey relation to both the positive-ideal solution (PIS) and negative-ideal solution (NIS).Finally, the proposed approach is demonstrated and its practicality and effectiveness are illustrated through an example. The example serves to verify the developed approach and showcase its applicability in real-world scenarios [16].The study proposes a hybrid multiple criteria decision-making (MCDM) approach that combines three techniques: simple additive weighting (SAW), order preference by similarity to an ideal solution (TOPSIS), and grey relational analysis (GRA). This method addresses the challenges of conflicts among alternatives in MCDM by integrating different evaluation methods and assigning attribute weights through an experimental design technique. The advantage of this approach is that it allows decision makers to make informed judgments without specialized skills or extensive experience.By integrating multiple MCDM methods, the proposed approach enhances the reliability of ranking results compared to relying on a single method. The effectiveness of the method is demonstrated through its practical application in an IC packaging company scenario and four additional numerical examples. The results obtained align closely with those of previous studies, validating the method's capability to solve real-life MCDM problems effectively.a numerical case study was conducted to select suitable locations for electric vehicle charging stations (EVCS). The results of this study were compared with other methods to further validate the proposed approach's efficacy [19].The proposed approach introduced a novel method for weighting indicators by combining (GRA) and (SRA). This combined method not only examines the correlation between indicators but also ensures the objectivity of indicator weights. The assessment results revealed that the sustainability level of Shenyang was relatively low, with the highest performance score reaching only 0.715.. The study found that the economy had the strongest relationship with city sustainability, followed by society and the environment [Reference: 20].The decision to utilize the Analytic Hierarchy Process (AHP) and Grey Relational Analysis (GRA) methods was made based on their advantages in addressing similar problems. However, it was discovered the GRA method, which relies on crisp values, were inadequate in accurately capturing the judgments of decision-makers, particularly when it came to reflecting vagueness and uncertainty. To overcome this limitation, fuzzy logic was integrated with AHP and GRA to better handle and represent the decision-makers' judgments [Reference: 21].The increasing frequency and severity of pollution emergencies underscore the importance of having a robust approach to address such incidents. Therefore, the selection of appropriate technology for responding to chemical spills during emergencies becomes crucial. In this study, a dynamic fuzzy GRA (Grey Relational Analysis) method is developed to establish an evaluation framework for determining the optimal technology for emergency treatment. This method utilizes dynamic analysis and linguistic terms to enhance the efficiency of emergency treatment procedures by addressing the uncertainty and vagueness involved in decision-making.. This approach not only facilitates the selection of emergency treatment technology but also helps decision-makers identify the most effective strategies for mitigating contaminants in a fast and cost-effective manner. Furthermore, the study addresses (MADM) where attribute values are represented using picture hesitant fuzzy numbers, and attribute weight information may be partially or entirely unknown. To determine the attribute weight vector, an optimization model inspired by conventional Grey Relational Analysis is proposed. This model effectively resolves attribute weights. Additionally, an optimization model is developed to handle cases where attribute weight information is completely unknown. The solution to this model provides a clear equation for determining attribute weights. This comprehensive approach empowers decision-makers to make well-informed choices, even in situations where attribute weight information is limited or uncertain [24, 25]

3. RESULT AND DISCUSSION

TABLE 1. Evaluating the websites of academic departments

Universities/criteria	C1	C2	C3	C4
A1	29	65	66	60
A2	35	44	37	52
A3	66	50	60	57
A4	5	7	14	18
A5	1	30	45	33

Table 1. shows Evaluating the websites of academic departments for Alternative: Performance criteria(C1), Design criteria (C2), Content criteria (C3), Meta tags criteria (C4), Backlink criteria (C5) Evaluation preference: Abdullah Gul University (A1), Adana Science and Technology University (A2), Aksaray University (A3), Alanya Alaaddin Keykubat University (A4), Anadolu University (A5).

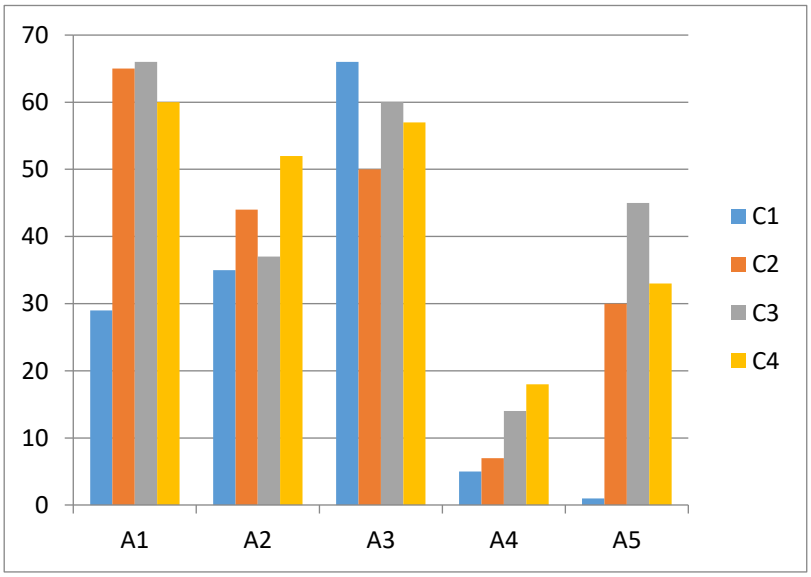

FIGURE 1. Evaluating the websites of academic departments

Figure 1 shows the graphical representation in Performance criteria it is seen that A3 shows highest value while A1 showed the lowest value. For Design criteria, it is seen that A4 shows the highest value while A1 showed lowest value. For Content criteria, it is seen that A1is showed the highest value and A2 showed the lowest value. In the case of Meta stages criteria, it is seen that A4 shows the highest value and A1 shows the lowest value.For Backlink criteria it is seen that A3 showed the highest value and A1 showed the lowest value.

TABLE 2. Normalized Data

Normalized Data			
C1	C2	C3	C4
0.4308	1.0000	0.0000	0.0000
0.5231	0.6379	0.5577	0.1905
1.0000	0.7414	0.1154	0.0714
0.0615	0.0000	1.0000	1.0000
0.0000	0.3966	0.4038	0.6429

Table 2 shows the Normalized data for Alternative: Performance criteria(C1), Design criteria (C2), Content criteria (C3), Meta tags criteria (C4), Backlink criteria (C5) Evaluation preference: Abdullah Gul University (A1), Adana Science and Technology University (A2), Aksaray University (A3), Alanya Alaaddin Keykubat University (A4), Anadolu University (A5).

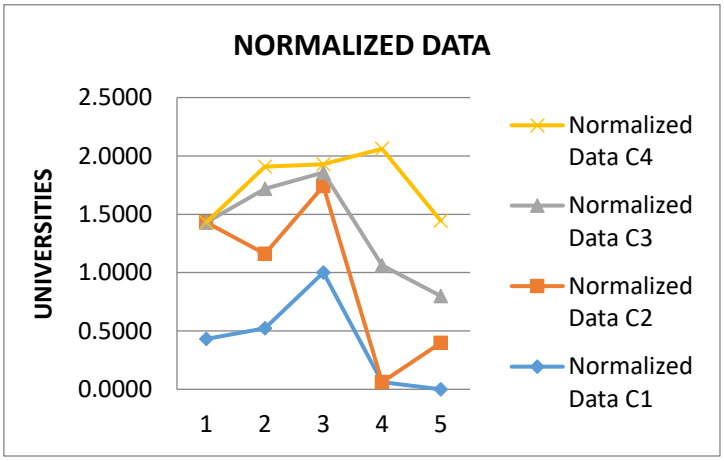

FIGURE 2. Normalized Data

TABLE 3. Deviation sequence

Deviation sequence			
C1	**C2**	**C3**	**C4**
0.5692	0.0000	1.0000	1.0000
0.4769	0.3621	0.4423	0.8095
0.0000	0.2586	0.8846	0.9286
0.9385	1.0000	0.0000	0.0000
1.0000	0.6034	0.5962	0.3571

Table 3 shows the Normalized data for Alternative: Performance criteria(C1), Design criteria (C2), Content criteria (C3), Meta tags criteria (C4), Backlink criteria (C5) Evaluation preference: Abdullah Gul University (A1), Adana Science and Technology University (A2), Aksaray University (A3), Alanya Alaaddin Keykubat University (A4), Anadolu University (A5).

TABLE 4. Grey relation coefficient

Grey relation coefficient			
C1	**C2**	**C3**	**C4**
0.4676	1.0000	0.3333	0.3333
0.5118	0.5800	0.5306	0.3818
1.0000	0.6591	0.3611	0.3500
0.3476	0.3333	1.0000	1.0000
0.3333	0.4531	0.4561	0.5833

Table 4 shows the Normalized data for Alternative: Performance criteria(C1), Design criteria (C2), Content criteria (C3), Meta tags criteria (C4), Backlink criteria (C5) Evaluation preference: Abdullah Gul University (A1), Adana Science and Technology University (A2), Aksaray University (A3), Alanya Alaaddin Keykubat University (A4), Anadolu University (A5).

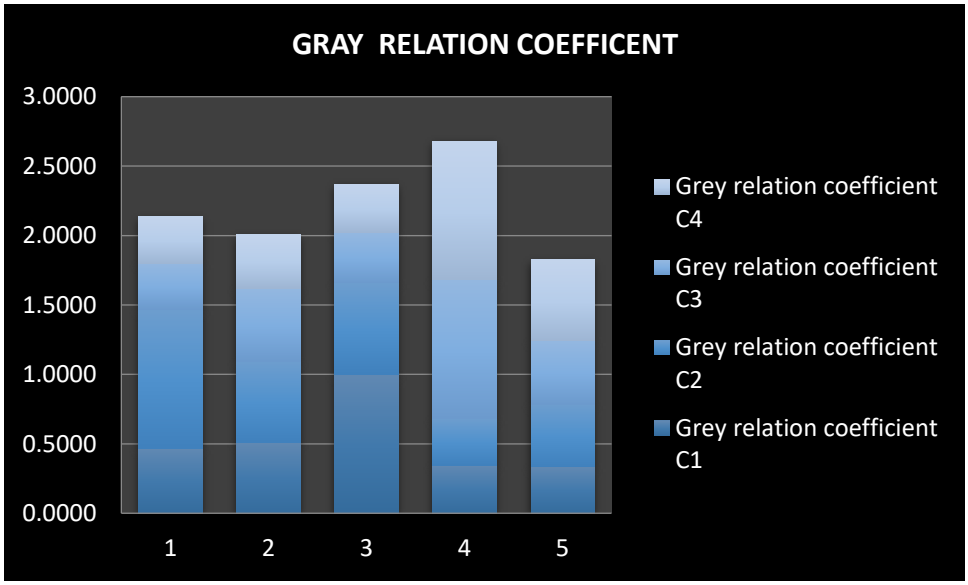

FIGURE 3. Grey Relation Coefficient

TABLE 5. GRG & Rank

	GRG	**Rank**
A1	0.5336	3
A2	0.5011	4
A3	0.5926	2
A4	0.6702	1
A5	0.4565	5

Table 5 Shows the GRG values for Alternative: Performance criteria(C1), Design criteria (C2), Content criteria (C3), Meta tags criteria (C4), Back link criteria (C5) Evaluation preference: Abdullah Gul University (A1), Adana science and technology university (A2), Aksaray university (A3), Alanya alaadin keykubat university (A4), Anadolu university (A5). Final rank Aksaray university (A3) are ranked Second, Adana science and technology university (A2) are ranked Fourth, Abdullah Gul University (A1) is ranked Third, Anadolu university (A5) are ranked Fifth Alanya alaadin keykubat university (A4) is ranked First. The GRA technique is used to generate the outcome.

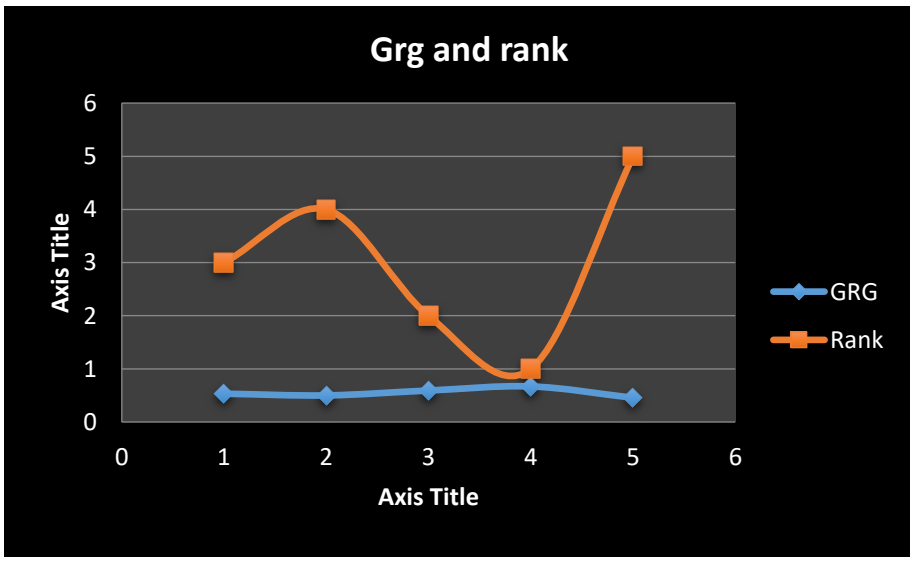

FIGURE 4. Grey Relation Analysis

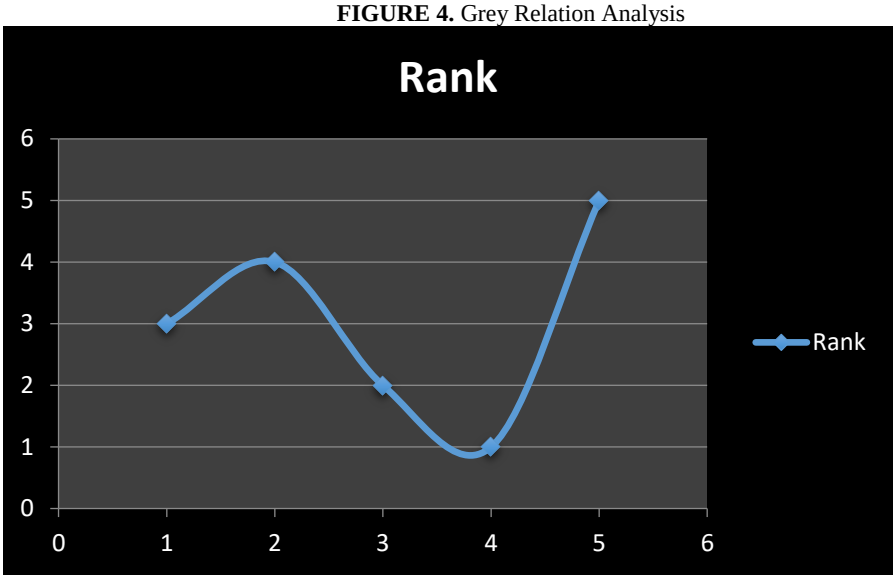

Figure 5. Rank

Figure 5. shows the graphical representation in Rank the final result of this paper Aksaray University (A3) is ranked Second, Adana Science and Technology University (A2) is ranked Fourth, Abdullah Gul University (A1) is ranked Third, Anadolu University (A5) is ranked Fifth and Alanya Alaaddin Keykubat University (A4) is ranked First.

4. CONCLUSION

The conclusions made in this study have implications for how Web links are used to compare departments and groups of departments. Firstly, the study found that the geographical location does not significantly influence how departments interlink in the United States. Secondly, Webometric comparisons of departments within the same discipline in economically advanced nations can be useful for assessing online impact, identifying trends, and recognizing areas of both good and poor performance. Thirdly, comparing departments from different disciplines to identify examples of good or bad practice would be unfair and unproductive. It also highlights the areas of concern regarding its usability and identifies user expectations from the website. employing a multi-method approach involving a representative number of users. The data analysis reveals that users primarily rely on the website for obtaining curriculum and research-related information. However, there is substantial room for improvement to align the CSL website with users' expectations. One major issue is the website's overall information architecture, which lacks logic and intuitiveness, requiring restructuring. The current structure causes confusion and misguides users. Additionally, users face difficulties in efficiently and effectively finding specific information within the website, as it takes more time than desired and leads to errors. Addressing these issues is crucial to enhance the website's usability and ensure it better serves its users' needs**.**

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