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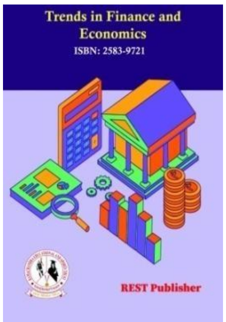

Firm Performance Analysis of Relation to the Implementation and use of Enterprise Resource Planning Systems using GRA Method

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Abstract. *Enterprise Resource Planning (ERP) is a business management system that allows organizations to integrate and manage their core business processes in a centralized system. The demand for integrated information system solutions among manufacturing and service companies has led to the development of ERP. The system is designed to streamline business operations and increase efficiency by providing real-time access to critical data across different departments. It encompasses the design, development, and implementation of ERP systems, as well as the processes and methodologies used to manage and optimize the system. Abstractly, ERP involves a thorough analysis of an organization's business processes to identify areas of inefficiency and opportunities for improvement. Based on this analysis, a customized ERP system is designed and developed to meet the organization's specific needs. The system is then implemented, tested, and ongoing maintenance and support are provided to ensure optimal performance. ERP systems typically include modules for accounting, human resources, inventory management, supply chain management, and customer relationship management. By integrating these processes into a single system, organizations can reduce redundant tasks, improve data accuracy, and make better-informed decisions based on real-time information. Overall, ERP is a critical tool for organizations looking to optimize their operations and remain competitive in today's fast-paced business environment. ERP systems have become increasingly popular among businesses of all sizes due to the numerous benefits they offer, such as increased efficiency, better decision-making, and improved customer service. The significance of ERP research lies in the fact that ERP systems have become critical to the success of many organizations, especially in today's fast-paced and competitive business environment. Research in this area can help organizations better understand the benefits and challenges of implementing ERP systems and develop strategies to optimize their use. Deng originally suggested Grey Relational Analysis (GRA) as a tool for MCDM problems, which has been successfully used to address many MCDM challenges. GRA is a model for evaluating effects that can assess the relationship between successions and their fit with certain information analysis techniques or calculation strategies. The factors considered in GRA include credit histories, behavior preferences, performance abilities, identity features, and interpersonal relationships. From the results, it is seen that behavior preference obtained the first rank, whereas performance abilities had the lowest rank among Entrepreneur 1, Entrepreneur 2, Entrepreneur 3, Entrepreneur 4, and Entrepreneur 5. The value of the dataset for Enterprise Resource Planning in the GRA (Gray-related analysis) method shows that it resulted in performance abilities ranking the highest.*

Keywords: *Behaviour preference, Performance abilities, Identity features, GRA.*

1. INTRODUCTION

"It enables organizations to streamline their operations, improve productivity, and make better-informed decisions by providing real-time data and insights. ERP systems are designed to facilitate the flow of information across different departments within an organization, enabling them to work together more efficiently and effectively. They typically consist of a suite of modules that can be customized to fit the specific needs of a business. ERP systems can be deployed on-premises or in the cloud, and they can be accessed via desktop computers, laptops, tablets, and smartphones. The benefits of ERP systems include increased operational efficiency, improved decision-making, reduced costs, better customer service, and enhanced competitiveness. Careful planning, customization, training, and ongoing maintenance and support are required. Therefore, it is important for organizations to choose an ERP system that fits their specific needs and goals and to work with experienced consultants and vendors who can guide them through the implementation process. Currently, an ERP system is considered a necessary tool for running a business, especially in the context of "business-to-business" electronic commerce with other companies in a network economy (Boykin, 2001). Many multinational companies also rely on ERP software to streamline their business operations with similar companies. ERP has become a reality for both large and small companies, but the approach should be adjusted according to each company's unique business model and practices. In the past, smaller enterprises may have struggled to compete due to limited access to powerful IT and integrated information systems compared to larger corporations. However, with the opening of the economy, operations can be streamlined and efficiency improved. The procurement module helps manage the purchasing process, including ordering, receiving, and paying for goods and services. The inventory management module helps manage the stock of goods and materials, including tracking inventory levels and reordering when necessary. The human resources module helps manage employee data, including payroll, benefits, and performance evaluations. The customer relationship management module helps manage interactions with customers, including sales, marketing, and customer service. By integrating these different modules, ERP systems provide real-time data and insights that enable organizations to make better-informed decisions. For example, an organization can use ERP data to optimize inventory levels, reduce procurement costs, and improve customer service. The centralized data provided by ERP systems can also help organizations identify inefficiencies and areas for improvement. ERP systems can be deployed on-premises or in the cloud. On-premises deployment requires organizations to install and maintain the software on their own servers, while cloud deployment involves accessing the software through a web browser. Cloud deployment can be more cost-effective and flexible but may raise concerns about data security and privacy. Implementing an ERP system can be a complex and time-consuming process. It typically involves identifying the organization's needs and goals, selecting the appropriate ERP software, customizing the software to fit the organization's specific requirements, and training employees on how to use the system. Ongoing maintenance and support are also required to ensure that the system continues to function effectively and efficiently. Despite these challenges, the benefits of ERP systems can be significant. By streamlining operations and providing real-time data and insights, ERP systems can help organizations reduce costs, improve productivity, enhance customer service, and increase competitiveness. For these reasons, many organizations have adopted ERP systems as a core component of their business management strategy. The conclusions drawn from the review will provide guidance for ERP selection and implementation in light of these challenges. With the business landscape becoming increasingly collaborative and competitive, companies must enhance their own business practices and procedures to improve their skills. This includes sharing more sensitive internal information with their suppliers, distributors, and customers, which was once fiercely protected. Companies must also improve their ability to create and communicate accurate information in a timely manner. To achieve these goals, more and more companies are turning to Enterprise Resource Planning (ERP).

2. METHODS AND MATERIALS

The GRAS method provides a user-friendly solution for recycling analysis that does not require a high-performance non-linear equation solver like GAMS to obtain results. However, the algorithm and solution provided by Julius and Oosterhaven in 2003 assume that every row and column of a matrix must have at least one positive element and be balanced, which may not always be the case in practice, particularly when working with large-scale input-output tables, supply and use tables (SUTs), social accounting matrices (SAMs), or any other type of matrix. In such cases, the GRAS method may not be the most suitable option for recycling analysis, and alternative approaches may need to be considered. For instance, other methods like the RAS algorithm, which allows for negative elements in a matrix, may be more appropriate for large-scale matrices. Additionally, it may be necessary to modify the matrix or adjust the data to ensure that it meets the assumptions required for the GRAS method. Overall, while the GRAS method provides an easy-to-use solution for recycling analysis, it is essential to consider its limitations and suitability for the specific matrix being analyzed. In cases where a fundamental matrix contains at least one row and/or column with negative elements and zeros, GRAS algorithms will not be effective since proportional adjustment multipliers cannot be defined. For instance, the four Macro-SAMs for Mozambique in 2000, 2005, 2007, and 2008 studied by Alarcon et al. (2011, pp. 49-50) all include one row and one column with net indirect lines types for functions with only negative nonzero components. Similarly, detailed SAMs that feature extended input-output accounts typically include depreciation as a subsection, which means that value-added has only negative inputs (for more details, see

Miller and Blair, 2009, p. 510-513). Moreover, in supply and use tables, all sector and end-use marginal products are negative in trade and transport margin matrices. Consequently, while the GRAS method may be an effective solution for some types of matrices, it may not work for those that feature negative elements and zeros in at least one row or column. In addition to net taxes, depreciation, and margins, situations where at least one row or column in a matrix has negative elements and zeros can also occur in input-output systems, depending on changes in inventories and net exports. In this note, we consider the possibility of such cases and propose modifications to the formulas and methodology of the GRAS analysis solution described in the literature. It's worth noting that the problem discussed in this note does not arise during the optimization process of GRAS when solving the nonlinear optimization problem using a suitable solver like GAMS. This is because, as Lesson et al. (2007, p. 464) explain, the solver only requires the objective function and constraints to be provided. However, there may be situations where the GRAS analysis solution needs to be modified to accommodate such cases.

3. ANALYSIS AND DISCUSSION

TABLE 1. Enterprise Resource Planning

	Credit histories	Behavior preference	Performance abilities	Identity features	Interpersonal relationships
entrepreneur 1	31.08	139.53	29.15	22.05	66
entrepreneur 2	29.12	142.97	33.69	27.3	6
entrepreneur 3	24.08	122.58	29.18	23.1	66
entrepreneur 4	23.17	128.28	24.6	17.59	34
entrepreneur 5	33.33	186.41	27.96	18.89	45

This table 1 shows that the value of dataset for Enterprise Resource Planning in GRA (Gray-related analysis) method Alternative: Credit histories, Behaviour preference, Performance abilities, Identity features, Interpersonal relationships. Evaluation Preference: entrepreneur 1, entrepreneur 2, entrepreneur 3, entrepreneur 4, entrepreneur 5.

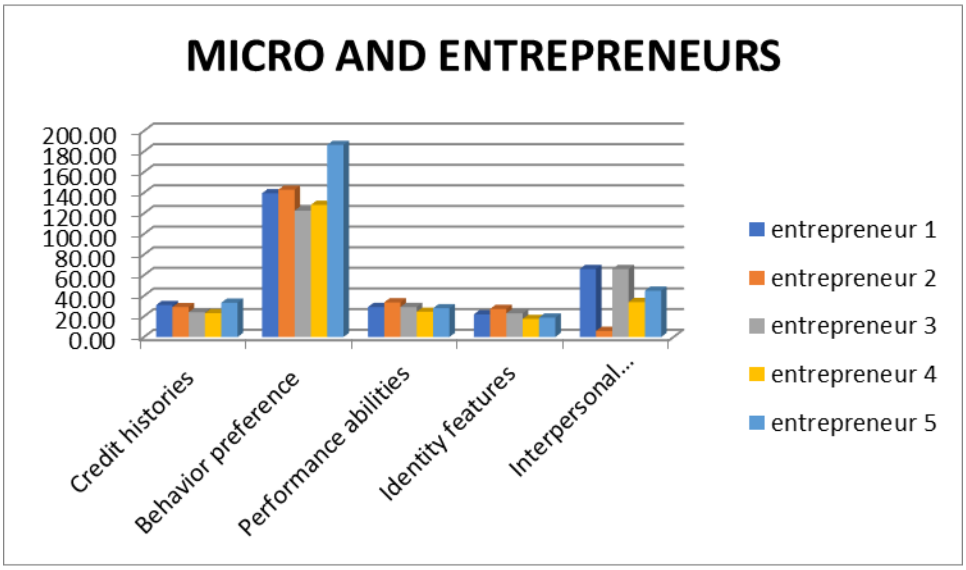

FIGURE 1. Enterprise Resource Planning

This figure 1 shows that the value of dataset for Enterprise Resource Planning in GRA (Gray-related analysis) method Alternative: Credit histories, Behaviour preference, Performance abilities, Identity features, Interpersonal relationships. Evaluation Preference: entrepreneur 1, entrepreneur 2, entrepreneur 3, entrepreneur 4, entrepreneur 5.

TABLE 2. Enterprise Resource Planning in Normalized Data

Normalized Data				
Credit histories	behaviour preference	Performance abilities	Identity features	Interpersonal relationships
0.22	0.19	0.20	0.20	0.30
0.21	0.20	0.23	0.25	0.03
0.17	0.17	0.20	0.21	0.30
0.16	0.18	0.17	0.16	0.16
0.24	0.26	0.19	0.17	0.21

This table 2 shows that the values of Enterprise Resource Planning in Normalized Data from using gray relation analysis Find the for entrepreneur 1, entrepreneur 2, entrepreneur 3, entrepreneur 4, entrepreneur 5.

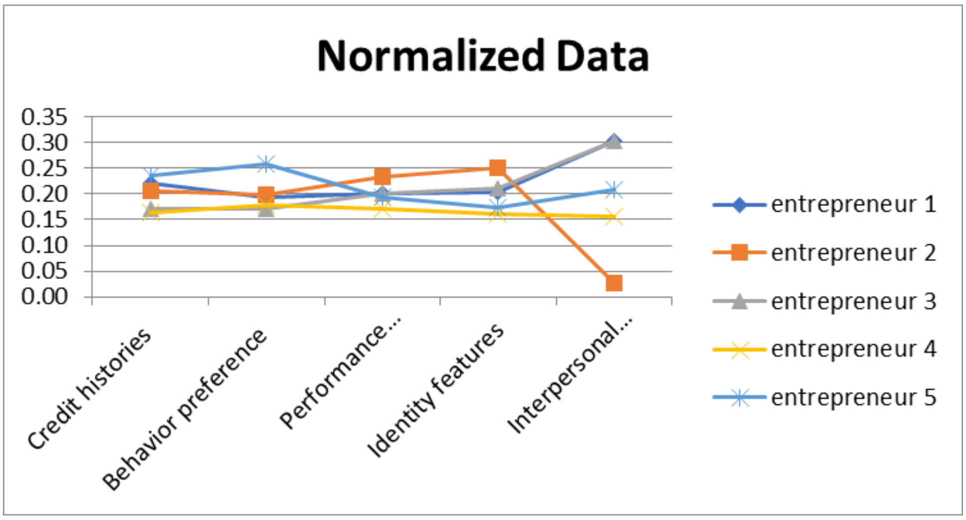

FIGURE 2. Enterprise Resource Planning in Normalized Data

This figure 1 shows that the values of Enterprise Resource Planning in Normalized Data from using gray relation analysis Find the for entrepreneur 1, entrepreneur 2, entrepreneur 3, entrepreneur 4, entrepreneur 5.

TABLE 3. Weight

Weight				
0.25	0.25	0.25	0.25	0.25
0.25	0.25	0.25	0.25	0.25
0.25	0.25	0.25	0.25	0.25
0.25	0.25	0.25	0.25	0.25
0.25	0.25	0.25	0.25	0.25

Table 4. This may not be true in practice, in particular, when dealing with large-scale IO tables, supply and use tables (SUTs), social accounting matrices (SAMs), or, in general, any other matrix.

TABLE 4. Weighted normalized decision matrix

Weighted normalized decision matrix					
entrepreneur 1	0.06	0.05	0.05	0.05	0.08
entrepreneur 2	0.05	0.05	0.06	0.06	0.01
entrepreneur 3	0.04	0.04	0.05	0.05	0.08
entrepreneur 4	0.04	0.04	0.04	0.04	0.04
entrepreneur 5	0.06	0.06	0.05	0.04	0.05

Table 5. This may not be true in practice, in particular, when dealing with large-scale IO tables, supply and use tables (SUTs), social accounting matrices (SAMs), or, in general, any other matrix.

TABLE 5. Bi, Ci, Min(Ci)/Ci

Bi	Ci	Min(Ci)/Ci
0.154	0.127	0.5493
0.16	0.07	1
0.136	0.129	0.5391
0.128	0.08	0.8746
0.172	0.095	0.7308
min(Ci)*sum(Ci)	0.0348	3.6938

This Table 4 shows the values of Comparative Analysis in Grey relation coefficient from using gray relation analysis Find bi, ci, Min (Ci)/Ci the for entrepreneur 1, entrepreneur 2, entrepreneur 3, entrepreneur 4, entrepreneur 5.

TABLE 6. Rank

Rank	
entrepreneur 1	4
entrepreneur 2	1
entrepreneur 3	5
entrepreneur 4	3
entrepreneur 5	2

This table 6 shows that from the result entrepreneur 2 and entrepreneur 3 are ranked first. having the lowest rank.

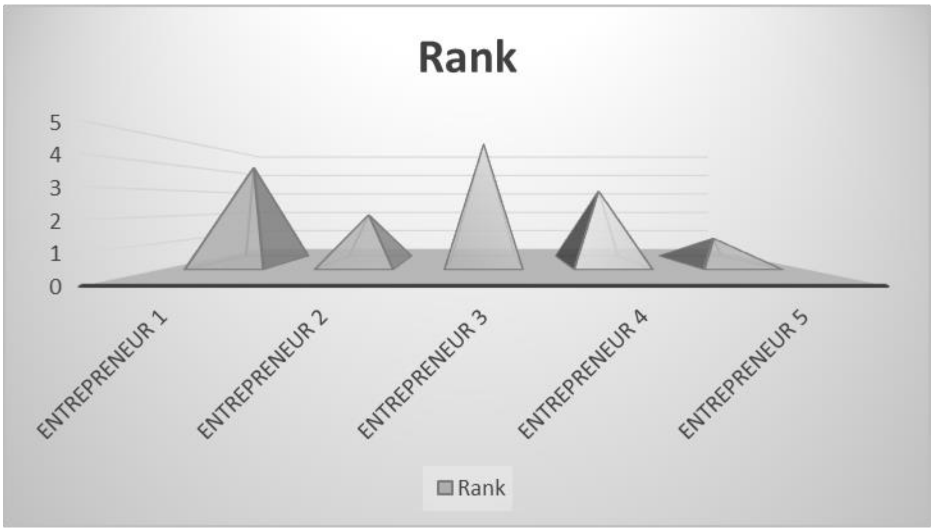

FIGURE 3. Enterprise Resource Planning in Rank

This figure 3 shows that from the result 1980and found first rank whereas is the 1975 got is having the lowest rank.

4. CONCLUSION

In summary, ERP software has become a crucial component for the success of many organizations. It provides numerous benefits, such as increased efficiency, better decision-making, and improved customer service. However, implementing and managing an ERP system can be challenging, and research in this area is essential to help organizations optimize their use of these systems. Research in ERP covers various areas, such as implementation and adoption, performance and effectiveness, integration and customization, and security and risk management. Understanding the factors that influence successful implementation and adoption, the impact of ERP systems on organizational performance, challenges related to integration and customization, and the need for effective security and risk management is essential to ensure that organizations can effectively leverage ERP systems to meet their business needs. As technology continues to evolve and business environments become increasingly complex, ERP research will remain critical for organizations to stay competitive and maximize the benefits of these systems.

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