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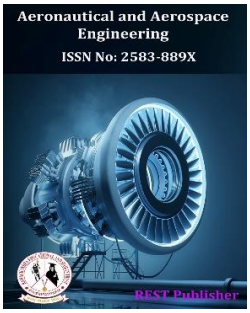


# Challenges, Alternatives, and Paths to Sustainability for Health Information Exchange Efforts Using PROMETHEE Method

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**Abstract.** *Electronic health information sharing and regional health information centres The practise of emergency medicine in the United States can have a significant impact. Regional Health Information Institutes are stakeholder networks that share local or regional information in a specific geographic area. Set up electronic data transfer. Safety of medical care and to improve efficiency across the country regional health information institutions are being created; Public health initiatives, biological surveillance and enhancing the reaction of catastrophe management; and identifying for research enormous databases of aggregate data. However, the economy Organizational issues and including geography to facilitate exchange With the Regional Health Information Organization (RHIO) model They identified challenges. Direct, institutional HIE and such as seller-mediated exchange versus alternative modes of exchange RHIOs vary. Due to political and economic reasons HIE is a difficult task. It is of many types Classified by optional activities; they are for alternatives in judgments The differences between Used to allocate. Under conventional criterion priority functions Using PROMETHEE Choice of health information exchange. This paper proposes that in the final option to check the effect of different optional functions Comparable results are presented. Seven economic and environmental criteria, Four health information and Five decision makers health information exchange problem Major Structures. with decision makers using a five-point Likert scale by personal communication Data was collected. Under the usual criterion function PROMETHEE's algorithm is implemented. The pharmaceutical industry and research, medical trials, healthcare fraud detection, neurological research, and electronic health records are alternatives. Evaluation Parameters are Transparent, Autonomy, Open Source, Anonymity and Decentralized. Health Information Exchange using PROMETHEE. Electronic Health Records, is got third rank, Clinical Research is got first rank, Medical Fraud Detection is got forth rank, Neuroscience Research is got fifth rank and Pharmaceutical Industry and Research is got second rank*

***Keywords:*** *Biological Collections, Ship Hull, MOORA method.*

## 1. INTRODUCTION

Regional Health Information Institutions are, Computerized health information exchange networks for the purpose of creating of Amalgamated Shareholders A local or regional information sharing consortium. Health agencies, payers, patients, pharmacies, universities, skilled nursing institutions, clinics, private doctor's offices, and radiological facilities are just a few examples of potential partners. Data users, data providers, or both may be partners depending on the role each category plays. Specific stakeholders may vary regionally. Regional Health Information Institutes When formed, they are national level For Health Information Network become building blocks, it is safe in the national network Provides health information exchange. Health Information Exchange Reduce medical error rates, expenses, and congestion Performance in quick EDs could be enhanced. Infrastructure, software, network technologies, and guidelines for health informatics advancements to develop health information institutions Some restrictions have been removed. "National Health Information Infrastructure", lately, the Centers for Medicare and Medicaid Services from organizational change perspective Analysis of these efforts completed. Across the United States Health information organizations Interest in creating Since they are NHIIs, it is crucial to comprehend the amount of activity as it will serve as one of the fundamental building components. to promote the interchange of health information (HIE). From the National Plan developed Using the data, through health information organizations the amount of activity is crucial to comprehend because NHIIs are one of the fundamental building elements. to encourage the sharing of health information (HIE). The PROMETHEE approach can be applied to resolve the MCDM issue in a fuzzy setting. The PROMETHEE was extended by Goumas and Lygerou approach for choosing the best course of action in a fuzzy environment for an energy extraction project. A fuzzy PROMETHEE approach was put forth by Chen et al. for outsourcing information systems. As the benchmark for the alternative value, they chose the fuzzy number. In order to better explore copper, Fuzzy number was used by Gul et al. to construct the

PROMETHEE approach, which was based on the MCDM issue. The PROMETHEE approach was expanded by Feng et al. using fuzzy soft sets. However, there may be a lot of unknowns and unpredictable circumstances during the MCDM process. It not only establishes the extent to which a substitute satisfies the requirements but also shows the extent to which the substitute requirements are not met. Intuitionistic fuzzy sets (IFS) with membership and non-membership degrees were first introduced by Atanasov.

## 2. HEALTH INFORMATION EXCHANGE (HIE)

Increased health information Transfer access and One might argue that a correlation between usage is expected. Factors that may indicate complex events, or in other words, the sick, Access to health information exchange Providers increased their odds. Information seeking theory and in accordance with information sought by physicians, The information is very useful Providers may have access to data. With access to health information exchange Relevant patient characteristics, largely stored to generate health information Expected characteristics. Lack of communication of health information between providers Patient safety is compromised There are many health conditions. Patients to their normal healthcare system Outside For emergency departments usually go Sometimes may not be able to communicate, there are their providers A little about them or May not have prior information. In either an inpatient or outpatient situation, providers who don't know the patient through improved health information exchange Make safe decisions. In surgical patient care Many notable results and when changes occur, includes multiple caregivers, within a reasonable amount of time, and in terms of safety May cause significant corrosion. To improve Improved patient, possibilities for sharing health information for example, from hospitals Changes in home or nursing home settings. By health care managers for more widespread information sharing Reduce political and institutional pressures Cannot be estimated or relating to HIE All challenges It cannot be dismissed as purely technical. Almost as described above in all events, and in our review Especially unexplained for other countries too, Improvements in health standards and reducing costs Repetition is identified as a motivation for HIE. Funding Agents, Supporters of reform and health policy makers attractive targets for Ensures sustainable interest in HIE. In numerous nations This converts to helpful HIE instructions. Additionally, despite many technical challenges, Institutional relations for HIE initiatives, in governance and individual system adoption Management attention is required. This study uses HIE technology Focused on use in patient care. Why providers approached HIE; What kind of information did they collect? In patient care How they used this information We investigated. Transfer application and trigger effects of use We identified the factors. in each site HIE for clinical workflow How does it fit, Processing patterns connected to HIE in general Finding and researching exchange usage in clinical settings Key findings are: Patient care in delivery in knowledge of the front-line impact of HIE significant gap Our research addressed this. Previous HIE assessment efforts, such as duplicate test rates Through analysis of quantitative data Focused on proving return on investment. HIE organization in patient care Real impacts are subtle and rare It also offered clear financial benefits.

## 3. PROMETHEE METHOD

Priority is based on activities Outranking is routine A unique feature of MCDM tools is their capacity to rate various options for making decisions. The PROMETHEE method was created in 1985 by Brans and Vincke as an MCDM tool. It belongs to partial aggregation methods, it is also known as outranking methods, and this is for absolute integration (MAUT) methods Designed to be reactive. In this paper, to be assigned to workstations to get a full ranking of extraction tasks PROMETHEE II method is used. Sequel to PROMETHEE Alignment of phases followed: Each program is parallel to operate in an additional phase builds on the former. For performance of parallel programs which phases of PROMETHEE method To find out which contributed the most This allowed us to. The purpose of the current research is to illustrate and validate the PROMETHEE technique for additional industrial environment decision-making scenarios using soft and fuzzy criteria. The Analytical Hierarchy Process (AHP) is used in conjunction with the approach to assess the relative relevance of the quality criteria using a ranking value judgement on a fuzzy transition scale. An enhanced PROMETHEE approach for making decisions in a manufacturing context is presented in the following section. The PROMETHEE approach, which was developed by France et al., falls under the heading of advanced methodologies. Like all outranking techniques, PROMETHEE analyses alternatives pairwise on each criterion to identify partial binary connections that show how strongly option a1 is preferred to alternative a2. The alternatives are assessed using several criteria in the evaluation table. To implement PROMETHEE, additional sorts of information are needed. The "Priority Ranking System Method for Saturation Evaluation (PROMETHEE)" method is a well-known high quality-based methodology that supports the decision maker in handling decision problems among the different traditional approaches for dealing with MADM problems. great friendship that is valuable. This connection, which establishes the preferred setting for The "PROMETHEE" approach, which compares possibilities pairwise, was developed. The PROMETHEE technique is very beneficial in difficult decision-making procedures, especially in practical MADM problems including expert opinion and human perception. It is important to note that the PROMETHEE technique has several benefits when expert participation is limited by their diverse areas of knowledge. Due to the fact that it compares alternatives in pairs rather than simply ranking them, the PROMETHEE technique is a reliable method for making decisions. Through this method, potential

round-off errors during data normalisation are avoided. Additionally, using specific requirements or data features, the PROMETHEE methodology aids decision makers in selecting the proper evaluation criteria for each attribute.

**TABLE 1**. Health Information Exchange using PROMETHEE

| | Transparent | Autonomy | Open Source | Anonymity | Decentralized |
|---|---|---|---|---|---|
| Electronic Health Records | 25 | 46 | 64 | 41 | 47 |
| Clinical Research | 38 | 65 | 69 | 48 | 51 |
| Medical Fraud Detection | 36 | 24 | 42 | 53 | 62 |
| Neuroscience Research | 32 | 27 | 43 | 35 | 54 |
| Pharmaceutical Industry and Research | 57 | 43 | 28 | 65 | 43 |
| Max | 57 | 65 | 69 | 65 | 62 |
| Min | 25 | 24 | 28 | 35 | 43 |
| max-Min | 32 | 41 | 41 | 30 | 19 |

shows the table 1 Health Information Exchange using PROMETHEE method. alternatives are Electronic Health Records, Clinical Research, Medical Fraud Detection, Neuroscience Research, Pharmaceutical Industry and Research. Evaluation Parameters are Transparent, Autonomy, Open Source, Anonymity and Decentralized. shows the maximum and minimum output of each value.

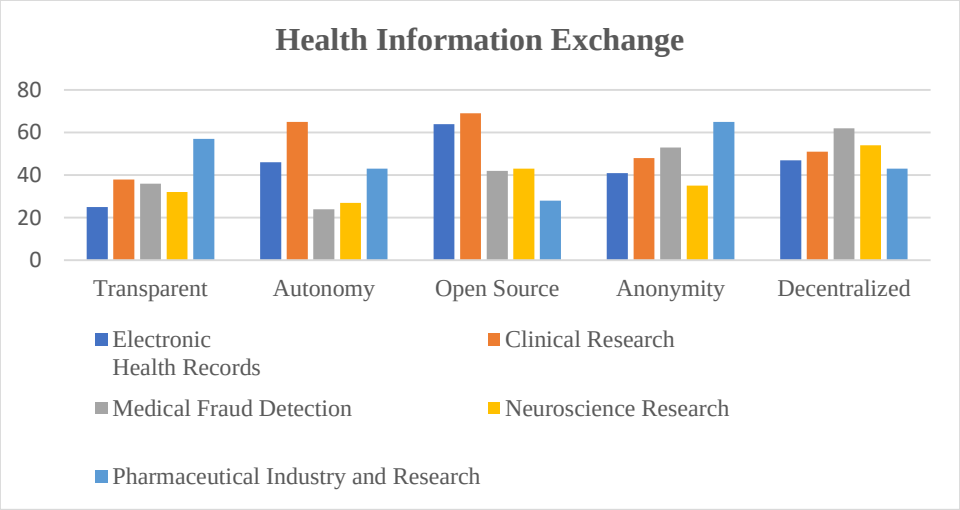



**FIGURE 1.** Health Information Exchange using PROMETHEE

Shows the figure 1 alternatives are Electronic Health Records, Clinical Research, Medical Fraud Detection, Neuroscience Research, Pharmaceutical Industry and Research. Evaluation Parameters are Transparent, Autonomy, Open Source, Anonymity and Decentralized. shows the maximum and minimum output of each value.

**TABLE 2.** Normalized Matrix

| | Normalized Matrix | | | | |
|---|---|---|---|---|---|
| Electronic Health Records | 0 | 0.536585366 | 0.87804878 | 0.2 | 0.210526316 |
| Clinical Research | 0.40625 | 1 | 1 | 0.433333333 | 0.421052632 |
| Medical Fraud Detection | 0.34375 | 0 | 0.341463415 | 0.6 | 1 |
| Neuroscience Research | 0.21875 | 0.073170732 | 0.365853659 | 0 | 0.578947368 |
| Pharmaceutical Industry and Research | 1 | 0.463414634 | 0 | 1 | 0 |

Table 2 shows the Normalized matrix of Sensitivity analysis promethea alternatives are Electronic Health Records, Clinical Research, Medical Fraud Detection, Neuroscience Research, Pharmaceutical Industry and Research. Evaluation Parameters are Transparent, Autonomy, Open Source, Anonymity and Decentralized. normalization is shown in the above tabulation. Table 2 shows the default matrix of Prometheus for the sensitivity analysis shown in the table above.

**TABLE 3.** Pair wise Comparison

| | Pair wise Comparison | | | | |
|---|---|---|---|---|---|
| D12 | -0.40625 | -0.463414634 | -0.12195122 | -0.233333333 | -0.210526316 |
| D13 | -0.34375 | 0.536585366 | 0.536585366 | -0.4 | -0.789473684 |
| D14 | -0.21875 | 0.463414634 | 0.512195122 | 0.2 | -0.368421053 |
| D15 | -1 | 0.073170732 | 0.87804878 | -0.8 | 0.210526316 |
| D21 | 0.40625 | 0.463414634 | 0.12195122 | 0.233333333 | 0.210526316 |
| D23 | 0.0625 | 1 | 0.658536585 | -0.166666667 | -0.578947368 |
| D24 | 0.1875 | 0.926829268 | 0.634146341 | 0.433333333 | -0.157894737 |
| D25 | -0.59375 | 0.536585366 | 1 | -0.566666667 | 0.421052632 |
| D31 | 0.34375 | -0.536585366 | -0.53658537 | 0.4 | 0.789473684 |
| D32 | -0.0625 | -1 | -0.65853659 | 0.166666667 | 0.578947368 |
| D34 | 0.125 | -0.073170732 | -0.02439024 | 0.6 | 0.421052632 |
| D35 | -0.65625 | -0.463414634 | 0.341463415 | -0.4 | 1 |
| D41 | 0.21875 | -0.463414634 | -0.51219512 | -0.2 | 0.368421053 |
| D42 | -0.1875 | -0.926829268 | -0.63414634 | -0.433333333 | 0.157894737 |
| D43 | -0.125 | 0.073170732 | 0.024390244 | -0.6 | -0.421052632 |
| D45 | -0.78125 | -0.390243902 | 0.365853659 | -1 | 0.578947368 |
| D51 | 1 | -0.073170732 | -0.87804878 | 0.8 | -0.210526316 |
| D52 | 0.59375 | -0.536585366 | -1 | 0.566666667 | -0.421052632 |
| D53 | 0.65625 | 0.463414634 | -0.34146341 | 0.4 | -1 |
| D54 | 0.78125 | 0.390243902 | -0.36585366 | 1 | -0.578947368 |

Table 3 shows the Pair Wise Comparison of table 2 the Transparent, Autonomy, Open Source, Anonymity and Decentralized. comparing each row with other row on the tabulation.

**TABLE 4.** Preference Value

| | Preference Value | | | | |
|---|---|---|---|---|---|
| | 0.2336 | 0.165 | 0.3355 | 0.102 | 0.042 |
| D12 | 0 | 0 | 0 | 0 | 0 |
| D13 | 0 | 0.089 | 0.18 | 0 | 0 |
| D14 | 0 | 0.077 | 0.1718 | 0.02 | 0 |
| D15 | 0 | 0.012 | 0.2946 | 0 | 0.009 |
| D21 | 0.0949 | 0.077 | 0.0409 | 0.024 | 0.009 |
| D23 | 0.0146 | 0.165 | 0.2209 | 0 | 0 |
| D24 | 0.0438 | 0.153 | 0.2128 | 0.044 | 0 |
| D25 | 0 | 0.089 | 0.3355 | 0 | 0.018 |
| D31 | 0.0803 | 0 | 0 | 0.041 | 0.033 |
| D32 | 0 | 0 | 0 | 0.017 | 0.025 |
| D34 | 0.0292 | 0 | 0 | 0.061 | 0.018 |
| D35 | 0 | 0 | 0.1146 | 0 | 0.042 |
| D41 | 0.0511 | 0 | 0 | 0 | 0.016 |
| D42 | 0 | 0 | 0 | 0 | 0.007 |
| D43 | 0 | 0.012 | 0.0082 | 0 | 0 |
| D45 | 0 | 0 | 0.1227 | 0 | 0.025 |
| D51 | 0.2336 | 0 | 0 | 0.082 | 0 |
| D52 | 0.1387 | 0 | 0 | 0.058 | 0 |
| D53 | 0.1533 | 0.077 | 0 | 0.041 | 0 |
| D54 | 0.1825 | 0.064 | 0 | 0.336 | 0 |

Table 4 shows the Performance value of the Wise Comparison of table 2 the Transparent, Autonomy, Open Source, Anonymity and Decentralized. When compare to all others. And the last one is the sum of the same row.

**TABLE 5.** Sum of Performance Value

| | M1 | M2 | M3 | M4 | M5 | Sum |
|---|---|---|---|---|---|---|
| **M1** | 0 | 0 | 0.268668293 | 0.268817561 | 0.315599487 | 0.85309 |
| **M2** | 0.245120381 | 0 | 0.400739024 | 0.453911626 | 0.441996534 | 1.54177 |
| **M3** | 0.154613684 | 0.041564035 | 0 | 0.108312632 | 0.156960976 | 0.46145 |
| **M4** | 0.066721053 | 0.006694737 | 0.020270732 | 0 | 0.147291271 | 0.24098 |
| **M5** | 0.31528 | 0.196556667 | 0.270696098 | 0.582468293 | 0 | 1.365 |
| **Sum** | 0.781735118 | 0.244815439 | 0.960374146 | 1.413510111 | 1.061848267 | |

Table 5 shows the sum of all rows and column are applied on the last row. The sum of all row of performance value are arranged above tabulation and the diagonal value are zero.

**TABLE 6.** Positive flow, Negative flow, Net flow

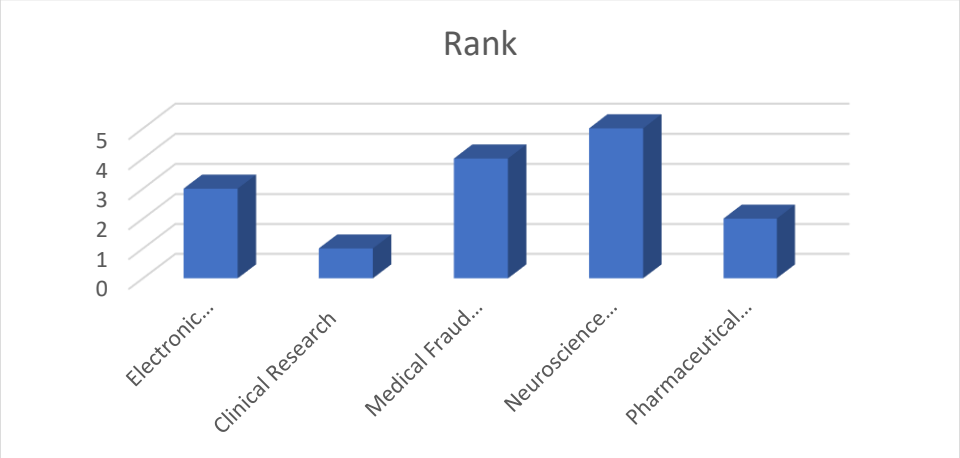
| | positive flow | Negative Flow | Net flow |
|---|---|---|---|
| Electronic Health Records | 0.17062 | 0.1563 | 0.014270045 |
| Clinical Research | 0.30835 | 0.049 | 0.259390425 |
| Medical Fraud Detection | 0.09229 | 0.1921 | -0.099784564 |
| Neuroscience Research | 0.0482 | 0.2827 | -0.234506464 |
| Pharmaceutical Industry and Research | 0.273 | 0.2124 | 0.060630558 |

Shows the table 6 Positive flow, Negative flow and net flow for the Electronic Health Records, Clinical Research, Medical Fraud Detection, Neuroscience Research, Pharmaceutical Industry and Research.

**TABLE 7.** Final rank

| | Rank |
|---|---|
| Electronic Health Records | 3 |
| Clinical Research | 1 |
| Medical Fraud Detection | 4 |
| Neuroscience Research | 5 |
| Pharmaceutical Industry and Research | 2 |

Table 7. PROMETHEE-based Health Information Exchange. Neuroscience research is ranked at the bottom, while clinical research is ranked first.




Health Information Exchange using PROMETHEE. Electronic Health Records, is got third rank, Clinical Research is got first rank, Medical Fraud Detection is got forth rank, Neuroscience Research is got fifth rank and Pharmaceutical Industry and Research is got second rank.

## 4. CONCLUSION

Widespread, simple sharing of patient-level data is desirable as a practise to assist patient care because of the potential advantages of health information exchange. Technology advancements and a rise in the use of EHRs globally have produced a situation where in which health information exchange is becoming increasingly possible. Different ways to national and international health information exchange have emerged as a result of these shared constraints, but there are still many obstacles to overcome. Then, we introduced a fresh strategy that turns the traditional PROMETHEE method into a clear fuzzy system. In order to compare various strategies, we also looked further into the crucial subject of risk investing. It demonstrates that the recently put out approach works well for resolving intuitionistic fuzzy MADM issues in practical settings. In addition to the benefits of the traditional PROMETHEE approach, our generic PROMETHEE method has the added ability to precisely represent experts' uncertain or neutral perspectives, making it better suited to handling ambiguity in real-world decision-making situations. It would be fascinating to explore ways to expand the PROMETHEE approach using neuromorphic fuzzy soft sets, Pythagorean fuzzy soft sets, or other soft computing models in future study. Health Information Exchange using PROMETHEE method Clinical Research is got the first rank and Neuroscience Research is got the lowest rank.

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