

Presenting the Key Drivers for Successful Technology Transfer in the Telecom Industry through Reverse Engineering: A VIKOR-based Prioritization Approach

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Abstract

Successful technology transfer plays a vital role in the Telecom industry, enabling organizations to gain a competitive advantage through the assimilation of external technologies. However, identifying the key drivers that influence the success of technology transfer, particularly through reverse engineering, remains a challenge. This article aims to address this gap by presenting a novel approach that utilizes the VIKOR method to prioritize the factors influencing technology transfer success in the Telecom industry. The article provides an overview of technology transfer in the Telecom sector, highlighting the significance of reverse engineering as a strategic approach for acquiring and integrating external technologies. By conducting an extensive literature review and consulting industry experts, a comprehensive list of factors affecting the success of technology transfer is compiled. These factors span various dimensions, including technological, organizational, human resources, financial, and environmental aspects. Utilizing the VIKOR method, the prioritization process begins by assigning relative importance and evaluating the performance of each identified factor.

Keywords: Technology transfer, Reverse engineering, VIKOR, Priority, MADM, Telecom industry

1. Introduction

Technology transfer refers to the process of sharing and disseminating knowledge, skills, technologies, or intellectual property from one entity or organization to another. It involves the transfer of technological innovations, research findings, or expertise, with the aim of commercialization, implementation, or further development in a different context (Cowan & Foray, 1997).

Creating models involves developing conceptual frameworks or representations that capture the essential elements and relationships within a specific domain of knowledge. This step requires expertise and analysis to identify the key concepts, variables, and causal relationships that underpin the knowledge being codified. Models provide a structured way of organizing knowledge and enable its transfer and application in different contexts (Cohendet & Meyer-Krahmer, 2001).

Creating languages involves defining the vocabulary, symbols, and syntax necessary for expressing and

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communicating knowledge within a particular domain. It includes establishing terminologies, classifications, and standardized nomenclature that allow for consistent and coherent communication among individuals or groups involved in knowledge exchange. Developing a common language ensures that the messages encoded in the codified knowledge can be effectively understood and interpreted by the intended recipients.

Creating messages involves packaging the codified knowledge into tangible forms, such as documents, manuals, databases, or digital formats. Messages serve as carriers of information, allowing knowledge to be transmitted, stored, retrieved, and utilized by individuals or organizations. The format and medium of the messages can vary depending on the intended audience and purpose of knowledge transfer.

2. Background

While the process of knowledge codification aims to facilitate the exchange and utilization of knowledge as an economic good, it is important to note that knowledge is not static. The act of codifying knowledge often leads to the generation of new knowledge as gaps, inconsistencies, or novel insights are discovered during the codification process. Additionally, the costs associated with creating models, languages, and messages can vary depending on the complexity and breadth of the knowledge being codified.

In the realm of technology transfer research, a clear distinction can be made between novice and experienced researchers. Novices, those new to the field, quickly realize the inherent complexities associated with technology transfer. Firstly, defining the boundaries of "the technology" itself poses a significant challenge. Secondly, attempting to outline the technology transfer process becomes a near-impossible task due to the multitude of concurrent processes involved. Lastly, measuring the impacts of transferred technology presents a formidable obstacle for scholars and evaluators, forcing them to delve deep into their repertoire of research techniques. Why is this the case? The impacts of technology transfer are often multifaceted and intricately intertwined with other aspects of organizational functioning. As a result, determining the effectiveness of technology transfer proves to be a daunting endeavour, as it often involves grappling with multiple, and at times conflicting, definitions of what constitutes effectiveness (Bozeman, 2000).

The latter aspect of gauging the importance or popularity of technology transfer holds particular relevance when conducting literature reviews. With numerous voices and diverse definitions in the discourse, the concept can lose its clarity. To navigate this cacophony, one approach is to dissect the technology transfer literature. This review primarily focuses on recent literature concerning domestic technology transfer from universities and government laboratories, excluding the extensive body of work on transfer within the private sector or international technology transfer.

The central focus of this review is on the impact and effectiveness of technology transfer. Subsequently, a "Contingent Effectiveness Model of technology transfer" is developed and utilized to organize the literature. The model considers various determinants of effectiveness, including the characteristics of the technology itself, the transfer agent, and the recipient of the technology. However, the model's most crucial aspect, as implied by its name, is recognizing that technology transfer effectiveness can manifest in several ways. These may include market impacts, political ramifications, effects on personnel involved, and the allocation of resources towards other scientific and technical objectives (Kedia & Mukherjee, 2009; Robinson, 1988; Zhao & Reisman, 1992).

This systematic literature review aims to provide a comprehensive understanding of technology commercialization, laying the groundwork for future empirical and theoretical contributions. Technological inventions play a vital role in driving a country's economic growth. However, to truly create value for society and generate profits, these inventions must successfully transition into the market. This necessitates the

integration of newly developed technologies into marketable products (Gerybadze & Reger, 1999; Kirchberger & Pohl, 2016).

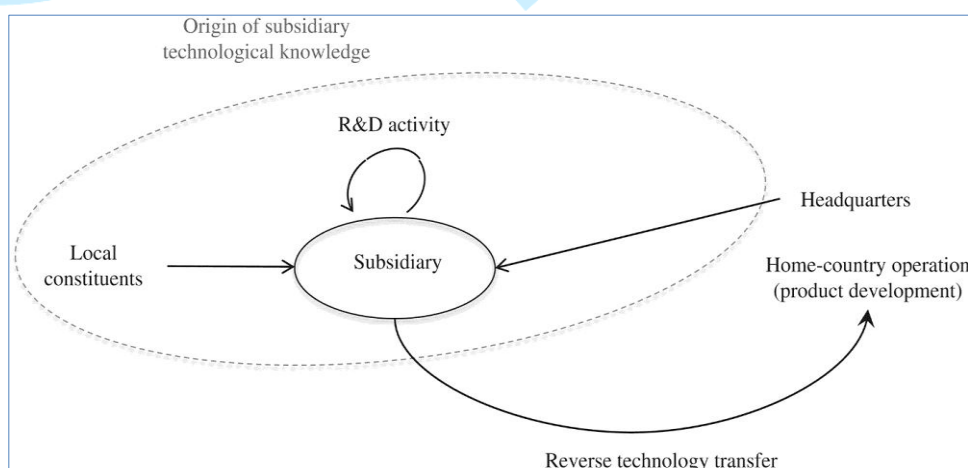
Reverse technology transfer refers to the process of transferring knowledge, technology, or innovation from a recipient country or organization back to the country or organization of origin. It involves the flow of expertise, ideas, and technologies from a subsidiary, partner, or licensee in a foreign location back to the parent company or original source.

Reverse engineering is the process of duplicating a component, subassembly, or product without relying on drawings, documentation, or computer models. It involves analysing a technology to understand its design and operational mechanisms. This investigative approach fosters a constructive learning process about systems and products. Reverse engineering is not limited to a specific purpose but is commonly employed in scientific and technological endeavours. Disassembling and studying the inner workings of a technology is often an effective means of gaining insights for replication or improvement. For instance, a chemical company may use reverse engineering to overcome a competitor's patent on a manufacturing process. In civil engineering, past successful bridge and building designs are replicated to minimize the risk of catastrophic failures. Similarly, in software engineering, high-quality source code often builds upon and refines existing code bases (Hosni, 1993).

The practice of reverse engineering has far-reaching applications across various industries. By deciphering the intricacies of existing technologies, practitioners can enhance their understanding, make advancements, and develop innovative solutions. This multidisciplinary approach encourages knowledge sharing, stimulates creativity, and contributes to the overall progress of scientific and technological development. As technology continues to evolve, reverse engineering remains a valuable tool for unlocking insights, driving innovation, and facilitating continuous improvement.

Technology transfer through reverse engineering is a significant avenue for accessing new technologies. Unlike other methods, reverse engineering does not require active participation from the technology source. This approach involves a team of subject experts who analyse the functional mechanisms of a product, enabling them to access its underlying technology. This method has the potential to bridge the technological gap between underdeveloped countries and industrialized nations. However, it is crucial for these countries to meet certain requirements, demonstrate development and application impact, and foster innovation (Lee & Woo, 2000).

Fig. 1 General Conceptual model Reverse Technology Transfer



Reverse engineering offers several key advantages and applications, including:

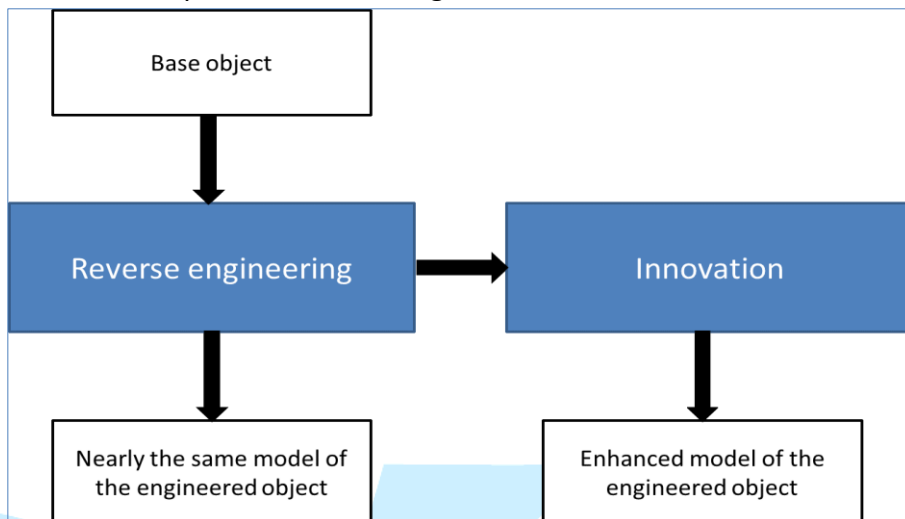
New product development: Reverse engineering serves as a catalyst for creating innovative products based on existing designs or concepts.

Adaptation to new systems and platforms: Reverse engineering enables the transformation of obsolete products into useful ones by modifying and optimizing them to work with new technologies, systems, or platforms.

Unrestricted technical data development: The primary objective of reverse engineering is to generate comprehensive technical data that can be used for competitive procurement through engineering evaluations of existing hardware.

By leveraging the benefits of reverse engineering, organizations and countries can unlock opportunities for innovation, overcome technological barriers, and advance their technological capabilities. This approach empowers them to utilize existing knowledge and resources to create new and improved products, ultimately driving economic growth and competitiveness in the global market.

Fig. 2 General Process of Reverse Engineering



The risks and disadvantages associated with reverse engineering and reverse technology transfer refers to the potential drawbacks and challenges that arise when employing these

approaches in the context of technological analysis, replication, and transfer. These risks and disadvantages can include legal and ethical concerns related to intellectual property infringement, limitations in capturing complete knowledge, potential compromises in quality and reliability, incomplete documentation, restricted innovation potential, and ethical implications of technology transfer from developed to underdeveloped countries. These factors highlight the potential negative aspects and considerations that need to be considered when engaging in reverse engineering and reverse technology transfer activities.

We have listed the most notable Risk and Disadvantages of Reverse Engineering and Reverse Technology Transfer in bellow:

- 2-1-** Legal and Ethical Concerns: Reverse engineering can raise legal and ethical issues, especially when intellectual property rights are involved. It may infringe upon patents, copyrights, or trade secrets, potentially leading to legal consequences and damage to the original technology owner (Burmeister et al., 2019).
- 2-2-** Limited Knowledge Capture: Reverse engineering may not capture the complete knowledge and expertise behind a technology. It focuses on understanding the functional aspects but may miss out on critical design principles, manufacturing processes, or underlying algorithms (Birtchnell, 2016).
- 2-3-** Quality and Reliability: Reverse-engineered technologies may lack the same level of quality, reliability, and performance as the original product. Variations in materials, manufacturing methods, and design details can affect the final output, potentially leading to inferior results (Yang & Zhu, 2007).
- 2-4-** Incomplete Documentation: Reverse engineering may result in incomplete or inaccurate documentation of the technology being analyzed. This can create challenges for future development, maintenance, and troubleshooting (Birtchnell, 2016).
- 2-5-** Limited Innovation Potential: While reverse engineering can help replicate existing technologies, it may hinder innovation and originality. By solely focusing on reproducing what already exists, it may restrict opportunities for creating novel solutions and pushing the boundaries of technological advancement (Yang & Zhu, 2007).
- 2-6-** Ethical Implications of Reverse Technology Transfer: Reverse technology transfer, which involves transferring technology from developed to underdeveloped countries, can raise ethical concerns. It

may perpetuate dependency, hinder local innovation and industrial development, and contribute to an imbalance in the global technology landscape (Bhattacharya & Kshetri, 2008).

3. Research Methodology

In the current study, the research methodology employed involves the identification of components that influence the effective transfer of technology through the reverse engineering approach. The study utilizes the Delphi Method and the VIKOR technique to gather expert opinions and prioritize the identified alternatives.

The Delphi Method is a widely recognized research approach that involves soliciting opinions from a panel of experts. Through multiple iterations of surveys or questionnaires, the method seeks to achieve consensus or convergence of viewpoints on the identified components affecting technology transfer in the Telecom domain.

After gathering the opinions from the experts, the VIKOR technique is utilized to sort and prioritize the alternatives. The VIKOR technique is a multi-criteria decision-making method that considers multiple criteria to rank the alternatives based on their performance and suitability.

By combining the Delphi Method and the VIKOR technique, the study ensures a rigorous and systematic approach to evaluating the components and selecting the most effective alternatives for technology transfer through reverse engineering. This methodology allows for the exploration of unknowns, the validation of findings, and the systematic resolution of problems related to technology transfer in the Telecom industry.

The Delphi Method and the VIKOR technique are both widely used in research and decision-making processes.

1. **Delphi Method:** The Delphi Method is a structured communication technique that aims to gather and consolidate expert opinions on a specific topic. It involves multiple rounds of questionnaires or surveys to achieve convergence or consensus among the participating experts. The method allows for anonymity, which encourages unbiased responses, and utilizes controlled feedback to refine opinions and reach a collective decision. The Delphi Method is commonly used in various fields, including technology assessment, forecasting, and decision-making processes (Linstone & Turoff, 1975).
2. **VIKOR Technique:** The VIKOR (ViseKriterijumska Optimizacija I Kompromisno Resenje) technique is a multi-criteria decision-making method used to rank or select alternatives based on multiple criteria. It aims to identify the most favorable compromise solution that achieves the best overall performance. VIKOR considers both the maximum group utility and the minimum individual regret in decision-making. It provides a systematic approach to deal with conflicting criteria and allows decision-makers to find a satisfactory solution to complex decision problems (Opricovic & Tzeng, 2007).

3.1 Categorize the KPIs of Transfer Technology and Reverse Engineering in Telecom Industry

Transferring technology through reverse engineering involves the process of studying and analysing an existing technology or product with the goal of recreating or adapting it for a different purpose, market, or context. Here are the key steps involved in transferring technology through reverse engineering (Dong & McAdams, 2017; Raj & Raj, 2019):

- A. Initial Assessment: The process begins by selecting the technology or product to be reverse engineered. This could be a physical device, software application, or any other technological system.
- B. Disassembly and Analysis: The chosen technology is disassembled or deconstructed to its individual components or software code. Each component or aspect is then carefully examined and analysed to understand its function, behaviour, and interactions.

- C. Documentation and Reverse Design: Detailed documentation is created to capture the findings during the analysis phase. This documentation may include technical specifications, system diagrams, algorithms, or any other relevant information that describes the workings of the technology.
- D. Reconstruction or Replication: Based on the information obtained from the analysis, the technology is reconstructed or replicated. This involves either building a new version of the technology or adapting it to suit a different purpose, market, or platform.
- E. Improvement and Innovation: During the reverse engineering process, opportunities for improvement and innovation may arise. The reverse engineers can identify areas where enhancements can be made, such as optimizing performance, improving user experience, or incorporating additional features.
- F. Testing and Validation: The reconstructed or adapted technology undergoes thorough testing and validation to ensure it meets the desired specifications and functions as intended. This step helps identify any issues or discrepancies that need to be addressed.
- G. Intellectual Property Considerations: It's essential to consider intellectual property rights and legal implications when transferring technology through reverse engineering. Unauthorized reverse engineering or replication of proprietary systems may infringe on intellectual property laws. Proper permissions, licenses, or agreements should be obtained to ensure compliance with legal requirements.
- H. Application and Commercialization: Once the reverse-engineered technology has been successfully tested and validated, it can be applied to the desired context or market. This may involve commercializing the technology, integrating it into existing systems, or introducing it as a new product or service.
- I. Transfer of technology through reverse engineering can be a valuable approach, particularly when the original technology is inaccessible, unavailable, or not suitable for a specific purpose. It allows for the understanding, adaptation, and application of existing technology, fostering innovation and development in various industries. However, it's crucial to respect intellectual property rights and adhere to legal and ethical standards throughout the reverse engineering process.

When engaging in technology transfer through reverse engineering, several key factors should be considered. These factors can greatly influence the success and effectiveness of the transfer process. Here are some key considerations (Smith, 2016; Wang & Huang, 2018):

- J. Legal and Intellectual Property Rights: It is crucial to consider the legal aspects and intellectual property rights associated with the technology being reverse engineered. Ensure that the reverse engineering activities comply with applicable laws, such as patents, copyrights, and trade secrets. Obtain necessary permissions, licenses, or agreements to avoid any legal issues.
- K. Scope and Objectives: Clearly define the scope and objectives of the reverse engineering process. Determine the specific aspects of the technology that need to be understood, replicated, or adapted. Establish clear goals and outcomes to guide the transfer process effectively.
- L. Resources and Expertise: Assess the availability of resources, including technical expertise, equipment, and tools required for the reverse engineering process. Determine if there is sufficient knowledge and skills within the team or organization to successfully carry out the transfer. If necessary, consider collaborating with external experts or organizations.
- M. Documentation and Analysis: Thoroughly document the reverse engineering process and findings. Create detailed documentation that captures the technical specifications, system architecture, algorithms, and any other relevant information. Conduct a comprehensive analysis to understand the functioning, interactions, and underlying principles of the technology.

- N. **Adaptation and Improvement:** Identify opportunities for adaptation and improvement during the reverse engineering process. Consider how the technology can be modified, enhanced, or optimized for the target context, market, or purpose. Assess whether additional features, scalability, or compatibility need to be incorporated.
- O. **Testing and Validation:** Rigorously test and validate the reverse-engineered technology to ensure it meets the desired specifications and functions as intended. Identify and address any issues, errors, or discrepancies discovered during the testing phase.
- P. **Documentation and Knowledge Transfer:** Document and organize the knowledge acquired during the reverse engineering process. Create comprehensive documentation, including technical manuals, guidelines, or standard operating procedures that can facilitate knowledge transfer to other team members or stakeholders.
- Q. **Ethical Considerations:** Adhere to ethical standards throughout the reverse engineering process. Respect the intellectual property rights and proprietary information of others. Ensure that the transfer activities are conducted ethically and responsibly, without infringing on legal or ethical boundaries.

By considering these key factors, organizations can approach technology transfer through reverse engineering in a systematic and effective manner, enabling successful replication, adaptation, or application of existing technologies.

In the telecommunication industry, the transfer of technology plays a critical role in driving innovation, expanding services, and improving infrastructure. Here are some important points to consider when transferring technology in the telecommunication industry:

3-1-1- Standards and Compatibility: Telecommunication technologies rely on interoperability and compatibility to ensure seamless communication across different networks and devices. When transferring technology, it is crucial to consider adherence to industry standards and protocols, ensuring compatibility with existing infrastructure and equipment.

3-1-2- Network Infrastructure: Telecommunication technology transfer often involves the transfer of network infrastructure, such as cellular networks, fiber optic networks, or satellite systems. Factors to consider include scalability, reliability, security, and efficiency of the infrastructure, as well as the ability to support increasing data traffic and emerging technologies like 5G or Internet of Things (IoT).

3-1-3- Spectrum Management: Effective technology transfer in the telecommunication industry requires consideration of spectrum management. This involves the allocation and efficient utilization of radio frequencies for wireless communication. Understanding the regulatory framework and spectrum availability is crucial for successful technology transfer and deployment.

3-1-4- Broadband Access and Connectivity: Technology transfer should focus on enhancing broadband access and connectivity, especially in underserved or rural areas. Considerations include deploying cost-effective technologies, improving network coverage, and bridging the digital divide to ensure equitable access to telecommunication services.

3-1-5- Security and Privacy: Telecommunication networks and services handle sensitive information, making security and privacy paramount. When transferring technology, it is essential to address cybersecurity risks, implement robust encryption mechanisms, and adhere to data protection regulations to safeguard user privacy and prevent unauthorized access.

3-1-6- Emerging Technologies: Telecommunication industry advancements are often driven by emerging technologies. Technology transfer should consider integrating and leveraging emerging technologies like 5G, artificial intelligence (AI), virtual reality (VR), or edge computing to enable new services, enhance network performance, and improve user experience.

3-1-7- Service Innovation: Technology transfer should facilitate service innovation and enable the introduction of new communication services. This can involve transferring technologies that support advanced features like voice-over-IP (VoIP), video conferencing, cloud-based services, or integrated communication platforms.

3-1-8- Training and Capacity Building: Along with technology transfer, investing in training and capacity building is crucial. Provide technical training and knowledge transfer to ensure that stakeholders, including technicians, engineers, and operators, possess the necessary skills to maintain, operate, and optimize the transferred technology.

3-1-9- Regulatory and Policy Considerations: The telecommunication industry is regulated by various policies and regulations. Ensure compliance with relevant regulatory frameworks, licensing requirements, and spectrum allocation policies when transferring technology.

3-1-10- Collaboration and Partnerships: Technology transfer in the telecommunication industry often requires collaboration and partnerships between different stakeholders, including technology providers, telecommunication companies, regulators, and government agencies. Foster collaboration to leverage expertise, resources, and industry knowledge for successful technology transfer.

4. Numerical Case Studies

At this stage, by identifying the important factors in the transfer of reverse technology in the telecommunications industry, which were identified using the opinion of 20 experts in this field, we will implement the VIKOR technique.

At first, we briefly explain the steps of implementation and problem solving in VIKOR technique.

4.1 VIKOR Technique:

- Apply the VIKOR technique to analyze the categorized indicators.
- Assign weights to each indicator based on their relative importance in achieving Factors (11 items)
- Evaluate each indicator against predefined criteria, considering environmental, social, and economic aspects.
- Calculate the VIKOR score for each indicator, representing its ranking in terms of its impact on supply chain sustainability.

4.2 Data Analysis:

- Analyze the results obtained from the VIKOR technique to determine the ranking of the indicators.
- Interpret the findings and identify the top-ranked indicators that significantly contribute to supply chain sustainability.

By utilizing the VIKOR technique, this research aims to provide valuable insights into the effective factors of information systems on supply chain sustainability in the telecom industry, specifically within Telecom Industry of Iran. The findings of this study will contribute to the existing knowledge on sustainable supply

chains and offer practical recommendations for MSC and other steel companies to enhance their supply chain sustainability practices.

Step 1: Formulate the Decision Matrix

Based on the number of criteria, alternatives, and evaluations of each alternative for different criteria, the decision matrix is constructed as follows.

$$X = \begin{matrix} & C_1 & \dots & C_n \\ \begin{matrix} x_{11} \\ \vdots \\ x_{m1} \end{matrix} & \dots & \dots & \dots \end{matrix} \begin{matrix} x_{1n} \\ \vdots \\ x_{mn} \end{matrix}$$

where x_{ij} the score of the alternative $i (i = 1, \dots, m)$ is related to the criterion $j (j = 1, \dots, n)$.

Step 2: Establish the Normalized Decision Matrix

In this stage, employing established techniques, the decision matrix is normalized. Specifically, all cost criteria are transformed into benefit criteria to ensure uniform treatment of all criteria in accordance with the VIKOR method.

$$\left\{ \begin{array}{l} n_{ij} = \frac{x_{ij}}{\sum_{i=1}^m x_{ij}}, i = 1, \dots, m; j \in \text{Benefit Set} \\ n_{ij} = \frac{1}{\sum_{i=1}^m \frac{1}{x_{ij}}}, i = 1, \dots, m; j \in \text{Cost Set} \end{array} \right.$$

$$N = \begin{bmatrix} n_{11} & \dots & n_{1n} \\ \vdots & \ddots & \vdots \\ n_{m1} & \dots & n_{mn} \end{bmatrix}$$

Step 3: Assigning Weights to Criteria

During this stage, the weight vector for the criteria is determined based on their respective importance in the decision-making process, following the principles of the VIKOR method. As $w_j (j = 1, \dots, n)$.

$$W = [w_1, w_2, \dots, w_n]$$

Step 4: Identify the Optimal and Pessimistic Values for Each Criterion

In this phase, considering the conversion of all criteria into profit-oriented measures in the previous step, only the best values are determined for profit indicators. However, if an alternative normalization method is employed, the optimal and pessimistic values should be determined for cost indicators as well, as part of this step.

$$f_j^* = \text{Max}_{i=1, \dots, m} \{n_{ij}\}, \quad j = 1, \dots, n.$$

$$f_j^- = \text{Min}_{i=1, \dots, m} \{n_{ij}\}, \quad j = 1, \dots, n.$$

Step 5: Calculating the Distance between Best and Worst Scenarios

During this step, the distance between the best and worst situations is determined for each criterion. This calculation helps to quantify the range of variation within each criterion and plays a vital role in the VIKOR decision-making process.

The distance to the best situation (utility measure) is indicated as $S_i(i = 1, \dots, m)$, and the distance to the worst situation (reject measure) is shown as $R_i(i = 1, \dots, m)$.

$$S_i = \sum_{j=1}^n w_j \left(\frac{|f_j^* - n_{ij}|}{|f_j^* - f_j|} \right), i = 1, \dots, m.$$

$$R_i = \text{Max}_{j=1, \dots, n} \left\{ w_j \left(\frac{|f_j^* - n_{ij}|}{|f_j^* - f_j|} \right) \right\}, i = 1, \dots, m.$$

Step 6: Calculating the Q Index

In this step, the Q index is computed by combining the convex combination of the two distances, S and R, which were calculated in the previous step. The Q index serves as a comprehensive measure that considers both the L-1 and L-∞ distances to assess the overall performance of each alternative in the VIKOR decision-making process.

$$Q_i = v \left(\frac{S_i - S^*}{S^- - S^*} \right) + (1-v) \left(\frac{R_i - R^*}{R^- - R^*} \right), i = 1, \dots, m.$$

$$S^* = \text{Min}_{i=1, \dots, m} \{S_i\}, S^- = \text{Max}_{i=1, \dots, m} \{S_i\}, R^* = \text{Min}_{i=1, \dots, m} \{R_i\}, R^- = \text{Max}_{i=1, \dots, m} \{R_i\}.$$

Step 7: Rank the alternatives

The alternatives are ranked using the R, S, and Q ranking system. Consequently, three ranking lists are generated, with lower values indicating superior alternatives.

In the ranking based on the Q index, the top-ranked alternative is selected if it satisfies the following conditions:

1. It has the lowest Q index value among all alternatives.
2. It possesses the shortest distance from the ideal solution, as represented by the R criterion.
3. It exhibits the smallest distance from the worst solution, as indicated by the S criterion.

By fulfilling these conditions, the top-ranked alternative is identified and considered the most favorable choice in the VIKOR decision-making process.

At the end the VIKOR technique was implemented for 3 most favorable and important domain: 1- OCS 2-Hot Billing 3- Network

For each implementation 5 providers or vendors were considered. Due to NDA Commitment of authors, we just show the final rank result in the [Table 1](#).

	OCS	Hot Billing	Network
Vendor-A	2	2	1
Vendor-B	1	1	3
Vendor-C	5	4	5
Vendor-D	3	3	2
Vendor-E	4	5	4

Table 1

5. Conclusion

In conclusion, this article has explored the key aspects of technology transfer in the context of reverse engineering. By utilizing a research methodology that combines the Delphi Method and the VIKOR technique, the study has identified and prioritized the components that influence the effective transfer of technology. The Delphi Method has provided a platform to gather expert opinions and insights from twenty experts in the Telecom domain, ensuring a comprehensive understanding of the subject matter.

Through the application of the VIKOR technique, the alternatives have been systematically sorted and ranked based on their performance and suitability. This approach allows for informed decision-making in

selecting the most effective alternatives for technology transfer. The combination of these research methods has facilitated a reliable and robust analysis of technology transfer in the reverse engineering domain.

The findings of this study contribute to the existing body of knowledge in technology transfer by providing a deeper understanding of the factors that impact the effectiveness of the process. Policymakers, practitioners, and researchers in the Telecom industry can benefit from the insights gained from this research, enabling them to enhance the efficiency and success of technology transfer initiatives.

It is important to note that this study has its limitations, such as the specific focus on the Telecom industry and the sample size of the expert panel. Future research can further expand on these findings by including additional industries and a larger pool of experts to validate and enhance the results.

Overall, this research serves as a foundation for future empirical and theoretical contributions in the field of technology transfer through reverse engineering. It highlights the significance of considering key components and employing appropriate methodologies to facilitate successful technology transfer processes, ultimately driving innovation, economic growth, and societal progress.

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Declaration of Conflict

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper

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