Comparative Study of the Effectiveness of IMaRD and IMGSIE Methodology for Information Technology Field

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Abstract

The usefulness of two well-known approaches, IMARD and IMGSIE, is compared in this paper within the context of information technology (IT) domains. Techniques are essential for organizing project workflows, improving productivity, and producing the intended results. IMARD, which comprises phases like Introduction, Method, Analysis, Results, and Discussion, is widely used in scientific academic papers and professional research to guarantee methodical problem-solving. On the other hand, IMGSIE methodology which consists of phases Introduction, Method, Generalization, Specification, Implementation, and Evaluation—has become more popular in technical and IT engineering projects. The objective of this paper is to evaluate the relative merits and demerits of different approaches in IT-related projects, taking into account variables like project and papers success rates, difficulties in implementation, and overall project management effectiveness. Discussion of case studies of IT projects that use both approaches offers practical insights into their efficacy. Key findings indicate that IMGSIE is more appropriate for graduation it projects needing iterative refinement and flexibility, even though IMARD offers a systematic and complete approach. Questionnaire was distributed to supervisors who used the IMARD and PPDIOO methodologies to evaluate its quality and effectiveness. The most important differences between the methodologies have also been identified, as well as where and when each method is used.

دراسة مقارنة لفعالية منهجية IMaRD و IMGSIE في مجال تكنولوجيا المعلومات

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الملخص

تقدم هذه الورقة دراسة مقارنة لفعالية منهجيتين معروفتين على نطاق واسع، IMARD و IMGSIE، في مجال تكنولوجيا المعلومات (IT). تلعب المنهجيات دورًا حيويًا في تنظيم سير العمل في المشاريع، وتعزيز الكفاءة، وتحقيق النتائج المرجوة. تتميز منهجية IMARD بمراحل مثل المقدمة، الطريقة، التحليل، النتائج، والمناقشة، وقد تم استخدامها بشكل واسع في الأبحاث الأكاديمية والمهنية لضمان حل المشكلات بشكل منهجي. في المقابل، تتضمن منهجية IMGSIE مراحل مثل المقدمة، الطريقة، التعميم، التخصيص، التنفيذ، والتقييم، وقد اكتسبت شعبية في المشاريع التقنية والهندسية بفضل نهجها المرن. تهدف هذه الدراسة إلى تحليل نقاط القوة والضعف النسبية لهاتين المنهجيتين في مشاريع تكنولوجيا المعلومات، مع الأخذ في الاعتبار عوامل مثل معدلات نجاح المشاريع، التحديات التي تواجه التنفيذ، وكفاءة إدارة المشاريع بشكل عام. يتم مناقشة دراسات حالة لمشاريع تكنولوجيا المعلومات التي استخدمت كلا المنهجيتين، لتقديم رؤى واقعية حول فعاليتهما. تشير النتائج الرئيسية إلى أنه بينما تقدم منهجية IMARD نهجًا منظمًا وشاملًا، فإن IMGSIE تعتبر أكثر ملاءمة للمشاريع التي تتطلب تحسينات متكررة وقابلية للتكيف. تم توزيع استبيان على المشرفين الذين استخدموا منهجيتي IMARD و PPDIOO لتقييم جودتها وفعاليتها. وكانت النتائج إيجابية للغاية، مما يبرز نجاح المنهجية ومستوى الرضا العالي بين المشرفين الذين قاموا بتطبيق النموذج.

1- Introduction

The rapid advancement of computer network technologies has created a pressing need for educational methodologies that can effectively equip students with the necessary skills and knowledge. This skill of writing a peer reviewed paper is highly specialized and challenging [1]. There is a massive change in the number of published scientific papers yearly Designing graduation projects that not only challenge students but also reflect real-world scenarios is crucial for preparing them for professional careers. There are numerous methods available to elicit requirements for IT projects from customers, executives, team members، agents, etc. In this context, a methodology presents a promising approach to enhance the educational outcomes for students in the Computer Networks department. The researchers provide the advantages and limitations of the methodologies. The main research topics related to Comparative studies to deal with writing issues and how to building a strong basement for research side [2].

The IMGSIE methodology integrates theoretical learning with practical application, promoting a comprehensive understanding of complex networking concepts. It emphasizes personalized learning paths, allowing students to explore specific areas of interest while ensuring a robust grasp of foundational principles [3]. This adaptability is particularly advantageous in the dynamic field of computer networks, where emerging technologies continually reshape the landscape.

With several methodologies available, selecting the right one for an IT project is a significant challenge faced by IT engineers. Despite the potential benefits of the IMGSIE methodology, its effectiveness in the context of designing graduation projects for Computer Networks department students remains underexplored. On the other hand ،the teaching of research methods has received a limited amount of attention Computer networks projects as a special

type of project are also required to be supported by project management processes [4]. This paper aims to evaluate the efficiency of using the IMGSIE methodology in this specific educational setting. By assessing the performance, engagement, and overall satisfaction of students who utilize this methodology for their graduation projects, we seek to determine its viability as a standard approach in computer network education. The findings of this paper could have significant implications for curriculum design and pedagogical strategies within computer network programs. A total of 124 instructors and students who actively work on computer network design were surveyed.

2- Literature review

Research methods have emerged as a critical area of concern in recent years[5]. Choosing the right project methodology significantly affects the efficiency of project delivery and success rates, especially in the rapidly advancing field of information technology (IT). Various studies have been conducted to evaluate the effectiveness of specific methodologies in improving the quality of IT projects. These methodologies provide structured approaches to planning, managing, and executing projects, ensuring a systematic progression from start to finish[6]. Within the IT sector, two methodologies have gained notable attention: IMARD and IMGSIE. IMARD, which stands for Introduction, Method, Analysis, Results, and Discussion, offers a structured framework commonly used in academic and professional research contexts. It is particularly suited for IT projects involving research and data analysis, as it ensures that each stage of the project is thoroughly explored, documented, and analyzed.

There is a massive change in the number of published scientific papers yearly [7]. However, in IT and engineering projects where flexibility and iterative processes are crucial, IMGSIE an acronym for Introduction, Method, Generalization, Specification, Implementation, and Evaluation has become increasingly popular. IMGSIE's flexibility contrasts with IMARD's more linear approach, making it ideal for projects that require frequent

modifications and adjustments. This paper aims to compare and contrast these two methodologies in the context of IT projects.

The main focus of research is to highlight how the student felt trouble selecting the right methodology and how he or she tried to make the right decision [8]. Research and development (R&D) is relevant for IT growth and for being a factor in determining the competitiveness and success of institutes in the long run. This comparative study focuses on two methodologies: IMARD and IMGSIE, analyzing their respective phases and application in IT projects [9]. IMARD, which stands for Introduction, Method, Analysis, Results, and Discussion, is a methodology traditionally used in scientific research and academic projects. Each phase of IMARD contributes to a deeper understanding of the problem being studied. The Introduction phase provides the background and context for the project, while the Method phase details the tools and processes employed. In the Analysis phase, collected data is carefully examined, leading to the Results phase, where findings are presented. Finally, the Discussion phase interprets these findings and draws conclusions based on the analysis.

3- AMaRD methodology

Composing a scientific article is an important and difficult task [10]. The Introduction, Method, Analysis, Results, and Discussion (IMARD) framework as illustrates in figure 1, is widely used in research-driven projects across various fields, including Information Technology. It follows a systematic, linear approach, ensuring that each phase is completed before progressing to the next. In the Introduction phase, the project's context is established by defining the research problem, objectives, and scope. This phase is critical for setting clear goals and establishing the foundation for the entire project. In the Method phase, the research design, tools, and techniques for addressing the problem are outlined. In IT projects, this may involve selecting specific hardware configurations, data analysis methods, or software development approaches. This phase is essential for ensuring the project has a well-structured plan to meet its goals efficiently.

The Discussion phase, which concludes the IMARD framework, interprets the findings and often provides recommendations for future research or improvements. In IT projects, this phase typically includes suggestions for enhancing system performance or addressing identified issues. Projects such as system optimization and algorithm testing greatly benefit from IMARD's structured approach, as these types of projects often have clearly defined objectives and require minimal flexibility. However, the rigidity of this methodology can be a disadvantage for more dynamic projects that require iterative development. All things considered; the methodology is one of the most important parts of any academic project [11]. Overall, the methodology is a crucial component of any academic project. Due to its ability to yield thoroughly analyzed and well-documented results, IMARD is a preferred choice for IT research and development projects where accuracy and precision are of the utmost importance.
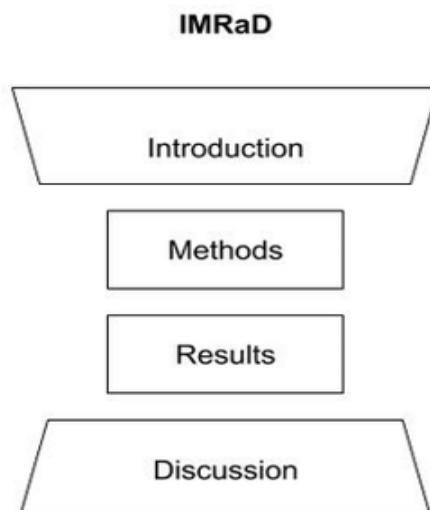
IMRaD

Figure 1. IMGSIE methodology

4- IMGSIE methodology

The technological methods that people use in the process of research projects have become diversified [12]. The Introduction,

Method, Generalization, Specification, Implementation and Evaluation (IMGSIE) methodology offers a more flexible and iterative approach compared to IMARD, making it particularly well-suited for Information Technology projects that require adaptability and continuous refinement. IT projects, being distinct in nature, also necessitate specific project management practices to ensure success. Project management procedures must also be used to assist IT projects, which are a unique kind of project [13]. In the IMGSIE framework as seen in figure 2, the Introduction phase establishes the project's objectives and scope. This may involve identifying the problem the project aims to solve or outlining the overall system requirements for IT projects. The Method phase follows, detailing the tools, techniques, and procedures to be employed. During this phase, teams determine the technologies or frameworks they will use, such as selecting a programming language, software architecture, or data processing tools tailored to the project's needs.

The Evaluation phase of the IMGSIE methodology is critical, as it allows for iterative improvements by assessing the project's performance against its initial objectives after implementation. In IT projects, this may involve system troubleshooting, gathering user feedback, and conducting performance testing. The flexibility of the IMGSIE approach makes it particularly suitable for projects like software development or AI model training, which often involve uncertainty and require ongoing adjustments. Its iterative nature allows teams to continually refine and adapt to new requirements or challenges as they arise.

However, this same flexibility can lead to delays if the project's objectives are not clearly defined from the outset. Despite this, the IMGSIE methodology remains a dynamic and effective approach for complex, evolving IT projects, where adaptability is essential for success. Overall, for the development of the IT project, it was necessary to Choice types of research methodologies [14], IMGSIE offers a dynamic approach that is ideal for complex, evolving IT projects, where adaptability is key to success .

Figure 2. IMGSIE methodology

5- Results

The findings suggest that IMGSIE offers a more dynamic framework appropriate for initiatives in quickly developing domains like artificial intelligence and machine learning, while IMARD is more successful for projects with defined, static goals.
To assess the quality and effectiveness of the PPDIOO and IMRad methodology, as well as to identify the challenges encountered by supervisors, the questionnaire was done a total of (124) participant.

To measure the quality and effectiveness of IMGSIE and IMaDR methodology, questionnaires have been done for supervisors who have a direct relationship with IT projects and scientific papers, the feedback was highly Satisfactory and positive towards the effectiveness of all supervisors who used the methodologies.
The most important questions were taken from questionnaire as follows:

Q1- How familiar are you with the IMRaD methodology (Introduction, Methods, Results, and Discussion) in the context of scientific papers?

In this question, supervisors were allowed to select multiple answers. The analysis of the results, as illustrated in Figure 3, revealed the following: 62.5% of responses indicated that " Very familiar (I have applied it in multiple papers," 16.7% cited" Somewhat familiar (I have basic knowledge but limited experience)," 12.5% noted" Slightly familiar (I have only read about it)," 8.3% mentioned "Not familiar at all,".
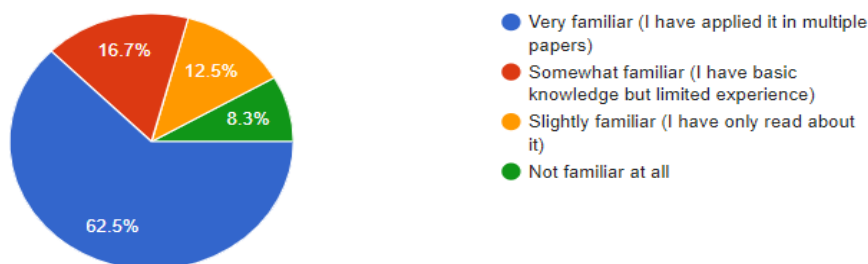

Figure 3. The percentage of the IMRaD scientific papers

Q2- How familiar are you with the IMGSIE methodology (Introduction, Method, Generalization, Specification, Implementation, and Evaluation) in the context of IT projects?

In this question, supervisors were allowed to select multiple answers. The analysis of the results, as illustrated in Figure 4 revealed the following: 66.7% of responses indicated that " Very familiar (I have applied it in multiple projects)," 16.7% cited" Slightly familiar (I have only read about it)," 12.5% noted " Somewhat familiar (I have basic knowledge but limited experience)" .

Figure 4. The percentage of the IMGSIE IT projects

Q3- Which methodology do you feel is more structured for scientific papers?

In this question, supervisors were allowed to select multiple answers. The analysis of the results, as illustrated in Figure 5, revealed the following: 62.5% of responses indicated that " IMRaD," 16.7% cited " IMGSIE" 12.5% noted " Both are equally structured," 8.3% mentioned " Neither methodology provides adequate structure,".

Figure 5. The percentage of methodology more structured for scientific papers

Q4- Which methodology do you feel is more structured for IT projects?

In this question, supervisors were allowed to select multiple answers. The analysis of the results, as illustrated in Figure 6, revealed the following: 70.8% of responses indicated that " IMGSIE," 12.5% cited " Both are equally structured " 8.3% noted " IMRaD," 8.3% mentioned " Neither methodology provides adequate structure,".
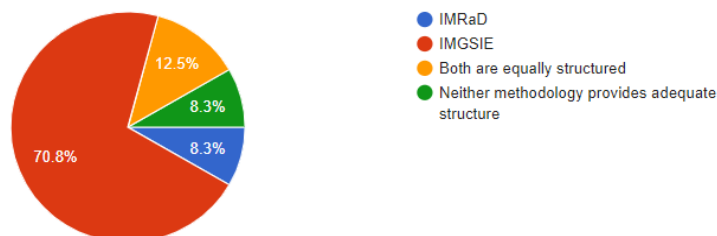

Figure 6. The percentage of methodology more structured for IT projects

TABLE 1. Comparative of the effectiveness of IMaRD and IMGSIE methodology for Information Technology Field

Criteria	IMARD	IMGSIE
Full Form	Introduction, Method, Analysis, Results, Discussion	Introduction, Method Generalization, Specification, Implementation, Evaluation
Best Suited For	Research-based, data analysis, and Scientific papers	Projects requiring adaptability, iterative development, and well-defined graduation projects
Phases	1. Introduction 2.Method 3.Analysis 4.Results 5. Discussion	1. Introduction 2. Method 3. Generalization 4. Specification 5. Implementation 1. Evaluation
Strengths	Structured approach ensures clarity and thorough documentation Ideal for projects with clear objectives and little room for change	Flexible and adaptable, allowing adjustments throughout the project - Suitable for dynamic environments such as AI and emerging tech
Implementation Focus	Emphasizes completion of each phase before moving to the next	Allows changes between phases, encouraging ongoing refinement
Evaluation	Discusses findings and conclusions after analysis	Continuous evaluation to adjust the project during and after implementation
Documentaton	Highly detailed, structured documentation	More flexible documentation, focused on project adaptability
Adaptability	Low: follows a rigid, sequential order	High: adaptable to changes throughout the project lifecycle

6- Conclusion

In conclusion, this comparative study has highlighted the strengths and limitations of the IMARD and IMGSIE methodologies within the Information Technology field. Both methodologies offer distinct advantages, depending on the nature and scope of the project. IMARD, with its structured and linear approach, is particularly well-suited for IT projects that require thorough analysis, documentation, and a well-defined workflow. Its strength lies in its ability to provide clear, measurable outcomes, making it highly effective in research-based projects, system analysis, and other areas that demand precision and rigor. However, its rigidity can be a limitation when applied to projects that require frequent changes or adaptations during the development phase.

Ultimately, the choice between IMARD and IMGSIE should be guided by the specific needs and goals of the project. For projects that are well-defined, stable, and require precise documentation and analysis, IMARD remains a highly effective methodology. Conversely, for projects that are more fluid, complex, or exploratory, IMGSIE's adaptability makes it the better option. As IT continues to evolve, particularly with the rapid development of new technologies, the ability to select the most appropriate methodology for a given project will be crucial for success.

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