Gyancity Journal of Engineering and Technology,
Vol.9, No.1, pp. 27-55, January 2023
ISSN: 2456-0065 DOI: 10.21058/gjet.2023.91002

Systematic Literature Review of Critical Success Factors for Turnaround Maintenance in the Oil and Gas Industry

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ABSTRACT

The aim of this review is to identify published papers on maintenance success and variables that have a positive impact on the success of maintenance in the oil and gas industry using the Kitchenham method. Data were collected from various sources such as Emerald, ScienceDirect, Informs, Taylor & Francis, ASCE, Wiley, and SpringerLink between 1972 and 2021 and were evaluated based on search criteria, inclusion and exclusion criteria, quality assessment, and answering research questions. The results showed that very little research has been conducted on these topics, with only 22 (17%) papers out of 126 published between 1972 and 2021. These papers were reduced to 19 (15%) and 9 (7%) after applying the quality assessment and research questions. The available research indicates that there is no universally accepted criteria for assessing the effectiveness of maintenance repair programs. Additionally, most of the prior researchers have not discussed any relevant theories regarding maintenance and have largely focused on project management success while ignoring subjective metrics of success in these initiatives. This study provides an opportunity for future research to enrich the industry with optimal solutions for maintenance, as delays can result in losses to a company's profits, damage its reputation, and affect the country's economy.

Keywords: Turnaround Management, Turnaround Maintenance, Critical Success Factors, Oil and Gas.

1 INTRODUCTION

Turnaround management (TAM) is an important procedure in the oil and gas industries, as it involves shutting down a facility regularly to ensure high plant reliability, availability, safety and quality. TAM is essential for ensuring the long-term reliability of a process. According to (Lenahan, 2011) and (U. Al-Turki et al., 2019), there are four phases to completing the TAM project:

- Phase 1-Initiation: TAM parameters are specified, the core staff is appointed, and basic data is organized during this time. It's possible to spread it out across several months.

- Phase 2-Preparation: is 3-to-18-months long (depending on the scale of the event) during which a substantial amount of technical and non-technical data is vetted and translated into a set of plans that will be utilized to carry out the TAM project. The task list is important at this stage because it serves as the basis on which all other components are configured, such as duration, cost, quality, equipment, materials, safety, logistics, and resources. Extreme attention to details and meticulous calculations are hallmarks of the setup.
- Phase 3-Execution: Typically, it is a 2–8-week period during which scheduled work is completed and updated against the plan, cost, safety, and quality standards. During this stage, the focus is on effective work control.
- Phase 4-Termination: It usually takes 1-2 weeks, and when the work is finished it is evaluated on performance.

The duration, cost, and implementation strategy of the TAM project are determined by the approved activities, and creating the best turnaround assignment is important for project completion (U. Al-Turki et al., 2019). The inspection, repair, upgrade, or overhaul of a process plant is a difficult asset renewal project in process sectors such as the oil and gas or chemical industries (Moniri et al., 2020). Oil refineries usually pass-through TAM every four years for an average of forty-two days, requiring more than 300k man-hours and a success rate of around 80%. TAM projects frequently fall short of their goals and objectives. According to (C. C. Obiajunwa, 2012), 80% of TAM projects achieve their target goals, while (Al-Marri et al., 2020) based on (Vichich, 2008) & (AlHamouri et al., 2019) says that on average, 83 percent of TAM initiatives fail to fulfill full performance goals and that in almost all TAM projects, the expected cost and time targets are surpassed by 20% on average. The question of project success is frequently addressed but rarely agreed upon. According to (Liu & Walker, 1998) and (Chan et al., 2004), the concept of project success can imply a lot of different things to various people, which leads to conflicts regarding whether a project is successful or not. TAM project success assessment criteria are consequently necessary not only to aid in the identification of factors that influence TAM project success but also to ensure that the TAM project outcome is appropriately evaluated [4]. This paper presented a Systematic Literature Review (SLR) study on the number of papers published on TAM's success and the identification of success variables used in TAM between 1972 and 2021 and its purpose is to demonstrate the shortcomings of research in the field of TAM and the factors that contribute to its success. It provides numerous contributions both academically as well as to the oil and gas industry in TAM management. First, it opens the way for researchers interested in this field to increase research and find optimal solutions to avoid TAM failure. Second, it supports oil and gas professionals to know the project success factors to avoid project failure that will lead to the company losing its reputation and profits. Third, to our knowledge, this SLR is a unique study in that it quantifies the number of studies in TAM success, relevant factors, methodology used, frequent factors used, and moderators or mediators used in TAM success projects.

2 THEORETICAL BACKGROUND

Turnaround maintenance is a significant feature of an organization's maintenance policy. These programs are needed for the preventative maintenance of constantly operating machinery that cannot be stopped for repairs during plant operations (Hlophe, S. C., & Visser, 2018). The processing plant is shut down during the turnaround process so that the equipment can be tested appropriately and cleaned until repairs can begin (Wenchi et al.,

2015). According to (Sahoo, 2014), standard turnaround maintenance entails thousands of activities that necessitates the organization of a multi-disciplinary team and is prone to discovery work, has a high risk of safety incidents, and necessitates a large budget. As a result, the progress of these programs is important to all concerned (Müller & Jugdev, 2012). Although the importance of turnaround maintenance programs for multiple process plants, several project failures have been recorded (C. C. Obiajunwa, 2012). According to reports, approximately 25% of turnaround programs collapse entirely, and 80% of these projects fail to meet their production goals (J. U. D. Akbar & Ghazali, 2016). Other researchers (Hansen & Schroeder, 2016) and (Shirley, 2012)) found that roughly 40% of turnaround programs fall short of average production goals by at least 30%. Similar sentiments were expressed by Ertl (2004), who stated that nearly 70% of turnaround ventures faced delays and cost overruns.(AL-Qadhi & Dr.Prof.Abdulaziz Abdullah, 2021) report that insufficient training of workers led to a direct failure of the turnaround maintenance success in Yemen. Also (Al-Hodiany & Misztal, 2022) stated that it is important to note that there isn't many research on TAM projects for turnaround maintenance in Yemen's oil and gas sector. Critical success factors are recognized as critical elements that are used to maximize project success and define primary project concerns (AC & RW, 1984) and (Müller & Jugdev, 2012). As a result, several types of research on variables that contribute to project completion has been conducted. Due to the unique existence of ventures and the differing views on these factors, (Andersen et al., 2006) stated that the critical performance factors are not uniform. (Albert et al., 2017) have displayed those various industries have their range of success factors, and (Montequin et al., 2016) conclude that performance variables vary depending on project partners, project form, and cultural and regional backgrounds. As a result, it is essential to identify the factors that influence the progress of shutdown projects.

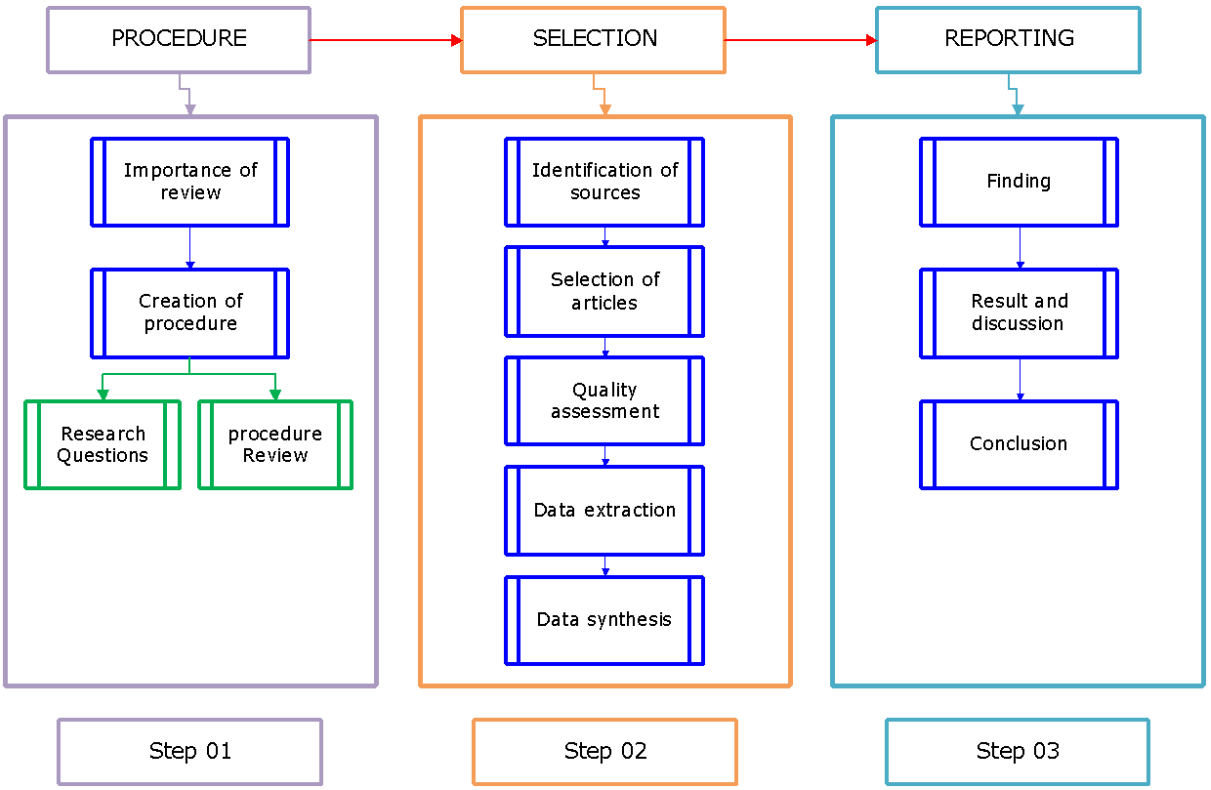
3 RESEARCH METHODOLOGY

A systematic literature review (SLR) is a type of literature review that follows a systematic and organized approach to identifying, evaluating, and synthesizing published research on a specific research question or topic. This methodology is designed to be repeatable and objective, and it is often used to provide a comprehensive overview of the current state of knowledge on a particular subject. The SLR process typically involves developing a clear research question, identifying relevant studies through a systematic search of the literature, evaluating the quality and relevance of the studies, and synthesizing the findings to draw conclusions. The SLR protocol may be based on a method such as the one proposed by (Kitchenham, 2004).

3.1 Procedure

The main objective of the systematic review is to synthesize and evaluate the current evidence on a particular research question or topic. The review tasks in this phase involve defining the research question, identifying relevant studies, and deciding on the inclusion and exclusion criteria for the studies to be included in the review. The procedure step involves identifying the sources of information, such as databases and other relevant sources, and establishing a plan for searching for relevant studies. The selection step involves reviewing the studies that have been identified and selecting those that meet the inclusion criteria for the review. The reporting step involves organizing and presenting the findings of the review in a clear and transparent manner, including a discussion of the limitations of the review and the implications for future research.

Figure 1. SLR process steps adopted from Kitchenham



Source:(Kitchenham, 2004)

3.1.1 Importance of review

There was no previous SLR in the field of variables that affect the success of TAM projects in the oil and gas industry. This lack of research prompted us to conduct this study, and its outcomes are expected to help stakeholders. As a result, it is important to conduct this research to benefit researchers and practitioners, to improve the project success process by utilizing all available resources, and to avoid project failure in the future.

3.1.2 Creation of review

A predetermined procedure is required to reduce the potential for researcher bias in the systematic literature review (SLR). Without this clearly explained procedure, it will affect the selection of articles or the influence of the researcher in the process of assessment and analysis. Therefore, before starting the study, the researcher must write a procedure that defines each step in the research with specific conditions to avoid the influence of the researcher's individual bias on the expected results. Alternatively, the researcher could involve other researchers or practitioners from this field to review and evaluate the research to validate the results.

3.1.3 Research questions

These research questions (RQ) will apply to all articles related to the oil and gas industries. The following questions will be addressed in this SLR:

RQ1: Has research been conducted on the TAM success?
RQ2: Has research been conducted on the impact of CSF on TAM projects?
RQ3: What is the most common method for assessing the TAM success?
RQ4: What are the most frequently used factors that influence the TAM success?
RQ5: What are the moderators or mediators used in the TAM success?

3.1.4 Procedure review

This procedure is an important component of any SLR. Scientists must agree on a way to review the procedure. If the appropriate budget is available, a group of independent professionals should be asked to review the procedure. Then, the same professionals may be asked to review the conclusion. In the case of articles, the journal editors are the ones who review and evaluate the procedure, as well as review the results of the research

3.2 Selection the review

The selection step for review begins after developing the procedure and defining the criteria that will be used in the process of selecting articles related to the research objectives. Selection is consisting of identification of sources, selection of articles, quality assessment, data extraction and data synthesis.

3.2.1 Identification of sources

A systematic review may provide a higher level of credibility to its conclusions by finding, analyzing, and summarizing all available evidence on a particular research topic. To ensure that the research area is adequately covered, it was chosen to focus the literature search on the following digital libraries; Emerald, ScienceDirect, Informs, Taylor & Francis, ASCE, Wiley, and SpringerLink. Searches for publications was limited to journals and conference papers published between early 1972 and mid-2021. These sources were adopted in this research because of their credibility in the field of research through reviewing and evaluating articles before publishing them.

A strategy was conducted to determine which sources to consider when searching, and which keywords to use for each source. The keywords in the search chain were extracted from the research questions. The keywords used in the papers' search terms are: “turnaround maintenance” OR "shutdown maintenance", “evaluation of turnaround maintenance” OR “optimization of turnaround maintenance”, “turnaround maintenance AND success project”, “turnaround maintenance AND performance”, “critical success factors AND turnaround maintenance”, “turnaround maintenance AND management”, “turnaround” OR “shutdown” OR “outage”, “optimization AND turnaround maintenance”, “critical success factors” AND shutdown”, “shutdown AND success project”, and “shutdown AND performance”.

3.2.2 Selection of articles

The selection procedure tries to filter the candidate papers that were picked by applying the search string to the libraries chosen at each paper's abstract, introduction, and conclusion. We chose papers that were written in English and met at least one of the following inclusion criteria:

1. Papers presenting TAM projects success in oil & gas industry.
2. Papers presenting the impact of variables on the full success of the TAM project in the oil and gas industry.

3. Papers presenting moderator or mediator used in the success of the TAM project in the oil and gas industry.

Regarding the exclusion criteria, papers that matched at least one of the following criteria were disqualified:

1. Papers that are not focused on influencing factors, performance, or management of TAM projects success.
2. Studies written in languages other than English.
3. Studies published before than 1972 or after mid of 2021.
4. Studies published in sectors other than Oil & Gas industries
5. Sources such as thesis, books, technical reports, and other documents that had no peer review process.

3.2.3 Quality assessment

The relative strength of the empirical evidence given was evaluated using a paper quality assessment. A set of quality assessment questions are applied to evaluate the rigorousness, credibility, and relevance of the selected studies using (Dybå & Dingsøyr, 2008) checklist.

Q1. Is the objective of study clearly stated?
Q2. Is the context of the research sufficiently explained?
Q3. Is the research design adequately prepared?
Q4. Are the data collection & measures clearly stated?
Q5. Are the constructs and measures utilized in the research relevant for answering the research question?
Q6. Is the data analysis in the study sufficiently explained?
Q7a. Qualitative study: Are the analysis and description of the evidence described adequately?
Q7b. Quantitative study: Is the assessed statistical significance used to report the effect size?
Q8. Are alternative solutions considered and discussed in the analysis?
Q9. Are the search results clearly defined and corroborated by the findings?
Q10. Does the article explain limitations or validity?

To answer to quality assessment questions, we used a four-point Likert scale by (Jamieson, 2004). There are four alternative answers to each question:

Score 0 - No issue was ever explained
Score 1 - Slight explained
Score 2 - Sufficiently explained
Score 3 - Fully explained and articles with an average Quality Score of 1 or higher were evaluated to ensure the reliability of the selected articles.

3.2.4 Data extraction

A data extraction form was used to obtain relevant data from the selected papers to answer the study questions.

RQ1: To answer this research question the TAM projects success in oil & gas industry are identified.

RQ2: To answer this research question the impact of success factors on the success of TAM projects in the oil and gas industry.

RQ3: To answer this question the most common method for assessing the success of a TAM project that has been used based on the literature.
RQ4: To answer this question the most frequently used factors that influence the success of TAM projects**.**
RQ5: To answer this question the moderator or mediator used in the success of the TAM project.

3.2.5 Data synthesis

The data structure involves collecting and summarizing the results of the selected primary articles. The data structure can be explained descriptively and sometimes it is possible with a quantitative summary. The answers to the research questions specified in section 3.1.3 will be discussed in the following part. Different methodologies were used to synthesis the retrieved data to answer the study questions. The entire narrative synthesis method was applied to answer the research questions. In addition, based on the research topics, visualization approaches such as tables and charts were used.

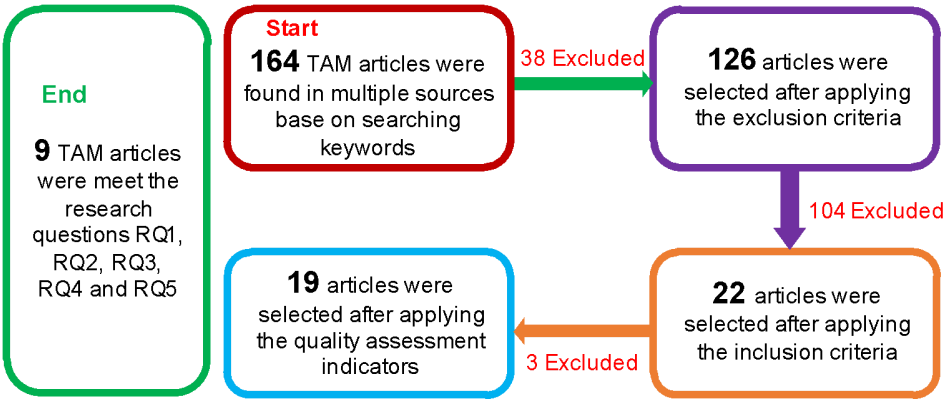
4 Reporting

This section of the study reports on the findings of the (TAM) selection process. The findings are presented in two parts: a broad summary of the overall findings, followed by a more detailed breakdown of the findings for each research question.

To begin with, a summary of the findings: after pre-filtering the research papers (excluding those from industries, book and thesis), the remaining papers were subjected to a third nomination process using inclusion criteria. The papers that passed this stage were then assessed using quality assessment indicators in a fourth nomination process. The final set of papers was evaluated based on the research questions.

Figure 2 shows the results of each step in the systematic literature review (SLR) evaluation cycle. Next, we present the findings for each research question in more detail. Finally, we draw some conclusions based on the findings of the study.

Figure 2. Systematic literature review cycle result

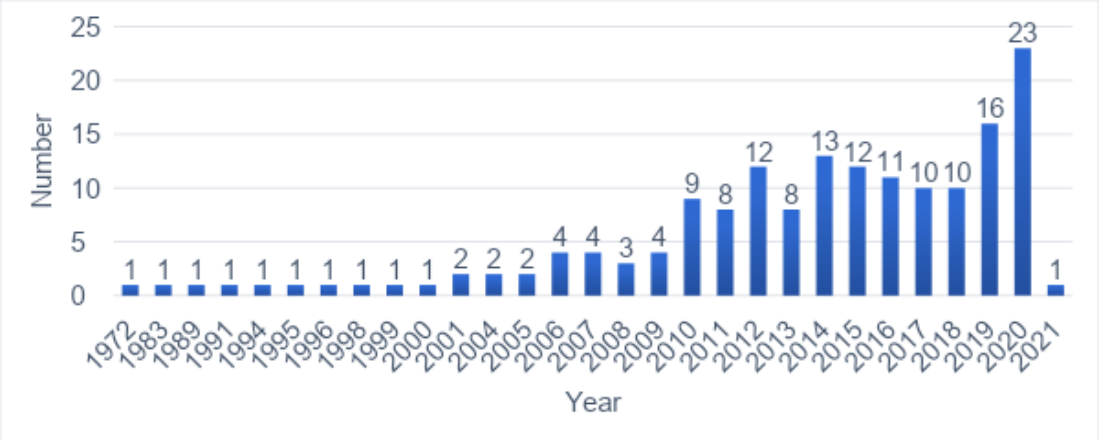


Source: Prepared by the author

4.1.1 Turnaround management publications

A total of 164 papers were identified by searching multiple databases using keywords and search criteria, as shown in Figure 3 and Table 1. The graph in Figure 3 illustrates the number of publications on turnaround management per year, starting from 1972 and ending in 2021. It shows that the number of publications increased steadily over time, with only one publication per year in the early years (1972-2000) and a peak of 23 publications in 2020. It is also apparent that the number of publications fluctuated from year to year, with some years having higher numbers than others.

Figure 3. Yearly turnaround management publications



Source: Prepared by the author

Table 1. Search result list of turnaround Management articles

Data sources	Total Result Found	Exclusion Criteria Result	Inclusion Criteria Result	Quality Assessment Result	Research Questions Result
AAMI	1				
ACS Publications	1	1			
American Institute of Chemical Engineers	1	1			
ASCE	5	4	1	1	
Conference	34	31	5	4	1
Crambeth Allen Publishing	1	1			
Dissertation	16				
Elsevier	22	17	1	1	1
Emerald	8	8	3	3	2
Engineering Information Transfer	1	1			
Gulf Publishing	2	2			
IEEE	5	4	1	1	
Inderscience	3	3	1	1	
Informs Publications	1	1			

IOP Publishing	3	2	1	1	
John Wiley and Sons Inc.	2	2			
Journal	40	33	9	7	5
Maney Publishing	1	1			
MDPI	3	2			
NACE	2	1			
Springer	3	3			
Taylor & Francis	7	7			
Taylor & Francis (Book)	1				
Wiley-VCH Verlag	1	1			

Source: prepared by the author

4.1.2 Exclusion criteria

The exclusion criteria defined in Section 3.2.2 were used to exclude studies that were identified by the search terms but did not align with the research objectives or were not related to the oil and gas industry. Table 2 shows that 38 publications were excluded for these reasons. The remaining 126 papers were carefully reviewed to determine their relevance to TAM projects. Of these, 16 were in the field of education (theses for graduation projects), 11 were in the field of power plants, 3 were in the field of healthcare, 2 were in the field of aviation, and 1 was in the field of chemical plants. There were also publications in various other industries.

Table 2. List of excluded publications

Author [reference]	Industry	Publication Number
(Fricke & Schultz, 2009) and (Wu & Caves, 2000)	Aviation	2
(Iheukwumere-Esotu & Kaltungo, 2020)	Cement plant	1
(Osborne, 2006) and (Khandwalla, 1991)	Chemical plant	2
(Hameed et al., 2016), (Swart, 2015), (Shou, 2018), (Werfalli, 2019), (Vereen, 2017), (Tovani, 2017), (Hemmanoor Arjun, 2016), (C. C. Obiajunwa, 2010), (Ishekwene, 2011), (Karlsson, 2010), (Mhlanga, 2015), (Wang, 2016), (Benaya, 2007), (Hofmeijer, 2016), (Groot, 2011) and (ZULKIPLI BIN GHAZALI, 2010)	Education	16
(Hatcher, K., Miller, D., Patel, D. J., & Patterson, 2020), (Cruz & Haugan, 2019) and (Cruz et al., 2008)	Healthcare	3
(Hinze, 2005), (Zhang et al., 2017), (Shi et al., 2020), (Yang & Chou, 2018), (Matthews, 2004), (Ismail et al., 2020), (Hlophe et al., 2018), (Raoufi et al., n.d.), (Power & 1995, n.d.), (Ashok et al., 2011) and (Hariyanto, 2020)	Power plant	11

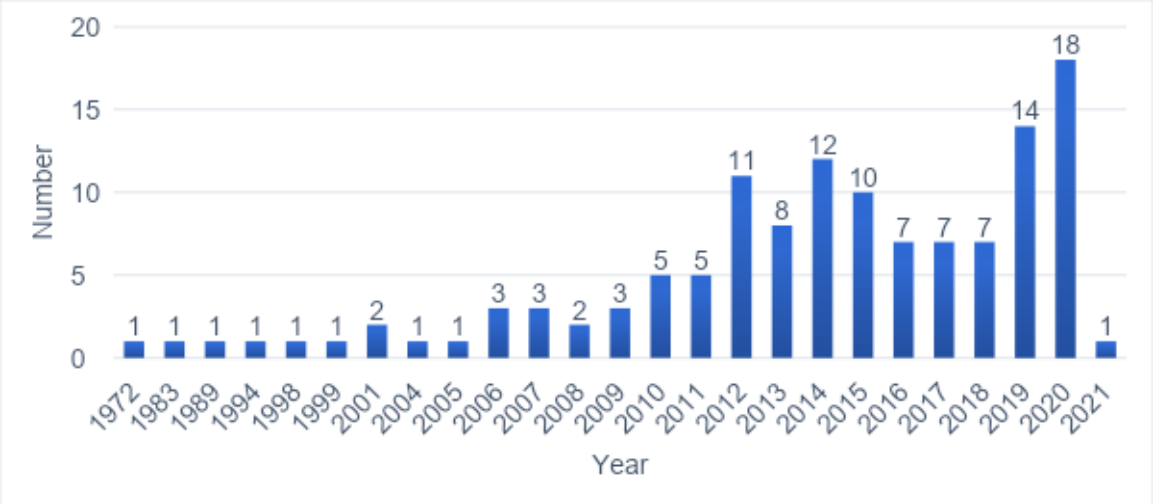
(Ghazali, 2010)	Process-based companies	1
(Bent & Humphreys, 2020)	Publishing- Books	1
(O'Hara et al., 2012)	Refinery	1

Source: prepared by the author

4.1.3 Relevant turnaround management publications

After applying the exclusion criteria, 38 publications were eliminated from a total of 164, leaving 126 papers that were thoroughly examined to determine their relevance to the research objectives. Figure 4 shows the distribution of relevant turnaround management articles, which can be divided into three parts: 1972-2005, 2006-2009, and 2010-2020. The publication of articles is irregular, with an average of one article per year in the first part, an average of 3 articles per year in the second part, and an average of 9 articles per year in the last part. These publications are related to turnaround management, which includes all articles that deal with process improvement in various areas such as technical, managerial, and economic aspects. The aim of the systematic literature review (SLR) is to achieve the research goal by identifying articles related to the TAM through the SLR process.

Figure 4. Relevant turnaround management publications



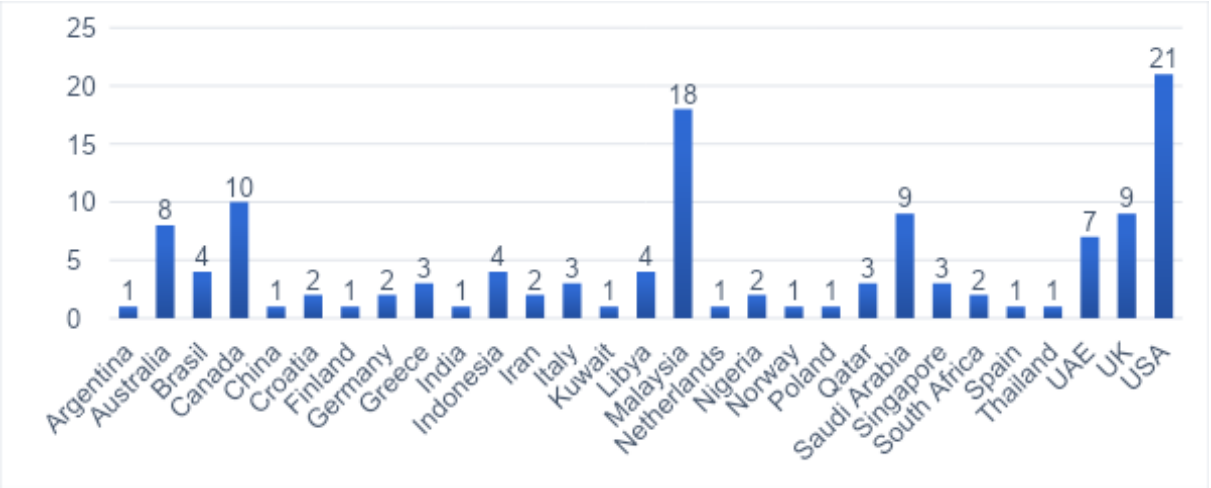
Source: Prepared by the author

4.1.4 Distribution of publications

Figure 5 shows the number of articles on turnaround management published at the global and regional level. A total of 31 countries from different continents have published articles on this topic, with the majority (17%) coming from the USA, followed by Malaysia (14%), Canada (8%), Saudi Arabia (7%), the UK (7%), and Australia (6%). When examining the distribution of publications by country on each continent, it is apparent that many European countries have published articles on turnaround management projects, including Croatia, Finland, Germany, Greece, Italy, the Netherlands, Norway, Poland, Spain, and the

UK. Latin America has only two countries with publications in this area, Argentina and Brazil, as well as two countries in North America, the USA and Canada. There were also publications from two African countries, Nigeria and South Africa. In Asia, the countries with publications on turnaround management include China, India, Indonesia, Iran, Malaysia, Singapore, Thailand, Saudi Arabia, the United Arab Emirates, Qatar, and Kuwait.

Figure 5. Publications Distribution country-wise

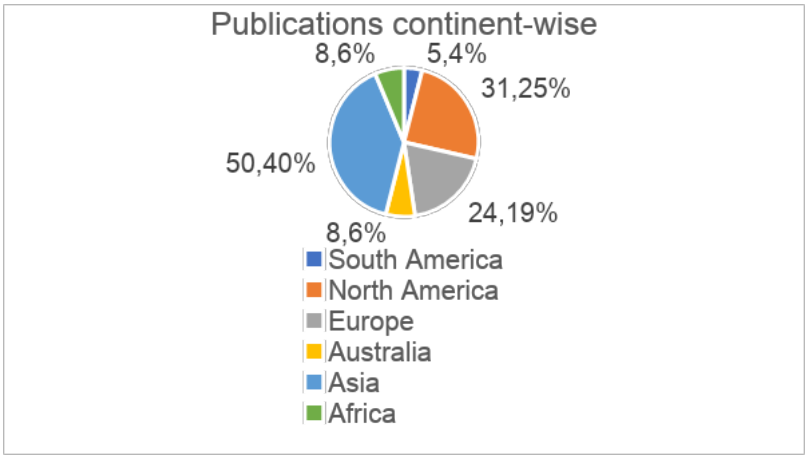


Source: Prepared by the author

Figure 6 shows that Asia has the largest number of publications on turnaround management, with 50 (40%) of the total, followed by North America with 31 (25%), Europe with 24 (19%), Africa with 8 (6%), and Australia with 8 (6%). South America has the lowest number of publications, with only 5 (4%). It is worth noting that the number of publications from Australia and Africa is the same.

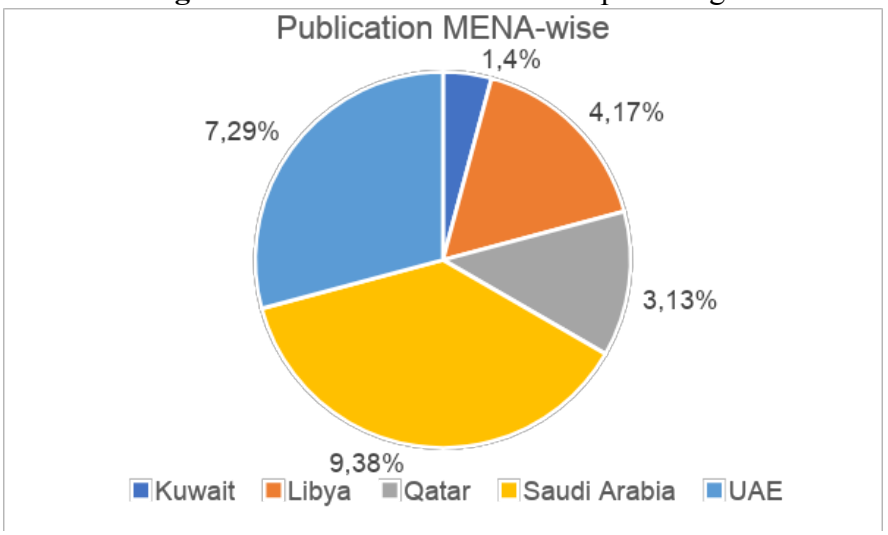
Figure 7 further breaks down the publication data by region, showing that only 6 out of 22 countries in the Middle East and North Africa (MENA) region have published articles on turnaround management. These countries include Kuwait (4%), Libya (17%), Qatar (13%), Saudi Arabia (38%), and the United Arab Emirates (29%).

Figure 6. Publication continents-wise percentage



Source: Prepared by the author

Figure 7. Publication MENA-wise percentage



Source: Prepared by the author

4.1.5 Inclusion criteria

It is important to carefully consider the inclusion criteria when selecting articles for a review, as this ensures that the review is focused on a specific topic or set of topics. In this case, the inclusion criteria are related to TAM success projects, which are likely projects that have been successfully implemented in a business or organization. By selecting articles that meet at least one of these inclusion criteria, the review can focus on the factors that contribute to the success of TAM projects.

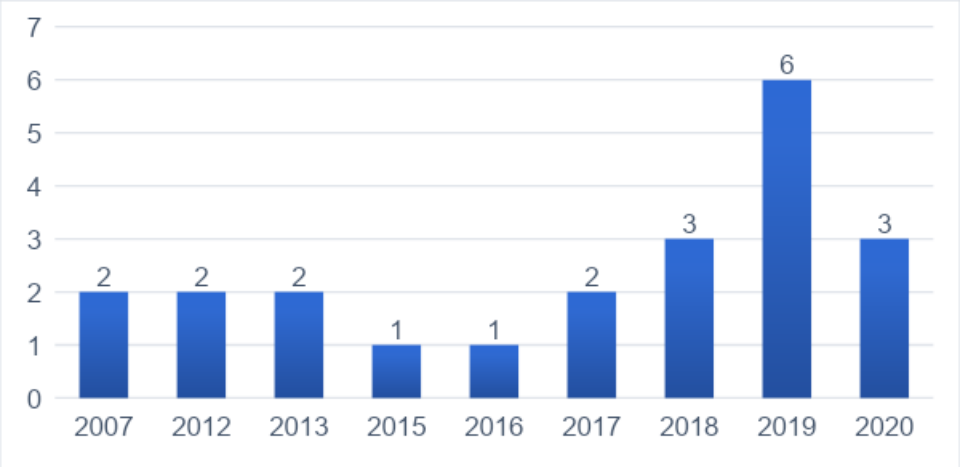
After the articles have been selected, it is also important to assess their quality to ensure that the review is based on reliable and well-researched information. This may involve evaluating the research methods used, the success factors, and the statistical analyses applied in the studies. By only including articles that have passed this quality assessment, the review can be confident in the accuracy and validity of the findings.

This process was used to include studies found through search terms that at least matched one of the inclusion criteria defined in section 3.2.2. After reviewing the titles, abstracts, and keywords of the publications that satisfied at least one of these criteria, only 22

Gyancity Journal of Engineering and Technology,
Vol.9, No.1, pp. 27-55, January 2023
ISSN: 2456-0065 DOI: 10.21058/gjet.2023.91002

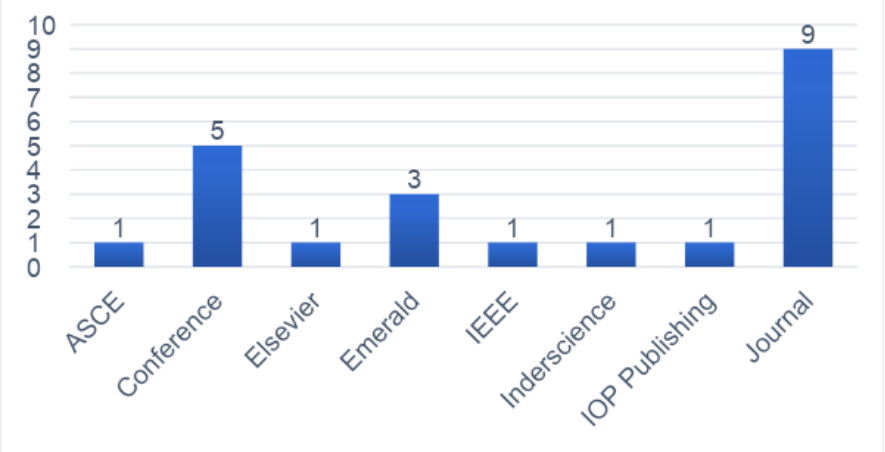
articles were selected for quality assessment. Table 3 shows the 22 out of 126 papers most associated with turnaround management (TAM) success projects. The largest number of articles published in 2019 was 6 (27%), and 9 out of the 22 publications were journals (41%), as shown in figures 8 and 9. The fact that there are relatively few articles published on TAM success projects suggests that there may be a lack of research in this area. This could be due to a variety of factors, such as a lack of funding or a lack of interest from researchers. However, understanding the factors that contribute to the success or failure of TAM projects is important for businesses and organizations seeking to implement these types of projects. As such, it may be valuable for researchers to focus on this area in order to better understand the factors that impact the success of these projects.

Figure 8. List of included publications per year



Source: Prepared by the author

Figure 9. List of Included publications per publisher



Source: Prepared by the author

The distribution of articles on TAM success projects by country. It mentions that Malaysia has published 5 (23%) articles globally, and that Saudi Arabia, Qatar, and the United Arab Emirates have also published articles in this field. The paragraph notes that Malaysia has published an article every year from 2015 to 2018, while Saudi Arabia published three

articles in 2019 and two in other years. Qatar published one article in 2012 and a second article eight years later.

The chart also mentions that there is no continuity in the publishing of articles on this topic, and suggests that the turnout for this type of research is deficient. This may imply that there is a lack of interest in studying TAM success projects in these countries, or that there are other factors that are limiting the production of research in this area. Figure 10 depicts the percentage of each country based on the number of articles published, which may provide additional context and information on the distribution of research on this topic.

Table 3. List of included publications

Sr. No.	Author [reference]	TAM Success	Critical Success Factors	Moderator	Mediator
1	(C. C. Obiajunwa, 2012)	TAM success	X	X	X
2	(Al-Marri et al., 2020)	TAM performance	Technical Human Management External	X	X
3	(Elwerfalli et al., 2019)	TAM optimization	X	X	X
4	(Khasanah et al., 2019)	TAM evaluation	X	X	X
5	(J. ud D. Akbar & Ghazali, 2017)	TAM performance	Leading		Team Alignment
6	(J. U. D. Akbar & Ghazali, 2016)	TAM performance	Planning		Team Alignment
7	(J. ud D. Akbar & Ghazali, 2018)	TAM performance	Coordination		Team Alignment
8	(U. Al-Turki et al., 2019)	TAM Planning	X	X	X
9	(Duffuaa et al., 2019)	TAM Integrated	X	X	X
10	(U. Al-Turki & Duffuaa, 2019)	TAM performance	X	X	X
11	(Fabić et al., 2020)	TAM management	Leadership Team Partnership & Resources Policy and Strategy	X	X
12	(Fabić et al., 2019)	TAM management	Process Process Management	Complexity	X

13	(C. C. Obiajunwa, 2013)	TAM success	Management skill	X	X
14	(Ghazali & Shamim, 2015)	TAM management	Centralisation Formalisation	X	X
15	(Din, Z. U., Akbar, J. U. D., Ghazali, A. D. Z. B., Hashim, M., & Bhatti, 2020)	TAM performance	Coordination Control	X	Team Alignment
16	(C. Obiajunwa, 2007)	TAM optimization	Internal & External Management skills	X	X
17	(Elemnifi & Elfeituri, 2007)	TAM performance	X	X	X
18	(Tol, 2018)	TAM performance	X	X	X
19	(Al-Kubaisi et al., 2012)	TAM optimization	X	X	X
20	(Duffuaa & Hadidi, 2017)	TAM performance	Technical Stakeholder	X	X
21	(WARATIMI et al., 2018)	TAM evaluation	X	X	X
22	(U. M. Al-Turki et al., 2013)	TAM measurement	X	X	X

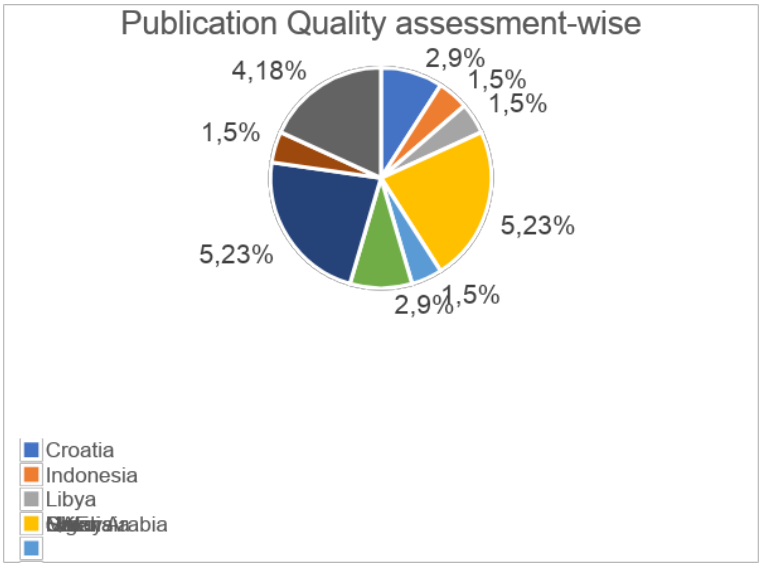
Source: Prepared by the author

Table 4. List of published articles by country

Country	2007	2012	2013	2015	2016	2017	2018	2019	2020
Croatia								1	1
Indonesia								1	
Libya	1								
Malaysia				1	1	1	1		1
Nigeria							1		
Qatar		1							1
Saudi Arabia			1			1		3	
UAE							1		
UK	1	1	1					1	

Source: Prepared by the author

Figure 10. Publication quality assessment-wise percentage



Source: Prepared by the author

4.1.6 Quality assessment

Quality assessment is a process for evaluating the quality of the selected articles. It explains that the quality assessment criteria were applied to the remaining 22 papers, which include questions related to various aspects of the research process such as the problem statement, research design, data collection, data analysis, and conclusion. Table 5 indicates that 19 out of the 22 papers passed the quality assessment study, and that the full details of the evaluation can be found in Appendix A, table A1.

Table 5. Result of quality assessment

Sr. No.	Author [reference]	TAM Success	Critical Success Factors	Moderator	Mediator
1	(C. C. Obiajunwa, 2012)	TAM success	X	X	X
2	(Al-Marri et al., 2020)	TAM performance	Technical Human Management External	X	X
3	(Elwerfalli et al., 2019)	TAM optimization	X	X	X
4	(Khasanah et al., 2019)	TAM evaluation	X	X	X
5	(J. ud D. Akbar & Ghazali, 2017)	TAM performance	Leading		Team Alignment

6	(J. U. D. Akbar & Ghazali, 2016)	TAM performance	Planning		Team Alignment
7	(J. ud D. Akbar & Ghazali, 2018)	TAM performance	Coordination		Team Alignment
8	(U. Al-Turki et al., 2019)	TAM Planning	X	X	X
9	(Duffuaa et al., 2019)	TAM Integrated	X	X	X
10	(U. Al-Turki & Duffuaa, 2019)	TAM performance	X	X	X
11	(Fabić et al., 2020)	TAM management	Leadership Team Partnership & Resources	X	X
12	(Fabić et al., 2019)	TAM management	Policy and Strategy Process Process Management	Complexity	X
13	(C. C. Obiajunwa, 2013)	TAM success	Management skill	X	X
14	(Ghazali & Shamim, 2015)	TAM management	Centralisation Formalisation	X	X
15	(Din, Z. U., Akbar, J. U. D., Ghazali, A. D. Z. B., Hashim, M., & Bhatti, 2020)	TAM performance	Coordination Control	X	Team Alignment
16	(Elemnifi & Elfeituri, 2007)	TAM performance	X	X	X
17	(Al-Kubaisi et al., 2012)	TAM optimization	X	X	X
18	(Duffuaa & Hadidi, 2017)	TAM performance	Technical Stakeholder	X	X
19	(WARATIMI et al., 2018)	TAM evaluation	X	X	X

Source: Prepared by the author

5 RESULT AND DISCUSSION

The goal of the SLR was to identify and evaluate research related to the success of turnaround management (TAM) projects in the oil and gas industries, and that 126 papers were identified and studied from a total of 164 papers. Figure 4 shows the steps of the evaluation cycle of the selected papers.

5.1 Research question 1 (Has research been conducted on the TAM success?)

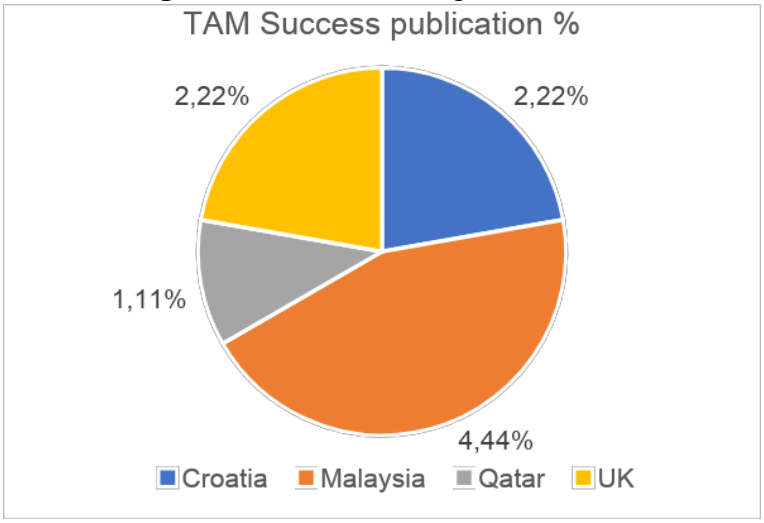
To answer question 1, Table 6 presents a list of articles related to the success of the TAM. Nine articles focus their studies on the success of TAM from different perspectives with different approaches. Statistical evaluation is shown below, including the distribution of articles by country and year as presented in Table 7. Figure 11 illustrates that Malaysia dominates TAM publications with an estimate of 45%. To conclude the answer to research question 1, the trend shows a straight line with one article published each year from 2012 to 2019, followed by an increase of three articles in 2020 published by Malaysia, Croatia, and Qatar. Overall, the aim of the research was to understand the number of studies that have addressed the success of TAM, but the results were not satisfactory as there have been only a few articles published on this crucial topic. The authors suggest that further research is needed to fully understand the success of TAM and to address the limitations of the existing research on this topic.

Table 6. List of articles related to TAM success

Sr. No.	Author [reference]	TAM Success
1	(C. C. Obiajunwa, 2012)	TAM success
2	(Al-Marri et al., 2020)	TAM performance
3	(J. ud D. Akbar & Ghazali, 2017)	TAM performance
4	(J. U. D. Akbar & Ghazali, 2016)	TAM performance
5	(J. ud D. Akbar & Ghazali, 2018)	TAM performance
6	(Fabić et al., 2020)	TAM management
7	(Fabić et al., 2019)	TAM management
8	(C. C. Obiajunwa, 2013)	TAM success
9	(Din, Z. U., Akbar, J. U. D., Ghazali, A. D. Z. B., Hashim, M., & Bhatti, 2020)	TAM performance

Source: Prepared by the author

Figure 11. TAM success publication %



Source: Prepared by the author

Table 7. List of articles published per country and year

Country	Author [reference]	2012	2013	2016	2017	2018	2019	2020
Croatia	(Fabić et al., 2020)and (Fabić et al., 2019)						1	1
Malaysia	(J. ud D. Akbar & Ghazali, 2017), (J. U. D. Akbar & Ghazali, 2016), (J. ud D. Akbar & Ghazali, 2018) and (Din, Z. U., Akbar, J. U. D., Ghazali, A. D. Z. B., Hashim, M., & Bhatti, 2020)			1	1	1		1
Qatar	(Al-Marri et al., 2020)							1
UK	(C. C. Obiajunwa, 2012) and (C. C. Obiajunwa, 2013)	1	1					

Source: Prepared by the author

5.2 Research question 2 (Has research been conducted on the impact of CSF on TAM projects?)

Table 8 shows 7 articles that provide answers to the question of what factors drive the success of TAM projects. It can be concluded that there are no standard criteria for selecting success factors; each author selects the factors based on their own problem statement. Therefore, there is no comprehensive list of critical success factors (CSFs) that can be used in the management of TAM success. (Al-Marri et al., 2020) selected factors based on a literature review and focus group, while (Fabić et al., 2020) and (Fabić et al., 2019) selected factors from the quality management model of the European Foundation for Quality Management (EFQM Model). For the articles by (J. ud D. Akbar & Ghazali, 2017), (J. U. D. Akbar & Ghazali, 2016), (J. ud D. Akbar & Ghazali, 2018), and (Din, Z. U., Akbar, J. U. D., Ghazali, A. D. Z. B., Hashim, M., & Bhatti, 2020), the factors were selected from the management functions of planning, coordination, and leading control (Campling, J., Poole, D., Wiesner, R., & Schermerhorn, 2006)

Table 8. List of success factors

Sr. No.	**Author [reference]**	**Success Factors (SF)**
1	(Al-Marri et al., 2020)	Technical Human Management External
2	(J. ud D. Akbar & Ghazali, 2017)	Leading
3	(J. U. D. Akbar & Ghazali, 2016)	Planning
4	(J. ud D. Akbar & Ghazali, 2018)	Coordination

5	(Fabić et al., 2020)	Leadership Team Policy and strategy Partnership and Resources Process
6	(Fabić et al., 2019)	Process management
7	(Din, Z. U., Akbar, J. U. D., Ghazali, A. D. Z. B., Hashim, M., & Bhatti, 2020)	Coordination Control

Source: Prepared by the author

5.3 Research question 3 (What is the most common method for assessing the TAM success?)

To answer this question, there are three methods used in assessing the success of TAM projects: quantitative (6 articles), qualitative (2 articles), and mixed methods (2 articles). The most common method is the quantitative method, which was used from 2016 to 2020. The mixed method was used in 2013 and 2020, while the qualitative method was used in 2012 and 2017. The quantitative method is easier and more flexible than the other methods. However, the qualitative method and the mixed method require extra effort, such as arranging a visit to the premises and obtaining permission to interview experts. This can be challenging, particularly in oil and gas companies that do not want information on TAM performance to be published because they consider it sensitive to the company's reputation. Therefore, some researchers prefer the quantitative method. In addition, most of the data analysis used is SPSS and SMART PLS-3.

Table 9. List of methodology

Methodology	**Author [reference]**	**2012**	**2013**	**2016**	**2017**	**2018**	**2019**	**2020**
Mixed Method	(Al-Marri et al., 2020) and (WARATIMI et al., 2018)		1					1
Qualitative	(C. C. Obiajunwa, 2012)	1						
Quantitative	(J. U. D. Akbar & Ghazali, 2016), (Din, Z. U., Akbar, J. U. D., Ghazali, A. D. Z. B., Hashim, M., & Bhatti, 2020), (Fabić et al., 2019), (J. ud D. Akbar & Ghazali, 2017), (J. ud D. Akbar & Ghazali, 2018), (Fabić et al., 2020)			1	1	1	1	2

Source: Prepared by the author

5.4 Research question 4 (What are the most frequently used factors that influence the TAM success?)

To answer this question, there are a few factors that have been frequently used in TAM success projects, as shown in Table 10. Four articles discussed the frequent factors used in TAM success, meeting the requirement for RQ1. The only two factors that are repeated in different articles are "Management" (mentioned in (Al-Marri et al., 2020) and (Fabić et al., 2019)) and "Coordination" (mentioned in (J. ud D. Akbar & Ghazali, 2018) and (Din, Z. U., Akbar, J. U. D., Ghazali, A. D. Z. B., Hashim, M., & Bhatti, 2020) The "Management" factor in (Al-Marri et al., 2020) contains a list of sub-factors that differs from the list of sub-factors in (Fabić et al., 2020). However, in the "Coordination" factor, it is the same in both (J. ud D. Akbar & Ghazali, 2018) and (Ghazali & Shamim, 2015).

Table 10. List of frequent success factors

Sr. No.	Author [reference]	Success Factors (SF)	SF Frequently used
1	(Al-Marri et al., 2020)	Technical Human Management External	Management
2	(J. ud D. Akbar & Ghazali, 2017)	Leading	
3	(J. U. D. Akbar & Ghazali, 2016)	Planning	
4	(J. ud D. Akbar & Ghazali, 2018)	Coordination	Coordination
5	(Fabić et al., 2020)	Leadership Team Policy and strategy Partnership and Resources Process	
6	(Fabić et al., 2019)	Process management	Management
7	(Din, Z. U., Akbar, J. U. D., Ghazali, A. D. Z. B., Hashim, M., & Bhatti, 2020)	Coordination Control	Coordination

Source: Prepared by the author

5.5 Research question 5 (What are the moderators or mediators used in the TAM success?)

To answer this question, Table 11 presents a list of moderators and mediators used in various studies. The only moderator identified in (Fabić et al., 2019) is complexity. On the other hand, the Mediator (Team Alignment) has been used in four different studies by (J. ud D. Akbar & Ghazali, 2017), (J. U. D. Akbar & Ghazali, 2016), (J. ud D. Akbar & Ghazali, 2018) and (Din, Z. U., Akbar, J. U. D., Ghazali, A. D. Z. B., Hashim, M., & Bhatti, 2020), respectively. The mediator was repeated in these studies because it was associated with a single author.

Table 11. List of moderator & mediator

Sr. No.	Author [reference]	Moderator	Mediator
1	(J. ud D. Akbar & Ghazali, 2017)		Team Alignment
2	(J. U. D. Akbar & Ghazali, 2016)		Team Alignment
3	(J. ud D. Akbar & Ghazali, 2018)		Team Alignment
4	(Fabić et al., 2019)	Complexity	
5	(Din, Z. U., Akbar, J. U. D., Ghazali, A. D. Z. B., Hashim, M., & Bhatti, 2020)		Team alignment

Source: Prepared by the author

6 CONCLUSIONS

The author of this study conducted a systematic literature review (SLR) to identify articles related to the success of turnaround maintenance (TAM) projects in the oil and gas industry. These articles included critical success factors, common methodologies, frequently used factors, and moderator and mediator variables. The authors' findings show that there is a significant knowledge gap on this topic, with only a small number of studies addressing success factors and moderator or mediator variables. Out of the 126 papers published on TAM, only 22 of them relate to the management or performance of these projects. This lack of thorough exploration of relevant theories may indicate that these theories have not been fully developed or tested in the context of TAM projects, or that they have not been given sufficient attention by researchers. The authors suggest that further research is needed to more fully understand and apply these theories to the success of TAM projects.

It was also found that most of the available research has focused on project management success in TAM projects, rather than subjective metrics of success. Additionally, the authors identified a deficiency in research on this subject based on geographical location, with fewer articles published in certain regions such as Asia, North America, Europe, Australia, Africa, and South America. The situation is similar in the Middle East, where publications are limited to certain countries.

The author also identified that previous research on TAM projects often did not consider all phases of TAM management, with some studies focusing on reducing the duration of TAM projects, while others focused on execution stage factors or the supply chain process. Others emphasized the role of the organization and team in TAM project success. This lack of comprehensive understanding of TAM management leads to incomplete conclusions about how to improve the process.

To accurately measure the success of TAM projects, the authors suggest that it is necessary to consider all phases of the project, including factors such as management, organization, technical aspects, human factors, project size, environmental considerations, economic factors, and the personal traits of the TAM manager and team. The authors also mention the value of theories such as strategic management, trait theories, production theory, and others for conducting research and identifying potentially fruitful areas of inquiry.

The author also found that the majority of researchers included did not follow proper research methodology procedures, leading to the exclusion of three articles during the quality

assessment process. The most frequent factors used in previous research on TAM projects were duration, cost, and safety. Moreover, there were few studies that included moderator or mediator variables, and those that did often used only a small number of variables.

Overall, the author of this study concluded that there is a significant knowledge gap on the success of TAM projects in the oil and gas industry, and further research is needed to better understand and apply relevant theories to these projects. They also suggest that more comprehensive research is needed to accurately measure the success of TAM projects, including consideration of all phases of TAM management and a range of relevant factors.

Annex 1 - Quality assessment questions

Table A1. Result of the quality assessment

Sr. No.	Author [reference]	Q 1	Q 2	Q 3	Q 4	Q 5	Q 6	Q 7a	Q 7b	Q 8	Q 9	Q 10	Average
1	(C. C. Obiajunwa, 2012)	3	3	3	2	2	2	2	n/a	0	3	0	2
2	(Al-Marri et al., 2020)	3	3	3	2	2	2	2	n/a	3	3	3	2.6
3	(Elwerfalli et al., 2019)	3	2	2	2	2	2	n/a	2	0	3	0	1.8
4	(Khasanah et al., 2019)	3	2	2	2	2	2	n/a	2	0	2	0	1.7
5	(J. ud D. Akbar & Ghazali, 2017)	3	3	2	2	2	2	n/a	2	0	3	0	1.9
6	(J. U. D. Akbar & Ghazali, 2016)	3	3	2	2	2	2	n/a	2	0	3	0	1.9
7	(J. ud D. Akbar & Ghazali, 2018)	1	2	2	2	2	2	n/a	2	0	3	0	1.6

8	(U. Al-Turki et al., 2019)	3	2	1	1	1	1	1	n/a	0	1	0	1.1
9	(Duffuaa et al., 2019)	2	1	1	1	1	1	1	n/a	0	1	0	1
10	(U. Al-Turki & Duffuaa, 2019)	2	1	1	1	1	1	1	n/a	0	1	0	1
11	(Fabić et al., 2020)	3	2	2	2	2	2	n/a	2	0	3	0	1.8
12	(Fabić et al., 2019)	3	2	2	2	2	2	n/a	2	0	3	0	1.8
13	(C. C. Obiajunwa, 2013)	3	2	2	2	2	2	n/a	2	0	3	0	1.8
14	(Ghazali & Shamim, 2015)	3	3	2	2	2	2	n/a	2	0	3	0	1.9
15	(Din, Z. U., Akbar, J. U. D., Ghazali, A. D. Z. B., Hashim, M., & Bhatti, 2020)	3	3	2	2	2	2	n/a	2	0	3	0	1.9
16	(C. Obiajunwa, 2007)	3	1	1	1	2	1	n/a	0	0	0	0	0.9
17	(Elemnifi & Elfeituri, 2007)	2	2	2	1	1	1	1	n/a	0	1	0	1.1
18	(Tol, 2018)	1	1	1	0	1	0	0	n/a	0	1	0	0.4
19	(Al-Kubaisi et al., 2012)	2	2	2	2	2	2	1	n/a	0	1	0	1.4
20	(Duffuaa & Hadidi, 2017)	3	3	3	3	3	3	3	n/a	0	3	0	2.4
21	(WARATIMI et al., 2018)	3	3	3	3	3	3	n/a	3	0	3	0	2.4
22	(U. M. Al-Turki et al., 2013)	3	2	1	0	1	0	1	n/a	0	1	0	0.9

Source: Prepared by the author

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