

Indicative Factors for SACCOs Failure in Tanzania

Cosmas Magashi

Department of Information Technology, System Development, and Management (ITSDM), Nelson Mandela African Institution of Science and Technology (NM-AIST), Tanzania
magashi80@yahoo.com (corresponding author)

Anael Sam

Department of Information Technology, System Development, and Management (ITSDM), Nelson Mandela African Institution of Science and Technology (NM-AIST), Tanzania
anael.sam@nm-aist.ac.tz

John Agbinya

School of Information Technology and Engineering, Melbourne Institute of Technology (MIT), Australia
jagbinya@mit.edu.au

Jimmy Mbelwa

Department of Computer Science and Engineering, University of Dar es Salaam (UDSM), Tanzania
jimmymbelwa@gmail.com

Received: 23 April 2023 | Accepted: 1 May 2023

Licensed under a CC-BY 4.0 license | Copyright (c) by the authors | DOI: <https://doi.org/10.48084/etasr.5989>

ABSTRACT

SACCOs are viewed as a feasible opportunity toward financial inclusion in an economy where most of the citizens are poor, as they are very essential for the socio-economic development of members, the community, and the world at large. However, SACCOs sometimes do not realize the expected socio-economic potential, especially when they fail. This study aimed to comprehensively assess financial and non-financial factors, at institutional and personal levels, that contribute to the failure of SACCOs in Tanzania. The data were collected using a questionnaire on 5,000 members of SACCOs, obtained using stratified random sampling. Data collected were analyzed using descriptive statistics and binary logistic regression. The findings showed that both financial and non-financial factors, at personal and institutional levels, had a statistically significant and positive relationship with the failure of SACCOs. Therefore, the performance of SACCOs and other Microfinance Financial Institutions (MFIs) should be addressed from a comprehensive view of both financial and non-financial factors, at personal or institutional levels. In other words, the failure of MFIs should be addressed from a holistic point of view.

Keywords-SACCOs failure; financial factors; non-financial factors

I. INTRODUCTION

The business ecosystems are continually evolving in the current era of science and technology [1], and Savings and Credit Cooperative Organisations (SACCOs) form one of these ecosystems. SACCOs are defined as voluntary associations where members are encouraged to make regular savings and subsequently obtain credit for use in different activities [2]. SACCOs are viewed as a feasible opportunity for financial inclusion in an economy where the majority of citizens are poor [3-5] and are considered very essential for the socio-economic development of members, the community, and the world at large [6-8]. SACCOs have attracted the interest of several studies for their contributions to the socio-economic

development of their members and the community at large. SACCOs have been an engine for mobilizing human, financial, and capital resources for national development [6].

SACCOs help their members accumulate capital and loans for social needs, such as building houses, buying clothes, paying school fees, organizing weddings, and other social activities [5]. They enable easy access to financial services, encourage savings, create employment opportunities, and directly support community development efforts, such as helping the community access social services, stimulating growth, etc. [7]. SACCOs make finance more accessible to underprivileged members, limit the incidence of financial exclusion, stimulate a thrift culture, aware ordinary people how

to create assets, and generally improve the economic performance of developing countries [9-10]. Regardless of such socioeconomic development and contributions, some unexpected issues of SACCOs' failures are noted. Some SACCOs fail from time to time due to not being operationally and financially stable [2, 5, 11]. Some studies revealed financial and non-financial factors for the failure of SACCOs [12-15], but they were not comprehensive, as they addressed limited factors and focused mainly on financial factors. In addition, these studies used only descriptive statistics to analyze these few factors that contribute to SACCO failure, instead of advanced statistical methods, such as logistic regression, which could show more logical relationships. Furthermore, several studies concentrated on the failure of MFIs and not specifically on SACCOs. The failure was addressed indirectly as poor loan repayment or loan default and not directly as a failure. The failure of SACCOs is more than poor loan repayment or loan default. Therefore, this study aimed to identify comprehensive statistical relationships between financial and non-financial factors that contribute to the failure of SACCOs in Tanzania.

Various studies investigated the failure of SACCOs after their formation. For example, out of 103 SACCOs in Tanzania, 61% and 51% failed operationally financially, respectively [2]. The number of SACCOs in Tanzania decreased from 4,177 at the end of December 2018 to 3,714 at the end of December 2019 [7]. Several SACCOs failed to provide adequate socio-economic benefits to members as expected. The failure of SACCOs is reflected directly or indirectly in terms of loan repayment or loan default. As loans are the key products of SACCOs, failure of loan repayment causes them to fail [19]. Poor loan repayment or loan default is the decline and failure of some microfinance institutions, including SACCOs [10]. The failure of SACCOs is caused by both internal and external factors, such as financial constraints, weak leadership, unreliable loan interest rates, and poor record-keeping systems [5]. In [11], it was shown that poor monitoring of loan use, poor intrapreneurship and environmental business opportunities, unfavorable loan repayment conditions, and poor strategies for choosing borrower groups were important factors for the failure of SACCOs. In [12], six factors out of ten were found to influence the failure of SACCOs, namely: poor educational level, lending methods, the proximity of borrower's residence to the institutions, family size, income from loan-financed activities, and training. In [13], clients' age, interest rates charged, and loss of collateral were noted as the principal factors leading to the failure of SACCOs. In [14], it was shown that factors such as training, education level, and annual income could cause the failure of SACCOs.

The Institutional Theory stresses the evaluation of MFIs, such as SACCOs, indicating that many SACCOs do not experience a proper circle of money market, mass distribution of credit, and uplifting microfinance systems as best practices for improving efficiency due to poor management systems, finance and accountability, marketing, and service delivery. Additionally, Working Capital Management Theories (WCMT) indicate that the failure of SACCOs depends on existing or anticipated internal and external constraints, which vary from operational, managerial, or resource constraints. The

Information Asymmetry Theory (IAT) portrays that the lack of proper information may be one of the non-financial factors that cause the failure of SACCOs in Tanzania. Lenders fail to adequately differentiate the information between one borrower and another [16-18]. Misaligned information between lenders and borrowers may lead to losses when the money issued is delivered to the wrong borrowers. Furthermore, prospective SACCO borrowers may lack or have limited information, making them not borrow as expected [13].

This study attempted to distinguish the factors mentioned above into predictor and outcome variables. These factors were categorized into financial and non-financial factors and further divided into personal (SACCOs clients) and institutional (SACCOs) factors. The personal non-financial factors were clients' age, education level, family size, proximity of borrowers' residence to the institution, gender, type of business, and entrepreneurship/business environment. The institutional non-financial factors were the supervisory environment, record keeping, infrastructure, supportive regulations, human resources, choosing borrowers, training, and lending method. Personal financial factors were loan repayment, collateral loss, annual income, loan utilization, high transaction cost, client credit experience, knowledge of financial management, and loan management strategies. Financial institutional factors were loan interest, loan amount, loan category, lending methodology, criteria used in granting micro credits, unfavorable loan repayment conditions, income from loan-financed activities, and interest rates charged.

II. METHODOLOGY

This study used a quantitative approach, following the nature of the specific objective which is characterized by a causal-effect relationship, attempting to explain the relationship between variables. This approach uses statistical data as a tool to save time and resources by focusing on numbers and figures in data collection and analysis [20]. This study applied the explanatory cross-sectional survey research design, due to various reasons following the nature of its objective. Each SACCO was treated as a unit of analysis covering a large geographical area of Tanzania, to provide fast, well-organized, and precise means of analyzing failure information. The study was dominated by "what" questions, which prompt the explanatory cross-sectional survey research design [21-22]. The study was carried out in Tanzania, based on five regions, namely Dar es Salaam, Arusha, Mbeya, Mwanza, and Dodoma, which have high concentrations of SACCOs and can represent the country as a whole. These regions have both successful and failed SACCOs, and also have SACCOs with the alert of the possibility of being closed by TCDC.

The population of this study included members, staff, and management of SACCOs, and TCDC management. The members were considered because they were the owners of the SACCOs; hence, they were very well informed of their performance. The SACCOs staff and management and the TCDC management are the key informants on any performance, success or failure, regarding SACCOs.

First, the sample was chosen from the Dar es Salaam, Arusha, Mbeya, Mwanza, and Dodoma regions and the sample

population of SACCOS members was obtained. The population of SACCOS members obtained from the given regions was 5,000, i.e. 1011 in Dar es Salaam, 1000 in Arusha, 1030 in Mbeya, 999 in Mwanza, and 960 in Dodoma. The formula in [23] was used to calculate the sample size for this study as indicated below:

$$n = \frac{Z^2 pqN}{e^2(N-1) + Z^2 pqN} \tag{1}$$

where n is the sample size for a finite population, N is the size of the population that is the number of SACCOS members (5000), p is the population reliability (or frequency estimated for a sample of size n) taken as 0.5 for all developing countries population, $p+q=1$, e is the margin of error considered 3%, and Z^2 is the normal reduced variable at 0.05 level of significance, which was chosen as 1.96. According to the above formula, the sample size for this study was:

$$n = \frac{(1.96)^2 \times (0.5 \times 0.5) \times 5000}{(0.03)^2 \times (5000 - 1) + (1.96)^2 \times 0.5 \times 0.5} \tag{2}$$

$$n \approx 880$$

The primary data of this study were collected mainly using a questionnaire and 880 questionnaires were distributed to the members of SACCOS. However, only 500 questionnaires were received and found to be complete and useful for data analysis. The response rate was 57% and could not affect the assumption (sample size) of the binary logistic regression model for data analysis. The questionnaire was able to produce information from the respondents at a low cost with a large and geographically spread population. The questionnaire provided the respondents with a suitable time to give well-thought responses and allowed not easily approachable respondents to be reached. It was a structured questionnaire, prepared in advance with fixed, concrete, and predetermined questions. The questions had the same wording and order for all respondents, with the same stated responses, and had closed answers. The respondents completed the questionnaire on their own. Furthermore, the secondary data of this study were collected using a documentary review of published and non-published reports on the performance of SACCOS in Tanzania and other developing countries, such as Kenya, Ethiopia, Nigeria, and others. Secondary data provided the basis for collecting primary data and finally making comparisons.

To ensure the quality of the findings, the questionnaire was first pre-tested and piloted in a small intended sample to examine its reliability and variability. The comments given during the pre-testing and pilot study were scrutinized and incorporated accordingly. Cronbach's alpha coefficient was used to investigate whether the study scales were free from random error, of which a minimum level of 0.7 was used [24]. The use of multiple data collection methods, i.e. questionnaire and documentary reviews, also ensured validity and reliability. The use of various respondents, i.e., SACCOS members, staff, management, and TCDC management, likely ensured triangulation, validity, and reliability of the findings.

This study adapted scales from previous empirical studies to ensure empirical evidence and confidence of definitions, measurements, and operationalization of variables and scales as

a way to ensure validity and reliability. The collected data were analyzed using binary logistic regression. The model was used to test and predict a dichotomous dependent variable from several categorical or continuous independent variables. Specifically, the dependent variable is SACCO's sustainability, where 0 indicates "Fail" and 1 indicates "Successful". The model allowed for the establishment of the predictive ability of sets of independent variables. Data analysis was performed using R Statistics version 4.0.5.

III. FINDINGS

Table I briefly describes the personal information of the respondents, to ensure that homoscedasticity, independence of residuals/relations, normality, sample size, outliers, and multicollinearity were met before running the model.

TABLE I. PARTICIPANTS' INFORMATION

Personal Information	Scale	Frequency	%
Gender	Male	300	60
	Female	200	40
	Total	500	100
Age	21-24 years	95	19
	25-29 years	150	30
	21-24 years	95	19
	25-29 years	150	30
	30-34 years	185	37
	35-39 years	50	10
	40 years and above	20	4
	Total	350	100
Family status	Single	295	59
	Married	150	30
	Divorced	30	6
	Widow	25	5
	Total	500	100
Region	Arusha	100	20
	Dar es Salaam	102	20
	Mbeya	103	21
	Mwanza	99	20
	Dodoma	96	19
	Total	500	100
Educational level	Formal Education	95	19
	Primary Education	150	30
	Secondary Education	185	37
	Undergraduate Education	50	10
	Postgraduate Education	20	4
	Total	500	100

This study had one main question: "What are the factors that predict the failure of SACCOS in Tanzania?", or alternatively: "How well does a set of factors predict and explain the failure of SACCOS in Tanzania?". The question was answered using a binary logistic regression model. Although the model produced a lot of information, this section just highlights the results that are straightforward in explaining the influence of financial and non-financial factors on SACCOS failure in Tanzania. Regarding the overall model fit, the omnibus test of model coefficients was used to indicate in general how well the model performed, frequently referred to as the goodness of fit. The results showed that this value was 0.000 ($p < .0005$). The overall model fit was also tested using chi-square, showing a value of 87.02 with 4 degrees of freedom (df). Additionally, the results of the Hosmer-Lemeshow test

portray the reliability of the model fit. The chi-square value for the Hosmer-Lemeshow test was 17.019 with a significance level of 0.309, and as this value is larger than 0.05 it indicates support for the model. It should be noted that the Hosmer-Lemeshow goodness of fit is indicated by a significance value greater than 0.05, while the omnibus test of model coefficients is indicated by a significance value less than 0.05 [25-26]. The usefulness of the model was also established. This information provides the variation capacity in the outcome variable explained by the used model, i.e. the usefulness of the model. Table II shows these results, along with the Cox and Snell R squared and the Nagelkerke R squared values. However, the pseudo-R square statistics were used rather than the true R square values as provided in the multiple linear regression results. The results indicated two values of 0.371 and 0.463, meaning that between 37% and 47.3% of the variability is explained by this set of variables.

TABLE II. THE OVERALL MODEL FIT

Omnibus Tests of Model Coefficients			
	Chi-square	df	Sig.
Step 1	87.02	4	0.000
Block	87.02	4	0.000
Model	87.02	4	0.000
Hosmer and Lemeshow Test			
Step	Chi-square	df	Sig.
1	17.019	8	0.309
Model Summary			
Step	2-log likelihood	Cox and Snell R ²	Nagelkerke R ²
1	352.376 ^a	0.371	0.463

The contribution of financial and non-financial factors to the failure of SACCOs was similarly established. Table III shows the predictive ability of each predictor variable using the Wald test. The results indicated that all predictor variables were statistically significant. All factors influenced the failure of SACCOs: poor loan repayment or excessive loan defaults. Checking the contribution capacity of each factor, it is noted that clients' and institutional financial factors had major contributions to the failure of SACCOs compared to non-financial factors. The direction of all predictor variables was positive, showing that all financial and non-financial factors positively impact the failure of SACCOs.

TABLE III. INFLUENCE OF FINANCIAL AND NON-FINANCIAL FACTORS ON SACCOs' FAILURE

	B	S. E	Wald	Df	Sig.	
Step 1a	Clients' F.N. fs	1.987	.325	37.311	1	0.023
	Inst. F.N fs	3.634	.336	37.311	1	0.012
	Clients' F. fs.	5.012	.365	39.671	1	0.000
	Inst. F fs.	4.339	.315	38.331	1	0.000
	Constant	2.954	2.434	2.825	1	0.006

^a Variable (s) entered on step 1: Personal F.N. fs, Inst. F.N fs, Personal F. fs., Inst. F fs.

Table IV displays the predictive ability of each variable on SACCOs' failure, showing that all predictor variables had a statistically significant and positive relationship ($p \leq 0.05$) with the failure of SACCOs. Generally, both financial and non-financial factors at personal or institutional levels lead to the failure of SACCOs. These results are consistent with previous studies [10-13] that did not exhaust such a large set of predictor factors. These studies noted the inconsistency of some factors,

but this study did not. These factors apply not only to SACCO's failure but also to other sectors. For example, time, price, costs, designs, labor issues, scarce preparation, and resource shortage have been found to cause failure in construction projects [26]. These factors are similar to the ones highlighted in SACCO failure, except for the language used. SMEs are similarly affected by financial resources, technical upgrading, marketing, training and development of human resources, lack of strategic planning, and lack of advanced industrial digital technologies [1]. Total Productive Maintenance (TPM) in different companies is affected by strategic, managerial, departmental, financial, and social constraints, and workers' insufficient training and lack of commitment [28].

TABLE IV. INFLUENCE OF FACTORS ON SACCOs FAILURE

	B	S. E	Wald	df	Sig.
Credit experience	1.907	0.341	4.356	1	0.000
Loan amount	1.523	0.333	7.311	1	0.000
Annual income	1.978	0.329	6.673	1	0.000
Loan Mgt/Utn.	0.769	0.386	7.733	1	0.032
Loan interest	3.328	0.288	8.125	1	0.000
Age	0.328	0.088	0.738	1	0.024
Gender	0.717	0.191	6.531	1	0.043
Family size	1.591	0.298	7.037	1	0.012
Residence distance	1.175	0.397	6.319	1	0.002
Business type	1.175	0.395	7.017	1	0.004
Business env/ment	1.444	0.360	6.913	1	0.001
Record keeping	1.733	0.638	8.072	1	0.000
Infrastructure	1.733	0.392	4.754	1	0.030
Regulations	1.034	0.371	7.031	1	0.065
HRs	1.461	0.325	7.171	1	0.001
Loan category	1.361	0.325	6.732	1	0.000
Collateral	1.284	0.219	5.621	1	0.000
Training	1.339	0.219	7.079	1	0.024
Lending method	0.915	0.162	5.127	1	0.007
Constant	5.123	4.931	7.923	1	0.002

Examining the classification of cases in Table V shows that the overall percentage of correctly classified cases was approximately 77%, meaning that there was a higher percentage of respondents regarding a particular financial and non-financial factor leading to the failure of SACCOs. Table VI highlights the results of a set of predictor variables to improve the accuracy of the predictions, i.e., testing the set model of predictor variables, showing that these factors contributed to the SACCOs' failure by 82%.

TABLE V. CLASSIFICATION TABLE^{a,b}

Observed	Predicted		% Correct
	Prob failure recode 01		
	No	Yes	
Step 0 prob failure recode No	0	117	100.0
01 Yes	0	383	0.0
Overall percentage			76.6

TABLE VI. CLASSIFICATION TABLE^a

Observed	Predicted		% Correct
	Prob failure recode 01		
	No	Yes	
Step 1 prob failure recode No	89	294	17.8
01 Yes	32	85	82.2
Overall percentage			100.0

IV. CONCLUSION AND RECOMMENDATIONS

The failure of SACCOs is caused by several financial and non-financial factors at personal or institutional levels. This study showed that the performance of SACCOs and other MFIs should be addressed from a comprehensive view of both financial and non-financial factors, whether at personal or institutional levels. These results conclude on the statistical and significant relationship between financial and non-financial factors on SACCOs' failure in Tanzania and established their prediction/explanatory capacity in explaining the phenomenon. Furthermore, the inconsistencies observed in previous studies on factors and their contributions to the failure of SACCOs were resolved. However, a future study using a qualitative approach could investigate the detailed contribution capacity of the given factors to the failure of SACCOs.

REFERENCES

- [1] M. F. Mubarak, F. A. Shaikh, M. Mubarik, K. A. Samo, and S. Mastoi, "The Impact of Digital Transformation on Business Performance: A Study of Pakistani SMEs," *Engineering, Technology & Applied Science Research*, vol. 9, no. 6, pp. 5056–5061, Dec. 2019, <https://doi.org/10.48084/etasr.3201>.
- [2] B. O. Ndiege, L. Mataba, M. Msonganzila, and K. L. Nzilano, "The link between financial performance and loan repayment management in Tanzanian SACCOs," *African Journal of Business Management*, vol. 10, no. 4, pp. 89–97, Feb. 2016, <https://doi.org/10.5897/AJBM2015.7919>.
- [3] N. Marwa and M. Aziakpono, "Technical and Scale Efficiency of Tanzanian Saving and Credit Cooperatives," *The Journal of Developing Areas*, vol. 50, no. 1, pp. 29–46, 2016.
- [4] J. K. Kamau and D. W. Guyo, "The Effects of SACCOS' Regulations on the Performance of Savings and Credit Societies (SACCOS) in Kenya: a Case of Saccos in Nairobi," *International Journal of Business Management & Finance*, vol. 1, no. 8, pp. 121–131, Apr. 2017.
- [5] M. T. Pasara, A. Makochekanwa, and S. H. Dunga, "The Role of Savings and Credit Cooperatives (SACCOS) on Financial Inclusion in Zimbabwe," *Eurasian Journal of Business and Management*, vol. 9, no. 1, pp. 47–60, 2021.
- [6] P. Anania and A. Gikuri, "SACCOS' and Members' Expectations: Factors Affecting SACCOS Capacity to Meet Members' Expectations," presented at the Co-operative Research Workshop, Moshi, Tanzania, Mar. 2015.
- [7] Mjatta, G.T, Akarro, and R.R.J, "Traits Associated with the Success or Failure of Emerging SACCOS in Tanzania : A Case of Four Regions in Tanzania Mainland," *Global Journal of Commerce & Management Perspective*, vol. 5, no. 4, pp. 29–38, 2016.
- [8] "SACCOS loan portfolio increases." <https://business.go.tz/-/saccos-loan-portfolio-increases>.
- [9] E. A. L. Mumanyi, "Challenges and opportunities facing SACCOs in the current devolved system of government of Kenya: A case study of Mombasa County," *International Journal of Social Sciences and Entrepreneurship*, vol. 1, no. 9, pp. 288–314, 2014.
- [10] N. M. Duncan and D. A. Njeru, "Effect of Loan Repayment on Financial Performance of Deposit Taking SACCOs in Mount Kenya Region," *International Journal of Innovation and Applied Studies*, vol. 10, no. 4, pp. 1238–1244, 2015.
- [11] T. M. Mallya, "The Role of SACCOS on Improving Livelihood of Clients in Moshi Rural District.," MSc Thesis, The Open University of Tanzania, 2020.
- [12] P. Mphaka, "Strategies for Reducing Microfinance Loan Default in Low-Income Markets," Ph.D. dissertation, Walden University, 2017.
- [13] G. G. Jote, "Determinants of Loan Repayment: The Case of Microfinance Institutions in Gedeo Zone, SNNPRS, Ethiopia," *Universal Journal of Accounting and Finance*, vol. 6, no. 3, pp. 108–122, Aug. 2018, <https://doi.org/10.13189/ujaf.2018.060303>.
- [14] L. Mapunda, "Factors Affecting Loan Repayments Efficiency Among SACCOs Borrowers in Tanzania: a Case of Selected SACCOs in Kibaha Town Council," MSc Thesis, Mzumbe University, 2019.
- [15] M. Melese and M. Asfaw, "Determinants of Loan Repayment Performance of Omo Microfinance Institution: In the Case of Mizan Aman Town, Southwest Ethiopia," *Research Journal of Business Management*, vol. 14, no. 1, pp. 7–14, Dec. 2019, <https://doi.org/10.3923/rjbm.2020.7.14>.
- [16] R. Rangelova, "Current-Account Imbalances and Economic Growth During the 2008-2009 Financial Crisis: An Empirical Analysis," *Contemporary Economics*, vol. 8, no. 2, pp. 123–136, Jun. 2014.
- [17] L. Auronen, "Asymmetric Information: Theory and Applications," Tu-91.167 Seminar in Strategy and International Business, 2003.
- [18] E. Richard, "Factors that Cause Non-Performing Loans in Commercial Banks in Tanzania and Strategies to Resolve Them," *Journal of Management Policy and Practice*, vol. 12, no. 7, pp. 104–116, 2011.
- [19] "SACCOS Industries in Emerging Economies. A Comparative Study into Effectiveness as a tool of Poverty Reduction," *Journal of Accounting, Ethics and Public Policy*, vol. 15, pp. 55–75, 2014.
- [20] A. Bryman, *Social Research Methods*. Oxford, UK: Oxford University Press, 2001.
- [21] R. K. Yin, *Case Study Research: Design and Methods*, 5th ed. Los Angeles, CA, USA: SAGE Publications, Inc, 2013.
- [22] M. Saunders, P. Lewis, and A. Thornhill, *Research Methods for Business Students*. Harlow, UK: Pearson Education, 2009.
- [23] C. R. Kothari, "Sample Size Determination," in *Research Methodology: Methods and Techniques*, New Age International, 2004, pp. 74–81.
- [24] J. Nunnally, *Psychometric Theory*, 2nd ed. New York, NY, USA: McGraw Hill, 1978.
- [25] B. G. Tabachnick and L. S. Fidell, *Using Multivariate Statistics*, 5th ed. Boston, MA, USA: Pearson College Div, 2006.
- [26] J. Pallant, *SPSS Survival Manual: A step by step guide to data analysis using IBM SPSS*, 7th ed. London, UK: Routledge, 2020.
- [27] F. A. Shaikh, "Financial Mismanagement: A Leading Cause of Time and Cost Overrun in Mega Construction Projects in Pakistan," *Engineering, Technology & Applied Science Research*, vol. 10, no. 1, pp. 5247–5250, Feb. 2020, <https://doi.org/10.48084/etasr.3271>.
- [28] M. A. Munir, M. A. Zaheer, M. Haider, M. Z. Rafique, M. A. Rasool, and M. S. Amjad, "Problems and Barriers Affecting Total Productive Maintenance Implementation," *Engineering, Technology & Applied Science Research*, vol. 9, no. 5, pp. 4818–4823, Oct. 2019, <https://doi.org/10.48084/etasr.3082>.