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Table of Contents

Volume 9, Issue 11 - Serial Number 100, November 2022

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Original Research

Time Pressure Influence and Audit Quality of Audit Firms in Abuja, Nigeria

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Abstract

This study empirically examined time pressure influence on audit quality of audit firms in Abuja, Nigeria. Specifically, the study examined the effect of unreasonable deadlines for reporting on audit quality; effect of intense competition among audit partners on audit quality and the effect of work stress on the audit quality. Primary data were gathered through the questionnaire administered on principal partners of selected audit firms in Abuja, Nigeria. The data were analysed using descriptive and inferential statistics. The result of the study shows that unreasonable deadlines and intense competition among audit partners have significant effects on the quality of audit reporting. In other vein, work stress of the auditors was found to have no significant effect on audit quality in Nigeria. The study recommends that unreasonable deadlines should not be set for auditors, auditors should be encouraged to involve in moderate competition and work stress should not be allowed to influence their audit reports.

Keywords: Unreasonable deadlines, intense competition, work stress, time pressure, audit quality, reporting.

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Introduction

An audit is said to have been of high quality if the auditor's opinion truly represents the company's actual status and current state. (Amalia, Sutrisno & Baridwan, 2019). The audit quality is a crucial issue that must be taken into consideration. Audit quality is difficult to observe and, as a result, challenging to assess. As a result, a variety of proxies have been used to assess it (Xie, 2016). According to the Financial Reporting Council (FRC, 2006), there is no universally accepted definition of audit quality that can be used as a baseline against which real performance may be measured. Different definitions of audit quality have been established, such as the assurance that the financial statement accurately reflects relevant and accurate information about the firm's underlying economic conditions, distinctive features, and financial reporting standards. Neri and Russo (2014) explain that audit quality is marked by a high degree of inconsistency, making it difficult to assess, by contrast to other economic operations where quality can be expressed more precisely.

Recent financial turbulence has emphasized the indispensable significance of accurate, credible, high-quality financial reporting in all sectors of the worldwide economy, including the capital markets, small businesses, not-for-profit organizations and government organizations in Nigeria. It is therefore necessary to maintain the quality of audit because it helps to minimize the agency problem. The importance of continuous improvement in audit quality have also been emphasized in the best interest of the public. When the auditor's opinion on the financial statements can be properly depended on since it was based on relevant and correct audit evidence gathered from an auditor, the audits is expected to be of high quality..“Significant threat to audit quality occurs when audit evidence obtained during the execution of audit procedures are unreliable and insufficient as an adequate basis for the auditor to express an opinion on the truthfulness and fairness of the audited financial statements” (Wijaya & Mentari, 2017).

The auditing profession in Nigeria has experienced a decline in audit quality which is as a result of time pressure faced by auditors. Time budget pressure and time deadline pressure are two types of time pressure identified. “Time budget pressure arises when an audit firm allocates insufficient hours for auditors to complete specified audit procedures, while time deadline pressure occurs when auditors find it difficult to complete a work by the specified deadline” (Margheim, Kelley, & Pattison, 2005). However, this study focused majorly on time budget pressure for the following reasons. The effect of these two distinct types of time pressure on auditors’ behaviour was investigated by Kelley, Margheim and Pattison (2005) and it was noted how important it is to differentiate between the two while performing research. These researchers discovered that while both forms of time pressure influence auditors, only time budget pressure affects senior auditors' behaviour. The researchers also found that time budget pressure is much more closely related to some dysfunctional behaviours than time deadline pressure.

Auditors are responsible for completing audit assignments within the timeframes set by management and in conformity with audit principles, rules, and regulations. Nonetheless, balancing these tasks might be challenging, resulting in one of the qualities being compromised (Nwanyanwu, 2017). In terms of auditing, auditors are to ensure that

they perform their assurance services without delays and within the norms imposed by the professional code and ethics. Al-Qatamin (2020) argued that auditing is considered as a challenging profession as it requires a lot of work, a lot of deadlines, a lot of time pressure, a lot of social pressure, and a lot of commitment to the organization. Timeliness is an important qualitative characteristic of financial statements, as it demands that information be made available to users of financial statements as at when due.

Rustianawati, Kustono and Wardayati (2017) opines that "auditors are frequently under pressure to produce high-quality audits, and yet may be under severe time pressures or dealing with auditees in stressful situations". In recent times, several audit approaches, as well as a lack of timeliness, reliability, and adequacy, have all attributed to reduced audit quality practices. The rapid increase in the reduced audit quality practices caused by time pressure constraints has given rise to the relevance of external audits to be questioned because numerous banking firms failed following unqualified audit opinions. As a result, users of financial statements frequently cast doubt on the quality of audit work performed, regardless of whatever approach adopted by the auditor.

Despite series of previous studies on the impact of time pressure on the quality of audit report such as Al-Qatamin (2020), Glover, Hansen and Seidel (2015), Margheim, Kelley and Pattison (2005). Amalia, Sutrisno and Baridwan (2019). All these studies were conducted on audit quality in the areas of examining its relationship with variables such as auditor's independence, professional judgment, professional scepticism and other factors affecting audit quality, but it seems limited research works were conducted on the influence of time pressure on audit quality on audit firms in Nigeria and non was able to proxy time pressure influence with unreasonable deadlines, intense competition and work stress. Also, few studies were also conducted outside Nigeria and all these missed links form the crux of this study to evaluate the influence of time pressure on audit quality of Audit Firms in Abuja, Nigeria.

Objective of the Study

The broad objective of the study is to investigate the effect of time pressure on audit quality of audit firms in Nigeria. Specifically, the study examined:

1. the influence of unreasonable deadlines for reporting on audit quality;
2. the effect of intense competition among audit partners on audit quality and the effect of work stress on audit quality.
3. how work stress of the auditor affects the quality of audit.

Research questions

1. How does Unreasonable Deadlines influence the Quality of Audit Reporting?
2. What are effect of intense competition among audit partners on the Quality of Audit?
3. How does work stress of the auditor affect the Quality of Audit?

Research hypotheses

$H_0$1: Unreasonable Deadlines has no significant effect on audit quality

$H_0$2: Intense competition among audit partners has no significant effect on audit quality.

$H_0$3: Work stress of the auditor has no significant effect on audit quality.

Literature Review

Empirical Review

Amalia, Sutrisno, Baridwan (2019) examined "audit quality: Does time pressure influence independence and audit procedure compliance of auditor"? the study established the effects of independence and audit techniques on audit quality. The moderator variable was budget pressure. Primary data was used for the study and the finding revealed that statistically audit procedure and independence significantly affects audit quality.

Agustin, Handayani and Syahrial (2015) studied "the Influence of time pressure on the behaviours of premature sign off in audit procedures". Survey research type was adopted, and questionnaire was used to collect data for the study. Control testing computer-assisted audit techniques were found to be the most frequently skipped audit procedure, while understanding the client's business and industry was shown to be the most rarely skipped audit procedure.

Al-Qatamin (2020) examined "the impact of time pressure on the audit quality: A Case Study in Jordan". This study used a technique called purposive sampling. The auditor can conduct the audit in a more effective and efficient manner because the time pressure is reduced. Time pressure was connected to auditor dysfunctional behaviour, early signoffs during the audit process without any alternative procedures by external auditors under time pressure in Jordanian audit firms, according to the study.

Abdullahi, Mazloomi and Poordadashi, (2016) investigated time pressure, fee pressure and audit quality. The purpose of this study was to investigate if audits done under time pressures, as measured by the proximity of the audit report date to a company's filing deadline, are associated with low audit quality. The findings revealed that time and fee pressure have an effect on audit quality, and that when budget pressure is decreased, engagement teams make use of the extra time.

Broberg et al. (2017) evaluated "explaining the influence of time budget pressure on audit quality in Sweden". According to the findings, auditors who are under more time budget pressure (TBP) are more likely to involve in AQ-reducing behaviours such premature signoffs, accepting weak client arguments, and underreporting time. The study's practical consequences include the fact that when balancing audit efforts and available resources, as well as setting time budgets for each audit assignment, audit companies should take into consideration the auditors' personal qualities as well as their local context.

Glover, Hansen and Seidel, (2015) studied "the effect of deadline-imposed time pressure on audit quality to examine relationship between deadline-imposed time pressure and audit quality." The researchers analyzed archival evidence to investigate whether deadline-imposed time pressure influences audit quality. The study found significant indicators of decreased audit quality whenever auditors are under intense schedule time pressure. These negative effects were shown to persist even among auditors who had additional resources at their disposal. The hypothesis was tested using a logistic regression model and propensity-score matched (PSM) samples. Their results indicate that auditors who complete processes close or on the required (or extended) filing deadline may compromise audit quality in order to fulfill the reporting deadline.

Xiao, Geng and Yuan (2020) evaluated "how audit effort affects audit quality: An audit process and audit output perspective". This research added to the existing knowledge on the effect of audit effort on audit quality in emerging markets. The findings indicate that audit effort raises the probability of audit adjustments, which prevents positive earnings management and enhances audited financial statement quality. It also revealed that audit effort has no effect on the issuing of changed audit opinions in general, but any changed audit opinion is most likely to be provided in the absence of an audit adjustment.

Johari, Ridzoan and Zarefar (2019) investigated "the influence of work overload, time pressure and social influence pressure on auditors' job performance". The study focused on which potential variables of pressure have a significant relationship with the job performance of government auditors. Work overload, time pressure, and social influence pressure were all factors investigated in the study. The findings revealed that there was no relationship between work overload and auditors' job performance. However, the results of this analysis revealed that time pressure has a positive significant correlation with auditors' job performance, whereas social influence pressure has a negative significant relationship with auditors' job performance.

Huanmin and Shengwen (2016) examined "how does auditors' work stress affect audit quality? empirical evidence from the Chinese stock market from 2009 to 2013". this study empirically assessed the effect of auditors' work stress on audit quality. The study indicated "there was no widespread degeneration in audit quality as a result of auditors' work stress, there was a significant negative relationship between work stress and audit quality in new client initial audits; and the perception of work stress depends on auditors' personal qualities".

Zadegan and Aqa'I (2018) carried out study on "the impact of auditors' work stress on audit report quality in companies acquired in Tehran stock exchange between 2011 to 2016". This study showed that audit quality significantly reduced due to the stress of under-control auditors, and that, as a result, auditor stress has an impact on the quality of corporate audit work. Secondly, due to a lack of conceptual knowledge of the client based on industrial data, there was a significant relationship between job stress and the initial audit of new customers.

Rikkert (2020) studied "the effect of work pressure on audit quality within a Big-4 accounting firms". The purpose of the study was to examine the impact of work pressure and regulatory pressure on audit quality, and the JD-CS model provided the theoretical

framework for the study. This study focused on the mediating role of decision latitude and social support in the reported relationship rather than the main effects. A multiple regression analysis with interaction effects is used to examine the corresponding hypotheses. The findings did not support the mediation role of decision latitude and social support; however, it was revealed that psychological demands have a significant negative main effect on audit quality.

Persellin, Schmidt, Vandervelde and Wilkins (2019) investigated "auditors 'perceptions of audit workloads, audit quality, and job satisfaction". Over 700 auditors were surveyed for their opinions in the study. The results show that auditors are spending five hours per week on average above the threshold where they believe audit quality begins to decline, and up to 20 hours per week during peak season. According to the study, the fundamental causes of workload (such as deadlines and staffing issues) may be the true "root cause" of workload-related audit deficiencies.

White (2018) explored "the relationship between audit quality and competition at the intersection of the large and small audit firm markets". The study looked at the association between audit quality and a variety of geographic competitiveness indicators. The smallest absolute difference in audit fee market shares between an audit firm and its nearest rival was used to determine spatial competition. The test carried in the study provided some evidence that local competition affects audit quality. The result showed that for abnormal accruals, decreasing local competitive distance between large audit firms is linked with higher abnormal accruals. In contrast, decreasing local competitive distance between a large audit firm and its nearest small audit firm competitor was associated with lower abnormal accruals and a lower likelihood of a restatement.

Numan and Willekens (2012) observed ccompetitive pressure, audit quality and industry specialization. The study investigated whether the incumbent auditor's quality level is affected by pressure from close competitors. Financial statement data and customer location data from CompStat Industrial Annual were utilized. Competitive pressure has a negative relationship with audit quality, according to the findings. The incumbent audit firm was less likely to offer a going concern opinion when there was more competitive pressure from the closest competitor audit firm, and earnings quality was lower.

Xie (2016) assessed "competition, auditor independence and audit quality". novel approach, using structural equation modelling (SEM) to develop a latent variable to measure audit quality and to analyse both the construct of audit quality and the overall (direct and indirect) effects of audit market competition on audit quality. The findings revealed that increased audit market competition significantly improves audit quality and has significant moderation effects on audit quality through auditor independence, as evidenced by the provision of non-audit services (NAS) and the length of time an auditor has worked with a client.

This study is anchored on the inverted U Theory, which is also known as the Yerkes-Dodson Law. In 1908, psychologists Robert Yerkes and John Dodson proposed this theory. It's a model that's been around for a long time. The theory describes a clear relationship between pressure and performance, implying that pressure has a significant

impact on an entity's performance. According to Yerkes and Dodson, peak performance is attained when the level of pressure experienced is appropriate for the work done, performance declines when it is too much or too little pressure, sometimes severely. When the levels of pressure experienced by individuals are right for the work they are performing, they become influenced in a beneficial way: they become motivated, engaged, and excited about doing our best. But when stress happens, individuals feel out of control, and it's a totally negative thing. The Inverted-U Theory is about wisely using pressure, always being aware of where the benefits end and stress begins. The suggestions of this theory fit in to the study's investigation of the influence of time pressure on the audit quality of firms located in Abuja, Nigeria.

Methodology

This study adopted cross-sectional survey research design because it allows data to be collected from many different individuals at a single point in time. The research population covered the principal partners of the selected audit firms in Abuja. A sample of one hundred and twenty (120) respondents was selected from one hundred and twenty audit firms used for the study. Primary data was gathered through a well-structured questionnaire The instrument was validated by erudite professors and reputable senior lecturers in the college of social and management sciences of Afe Babalola University, Nigeria. Reliability coefficient of 0.75 Cronbach Alpha was obtained from the pilot test conducted which implies that the instrument was reliable. Data collected were analyzed using percentage frequency counts, mean and standard deviation to provide answer for research questions in the study and analysis of variance ANOVA was used to test the hypotheses at 0.05 level of significance.

Data analysis and interpretation

Descriptive Analysis

The gender distribution of the respondents as revealed in table 1 shows that male respondents constitute larger percent (55%) of the population while female account for (45%). This implies that, male respondents involved in the study than female during the cause of the study.

The age group of respondents from the table showed that majority (41.7%) is within 26-40 years, followed by (29.2%) who fall between 41-60 years, (25.8%) fall within 19-25 years, while (3.3%) fall to 61years and above. This implies that majority of the respondents are elderly ones.

The marital status of respondents from the table reveled that majority (53.3%) of the respondents are married, (43.3%) are single, (2.5%) are window while (0.8%) are Divorced

The majority of staff investigated in the study had B.Sc./HND (53.3%), MSc/MA/MEd/MBA (25%), Ph. D (10%), MPhil (5.8%), SSCE (4.2%), while (1.7%) of the respondents had OND/NCE as their educational qualification. This showed that qualified staffs are employed to work in the audit firms selected for the study.

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The majority of staff further had other qualifications ICAN (46.7%), ANAN (20.8%), others (14.2%), CIMA (9.2%), ACCA (5.8%), and (3.3%) among the respondents had CFA as their professional qualification. This indicated that the majority of the staff are chartered accountants that are professionally qualified to work in audit firms.

Table 1. Gender, Age, Marital Status, Educational Qualification, and Professional qualification

Variables	Categories	Frequency	Percentage
Gender	Male	66	55%
	Female	54	45%
Age	61years above	4	3.3%
	41-60 years	35	29.2%
	26-40 years	50	41.7%
	19-25 years	31	25.8%
Marital Status	Widowed	3	2.5%
	Divorced	1	0.8%
	Married	64	53.3%
	Single	52	43.3%
Educational Qualification	PhD	12	10%
	MPhil	7	5.8%
	MSc/MA/MEd/MBA	30	25%
	BSc/HND	64	53.3%
	OND/NCE	2	1.7%
	SSCE	5	4.2%
Professional Qualification	ICAN	56	46.7%
	ACCA	7	5.8%
	ANAN	25	20.8%
	CIMA	11	9.2%
	CFA	4	3.3%
	Others	17	14.2%

Research question 1: How does unreasonable deadlines influence the quality of audit reporting?

The result presented in Table 2 revealed the influence of unreasonable deadlines on the quality of audit reporting. It was revealed that 95% of the respondents shows that deadlines are usually set for audit works in their firm, 73.4% of the respondents indicated that deadlines is always been insufficient for audit assignment, majority 75% of the respondents agreed that auditors usually struggle to meet up with deadlines, also, 81.7% of the respondents shows that auditors could greatly improve the quality of their work if unreasonable deadlines were not given and 80% of the respondents agreed that deadlines set has an impact on the quality of audit. The mean responses in the table are greater than 3.00indicated that majority of the respondents agreed with all statements in item 1- 5 and the weighted mean 3.96 is greater than 3.00. This further justified the claimed that unreasonable deadlines may influence the quality of audit reporting.

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Table 2. Mean scores and standard deviation on influence of Unreasonable Deadlines on the Quality of Audit Reporting

S/N	Item	SA	A	U	D	SD	Mean	Std. Dev.	Remark
1	Deadlines are usually set for audit works in my firm	66 (55%)	48 (40%)	3 (2.5%)	1 (0.8%)	2 (1.7%)	4.46	0.74	Agreed
2	Deadlines set has always been insufficient for audit assignment	20 (16.7%)	68 (56.7%)	14 (11.7%)	17 (14.2%)	1 (0.8%)	3.74	0.93	Agreed
3	Auditors usually struggle to meet up with deadlines	16 (13.3%)	74 (61.7%)	15 (12.5%)	13 (10.8%)	2(1.7%)	3.74	0.88	Agreed
4	Auditors could greatly improve the quality of their work if unreasonable Deadlines were not given	35 (29.2%)	63 (52.5%)	9 (7.5%)	13 (10.8%)	-	4.00	0.98	Agreed
5	Deadlines set has an impact on the quality of audit	34 (28.3%)	62 (51.7%)	4 (3.3%)	16 (13.3%)	4 (3.3%)	3.88	1.07	Agreed
	Weighted mean						***3.96***		***Agreed***

$\bar{X} \leq 3.00$ *indicate* "Agreed" *otherwise* "*Disagreed*"

Research question 2: What effect intense competition among audit partners have on the quality of audit?

The result presented in Table 3 shows the effect of intense competition among audit partners on the quality of audit. The mean values in the table are greater than 3.00 which revealed that majority of the respondents agreed with all statements in item 6- 10 as 90.8% of the respondents shows that partners are given role to perform for every audit engagement, 86.6% of the respondents agreed that partners aim at concluding their role within a reasonable time and are not interested in lagging behind, 65% of the respondents revealed that assistance are usually rendered for any assignment to partners who fails to

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perform. 50.9% of the respondents revealed that there is possibility of intense competition amongst partners while performing their audit role and 48.3% of the respondents indicated that intense competition has negative impact on audit quality. The weighted mean in the table is also greater than 3.00. This further authenticates that intense competition among audit partners have some effects on the quality of audit.

Table 3. Mean scores and standard deviation on effect of intense competition among audit partners have on the Quality of Audit

S/N	Item	SA	A	U	D	SD	Mean	Std. Dev.	Remark
6	Partners are given role to perform for every audit engagement	51 (42.5%)	58 (48.3%)	7 (5.8%)	4 (3.3%)	-	4.30	0.73	Agreed
7	Partners aim at concluding their role within a reasonable time and are not interested in lagging behind	46 (38.3%)	58 (48.3%)	10 (8.3%)	6 (5%)	-	4.20	0.79	Agreed
8	Assistance are usually rendered for any assignment to partners who fails to perform	18 (15%)	60 (50%)	23 (19.2%)	15 (12.5%)	4 (3.3%)	3.61	0.99	Agreed
9	There is possibility of intense competition amongst partners while performing their audit role	17 (14.2%)	44 (36.7%)	21 (17.5%)	19 (15.8%)	19 (15.8%)	3.18	1.30	Agreed
10	This intense competition has negative impact on Audit Quality	15 (12.5%)	43 (35.8%)	22 (18.3%)	34 (28.3%)	6 (5%)	3.23	1.14	Agreed
	Weighted Mean						***3.70***		***Agreed***

$\bar{X} \leq 3.00 indicate$ Agreed $otherwise$ "$Disagreed$"

Research question 3: How does work stress of the auditor affect the quality of audit?

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The result presented in Table 4 shows the effect of work stress of the auditor on the quality of audit. The mean values in the table are greater than 3.00 which revealed that majority of the respondents agreed with all statements in item 11- 15 as 70.7% of the respondents indicated that they experience work stress while carrying out an audit exercise and it limits them from achieving an effective audit. Majority 65% of the respondents revealed that work stress causes some auditors to ignore important information, also, 65% of the respondents imply that work stress limits ability of some auditors to obtain sufficient evidence to support an audit opinion, 63.3% of the respondents revealed work Stress limits ability of some auditors to complete audit within the timeframe set by the audit firm, and 84.1% majority of the respondents indicated that audit quality is likely to be compromised due to work overload caused by limited time. The weighted mean in the table is also greater than 3.00. This further indicated that work stress of the auditor has some effect on the quality of audit in audit firms.

Table 4**.** Mean scores and standard deviation on effect of work stress of the auditor on the Quality of Audit

S/N	Item	SA	A	U	D	SD	Mean	Std. Dev.	Remark
11	I experience work stress while carrying out an audit exercise which limits me from achieving an effective audit	22 (18.2%)	63 (52.5%)	11 (9.2%)	21 (17.5%)	3 (2.5%)	3.67	1.04	Agreed
12	Work stress causes some auditors to ignore important information	29 (24.2%)	49 (40.8%)	14 (11.7%)	25 (20.8%)	3 (2.5%)	3.63	1.13	Agreed
13	Work Stress limits ability of some auditors to obtain sufficient evidence to support an audit opinion	23 (19.2%)	55 (45.8%)	12 (10%)	26 (21.7%)	4 (3.3%)	3.56	1.12	Agreed
14	Work Stress limits my ability to complete the audit within the timeframe set by the audit firm	16 (13.3%)	60 (50%)	10 (8.3%)	30 (25%)	4 (3.3%)	3.45	1.10	Agreed
15	Audit Quality is likely to be compromised due to work overload caused by limited time	37 (30.8%)	64 (53.3%)	7 (5.8%)	12 (10%)	-	4.05	0.87	Agreed
	Weighted mean						***3.67***		***Agreed***

$\bar{X} \leq 3.00 indicate$ Agreed $otherwise$ "$Disagreed$"

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Research question 4: What are the variables affecting the quality of audit?

Table 5 revealed variables are affecting the audit quality in audit firms. Majority of the respondents (94.2%) indicated that audit quality is of paramount importance to audit firm, majority of the respondents revealed that audit quality is affected by time budget (80%), also, audit quality is significantly affected by unreasonable deadlines (80.8%), majority (63.3%) of the respondents agreed that audit quality is affected by intense competition among audit partners, and 73.3% of the respondents shows that audit quality is influenced by work stress. The mean responses in the table are greater than 3.00 and the grand mean 4.04 is greater than 3.00. This implies that variables such as time budget, unreasonable deadlines, competition among audit partners, and work stress are affecting the quality of audit.

Table 5. Mean scores and standard deviation on variables affecting the Quality of Audit

S/N	Item	SA	A	U	D	SD	Mean	Std. Dev.	Remark
16	Audit quality is of paramount importance to my firm	78 (65%)	35 (29.2%)	4 (3.3%)	2 (1.7%)	1 (0.8)	4.56	0.71	Agreed
17	Audit quality is affected by time budget	30 (25%)	66 (55%)	13 (10.8%)	11 (9.2%)	-	3.96	0.85	Agreed
18	Audit quality is significantly affected by unreasonable deadlines	34 (28.3%)	63 (52.5%)	12 (10%)	11 (9.2%)	-	4.00	0.87	Agreed
19	Audit quality is affected by intense competition among audit partners	64 (53.3%)	12 (10%)	18 (15%)	21 (17.5%)	5 (4.2%)	3.91	1.32	Agreed
20	Audit quality is significantly influenced by work stress	34 (28.3%)	54 (45%)	9 (7.5%)	21 (17.5%)	2 (1.7%)	3.81	1.08	Agreed
	Weighted mean						***4.04***		***Agreed***

$\bar{X} \leq 3.00$ ***indicate*** **Agreed** ***otherwise*** "***Disagreed***"

Test of Hypotheses

All the hypotheses were test at 0.05 level of significant

H_{01}: Unreasonable Deadlines has no significant effect on the Quality of Audit Reporting

The result presented in table 6 revealed significant effect of unreasonable deadlines on the quality of audit reporting, F-cal = 3.324, df = (1, 106) and P-value (0.000) < 0.05 level of significance. This makes the null hypothesis one to be rejected. Therefore, there is statistically significant effect of unreasonable deadlines on the quality of audit reporting.

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Table 6. Analysis of variance for significant effect of Unreasonable Deadlines on the Quality of Audit Reporting

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	285.422[a]	13	21.956	3.324	.000
Intercept	19058.738	1	19058.738	2885.853	.000
Unreasonable Deadlines	285.422	13	21.956	3.324	.000
Error	700.045	106	6.604		
Total	50112.000	120			
Corrected Total	985.467	119			

P < 0.05 (Significant)

H_{02}: intense competition among audit partners has no significant effect on the Quality of Audit

The result presented in Table 7 revealed significant effect of intense competition among audit partners on the quality of audit reporting, F-cal = 2.373, df = (1, 108) and P-value (0.011) < 0.05 level of significance. The null hypothesis two which stated that intense competition among audit partners has no significant effect on the quality of audit was rejected. Therefore, intense competition among audit partners statistical has significant effect on the quality of audit reporting.

Table 7. Analysis of variance for significant effect of intense competition among audit partners on the quality of audit reporting

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	191.808[a]	11	17.437	2.373	.011
Intercept	32932.392	1	32932.392	4481.395	.000
intense competition	191.808	11	17.437	2.373	.011
Error	793.659	108	7.349		
Total	50112.000	120			
Corrected Total	985.467	119			

P < 0.05 (Significant)

H_03: Work stress of the auditor has no significant effect on the Quality of Audit.

The result presented in table 8 revealed significant effect of work stress of auditor on the quality of audit reporting, F-cal = 1.557, df = (1, 108) and P-value (0.122) > 0.05 level of significance. The null hypothesis which stated that work stress of the auditor has no

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significant effect on the quality of audit is not rejected. Therefore, work stress of auditors has no statistically significant effect on the quality of audit report in audit firms.

Table 8: Analysis of variance for significant effect of work stress of the auditor on the quality of audit reporting

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	134.859[a]	11	12.260	1.557	.122
Intercept	19855.223	1	19855.223	2520.980	.000
Work Stress	134.859	11	12.260	1.557	.122
Error	850.607	108	7.876		
Total	50112.000	120			
Corrected Total	985.467	119			

P>0.05 (Significant)

Discussion of Findings

The findings of the study revealed that unreasonable deadlines lead to setting insufficient time for audit assignment; it makes auditors to struggle to meet up with deadlines, and also not allows auditors to improve the quality of their work before delivery. The finding showed that there is statistically significant effect of unreasonable deadlines on the quality of audit reporting. This study supported that of Abdollahi, Mazloomi and Poordadashi (2016) who revealed that audit quality is affected by time pressure. The findings are in line with Glover, Hansen and Seidel (2015) who found consistent evidence of lower audit quality when auditors are under heightened deadline-imposed time pressure, this finding is in consonance with inverted-U theory. which suggest that pressure little or extreme affects performance positively and negatively depending on the size of the pressure which can be geared by unreasonable deadlines.

The study revealed that intense competition among audit partners trigger auditors to perform their role within a reasonable time and not interested in lagging, within audit firms' competition makes auditors to assist partners especially who fails to perform assignment. The study revealed that intense competition among audit partners statistical has significant effect on the quality of audit . The study is related to the finding of White (2018) who found that local competition among auditors affects audit quality, it is also in tandem with the provisions of inverted-U theory underpinning the study.

The findings also showed that work stress of the auditor made some auditors to ignore important information, it limits ability of some auditors to obtain sufficient evidence to support an audit opinion, work stress also limits ability of auditors to complete audit within the timeframe, and work stress led some authors to compromise due to work overload. Although, despite the effect of work stress, the result revealed that work stress of auditors has no statistically significant effect on the quality of audit report in audit firms. The three findings are in consonance with inverted-U theory. which suggest that pressure little or extreme affects performance positively and negatively depending on the

size of the pressure which can be geared by unreasonable deadlines, intense competition and work stress.

Conclusion

Based on the findings of this study, it was concluded that unreasonable deadlines and intense competition among audit partners have effects on the quality of audit reporting. This work is in line with Abdollahi, Mazloomi & Poordadashi, (2016); Al-Qatamin (2020); Broberg, et.al. (2017); Numan and Willekens (2012); Xie (2016) and White (2018). This means that competition does not impair audit report, and it can lead to higher audit quality. Thus, unreasonable deadlines and competition affects audit quality either positively or negatively. Also, it was concluded that work stress of the auditors has nothing to do with quality of audit reports in audit firms in Nigeria and all the results are in agreement with inverted-U theory on which this study is anchored.

Recommendations

The following recommendations were made based on the findings of the study.

Unreasonable deadlines should not be sets for auditors while carrying out audit exercise so that they can do comprehensive examination audit report since many investors often used audited financial reports basically for investment decisions in the capital markets. Thus, enough time will allow auditors to conduct the audit in a more effective manner.

Auditors should be encouraged to involve in competition that will positively affects audit quality so that users of financial reports such as investors, lenders, employees, and public will have confidence in the audited financial report produced by the authors.

Auditors should not allow work stress to influence their audit reports in order to get the real pictures of what had happened in the firms where audit exercise is being conducted in order to arrive at unbiased opinion.

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Original Research

Predicting the Efficiency of Inventory Management Using Artificial Neural Networks

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Abstract

The purpose of this study is to design a model to predict the efficiency of inventory management to help creditors and actual and potential investors and other stakeholders to avoid major losses in the capital market. For this reason, 137 companies listed on the Tehran Stock Exchange during the 10-years period 2012-2021 were examined. In this study, the predicting variables of institutional ownership, managerial ownership, corporate ownership, ownership concentration, board size, percentage of non-executive board members, and duality of CEO (Chief Executive Officer) role have been used. The efficiency of inventory management was predicted using a three-layer perceptron artificial neural network with the Backpropagation of Error algorithm. Finally, a network with the mean squared error of 0.360, 0.428, 0.261 and 0.353, respectively for training data, validation, test and total data and a coefficient of determination of more than 72%, as the best network Selected.

Keywords: Inventory management efficiency, Predictive variables, CEO, Artificial Neural Networks, Backpropagation of Error algorithm.

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Introduction

Commodity inventories have always been a major part of companies 'investments and resource expenditures and are very important in terms of amount and also have a significant impact on companies' profitability activities, therefore, commodity inventories are considered as one of the most important economic factors in the promotion and continuity of business units (Ji, Cheng, Lee, & Lin, 2012). In recent decades, the decision of business units to determine the optimal amount of inventories required for each financial period (inventory management), has become one of the most important financial and managerial decisions of business units (Setayesh & Kazemnezhad, 2010).

The goal of inventory management is to maximize shareholder wealth through the design and implementation of policies and strategies that reduce the cost of purchasing and maintaining goods. Inventories are not profitable in themselves and only generate revenue if they are sold, but by applying inventory management, which, in fact, maintains regular continuity in the coordination of production and sales activities and prevents operations from stopping due to lack of inventory. In a way, the process of profitability is achieved (Noravesh, Karami, & Vafi sani, 2009). (Bao & Bao, 2004) on the importance of inventory management believe that inventory management affects the performance of the company in various ways. They argue that companies can improve production planning by maintaining inventory, minimizing the cost of inventory shortages, and significantly reduce purchase costs through bulk purchases and speculation at transaction prices.

Due to the changes that have taken place in the inventory maintenance policies in commercial units in the last few decades, different opinions have been raised about the method of inventory management. Some researchers, such as the philosophy of timely production and information technology, believe that the maintenance of inventory in companies should be reduced, while others, such as growing demand for various products and the level of customer service, believe that more inventories should be maintained (Chen, Frank, & Wu, 2005).

On the other hand, the two main groups of corporate financiers are creditors and investors. Lenders are always looking to receive the principal and interest of their loans to the company and shareholders are looking to get their expected return on the company's activities and stock price changes due to the growing activity of the company (Etemadi, Noravesh, Azar, & Seraji, 2010). In such circumstances, the question that always arises is whether the inventory of goods as one of the most important economic factors in the promotion and continuity of the activities of organizations, is managed in the most efficient way possible? Do company managers manage inventory in the best possible way in order to meet the daily needs of the company, create value for shareholders and improve the organizational position? Is the inventory managed in such a way that creditors have a relative confidence in receiving the principal and interest of their loans and shareholders in obtaining their expected cash and price returns from the company's activities?

Therefore, the purpose of the present study is to design a model for predicting the efficiency of inventory management, in order to help financially sourcing companies

(especially creditors and actual and potential investors) and other stakeholders in sensible decisions and avoiding major losses in the capital market. One of the most practical methods in modeling and forecasting are artificial neural networks that have many applications in the fields of finance and accounting. These include forecasting companies' bankruptcy and financial helplessness and forecasting daily market returns. In this study, using a perceptron neural network, a three-layer model is presented to predict the efficiency of inventory management in companies listed on the Tehran Stock Exchange.

Literature Review

Inventory Management Efficiency

The inventory of goods in each business unit is one of the most important items of current assets of that business unit. Many experts consider inventory as a key tool to create value, flexibility and control in modern business units, so proper and effective inventory management at both corporate and macroeconomic levels seems important and necessary (Chikan, 2009).

Inventory management is a continuous process that on the one hand monitors and controls the orders and use of components that the company will use in the production of items, and on the other hand controls and monitors certain quantities of products for sale. The best policy in the field of inventory management is to optimize the level of orders and investment at the right time, and therefore Adapting and implementing an efficient strategy in inventory is a challenging task in any organization (Rajan & Francis, 2012).

Business units use different methods to manage inventory. The methods adopted have a significant impact on sales volume, profits and returns of business units. If inventory management is viewed solely as inventory, traditional models such as the economic order volume model can be offered. The economic order volume model is a valuable model that maximizes the company's revenue by minimizing inventory costs (Michalski, 2009). If inventory management is viewed as an internal system, the issue of material needs planning is considered as a product-oriented computer technology, with the aim of minimizing inventory and maintaining a delivery schedule (Lysons & Gillingham, 2003). Finally, if inventory management is viewed as an extra-organizational activity, the model of inventory management or control by the seller (the seller controls the level of inventory of customers and feels responsible in completing their inventory) and timely production, is proposed (Hojaji, Maaref doust, & Ebrahimi, 2009).

On the other hand, in a general view, corporate governance can be considered as including legal, cultural and institutional arrangements that determine the direction and movement of companies. Elements that are present in this scene are: shareholders and their ownership structure, board members and their combinations, company management led by the CEO, and other stakeholders who can influence the company's movement. (Setayesh & Kazemnezhad, 2010). According to (Bushman & Smith, 2001), regulatory mechanisms should be put in place to bridge the gap between ownership and management. One of the existing mechanisms to reduce agency problems and information asymmetry between managers and shareholders and consequently reduce problems in managing inventories and cash is the existence of an efficient board as one of the internal

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mechanisms of corporate governance. Therefore, the proper establishment of corporate governance mechanisms is a key step to promote accountability, optimal use of resources and effective management of inventory (Hashemi & Kamali, 2010).

Artificial Neural Networks

Artificial neural networks are trainable and analysis tool that attempts to mimic the patterns of information processing in the human brain. These networks are dynamical systems consisting of parallel processing units, or neurons which is a propensity to keep their experiential knowledge and making it available for use (Foruresh, 2005). Learning property of neural networks is important. The network as the learning systems has the potential to learn from past experience and environment and improve their behavior during the learning.

Improve learning network over time is measured based on the criteria for improvement; the goal is to model learning system (Menhaj, 2002). In Figure (1) is shown the components of a neuron.

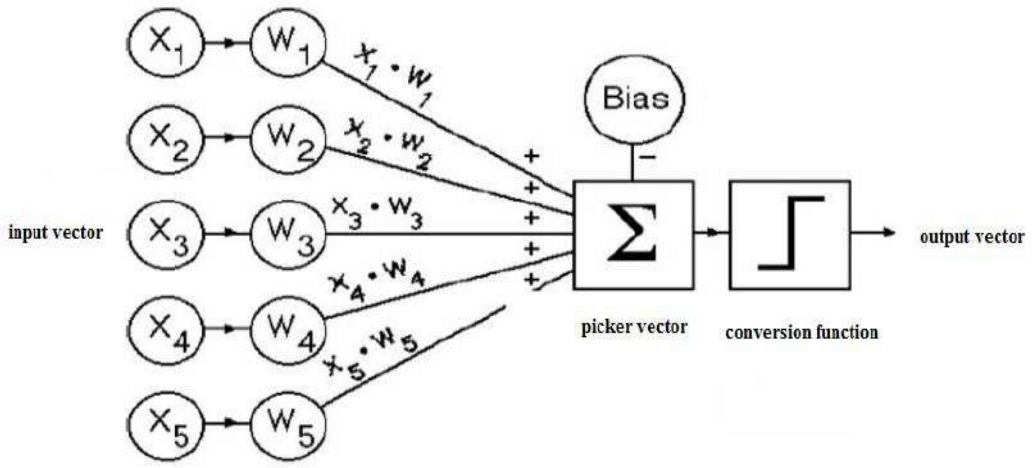

Figure 1. Components of a neuron.

In this model, the input vector x with the size xw + b enters into neurons. Then, it is under other action or process that is called as transfer function that provides neurons function. W parameter is called weight parameter. When a great neural network was created by putting together a large number of neurons, a network is available that is completely dependent on b and w amounts in addition to output function.

In such a large network, a large number of parameters w and b should be set by the network designer. The process of the work, in terms of neural networks, is known as the learning process. In fact, in a real test, after the presentation of the input vector, network is trained by measuring the output with the by selecting parameters w and b such that the desired output is achieved. Therefore, after such a network trained for a set of inputs to create the desired outputs, it can be used to solve the problems made by different compounds of inputs (Kordstani, Masomi, & Baghaei, 2013).

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Multi-Layer Perceptron Artificial Neural Network

Multi-layer perceptron artificial Neural Network is one of the strongest models of artificial Neural Network including input, hidden (center) and output layers. The structure of each of these layers is composed of a large number of neurons or nodes.

Figure (2) shows a multi-layer perceptron artificial Neural Network.

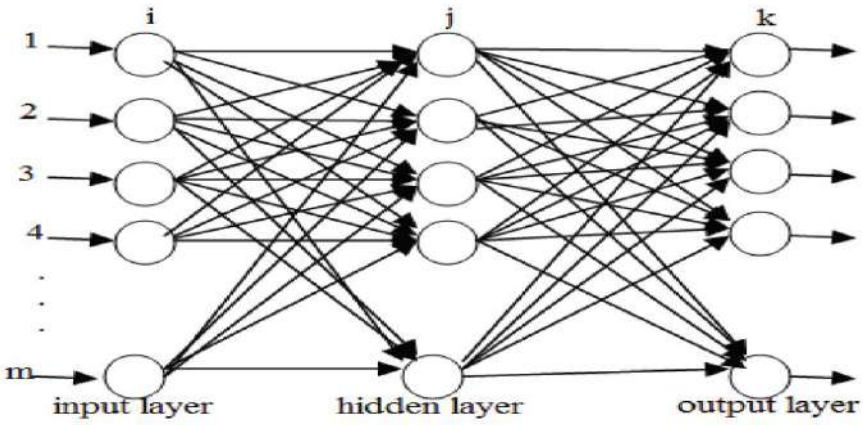

Figure 2. Multi-layer perceptron artificial Neural Network.

The number of neurons in the input and output layers tasked with only incoming and outgoing data depends on the number of input variables (training) and output variables of network. But, unlike the input and output layers, determine the number of neurons in the middle layer with the number of repeat cycles, are considered as the main problem in the design of artificial neural networks. Almost there is no proven formula for determining the optimal structure of network. This structure (the number of middle layers, number of neurons in the middle layers, the number of repeated cycles of learning) is determined experimentally. If the number of neurons in the middle layer and number of repeated cycles are selected underrepresented, the network will have the ability to adapt to the mapping.

On the other hand, high amount of these neurons and number of the repeated cycles, result in high fitness and lack of network generalizability, so that the network is experiencing a large increase in input becomes unstable. Thus, the low cycle of neurons should be used in the middle layer and are gradually used for the improvement of error, increases their number. Different methods are suggested solving this problem, the extent we can add to the number of neurons in the middle layer and the repeats cycle to avoid network with too fit, including early stopping rule using validation data (Roiger & Geatz, 2003).

According to early stopping rule, data is divided into three groups as training data, validation data, and test data. Training data is used for determining weights. Validation data are used when training, but they play no role in determining weights. Duty of validation data includes monitoring the generalization of network in line with network training. After offering all training data to network completely, using the weights,

validation data enters the network and the network amounts are calculated based on them. The calculated amounts are calculated by network for training data, and validation data are calculated by main amounts, and error amounts of training data and validation data. These errors are calculated again after each complete cycle of presenting the training data to the network.

Since a cycle, error of validation data increases. This means the network misses its generalization ability little by little, and keeps training data, without the ability to receive correct relationship between input and output data. Therefore, after presenting more validation error by network after consecutive times, the training process stops, and the weights of the least validation error are considered as the best result of the network training. If the error amount is not desired, it is essential to start a new training cycle. After the error on the training data and validation reached the desired level, test data that has not been used until this stage of the work, is used for final testing of network interoperability. This data group enters into the training network its optimal weight coefficients are calculated, their output is calculated, and finally are compared with main amounts. If you have a good amount of test data error, the job is finished.

"Movement technique" is another method that is helpful in network training, especially in cases where limited data is available. In this method, after network training of the obtained weights are used as the initial weights of the second round of training network, but in this new round of train, the place of training and validation data is changed. The previous validation data are used as training data and previous training data are used instead of the current validation data (Dezfoolian & Akbarpour, 2011).

Empirical Evidence

No research has been done on the subject and in general, research on inventory management efficiency has examined the relationship between inventory management efficiency and some variables (including some corporate governance mechanisms). However, in these studies, these variables have not been used directly to predict the efficiency of inventory management. Therefore, the following are some of the researches conducted in the field of inventory management efficiency and some corporate governance mechanisms.

(Tribo, 2007) examined the effect of ownership structure on investment in inventory. He concluded that institutional ownership reduces the company's liquidity needs and prevents over-investment, which in turn reduces inventory levels.

(Ameer, 2010) in a study examined the role of institutional investors in the management of cash and inventory of Asian companies. The results of his research showed that the increase in the stock portfolio of foreign banks (as a group of institutional investors) compared to the stock portfolio of domestic banks (as another group of institutional shareholders) led to more cash holdings and the inventory of goods becomes less.

(Elsayed & Wahba, 2013) concluded in a study that in the presence of large (small) managerial ownership, dual CEO (non-dual) and large (small) board of directors, institutional ownership has a positive (negative) effect on inventory management.

(Ali & Shah, 2017) investigated the effect of corporate governance mechanisms on the efficiency of working capital management in Pakistani manufacturing companies. The results showed that the audit committee, the size of the board and the gender effect improved working capital.

(Nazemi, Momtazian, & Salehi nia, 2014) in a study examined the relationship between corporate governance mechanisms and inventory management efficiency. The results of their research indicated that there is a positive and significant relationship between corporate ownership, managerial ownership, institutional ownership and board size with the efficiency of inventory management. There is a negative and significant relationship between the duality of the role of the CEO and the percentage of non-executive board members with the efficiency of inventory management, but no significant relationship was found between the concentration of ownership and the efficiency of inventory management.

(Kengatharan & Sanoli Tissera, 2019) examined the effect of corporate governance factors on the efficiency of working capital management in Sri Lanka. Factors such as the structure of the board, the size of the board, the number of board meetings and the separation of the position of the chairman of the board from the CEO were tested. The results showed that the number of meetings of the board of directors and the separation of the position of the chairman of the board of directors from the managing director has a positive and significant relationship with the management of working capital.

(Ghayour, Heydary Farahany, & Shahi, 2022) in a study examined the effect of inventory management on financial distress with respect to the interactive role of management behavioral strains, namely overconfidence, myopia, and narcissism. Findings of their study showed that the increase of inventory management efficiency leads to decreased financial distress, and the behavioral strains do not have a significant effect on the change of such a relationship.

(Hashed & Shaik, 2022) examined the relationship between inventory management efficiency and financial performance in Saudi Arabian companies. The results showed that the management of inventory in Saudi Arabian firms is efficient. Further, the firm size is positively associated with ROA and Inventory Turnover Ratio (ITR). This shows a nexus between inventory management efficiency and firms' financial growth in Saudi Arabian companies.

Methodology

In this study, after the preparation of the data in Microsoft Excel and perform calculations for the required variables, three-layer Perceptron Neural Network was made for prediction of related party transactions. It has 8 neurons in the input layer and one neuron in the output layer, according to the number of input variables (training) and output.

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The optimal number of neurons in the middle layer is achieved by trial and error, i.e. starting from the small number of neurons in the middle layer and then gradually increasing them and check the error changes, the optimum number is determined. To avoid overheating and improve network fit, the early stopping rule using data validation is used. For this purpose, according to this rule, the data is divided into three categories:

60% as training data, 20% as validation data, and 20% as data for network testing. Stopping rule is such that if validation error increases over 6 consecutive steps, even if the training data error is increasing, the training process is stopped. Criteria to measure network performance in the training process, is considered the mean squared error. Also, according to the surveys conducted, Tangent sigmoid transfer function was used in the middle layer, and linear transfer function was used in output layer.

Network training was done using Backpropagation of Error algorithm and Levenberg–Marquardt method. Because setting a linear efficient structure was difficult to predict the amount of related party transactions, and basically there is no knowledge of linear or non-linear relationship between the amount of related party transactions and the relevant variables (predictors), the ANN with specifications, is considered as the best tools to predict the efficiency of inventory management.

The Population and Sample

The study population consists of all companies listed on Tehran Stock Exchange during the period from 2012 to 2021. Taking into account the following restrictions for the companies, a sample (137 companies) was selected: 1- In terms of increased comparability, the fiscal period ended March. 2- Do not change the financial year during the period. 3- During the period under review, the trading symbol is not out of exchange. 4- The sample does not include financial intermediation companies, investments, leasing companies, banks and insurance companies; because the nature of the assets of these companies is different.

Research Variables

Inventory Management Efficiency

In the present study, inventory management efficiency has been used as an output for neural network training. According to the research of (Elsayed & Wahba, 2013), the efficiency of inventory management is obtained by using the ratio of the average inventory (the algebraic sum of the beginning inventory and ending inventory divided into two).

The Predictor Variables

In the theoretical foundations of inventory management efficiency, major research has examined the factors that significantly affect the efficiency of inventory management, but these variables have not been used directly to predict the efficiency of inventory management. Therefore, in this study, among the variables that has been studied in research on inventory management efficiency, based on the importance and computability

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in the Iranian business environment, the following seven variables as input variables, for neural network training, Used:

1) Institutional ownership: equal to the percentage of shares held by state-owned and public companies of the total capital stock, which includes insurance companies, financial institutions, banks, state-owned companies and other government components (Tsai & Gu, 2007).

2) Managerial Ownership: Indicates the percentage of shares held by family members of the Board of Directors.

3) Corporate Ownership: Equal to the percentage of shares held by Corporations of the total capital stock and includes a variety of Corporations (J, 2004)

4) Ownership Concentration: Absolute control of major shareholders over the management of the company is called ownership focus.

In this study, ownership concentration was measured using the Herfindahl-Hirschman index. The higher the index, the greater the concentration and presence of a small number of major shareholders in the ownership structure of the company, and vice versa. This is because some of the companies surveyed did not disclose less than 5% ownership in their financial statements. Therefore, due to the insignificance of percentages less than 5% and in order to homogenize the measurement method for all companies, a greater percentage of ownership and equal to 5% were included in the calculation of formulas. Herfindahl-Hirschman index is measured by the following formula:

$$HHI = \sum_{i=1}^{Nj} (SHARE_{i,j})^2$$

In this regard, $SHARE_{i,j}$ is the percentage of shares owned by shareholder i in company j.

5) Board size: Board size is the total number of board members of the company

6) Percentage of non-executive board members: This variable is obtained by dividing the number of non-executive board members by the total number of board members.

7) Dual role of CEO: This variable is a virtual variable, so that if the CEO is also the chairman of the board of directors, the value is one and otherwise the value is zero.

Research Findings

The purpose of this study is to predict the efficiency of inventory management among 137 companies listed on the Tehran Stock Exchange during 10 years. Therefore, a multilayer perceptron neural network was designed in MATLAB software and after several tests and changes in network parameters; the model structure with the lowest error was the structure (7-10-1) which was stopped using validation data. Therefore, the best

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neural network structure of the present study has 10 neurons in the middle layer. An overview of the neural network implemented by the software is shown in Figure (3).

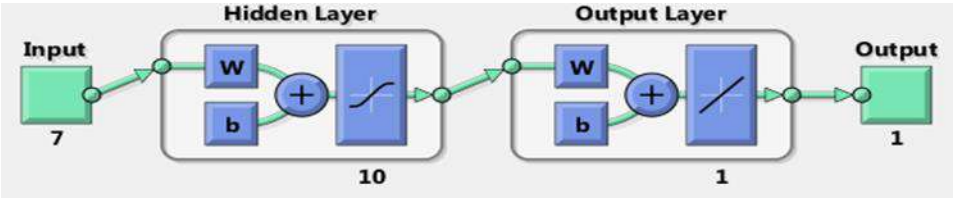

Figure 3. Neural network implemented by MATLAB software

In this study, the early stop method was used to prevent over-fitting of the network. According to the settings made in the network design process, if the validation data error increases by more than 6 consecutive steps, if even the training data error is decreasing, the training process will stop. The process of training the designed neural network, as shown in Figure (4), has stopped after 16 repetitions, because the validation data error has increased by 6 consecutive steps.

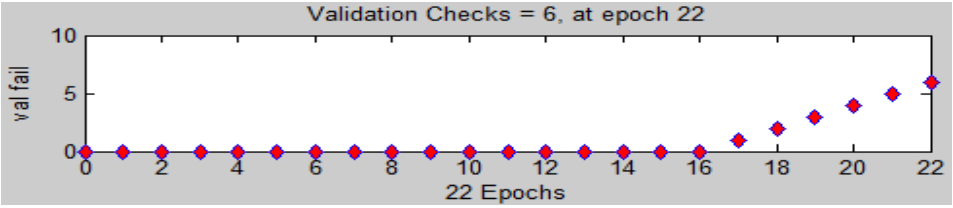

Figure 4. Investigation of validation data error in the training process

Figure (5) shows the curve of changes in the mean squared error in terms of the number of iteration cycles for the input data (predictor variables). This figure shows how the neural network training process proceeds from the input data. As can be seen, after 16 cycles of repetition, the designed artificial neural network reaches its best performance, meaning it causes the least squared error, so that if the network training continues, the training set error will start to increase and the network will start maintaining patterns. As shown in the figure, the best performance of the artificial neural network is designed at a point (16th iteration cycle) where the mean squared error for training data is .360, the mean squared error for validation data is .428, the mean squared error for test data is .261. And the mean squared error of the total data is .353. Also, according to Figure (6), it is clear that training data errors have almost the same behavior and characteristics as validation data errors. In addition, no over-fitting has occurred until step 16 (when the best performance for validation data occurs).

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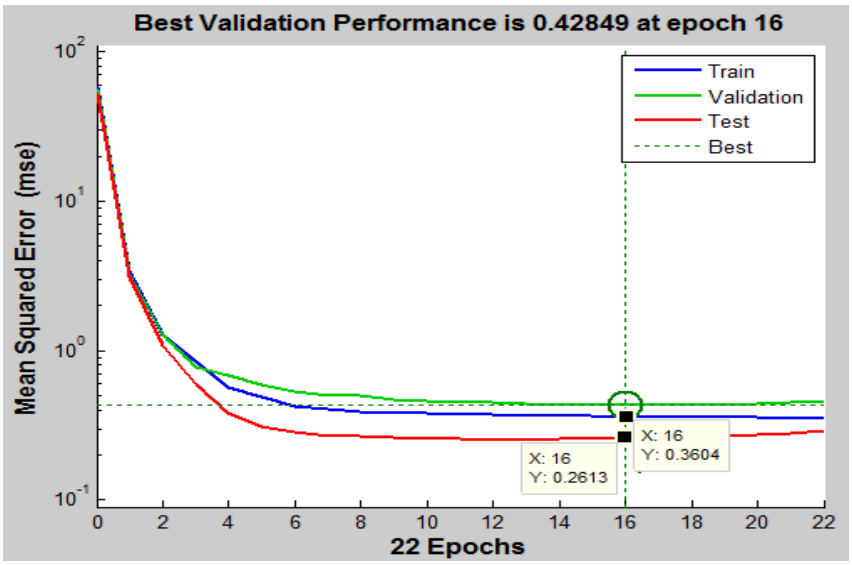

Figure 5. Curve of mean squared error versus number of replications performed in training, validation and test modes

Figure (6) shows the accuracy and use of the selected artificial neural network in modeling each of the training data, efficiency, test and total data set, to predict the efficiency of inventory management. If the output of the neural network is exactly equal to the actual values of the data, all points will be on the line Y = T. The more concentrated the data around the Y = T line, the better the identification of the data by the neural network. The Fit line is the regression line fitted to the data.

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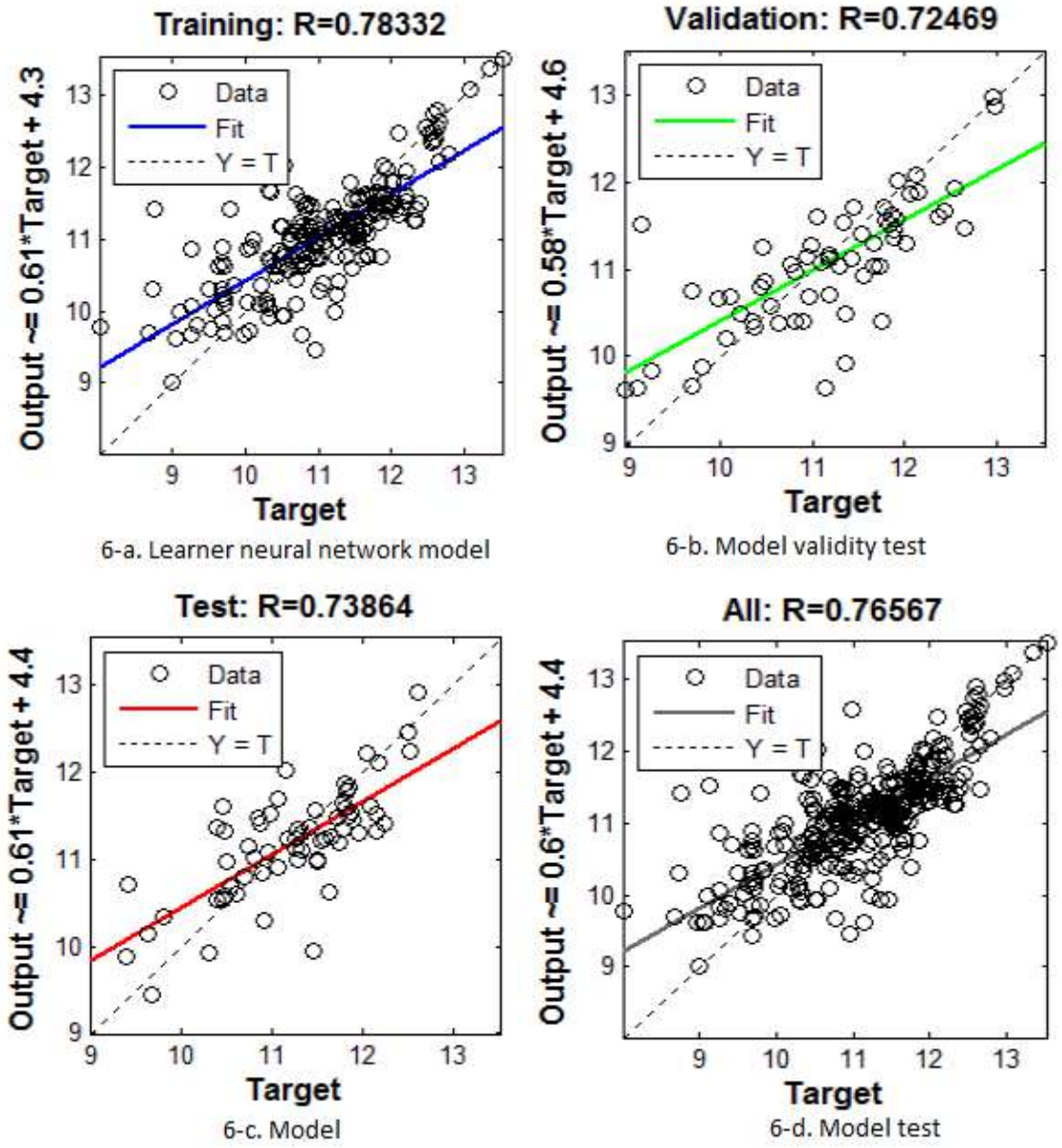

Figure 6. Evaluation of artificial neural network efficiency using regression analysis

Figure 6-a shows the general results of the training. This figure explains the model test using the training data. As can be seen, the model has a validity of %78 for validation, as shown in Figure 6-b, the model itself is validated again using validation and retest data with a coefficient of determination of 72%. Figure 6-c is a test of the model using the test data. This model with a coefficient of determination of 73% is also valid for test data. In Figure 6-d, where the model is tested using a set of data, a coefficient of determination of 76% confirms this validity.

Conclusion

Inventory management is a continuous process that on the one hand monitors and controls the orders and use of components that the company will use in the production of items, and on the other hand controls and monitors certain quantities of products for sale. Inventory management affects the company's performance in various ways. By maintaining inventory, companies can improve production planning, minimize the cost of inventory shortages, and significantly reduce purchasing costs through bulk purchases and bargaining at transaction prices.

In this regard, this study has predicted the efficiency of inventory management using artificial neural networks. The use of such forecasting models is useful to increase the accuracy of forecasts based on financial data. In this research, a multilayer perceptron neural network with the Backpropagation of Error algorithm has been used. Network parameters were determined after several tests. Finally, a network with the mean squared error 0.360, 0.428, 0.261 and 0.353 for training data, validation, test and total data respectively, and a coefficient of determination of more than 72%, as the best network for Predicting the efficiency of inventory management in companies listed on the Tehran Stock Exchange has been selected. Therefore, with neural network technology and predictor variables (institutional ownership, managerial ownership, corporate ownership, ownership focus, board size, percentage of non-executive board members, dual role of CEO), more than 72% of inventory management efficiency can be explained.

Practical Suggestions from the Research

1. In order to evaluate the risk and opportunities facing the business unit, creditors and potential and potential investors are recommended to estimate the efficiency of inventory management through artificial neural network technology and predictor variables of this research.

2. The board and non-executive members of the board as one of the pillars of corporate governance to understand the efficiency of inventory management is recommended to use the technique of artificial neural networks and predictor variables of this study.

The Securities and Exchange Commission, as a Supervisor, is recommended to use artificial neural network technology and predictor variables in order to reduce financial crises in companies and help promote and sustain the activities of business units.

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Original Research

Factors Affecting Income from Fish Pindang Businesses in Mlaten and Kedawang Villages, Pasuruan Regency, Indonesia

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Abstract

People of Pasuruan Regency seize market opportunities for fishery commodities by conducting fish pemindangan (processing) businesses. The study aims to analyze factors that affect income of the fish pindang business in Mlaten and Kedawang Village, Pasuruan Regency. The research respondents were all fish processing business actors, totaling 24 business actors in Mlaten Village and 26 business actors in Kedawang Village. Data collected through interviews with respondents, and analyzed with multiple linear regression models. The results showed that income of the business in Mlaten Village was simultaneously influenced by price of raw materials, business experience, number of workers, education, processing facilities, firewood, and amount of salt. Partially, the income was significantly influenced by business experience, number of workers, and processing facilities. In Kedawang Village, simultaneously, all of these variables also have a significant effect on the income. But partially, business experience, processing facilities, and the amount of salt have a significant effect on the income. Most dominant factor is processing facilities.

Keywords: Pemindangan (processing), fish, income, SMEs.

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Introduction

Potency of the Indonesian fishery sector is the largest in the world, both capture fisheries and aquaculture with a sustainable production potential of around 67 million tons/year. East Java has the largest and most diverse fishery resource potential in Indonesia (Rosana & Prasita, 2016) with a production of 362,624 tons/year (Norromadani et al., 2016), of which consist of pelagic and demersal fish (Rosana & Prasita, 2015). Opportunities for export and import of these commodities are also large so it is necessary to observe their development from year to year because of their positive and negative impacts on the trade balance (Pudjiastuti, 2014; Pudjiastuti et al., 2013; Pudjiastuti & Kembauw, 2018). The export value of Indonesian fishery products in 2020 reached USD 5.2 billion or grew positively by 5.7% compared to 2019. In contrast to Indonesia, most of the world's main exporters of fishery products experienced a significant decline compared to 2019, such as China, which fell 7.8%. , Norway 7.5%, Vietnam 2.1%, India 15.1%, Thailand 2.2%, and Ecuador 1.5%. In 2022, the value of Indonesia's fish imports was recorded at 11.37% of its export value, which implies that Indonesia is called a net exporter of fish commodities. However, not all types of Indonesian fish are sold in the international market. Main export commodities include tuna, skipjack, squid, octopus, seaweed, and crabs (Suhana, 2020).

This shows that fishery products have potential market opportunities for business actors in the fisheries sector. Fishery products were marketed in various types of processing because of their perishable nature. There are many processed fish products currently developing, where the sustainability of the business is highly dependent on the behavior of entrepreneurs (Arnis et al., 2018), technical skills availability, capital availability and culture (Nuh. et al., 2018), consumer preferences such as taste, price, product color, packaging color (Yanfika et al., 2020), and distribution (Christian et al., 2021). Nevertheless, it should be understood that the changes in chemical composition, physicochemical parameters, microbiological quality and sensory properties associated with fish salting and storage periods (Hafez et al., 2019).

Availability of large fish because East Java as one of the centers of capture fish production in Indonesia, is well utilized by people in Pasuruan Regency, especially in Mlaten and Kedawang Villages. Due to the perishable nature of this commodity, so that it can be consumed by people in the form of a safe product, curing must be carried out. There are many fish preservation activities that are commonly carried out, including pemindangan.

Pemindangan of fish is one of the traditional processing techniques by means of a combination of boiling/cooking and salting. Considering the simple nature of the transfer business, the costs incurred only include three items, namely fish raw materials, other raw materials and fixed costs (Fitrianingsih et al., 2021). Pemindangan is a processing and preservation technique by boiling/cooking fish in a salty atmosphere for a certain period of time in a container and then the process of reducing the water content to a certain extent occurs (Pandit, 2016). Fish pemindangan businesses have sprung up in various regions because they are very profitable, including in Magelang City (Hardjanto & Windoatmoko, 2021), Musi Banyuasin Regency (Wahyuni et al., 2018), Lombok Timur Regency (Subhan, 2018), Trenggalek Regency (Purnadwiyanti et al., 2017), Situbondo

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Regency (Junianingsih, 2015). The business continues even though it causes environmental pollution (Astuti, 2018) and faces risks in the form of fluctuations in production and prices (Talakua, 2014).

Some results of empirical studies show that there are many factors that affect the income obtained from fish processing business. These factors include: raw materials (Lubis & Ginting, 2020; Maringka et al., 2021), and social demographics (Anom et al., 2017), while other fish processing incomes are influenced by age and business scale (Wulandari et al., 2020). The results of another study also found that socio-demographic variables also affected the welfare of fish-fishing entrepreneurs in Tabanan Regency (Anom et al., 2017). One of the proxies of welfare is income.

In Pasuruan Regency, pemindangan business is carried out by community individually and in groups. Types of fish considered are scad, salmon, tuna, zero, perkak, mackerel, selar, tembang, and milkfish. Pindang of layang and salmon fish have a relatively high market demand compared to other types. Pindang fish was marketed to Bojonegoro, Sidoarjo, Malang, and other areas around Pasuruan. Emergence of MSMEs in the fisheries sector is a positive impact of the economic role of fishery sector. Based on the Fisheries Service of Pasuruan Regency, there are 125 MSMEs that specifically carry out fish processing business. Therefore, the business has become a leading processed business and is one of the main sources of income by people in this region. Based on the description that has been explained, this study aims to analyze factors that influence income of fish pemindangan business in Mlaten Village and Kedawang Village, Pasuruan Regency.

Methodology

The research had been carried out in Mlaten Village and Kedawang Village, Nguling District, Pasuruan Regency. Location was chosen purposively with consideration that the two villages are centers of fish processing business. In addition, it is also a priority in the economic development of the Pasuruan Regency.

Population were all fish pemindangan entrepreneurs in Mlaten Village and Kedawang Village. Census method was used because there were only 24 fish processing business actors in Mlaten Village and 26 business units in Kedawang Village. Data were collected through interviews with a questionnaire instrument. Primary data collected includes factors that affect income of entrepreneurs, price of raw materials, business experience, number of workers, education, processing facilities, firewood, and the amount of salt.

After data were edited in the field, compiled and tabulated, then it was analyzed using multiple linear regression models. Prior to the regression analysis, validity and reliability tests were first performed. Validity test is used to assess accuracy of the instrument in measuring data. Validity testing is done by calculating correlation between each statement/indicator with total score using Product Moment (r) correlation. The correlation formula can be written as follows:

$$r_{xy=} \frac{n(\sum xy) - (\sum X \sum y)}{\sqrt{[n\sum x2 - (\sum x)2][n\sum y2 - (\sum y)2]}} \qquad (1)$$

International Journal of Management, Accounting and Economics
Volume 9, Issue 11, November, 2022
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www.ijmae.com

where: rxy = correlation coefficient, n = number of samples, x = score of each statement item, y = total score of statement items, x = total score of statement items, y = total score of statement items, ∑xy = number of multiplication x and y. If r count > r table, then the instrument is said to be valid.

Reliability test is used to determine consistency of measuring instrument, whether measuring instrument used is reliable and consistent if the measurement is repeated. The test uses the Cronbach's Alpha method with formula:

$$r_{11} = \left[\frac{k}{(k-1)}\right]\left[1 - \frac{\sum \sigma_b^2}{\sigma_t^2}\right] \qquad (2)$$

where: r_{11}= instrument reliability coefficient, k = number of item variants, $\sum \sigma_b^2$ = number of item variants, σ_t^2 = total score variance. If r count > r table 5%, then the instrument is said to be reliable.

To analyze factors that affect income of fish pemindangan business, a multiple linear regression equation is used which is mathematically written as follows:

$$Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 \qquad (3)$$

where: Y = fish pemindangan business income, α = constant, β_{1-7} = regression coefficient, X_1 = price of raw materials, X_2 = business experience, X_3 = number of workers, X_4 = education, X_5 = processing facilities, X_6 = firewood , X_7 = amount of salt.

To find out the factors that affect income of the business, the following series of steps are carried out:

1) Classical assumption test, is a statistical requirement that must be met in multiple linear regression analysis based on ordinary least squares (OLS). The tests used are heteroscedasticity, normality, and multicollinearity. Heteroscedasticity test aims to prove whether in the regression model there is an inequality of variance from residuals of one observation to another observation. If variance of those residuals is different, it is called heteroscedasticity. Decision making for heteroscedasticity test: (a) If there is a certain pattern, such as the points that form a certain regular pattern (wavy, melted and then narrowed), it indicates that heteroscedasticity has occurred; (b) If there is no clear pattern, and the points spread above and below the number 0 on the Y axis, then there is no heteroscedasticity.

Normality test of data is based on the following criteria: (a) If data spreads around diagonal line and follows direction of the line or histogram graph shows a normal distribution, then regression model is said to meet assumption of normality; (b) If data is spread far from and/or does not follow direction of the diagonal line or the histogram graph does not show a normal distribution, then regression model is said to not meet assumption of normality.

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Decision-making criteria for the multicollinearity test are: (a) If the independent variables have a correlation number above 0.90, then it is an indication of multicollinearity; (b) Multicollinearity can also be seen from VIF number, if VIF < 10, there is no multicollinearity.

2) Goodness of fit model, carried out to determine ability of variations in raw material prices, business experience, number of workers, education, processing facilities, firewood, amount of salt to explain variations in fish processing business income. It can be seen from the coefficient of determination (R^2). If the coefficient is close to 1, more appropriate regression model has been formulated.

3) F test, it was conducted to determine effect of the factors simultaneously on income. To test the hypothesis, a decision-making criterion based on significance probability is used. If the probability of significance < 0.05, then simultaneously, factors of raw material prices, business experience, number of workers, education, processing facilities, firewood, amount of salt have a simultaneous effect on income. If the results are obtained, then a partial test (t test) can be applied.

4) Partially, t-test was made to determine effect of factors on business income. Decision making criteria in the test are also based on the probability of significance. If the probability of significance < 0.05, then factors of raw material prices, business experience, number of workers, education, processing facilities, firewood, amount of salt have partially effect on income.

Result and Discussion

Pasuruan is one of the regencies in East Java Province with regional boundaries: Sidoarjo Regency in the north, and the Java Sea, in the east with Probolinggo Regency, Malang Regency in the South, Batu City in the Southwest and Mojokerto Regency in the West. Geographically, this regency consists of mountains, lowlands and coastal areas with an area of 1,474 km2. The potential for marine and fisheries in Pasuruan Regency includes marine waters and coastal areas that stretch for ± 48 km from Nguling to Bangil District. In addition, this area also has areas of lakes, freshwater fisheries and brackish water fisheries that are very potential to be developed. Therefore, there are many fish pemindangan businesses in Pasuruan Regency, as the main livelihood of the people in Mlaten and Kedawung Villages. One of these fish preservation activities, apart from extending the shelf life of fresh fish with abundant production, also increases added value of fish. The following is a profile of the business actors and factors that affect the income obtained from the activity.

Profile of Fish Pemindangan Business Actors in Mlaten and Kedawung Villages

Profiles of business actors based on age, education level, number of family members, experience and business experience are presented in detail in Table 1. Age can affect productivity and technology adoption. There is a difference in the age range between the villages. In Mlaten Village, pindang fish entrepreneurs are 20-69 years old, while in Kedawang Village are 40-69 years old. It indicates that business regeneration has been carried out in the fish processing industry in Mlaten Village, although it is only 29%

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www.ijmae.com

recorded. On the other hand, the majority of entrepreneurs (96% in Kedawang Village and 87% in Mlaten Village) are of productive age.

Family members are people who eat and live in the same house with pindang fish entrepreneurs. There is a difference in the number of dependents of the entrepreneur. In Mlaten Village, the number of family members ranges from 2-7 people per household, while in Kedawang Village, they have a larger burden of 2-10 people. Most (67% in Mlaten Village and 65% in Kedawang Village) pindang entrepreneurs have 5-7 family members. It indicates that this business is able to support a household with a large number of family members.

Education in this case is intended to provide an overview of the last formal education taken by business actors. Most (96%) of the pindang fish business actors in the two villages have studied from elementary school to high school. This shows that this business does not require higher education. New business actors can enter this job market as long as they have the capital and knowledge of fish processing business. However, there are also entrepreneurs who have pursued higher education.

Table 1. Characteristics of fish processing entrepreneurs in Mlaten and Kedawang villages

Kedawang Village		Description/Category	Mlaten Village	
Frequency (person)	Percentage (%)		Frequency (person)	Percentage (%)
		Age (year)		
-	-	20-29	1	4
-	-	30-39	6	25
15	58	40-49	7	29
10	38	50-59	7	29
1	4	60-69	3	13
26	100	Total	24	100
		Family members (person)		
8	31	2-4	8	33
17	65	5-7	16	67
1	4	8-10	-	-
26	100	Total	24	100
		Education		
10	38	Elementary School	18	75
7	27	Junior High School	1	4
8	31	Senior High School	4	17
1	4	College	1	4
26	100	Total	24	100
		Business experience (year)		
11	42	1-9	9	38
11	42	10-19	13	54
4	16	20-29	2	8
26	100	Total	24	100

International Journal of Management, Accounting and Economics
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Based on their business experience, business actors have business experience of 1-29 years. Most (62% in Mlaten Village and 58% in Kedawang Village) perpetrators have more than 10 years of experience. This shows that this business is attractive to be chosen as a source of income because of various considerations such as the availability of raw materials, easy transfers to do, the prices of raw materials and the relatively suitable prices of imports, and the availability of the market.

Research Instrument Test

Research instrument is feasible to be used to collect data because it is valid and reliable. The results of the validity and reliability test can be read in Table 2. Validity decision criteria are based on the r-count value greater than r-table. Reliability test was carried out using the Cronbach alpha value as an indicator. The instrument is declared reliable if it has a minimum Cronbach alpha value of 0.6 (Ghozali, 2012).

Table 2 shows that each variable starting from price of raw materials to the amount of salt has an r-count > r-table. It proves that the instrument was valid. In addition, reliability analysis refers to Cronbach alpha value. As a result, this parameter in both villages has a number greater than 0.6 so it can be concluded that the instrument is reliable. These results become the starting point that data that has been collected through questionnaire can be used in further analysis.

Table 2. Parameters of instrument validity and reliability

Variable	Mlaten Village		Kedawang Village	
	r-stat	r-table	r-stat	r-table
Raw material prices	0.529	0.4044	0.675	0.3882
Business experience	0.531		0.551	
Manpower	0.598		0.828	
Education	0.505		0.636	
Processing facilities	0.693		0.650	
Firewood	0.617		0.500	
Amount of salt	0.557		0.615	
	Cronbach Alpha: 0.651		*Cronbach Alpha:* 0.724	

Factors Affecting Fish Pemindangan Business Income

The influence of the factors on fish processing business income was analyzed simultaneously (F test) and partially (t test). The results of this analysis can be seen in Table 4. Before presenting and discussing the tests, it is necessary to first describe the fulfillment of classical assumptions and goodness of the regression model.

Classic assumption test

As in general regression analysis with cross section data, classical assumption test is intended to detect multicollinearity, heteroscedasticity, and normality of data (Gujarati, 2012). Presence of multicollinearity is known by comparing tolerance value and VIF

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analysis results provided that tolerance value is > 0.10 and VIF is < 10.00. Table 2 shows the parameters has met provisions that there is no multicollinearity.

Table 3. Classical assumption test parameters

Variable	Mlaten Village			Kedawang Village		
	Tolerance	VIF	Sig	*Tolerance*	VIF	Sig
Raw material prices	0.221	8.175	0.537	0.272	3.671	0.521
Business experience	0.766	1.305	0.256	0.481	2.077	0.396
Manpower	0.156	6.430	0.763	0.136	7.366	0.698
Education	0.696	1.437	0.263	0.614	1.627	0.424
Processing facilities	0.236	4.230	0.358	0.334	2.994	0.543
Firewood	0.188	9.389	0.372	0.394	2.539	0.245
Amount of salt	0.453	2.209	0.386	0.424	2.361	0.432
asymp. Sig. (2-tailed) = 0.200			asymp. Sig. (2-tailed) = 0.200			

Heteroscedasticity test is carried out to determine whether in a regression model there is an inequality of variance from the residuals of one observation to another. A good regression model is a model with homoscedasticity or no heteroscedasticity. The test is carried out using the glejser method, where basis for decision making is, if significance value is greater than 0.05, then there is no heteroscedasticity. Table 3 shows that each variable has a significance value > 0.05 so it can be proven that there is no heteroscedasticity in the regression model.

Normality test is performed to measure whether a data has a normal distribution or not. If data is normally distributed, then it can be used in parametric statistics. Kolmogorov-Smirnov method was used to determine normality of data. Decision making on the data normality test is to compare it with significance values. If significance value is > 0.05, it can be stated that the data obtained has a normal distribution. Table 3 lists asymp. Sig. (2-tailed) = 0.200 which is > 0.05, meaning that it has a normal distribution.

Goodness of fit model

The appropriate regression model is very important in this analysis because the ability of raw material prices, business experience, manpower, education, processing facilities, firewood and amount of salt in explaining the variation in fish processing business income in the villages, must be high. Coefficient of determination (R2) of regression model for Mlaten and Kedawang Village is 0.922 and 0.911, respectively (see Table 4). That is, 92.2% of income from fish processing business in Mlaten Village and 91.1% of income in Kedawang Village are explained by variations in raw material prices, business experience, manpower, education, processing facilities, firewood and amount of salt. Because the number is close to 1, so the regression model is appropriate to analyze the determinants of income for the fish pemindangan business.

Simultaneous influence test (F test)

Price of raw materials, business experience, manpower, education, processing facilities, firewood and amount of salt, have a simultaneous effect on income. Conclusion

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is drawn based on the results of F test by comparing calculated F value and F table or its significance. Table 4 shows Fstat > F table (126,998 > 2.66) in Mlaten Village and (126.348 > 2.58) in Kedawang Village. This figure shows that those variables have significant effect simultaneously on the income of fish pemindangan business.

Partially influence test (t test)

After it was proven that simultaneously, the price of raw materials, business experience, number of workers, education level, processing facilities, firewood and the amount of salt, had a significant effect, then continued with a partial test (t test). This step is intended to identify of the seven independent variables, which one has a significant influence individually.

Table 4 shows that there are three factors that have a significant effect on the business income in Mlaten Village, namely business experience, manpower, and processing facilities. Meanwhile, in Kedawang Village, there are also three factors that have a significant effect on the entrepreneur income, namely business experience, processing facilities, and amount of salt. These results are similar with previous research (Sumolang et al., 2019) (Fitria & Ariva, 2018).

Table 4. Factors that influence fish pemindangan business income

Variable	Mlaten Village		Kedawang Village	
	Regression coefficient	sig	Regression coefficient	Sig
Constant	4.686	0.000	4.995	0.000
Raw material prices	-0.186	0.442	-0.147	0.185
Business experience	0.018	0.071	0.019	0.040
Manpower	0.229	0.050	0.088	0.396
Education	-0.022	0.573	-0.004	0.903
Processing facilities	0.541	0.001	0.583	0.000
Firewood	-0.029	0.883	-0.050	0.637
Amount of salt	0.022	0.127	0.030	0.052
R^2	0.922		0.911	
F Statistik	126.998		126.348	
F Table	2.66		2.58	
Sig. F	0.000		0.000	

Mathematically, the factors that affect the income of the fish processing business can be stated as follows:

(1) Fish pemindangan business in Mlaten Village

$$Y_1 = 4{,}688 - 0{,}186X_1 + 0{,}018X_2 + 0{,}229X_3 - 0{,}022X_4 + 0{,}541X_5 - 0{,}029X_6 + 0{,}022X_7 \quad (4)$$

(2) Fish pemindangan business in Kedawang Village

$$Y2 = 4{,}995 - 0{,}147X1 + 0{,}019X2 + 0{,}088X3 - 0{,}004X4 + 0{,}583X5 - 0{,}050X6 + 0{,}030X7 \quad (5)$$

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The effect of each factor on the income of the fish processing business is described below.

a. Price of raw material

In Mlaten Village, regression coefficient of raw material prices is -0.186, meaning that the increase in raw material prices is IDR 1000, will reduce income by IDR 186. In Kedawang Village, regression coefficient of the variable is -0.147, meaning that the increase in raw material prices is IDR 1000, will reduce income by IDR 147. This finding is in accordance with theory that higher raw material prices will increase costs and of course will reduce net profit (income) of a business.

Price of raw materials in this case is a proxy for total costs incurred by entrepreneurs to purchase fish raw materials (price per unit times amount of fish raw materials purchased). Inventory of raw materials is an important factor to support the process of pindang production. Control of raw materials was carried out to reduce errors that can cause losses. If supply of raw materials is too large compared to the need, it will increase interest expense, maintenance and storage costs in the warehouse, and allow for depreciation and the quality of raw goods. It can reduce profit of the business owner, as well as if the raw material is too small it can hold up production process and cause losses to the business owner (Maringka et al., 2021). The owners of fish processing businesses in Mlaten and Kedawang villages have partnered with the Bahari Indah Perkasa cooperative to reduce the cost of providing raw materials. Existence of cold storage machines is very helpful for business owners to minimize cost of providing raw materials.

b. Business experience

Business experience is a description of the length of time a business owner has in carrying out transfer activities. The longer of experience, the higher of knowledge and skills of business owners in managing their business. Regression coefficient of business experience is 0.018 for Mlaten Village and 0.019 for Kedawang Village. The coefficient is positive, indicating that the longer of business experience, the income from the pemindangan business will also increase. Experience can affect knowledge and ability of business actors in managing their business. Increased knowledge can support creativity in innovation. These innovations include creating new product variants, opening up markets and improving technology (Harahap & Faizien, 2021). Most of pindang fish entrepreneurs in Mlaten and Kedawang Village have more than 10 years of experience in the business.

c. Manpower

In Mlaten Village, labor regression coefficient is 0.229, meaning that every additional labor outpouring of one HOK will increase income by IDR 299. In Kedawang Village, the regression coefficient is 0.088, meaning that each additional labor force of one HOK will increase income by IDR 88. Generally, the businesses use family and non-family workers. One working day (HOK) consists of 7 hours of work, with a wage of IDR 70,000 for male workers and IDR 60,000 for female workers.

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Labor is the main factor in production activities, but the amount of its use needs to pay attention to the conditions of a business. If the use of labor exceeds production capacity, it increases production costs unnecessarily. Business actors are expected to be able to allocate the optimal number of workers by considering production capacity and profits (Agam et al., 2022). Fish pemindangan activities that require labor in Mlaten and Kedawang Village, include fish selection/sorting, cleaning, salting, boiling, cooling, and packaging.

d. Education

Education is a process of changing one's attitudes and behavior through teaching and training efforts. The regression coefficient for education level in Mlaten Village is -0.022, and in Kedawang Village is -0.004. A negative value indicates the higher of education, the lower of income earned. However, this factor has no significant effect on income. A negative relationship occurs due to the time spent in transfer business tends to decrease because business actors allocate more time in taking education. This can be seen from the profile of the respondent's business actors. Entrepreneurs who graduated from elementary school tend to have longer experience compared to entrepreneurs who graduated from high school/bachelor. This finding is similar with the study by (Iskandar et al., 2020) which revealed that the higher the level of education, the lower the performance.

e. Processing facilities

Processing facilities are very supportive of the process of pemindangan production. If there are more processing facilities, the income will also increase. Regression coefficients of this variable in Mlaten and Kedawang Village are 0.541 and 0.583, meaning that each additional one unit of processing facility will increase income by IDR 541 and IDR 583. Processing facility has a significant effect on the income of pindang fish business in those villages.

Processing facilities used in the fish pemindangan process begin from weeding and washing. Then the fish were washed again and again until completely clean. Fresh fish that have been washed are arranged in pots/boxes/containers according to their type and size. After the fishs were arranged, then salting was done. If the salting process is complete, container was closed with a lid equipped with a ballast, then continued under boiling activity as far as the fish was cooked. Boiling process is carried out using firewood as a heat source. The last activity carried out is packaging. During the activity, entrepreneur used facilities that include pots, containers, besek (packaged from woven bamboo), fish baskets, and firewood.

f. Firewood

Firewood serves as a source of heat needed in the boiling process. Fish processing is an effort to preserve and process fish using salting and smoking techniques. Regression coefficient of the firewood variable in the fish processing business in Mlaten Village is -0.029 and in Kedawang Village is -0.050. A negative value indicates a negative relationship between firewood and income variables. If the use of firewood increases, the

income obtained will decrease. It shows that the current use of firewood is too much and should be reduced. However, the factor has no significant effect.

g. Amount of salt

Salt serves to provide a savory taste to fish, reduce water content and inhibit the growth of spoilage bacteria in fish. Salt also acts as a preservative, so the fish can last a long time during marketing. In Mlaten Village, regression coefficient of the variable is 0.022 and in Kedawang Village it is 0.030. Regression coefficient has a positive value, meaning that an increase in the amount of salt, will increase income of the business. It shows that the amount of salt can be increased in number yet. In Mlaten Village, this factor has a significant effect, but in Kedawang Village it is not significant.

Conclusion

Income of fish pemindangan business in Mlaten and Kedawang Village is simultaneously and significantly influenced by price of raw materials, business experience, manpower, education, processing facilities, firewood, and amount of salt. Partially, business income in Mlaten Village is significantly influenced by business experience, manpower, and processing facilities. Meanwhile, business income in Kedawang Village is significantly influenced by business experience, processing facilities, and amount of salt. The most significant (dominant) variable in the both villages has something in common, i.e. processing facilities.

Government or private parties with an interest in the pemindangan business will contribute to efforts to increase the income of pindang entrepreneurs by: 1) providing training aimed at improving their technology and capabilities in the pemindangan process, 2) providing assistance in the form of processing facilities or soft loans for procurement. It is still possible for pindang entrepreneurs in Kedawang Village to increase the amount of salt, while in Mlaten Village it is still possible to increase the use of labor. Limitation of this research is that it has not explored in detail the natural conditions (weather for example) and pemindangan process in the both villages, so that there are differences regarding the factors that have a significant influence.

Author Contributions

The first author is in charge of collecting and analyzing data, as well as compiling a draft manuscript. The second author is in charge of compiling tabulation results and data analysis, revising draft articles, adjusting templates, submitting and correspondence. The third author collects articles for reference.

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Original Research

Problems and Prospects of Handloom Industries: A Regional Study

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Abstract

The handloom textile industry, one of the significant labor-contributing industries in Bangladesh, provides income and employment opportunities for a sizable section of rural labor. However, in recent years, the handloom textile industry has been experiencing several problems in its production. The residents of three Upazilas in the Sirajganj district rely directly or indirectly on this sector. This study will examine the issues and opportunities of the handloom industry in three Upazilas of the Sirajganj district in Bangladesh. The district of Sirajganj was chosen as a purposive sample and used the multistage random sampling method of fifty handloom units from twenty villages in Ullapara, Shahajdpur, and Belkuchi Upazila. The Cobb-Douglas production function is used to identify in this case to assess the variables' impact on the Handloom sector's annual income. Labor, input, and education coefficient is significant at 1 percent of the level. On the other hand, capital has negatively impacted the handloom industries and is also not statistically significant. Despite experience positively impacting the handloom weaver's income, it does not influence statistically significant. The estimated capital coefficient of -0.208, and the approximate labor cost is 25.73. Major problems of the handloom industry in the high rate of fabrics and colors. These results suggest that labor is a vital part of the handloom industry and with the posting of workers, handloom output rises as well.

Keywords: Handloom Industry, Cobb-Douglas, Socio-Demographic, Bangladesh.

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Introduction

The handloom industry is one of Bangladesh's most potential and traditional weaving industries (M. Islam & Hossain, 2022). It is one of the most potential industries in Bangladesh, whose fragile present situation, had a remarkable past and may have a bright future (M. Islam & Hossain, 2012). It provides income and employment for a sizeable section of rural labor groups. Handloom was formerly the second largest employer and source of revenue in rural areas, behind agriculture. According to the Bangladesh Bureau of Statistics (Bangladesh Statistics, 2018) the result of the significant demand for its products in India and Europe, it has a long history of success. Well-known handloom items include renowned Muslins, Jamdanis, Benarashis, etc. Surprisingly, the industrial revolution and the development of contemporary technologies progressively altered the landscape. Bangladesh's highest possible indigenous sector is handloom (2020)

The term Handloom refers to any loom other than a power loom. A hand-operated machine for making clothing. In such cases, the regrowing process can be carried out entirely by foot (Kiron, 2014). An alternative method for weaving textiles is using a handloom, and its equipment, or a tool made of wood with just some iron components. The deceased handloom's body of the dead handloom is powered solely by a guy's hands and feet. The handicraft industry has the potential to have significant micro and macroeconomic effects on Bangladesh's economy (Liton et al., 2016a).

But compared to other countries, the overall development of *Small and Medium-sized Enterprises* (SMEs) in Bangladesh has not been much. According to the Bangladesh Bureau of Statistics (BBS, 2018), the SME sector contributes 20 to 25 percent to the GDP of Bangladesh. The SME sector contributes 55 percent to the GDP of The Organization for Economic Co-operation and Development (OECD) member countries. Even in our neighboring country India, its contribution is about 45 percent. The SME sector contributes 60 to 70 percent to the GDP of China, Japan, and South Korea. Most of the employment is also in their SME sector. So the way it magnifies or relies on the contribution of big industry or big trade is wrong. And the general tendency toward the big industry is also one of the reasons for the neglect of the SME section. 40 to 45 percent of the workers are involved in the SME sector in Bangladesh. So the more significant the SME sector, the bigger the scope of employment (BBS, 2020). Fluctuations in volume and growth of small and cottage industries have been noticed in the past years. Its contribution to GDP in FY 2013-14 was 6.33 percent, which decreased to 4.60 percent in FY 2010-21, although the benefaction of the Small & Cottage Industry in FY 2016-17 was a maximum of 11.20 percent in GDP.

Table 1. The Volume and Growth Rate of Small & Cottage Industries in GDP

Type of Industry	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21
Small and cottage	26113.1	28342.6	30909.4	33945.8	37086.4	41148	42778.1	43519.1
Percentage of GDP	6.33	8.54	9.06	11.20	9.25	10.95	3.96	1.73

Source: BBS, 2020

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In Table 1, it is shown that the percentage of the Growth Rate of Small & Cottage Industries in GDP is declining over time. The handloom industry generates remarkable benefits for Bangladesh's economy regarding micro and macroeconomic impacts. It plays a vital role in reducing poverty, increasing employment, and enhancing household income and consumption in the country. Thus, in Bangladesh, The handloom sector has a positive contribution to employment generation and economic growth. But this sector faces various challenges which are the reasons for the non-operation of looms. Therefore, government and non-government agencies should come forward with financial, technical, and policy supports for developing the handloom industry in Bangladesh (Liton et al., 2016b).

In this context, the following questions will be addressed in this study. The research questions of the study are the following:

- What are the current problems of the handloom industries?
- What are the current prospects of this industry?
- Which kind of initiatives are needed to develop this sector?

In view of the above questions, the objective of this paper is to examine the problems and opportunities of the handloom industry in the study area.

The rest of the paper is organized into six parts. Following the introduction, the second section includes the literature reviews. The following order organizes the study's data, model and methodological framework, results and discussion, and finally discusses conclusions and recommendations.

Literature Review

An overview of the conclusions from the earlier literature is provided in this section. Also included here are some relevant findings from other nations. Some types of literature about the handloom industries will be discussed in detail in this section.

(Sangeetha & Charles, 2019) examined the Handloom wearers' problems and prospects in Thanjavur, Tamilnadu, India. This research is based on both primary and secondary data sources. Using the structured questionnaire and the personal interview method, they collected preliminary data from 120 respondents. This is a descriptive study, and the data have been gathered through in-depth interviews and semi-structured questions were asked. The secondary data was found in books, periodic journals, and articles relevant to this study. This study aims to understand issues confronting handloom weavers in Varanasi, Uttar Pradesh. The problems at stake are the invention of new technology (the power loom), capitalist domination, wage stagnation, and increased yarn price. (Das, 2016) carried out a survey of the present scenario and some problems of the Handloom industry in cooch behar district West Bengal, India. His study was derived from primary and secondary sources of data. He discovered that the climate was deteriorating due to illiteracy, financial limits, health issues, middle intermediaries, and government assistance. This study was done in coach Behar district India. In this study,

he did not find out the problems behind the handloom weaving industry. (Vimalkumar, 2018) discussed the handloom industry's future and challenges. This study focuses on selected handloom enterprises in Jaffna and their production and sales concerns. In Jaffna's rural districts, both men and women weave as a way of life. This study includes nine handloom industries. Northern handloom weavers have a rich history of culture and generational talents, a challenge for the handloom industry's survival. Sarongs, bed sheets, towels, curtains, table linen, kitchen linen, readymade clothing, soft toys, hand woven carpets, etc., are handloom textiles. In this research, the items are of high quality and texture and have a solid market and worldwide demand. They discovered that the current handloom industries confront several issues and obstacles. After the conflict, the Northern Sri Lankan handloom sector encounters various obstacles. The sector, which employs many families, must be revitalized. (Rohitha & Bharathi, 2017) identified the issues faced by the handloom industry. The study draws the attention of master weavers from the undivided state of Andhra Pradesh, especially four districts, namely, Nalgonda, Guntur, Krishna, and Prakasam districts. This study adopted the quantitative methodology, where 365 master weavers were selected through the purposive sampling technique. The study findings reveal that the handloom industry in this district is unorganized. This reflects that the weavers face some problems. This study has limitations as it was conducted in four sections of the undivided state of Andhra Pradesh only. There may be other issues related to weavers' supply chain management practices in other communities. Therefore, the study inference can't be counted as general. Thus, this study gives scope for conducting further research in the future. (Liton et al., 2016a) analyzed the present scenario and future challenges in the Handloom industry in Bangladesh. They discovered around 183512 handloom weaving units in Bangladesh, containing approximately 505556 looms. The overall number of functioning loans is 311851, or 61.7 percent of total rooms, while the remaining 193705 looms are inoperable. Additionally, they identified other issues in Bangladesh's handloom sector that contributed to the closure of looms, including a lack of finance, a scarcity of materials, insufficient technology, a flawed marketing system, and insufficient government backing. This study is too old to make policy. (M. K. Islam & Hossain, 2015) examined the determinant of technological efficiency of handloom in the kushtia district of Bangladesh. They collected 257 handloom units were chosen at random for the study. Technical efficiency is obtained using the Cobb-Douglas production function model. They found in the study area average efficiency of the handloom industry is 0.245 by the Tobit modal. They also found significant findings that influence the technical inefficiency of handlooms, such as the owner's expertise, education, and age, as well as the size of the unit. This study considered only the Kushtia district as the study area. (Rahman, 2013) identified the prospect of the handloom industry in Pabna district, Bangladesh. They considered five listed handloom industries in Pabna, Bangladesh. There are several factors that are negatively impacted the handloom industry in Patna. These include: a scarcity of lack of funding, higher material costs, lack of organizational capacity, inadequate technology and efficiency, a lack of government support, a huge knowledge gap, an inadequate power supply, and a scarcity of credit facilities, to name a few. Handloom industry issues are ignored in this study. (Narzary, 2013) concluded a survey of marketing problems and prospects of the handloom and handicraft industry which is based on 200 respondents who are the producer and retailers of the handloom and handicraft production. He found in his study that shows different market problems were faced by the producer and retailers in the study area. The study is based on the marketing

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system of the handloom industry. (Akter & Ghosh, 2005) studied the handloom industry as it was on its way to extinction. In this industry, working capital, the high cost of raw material acquisition, a lack of organizational skills, insufficient technology, and a lack of legislative support are only a few of the significant variables contributing to the rapid pace of development. Their efforts to find out what was wrong and what was going to happen was futile at best.

Most of the studies have been completed on either problems or prospects of the handloom industry. Moreover, very few studies have been done on the hazards and opportunities of the handloom industry. But those studies are too old for policy making. There are very limited work has been done specially in sirajganj district. Although Sirajganj district is the most suitable area for handloom textile industries. For those causes, a field base study is necessary to find the problems and prospects of the handloom industry in Sirajganj.

Data, Model and Methodological Framework

Sampling and Data Collection

The study is based on field based data. Both qualitative and quantitative data have been utilized. The Sirajganj district was selected as a purposive sample. Because this district is nationally and internationally renowned for its handloom textile industries. In terms of district-based and family based handloom units, the position of the Sirajganj district is fifth highest, and this district has the second highest number of handloom factories in regarding the number of handloom in Bangladesh (BBS, 2018). After that, a multistage random sampling approach was used to select the relevant information from 50 handloom industries in the study area. The investigation involved twenty villages, five Unions, and three Upazilas of the Sirajganj district in Bangladesh. The data was collected via a standardized questionnaire administered to the handloom owner during the face to face interview. The timeframe of data collection was from June to September of 2021. There were both open ended and closed ended data collection questions.

Table 2. Sample Size and its Distribution (N=50)

Name of District	Name of Upazila	Name of Union	Number of Samples
Sirajganj	Ullapara	Durganagar	19
		Ullapara	1
	Belkuchi	Dhukariabera	12
		Bhangabari	4
	Shahjdpur	Shahjadpur	14
Total	3	5	50

Descriptive Analysis

Descriptive analysis is used to portray the information about age (Year), education (Year of Schooling), experience (year), number of handloom machines (Number), labor cost/day (BDT), input cost/day (BDT), capital, yearly income (BDT), production cost (BDT), and selling cost of the handloom product (BDT). In addition, the present problems

International Journal of Management, Accounting and Economics
Volume 9, Issue 11, November, 2022
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and prospects of the handloom have been illustrated. It is also acclimated to organizing, summarizing, and designating the relationship between two or more variables. It is also used for analyzing frequency, percentage and rank, etc.

Functional Analysis

The following equation illustrates how the Cobb Douglas production function was constructed and used to estimate the effects of variables on the owner's yearly income variation.

$$Yi = \alpha + \beta 1X1 + \beta 2X2 + \beta 3X3 + \beta 4X4 + \beta 4X5 + ui \quad (1)$$

The Cobb-Douglas production function model is used to estimate the effects of variables on the annual income from the Handloom industry. For this reason, we consider the Cobb-Douglas type production function in this study.

The Cobb-Douglas production function model is used in this case to assess variables' impact on the handloom sector's annual income. As a result, this study takes into account the Cobb-Douglas type production function, i.e.,

$$\text{Ln } y = \ln \alpha + \beta 1 \ln X1 + \beta 2 \ln X2 + \beta 3 \ln X3 + \beta 4 \ln X4 + \beta 5 \ln X5 + ui \quad (2)$$

Where, Yi = Income, α = Intercept, B = β1 to β5 Coefficients, X1 = Capital, X2 = Labor Cost, X3 = Input Price, X4 = Experience, X5 = Education, ui = Error terms.

Specifically, it is assumed in this case that there is no serial correlation and no covariance between the error term and the explanatory variable when the mean value of the error term is zero. Ordinary least squares (OLS) are used to find the most appropriate estimation approach, and they are utilized to estimate the empirical model (Husain, 2016).

Results and Discussion

Socio-Economic Status of the Respondents

A technique of defining people based on their age, education, job type, family size, and income, among other things. Low, medium, and high socioeconomic status are common classifications. Lower socioeconomic level people often have fewer access to financial, educational, social, and health resources than higher socioeconomic status people (Husain, 2016).

Age of Respondents

The handloom owner's age is an absolutely crucial component of any income generated by people in any workplace. The highest age group respondents in this study are 35-39 & 50-54. Both are 18 percent. The second highest age group of handloom owners is 45-49 and 55-59; both contain 16 ratios of the total number. The lowest age group of the handloom owners are 25-29 and 30-34 with 4 percent of respondents only. It indicates that that young people do not want to be professionals in this sector. Because of the fragile situation of the handloom textile industries.

International Journal of Management, Accounting and Economics
Volume 9, Issue 11, November, 2022
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Table 3. Age Distribution of Handloom Industry's Owner

Age of Group	Frequency	Percentage	Cumulative Frequency
25-29	2	4	4
30-34	2	4	8
35-39	9	18	26
40-44	6	12	38
45-49	8	16	54
50-54	9	18	72
55-59	8	16	88
60-64	6	12	100
Total	50	100	

Education Level of Handloom Firm Owner

To present the educational status of the handloom unit owner, years of schooling have been utilized, i.e ., (i) 0 year, (ii) 1 to 5, (iii) 6 to 10, (iv) 11 and above. Table 4. exhibits the educational status of the handloom unit owner. The table shows that most of them had never gone to school, indicating illiterate. It can be seen from the table that the percentage of illiterate groups is 40 percent. Thirty-six percent of handloom farm holders were 1 to 5 years of schooling, and 16 and 42 percent had 6 to 10 years of schooling and 11 and above levels of education, respectively. It demonstrates that the majority of the handloom industry owner has no primary education.

Table 4. Years of Schooling Handloom Owner

Years of Schooling	Number	Percentage	Cumulative Frequency
0	20	40	40
1-5	18	36	76
6-10	8	16	92
11-Above	4	8	100
Total	50	100	

Occupations of the Handloom Owner

The significant parts of the handloom are occupied in their loom business. Eighteen percent of handloom farm owners are engaged in their own businesses. Only six percent of owners have been involved in agriculture besides their loom business. It can be seen that 12 percent of farm owners have been continuing loom business and others' work. Only 2 percent of handloom owners are doing services with their loom business. It implies that the majority of persons participating in the handloom industry rely only on this industry.

International Journal of Management, Accounting and Economics
Volume 9, Issue 11, November, 2022
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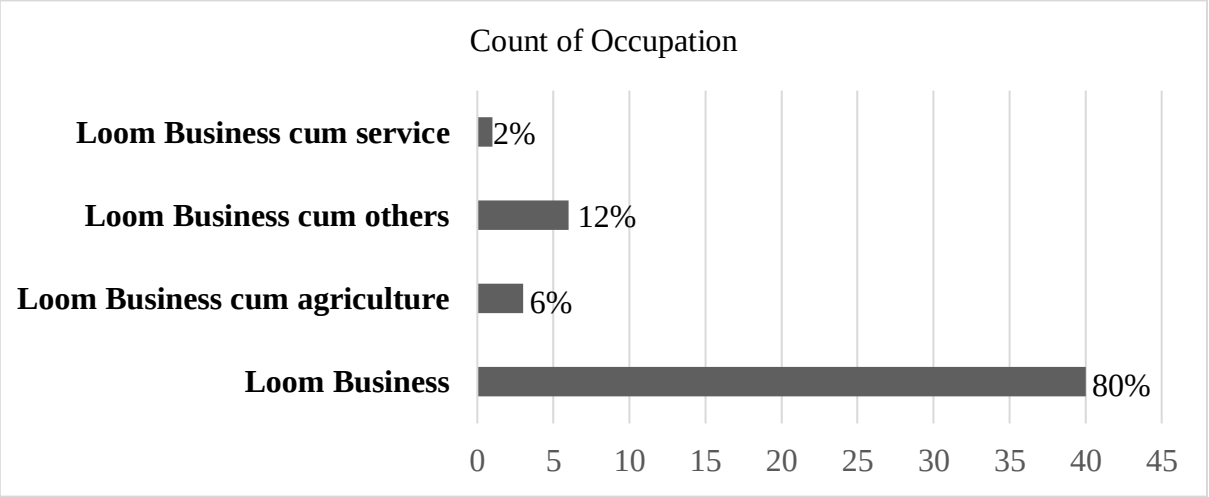

Figure 1. Occupation of Handloom Industry's Owner

Family Size of Handloom Industry's owner

This study categorizes family types based on the fact that all family members live together and eat in the same kitchen under the leadership of the family head. A family is classified into three categories small, medium, and large. Here, family members are those who take meals and live together. In a small family, the number of family members is not more than four. In medium and large families, the family numbers are equal to five and equal to or more than six, respectively. In this study, most respondents' families are medium with 48 percent. The small and large families are 26 percent with 13 frequency. So, the handloom owners basically own a medium size family.

Table 5. Family Size of Handloom Industry's Owner

Particulars	Frequency	Percentage	Cumulative Frequency
Small ≤ 4	13	26	26
Medium=5	24	48	74
Large ≥ 6	13	26	100
Total	50	100	

Experience in Operating Handloom Industry

The total production of handloom products little bit depends on the experience of the handloom owner experience. Considering Table 5.5, among all those areas, 10 percent of respondents' experience is 5-10 years, 12 percent of respondents experience 11-15 years, and 22 percent experience is 16-20 years. And 14, 14, 10, and 18 percent of respondents experience 21-25, 26-30, 31-35, 36-Above years respectively.

International Journal of Management, Accounting and Economics
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Table 6. Experience of Handloom Industry's Owner

Experience Range (Year)	Frequency	Percentage	Cumulative Percentage
5-10	5	10	10
11-15	6	12	22
16-20	11	22	44
21-25	7	14	58
26-30	7	14	72
31-35	5	10	82
36-Above	9	18	100
Total	50	100	

Monthly Income of the Respondents from Loom Business

Table 7. shows the monthly Income Distribution of the handloom industry's owners.

Table 7. Monthly Income Distribution of Handloom Owners from Handloom Business

Monthly Income	Frequency	Percentage	Cumulative Frequency
1001-3000	6	12	12
3001-5000	4	8	20
5001-7000	6	12	32
7001-9000	7	14	46
9001-1100	8	16	62
11001-13000	4	8	70
13001-15000	10	20	90
15001-17000	2	4	94
17001-19000	2	4	98
19001-Above	1	2	100
Total	50	100	

Table 7. shows that about 12 percent of respondents are included in the Income group 1001-3000, 8 percent in income group 3001-5000, 12 percent in income group 5001-7000, 14 percent of income group 7001-9000, 16 percent of income group 9001-11000, 8 percent of Income group 11001-13000, 20 percent of income group 13001-15000, 4 percent of income group 15001-17000, 4 percent of income group 17001-19000 and 2 percent of income group 19001-Above.

Handloom Farm’s Owners loan Recipient and its Sources

Figure 2. shows that 58 percent of the handloom industry's owners have taken loans from formal or informal sectors, and the remaining 42 percent do not belong to the loan recipient. This shows that almost half of those who do handloom business will not get any loan assistance.

International Journal of Management, Accounting and Economics
Volume 9, Issue 11, November, 2022
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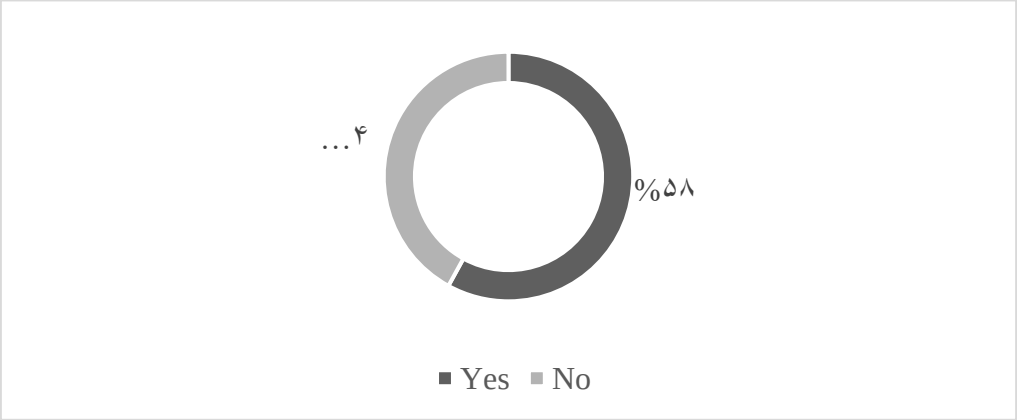

Figure 2. Percentage of Loan Recipients and Loan Non-Recipients

Handloom Farm's Owners' loan Sources and Interest Rate

Table 8. shows the sources of loans and Internet rates. Where most of the handloom owners borrowed from informal sources, i.e., loom Money lenders, 44.83 percent of respondents borrow from this source, and the rate of interest of loans taken from loom Money lenders can be seen in the informal sector as the lowest. Still, in reality, the interest rate is much higher than informal sector. In this case, a large part of the products has to be provided to the loom Money lender unconditionally, in a fixed amount and at a given price over some time. The second-largest source of loan for the handloom industry's owner is NGO, and 12 respondents received a loan from there, which is 41.38 percent of the total borrow. The interest rate of NGOs is 9 percent to 11 percent. The only institution source is Bank. Only 10.34 percent of respondents are taken loans from this sector. The lowest interest rate lender is the loom board. It gives loans in 2 percent. However, the number of their borrowers is also the quietest. Only one respondent was taken alone from there. It is shown that the rate of interest is too high to get a loan.

Table 8. Sources of Loan and Internet Rate

Sources	Frequency	Percentage	Interest rate
Loom money lender	13	44.83	0%
NGO'S	12	41.38	9-11%
Bank	3	10.34	11%
Loom Board	1	3.45	2%
Total	29	100	

Problems Existing in the Handloom Textile Industry

Handloom was one of the most promising small-scale industries in Bangladesh, but now it is full of problems. Sirajganj district, one of the weaving industries of Bangladesh, is not without these problems. The existing problems of the sample area weaving industry in this part are weavers have identified the biggest problem in the weaving industry as the price of dyes and yarns. The 100 percent handloom owner of this sample agrees. Since dyes and yarns are the primary raw materials of the handloom industry, the price of the

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www.ijmae.com

products depends on them. Due to the high cost of dyes and yarns, the production cost of the product is high, and the expected profit is not being achieved. Secondly, 96 percent of the weavers in this survey claim to get loans at an interest rate. As a result, they cannot go into production on a large scale. Capital problem and non-Cooperation of loom board, In both cases, there is a problem with the handloom industry, with 94 percent of handloom owners supporting it.90 percent of handloom owners informed that the problem of handloom is preliminary research, old technology, and lack of incentives in the time of the downturn respectively. Alone with these issues, bad weather problems, insufficient labor supply, and lack of industrial education hinder handloom production.

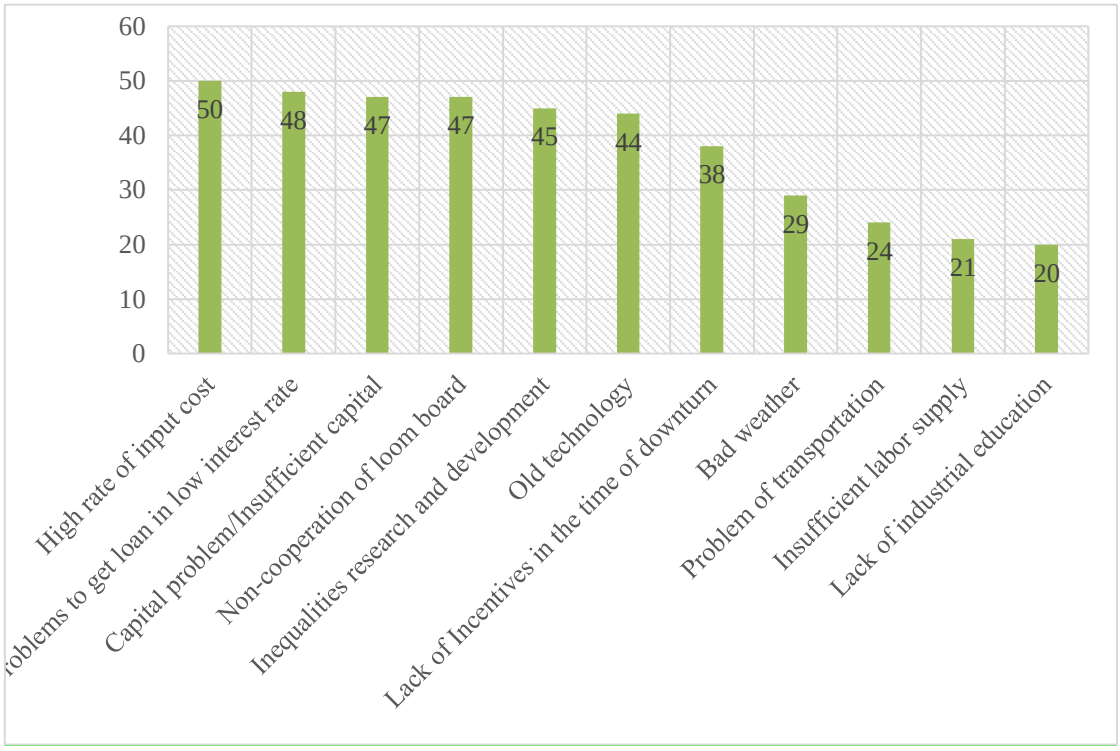

Figure 3. Problems that Existing in the Handloom Industry

Prospects that Enhance the Handloom Industry

Table 9. disclosed the critical factor that enhances the handloom industry boost in the production scale of the sample area. The total number of respondents is 50.

In the first phase, a favorable working environment gives total effort to all the firms. That study shows it is easy to get a fancy working environment to build the handloom industry. The second one is that living in the weaver community contributes 100 percent to handloom increase in handloom industries in this locality.

According to respondents, Positive things that enhance the handloom industry in this study are a third and fourth qualitative variable state that family business and easy market access can shock 90 percent. Almost 80 percent of the firm and the fifth and sixth available training and sufficient market selling push well enough in the handloom sector it's nearly 78 and 70 percent respectively. The crucial thing is that efficient transport

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www.ijmae.com

support has little opportunity for handloom owners, with only 52 percent adequate transport facility. And last one perfect weather, its make under the facility only 6 percent of the handloom industry got especial weather facility in this area.

Therefore above all, the positive affected is available, but the frequency percentage deviation varies spread.

Table 9. Positive Aspects of the Handloom Industry

No.	Main Opportunities	Frequency	Percent	Rank
i.	Favorable work environment	50	100	1
ii.	Living in the weaver community in this area	50	100	1
iii.	Family Business	45	90	3
iv.	Easy access to market	40	80	4
v.	Available training facilities	39	88	5
vi.	Sufficient market to sell	35	70	6
vii.	Efficient transport facilities	26	52	7
viii.	Perfect weather for making loom product	3	6	8

Result from Estimation of Cobb-Douglas Production Function

Using the Cobb-Douglas production function, the handloom firm's output and input are estimated here. The productivity of the handloom is examined using five explanatory variables. Table 10. provides an interpretation of the variables' effects on the handloom productions' yield.

Table 10. Estimation of Production Function

Explanatory Variables	Coefficients	Std. Error	t-Statistic	Pro.
Capital (X_1)	-0.21	0.112	-1.861	0.0694
Labor Cost (X_2)	25.74	8.848	2.909	0.006
Input Price (X_3)	11.51	3.588	3.207	0.003
Experience (X_4)	495.27	585.556	0.846	0.402
Education (X_5)	5943.91	1969.480	3.018	0.004
Constant	36956.80	181402.08	2.037	0.045
F-Value	17.50			
R-Squared	0.63			
Dependent Variable: Yearly Income from Handloom, Number of Observations (N)=50				

The estimated result shows that the constant is significant at 5 percent, and total labor, input cost, and education are necessary at 1 percent. The coefficient of multiple determinants of order square is 0.62. That means the explanatory variable is considered in the model that can explain the 62 percent of handloom weaver's yearly income variation. It implies that the interpretation of the handloom industry's owner income primarily depends on the explanatory variable considered in this model. Despite experience positively impacting the handloom weaver's income, its influence is not

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www.ijmae.com

statistically significant. On the other hand, capital has negatively impacted the handloom industries, and also its impact is not statistically significant. The explanation for capital's negative influence in the handloom sector is that the handloom weaving business continues to manage its production in the traditional manner. As a result, even if they have sufficient capital, the influence of capital has no effect on the handloom.

The estimated capital coefficient of -0.208 indicates that if the other factors remained constant, a 1 percent increase of capital would decrease the total revenue by 20.8 percent. The approximate labor cost is 25.73. That shows that the handloom weavers' income will increase by 25.73 percent change of labor cost change by 1 percent.

Conclusion and Recommendations

The study sought to assess the problems and prospects of the handloom industry, the socio-economic status of handloom, and the current situation of the loom industry in the six unions of the three upozillas under the Sirajganj district in Bangladesh.

Preliminary data was collected from the owners of 50 handlooms from this region by using purposive and multi-stage sampling methods. Both tabular and econometrics techniques were used to analyze the collected data. The highest 18 percent response to this study was 35-39 and 50-54. Most of the handloom owners experience between 16 and 20. Which is 22 percent of the total respondents. 47 percent of handloom owners have a medium family, i.e., five family members who live and eat together. 1002-3000 BDT is the lowest income, and 19000 to above is the highest income level of this study. Ten people earn between 13001 and 15000, a maximum of 20 percent among the respondents. The co-efficient of total labor, input costs, and education is significant at 1 percent. Experience and capital are not statistically significant, but experience positively affects the handloom industry. In the handloom industry, the biggest problem is the high rate of input cost, which means the price of colors and fabrics is too high for production. All the respondents agreed with this point. Problems with getting the loan at low interest rate, capital problem/Insufficient capital, non-cooperation of loom board, inequalities in research and development, old technology, lack of Incentives in the time of downturn, lousy weather, the problem of transportations, insufficient labor supply, lack of industrial education these problems are significant obstacles to the development of the handloom industry in Bangladesh. Positive things which enhance the handloom industry are favorable locality/work environment, living of the weaver community in this area, family Business, easy access to market, available training, good call to sell, efficient transport facilities, and perfect weather for making loom products. Respondent thinks that favorable work environment, living of weaver community in this area these two reasons are the main ones.

In this situation, the following recommendations have been made to improve the weaving industry from this fragile condition.

Handloom industries need to be produced in conjunction with new information technology. The responsibility of maintaining the handloom industry locally rests with its board. Their role needs to be made more active. The quality of handloom products needs to be improved. So that, it can make competition internationally. This industry needs to

be expanded internationally without being confined to the country. The color and fabric market needs to be controlled; the government should subsidize this market. Loan arrangements need to modernize so that handloom units owner can take loans on easy terms and at low-interest rates. All the past famous handloom products have to be reproduced, so the industry regains its lost glory. Although the weaving industry is directly handicraft, weavers need training to maintain their design and quality. Since the problems of the handloom industry are particular, therefore, by solving these problems, the country's most potential small-scale sectors can play a determining role in the economy of Bangladesh.

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Original Research

Cost Structure and Financial Performance of Quoted Industrial Goods Manufacturing Companies in Nigeria

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Abstract

Cost structure has considerably been a topical issue in the Manufacturing sector as it affects financial performance of the manufacturing companies and has not received reasonable attention in the accounting literature. The various components of cost structure were carefully assessed as independent variables and how they affected financial performance of the selected manufacturing companies. Return on Assets (ROA) was used to proxy financial performance of the companies. This paper aims at assessing the impact of cost structure on financial performance of quoted manufacturing companies in Nigeria. The study selects 7 industrial goods manufacturing companies listed by the Nigerian Exchange Group and the analysis was done using the financial statements for the period of 2011-2020. Ex-post facto research design and descriptive analysis through the use of regression and correlation analysis were used. The findings of the study confirm that there is a significant effect of cost structure on financial performance of selected manufacturing companies quoted by the Nigerian Exchange Group. The study recommended that cost structure should be well analysed into those components and the cost of each of the components should be investigated in order to manage and control the impact on the profitability of manufacturing companies.

Keywords: Cost components, direct cost, financial performance, indirect cost, industrial goods manufacturing companies, variable costs.

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Introduction

In today's competitive company environment, cost structure is critical to profit maximisation. As a result of incorrect cost structure control in commercial transactions all over the world, the manufacturing industry has faced worldwide issues that have posed a threat to healthy survival and competition. As a result, businesses, particularly manufacturing businesses, are now competing on a global scale (Kumar *et al*, 2016). As a result of the current trend, the market has shifted dramatically from a seller's to a buyer's market. Local manufacturing firms must compete favorably with overseas firms in terms of pricing forces, as established by the Cost Structure. Manufacturing companies should focus more on cost reduction in order to increase profitability because financial performance is directly measured by its profitability. This also demonstrates the importance of adequate control costs in order to declare accurate and fair earnings in a given time. A corporation with a balanced Cost Structure, according to Gunarathne and Samudrage (2018), has a better probability of improving financial performance. According to Johnson (2018), in order to achieve financial success and healthy growth, there should be a consistent and continual improvement in effective planning and other operations within the organization.

In Nigeria, the consumer market is currently saturated with both international and native products at various costs. As a result, consumers can now choose to buy cheaper products regardless of where they come from. As a result, profitability suffers since fewer products from manufacturing companies are purchased because customers are more sensitive to market price changes. Furthermore, production overhead expenses are significant, especially when combined with the high cost of doing business in Nigeria, such as power costs and other directly attributable production costs. In order for manufacturing firms in Nigeria to maintain a good financial performance, their cost structures must be properly controlled and monitored. Technological advancement and information system has led to changes experienced in the manufacturing processes.

Adequate control of cost structure makes possible the reduction in production cost, reaching competitive level and profitability for the manufacturing companies. Okwo and Ugwunta (2012) researched on the impact of input costs on firm profitability of the breweries in Nigeria. It was also stressed that general administrative expenses (indirect cost) had no significant relationship with profitability. Adigbole, *et al*. (2020) opined that there was a positive significant relationship between cost management practices and firm's performance in the manufacturing organisations. A well-managed cost structure entails controlling direct and indirect costs in order to maximize profits and create wealth.

It was argued that a positive relationship exists when considering Strategic Cost Management techniques as part of critical factors that enhance sustainable financial performance of manufacturing companies (Kumar & Vimala, 2016). In regards to the various findings of researchers on the impact of cost structure on financial performance of manufacturing companies in Nigeria, further work needs to be done to assess the impact of cost structure on profitability of manufacturing companies in order to bring out more suitable findings.

There have been inadequate studies on the effect of cost structure on financial performance of industrial goods manufacturing companies in Nigeria. The focus of the existing literature is

on direct and indirect cost and how they affect profitability. It is also noteworthy to state that existing studies focused on the cost classification as variable and fixed components. The current study focuses on further classification of cost structure into operating expenses structure, direct cost structure, employees' salaries and allowances structure, depreciation and amortization structure and finance cost and tax structure. The effects of these components on financial performance of industrial goods manufacturing companies which have not been covered in the previous studies are investigated. The pertinent questions raised here are what constitutes cost structure and how does each of the components affect financial performance of industrial goods manufacturing companies in Nigeria?

The main objective of this study is to evaluate the impact of Cost structure on financial performance of quoted industrial goods manufacturing companies in Nigeria while the specific objectives are to assess the components of cost structure and to evaluate the impact of those components of cost structure on financial performance of the companies.

This study is limited to seven Quoted industrial goods manufacturing companies in Nigeria. The study covers a period 2011-2020 (Ten years). The choice of these Quoted industrial goods manufacturing companies is based on the consistency of these industrial goods manufacturing companies on the Nigerian Exchange Group and being among companies that reported highest sales volume for the period covered.

The subsequent sections of this paper are Literature Review on the conceptual and empirical studies as well as establishment of a relationship between cost structure and financial performance in order to formulate the study hypotheses. The rest of the paper deals with Data and Methods, Data Analysis and Discussion of Findings, and Conclusion and Recommendations.

Literature Review and Hypotheses Development

Cost Structure

Cost structure can be defined as the proportion of fixed costs and variable costs in the firms (Pualam & Wibowo, 2019). There are always fluctuations in the variable costs as they are determined by the unit of productions change while fixed costs remain constant when no additional asset is acquired. Cost structure refers to an outline of the funding structure into the various operations of organization and is divided into fixed and variable costs (Chen *et al.*, 2019). There are also some costs that are not classifiable as fixed or variable costs. Such costs are classified as semi-fixed or semi-variable costs (Obamuyi, 2013)

Determinable changes of production and competitive environment being experienced in the 21st century have called for Strong and viable cost structure for the modern manufacturing companies in the world. Cost structure analysis is important for the accounting, cost control, decision making and planning (Dahal, 2018). This is done to determine the cost behavior of the mixed costs by classifying it into direct and indirect costs. This has created a knowledge gap in respect of the composition of the cost structures of companies in emerging economies, like Nigeria and how it affects financial performance of manufacturing companies.

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Financial Performance

Financial performance is a complete evaluation of a company's overall standing in categories such as assets, liabilities, equity, expenses, revenue, and overall profitability (Too & Simiyu, 2018). For internal users, financial performance is examined to determine their respective companies' well-being and standing among other benchmarks. For external users, financial performance is analysed to dictate potential investment opportunities and to determine if a company is worthwhile. The accomplishment of an organization could be measured in both financial (qualitative) and non-financial (qualitative) terms. The financial way of measuring performance comprises Return on Investment (ROI), Return on Assets (ROA), Earning Per Share (EPS), product market performance (market share), shareholders returns (dividends ratio), Economic Value Added (EVA, and Stock price). The aforementioned measures of organizational performance produce effective and success indicators of firm's accomplishments being talked about. The studies carried out by Gunday *et al,* (2011) and Shaukat *et al,* (2013) used these performance indicators to buttress their points. The current study considers Return on Assets as a proxy for the measurement of performance for the selected manufacturing companies quoted by the Nigeria Exchange Group.

Direct Cost (DIRC) Structure and Financial Performance

Direct costs can be referred to as directly attributable cost of production. Cokins (2002) explained the effect of direct costs such as direct material cost and direct labour cost on the financial performance. Among the different cost classifications, direct cost is essential for decision making and which is behavior based that aims at describing costs and revenues at different level of activity (Horngren, *et.al*, 2016).

Activity or volume of transactions can be measured in relative terms of units produced or sales recorded number of hours worked, kilometers covered or any other relevant measure. Generally, direct costs are readily identified and traceable to a particular product, operation or plant.

Operating Expenses (OPEX) Cost Structure and Financial Performance

Operating expenses relate to those costs incurred on the running of the company's activities, and also connected to the effective use of the assets. The allocation of costs is primarily linked to the financial performance (Swink, *et.al,* 2005). Enlarged operating expenses might have significant effect on financial performance whereas low operating expenses do not necessarily enhance better financial performance.

The extant studies conducted in the past concluded that efficiency in operating cost could be closely connected with financial performance of manufacturing companies. Dhillon (2012) showed that insignificant positive correlation existed between profitability and operating expenses.

Employees' Salaries and Allowances (EMSA) Cost Structure and Financial Performance.

Employees' salaries and allowances relates to the accounting recognition of human assets in financial reporting. Balogun and Omotoye (2020) stated that direct costs include wages for

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the factory workers that are on assembly line while indirect costs are associated with other support staff. Salaries constitute fixed compensation paid to an employee as a result of work done. Allowances relate to those benefits paid or payable other than salaries and earned emoluments.

Ifurueze & Odesa, 2014 examined the relationship between employee's costs and financial performance with the use of structured information and annual financial reports of selected firms in Nigeria. The current study seeks to evaluate the impact of employees' salaries and allowances on financial performance of quoted manufacturing companies in Nigeria.

Depreciation and Amortization (DEPA) Cost Structure and Financial Performance.

Fixed costs in the form of depreciation and amortization are 'real' fixed costs that represent the economic value of assets used and consumed in respect of property, plant and equipment and intangible assets respectively. Depreciation and amortization are very much a point of interest when considering fixed costs, considering the effect it has on financial performance.

Finance Cost and Tax Structure (FCOT) and Financial Performance.

International Financial Reporting Standards (IFRS), International Accounting Standards (IAS 23) defines finance cost as 'interest and other costs that an entity incurs in connection with borrowing of funds'. Finance costs are also known as 'financing costs and 'borrowing costs'. These costs are incurred through borrowing and loans. These costs which can also be regarded as interest expenses, affect the financial performance of a firm. This invariably poses a threat to the financial stability of manufacturing companies if not properly managed.

Adenugba *et al.* (2012) had a research work done on the effect of financial leverage on corporate performance of manufacturing companies. The findings of the research show that finance cost has general impact on corporate financial performance as shown by dwindling Return on Assets (ROA) over a period of time. The effect is generated from the fact that repayment of interest element of the borrowed funds was due on yearly basis.

Tax structure defines the component of cost classification that entails compulsory payment to the Relevant Tax Authority for a given period of time. Policy implications of Finance Acts, 2020 provides that taxation is basically the process of collecting taxes within a particular location (Abiahu *et al*, 2020). A tax policy defines the cost structure of firms as it is factored into the pricing model of the company (Abiahu *et al*., 2021).

Theoretical Review

This study is underpinned on the *Kaizen* Costing theory.

Kaizen Costing Theory

The term Kaizen originated from Japanese citizen, known as Masaaki Imai. The concept, *KAIZEN* combines two Japanese words: KAI(change) and ZEN (for better). The concept means "the process of continuous improvement". This theory talks about achieving small, gradual but continuous improvements in the process of production at minimal cost. The customer's demands and specifications are met with the help of Kaizen costing system. All the processes that trigger product cost up are eliminated sequentially.

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This technique has impacted manufacturing companies not only in Japan, but also all over the world (Ogundele, 2004). Novak *et al*, (2014) defined Kaizen costing as the "process of continuous improvement, encouraging constant reductions by strengthening the standard".

Jayeola *et.al*. (2012) observed that Kaizen Costing ensures that products meets or exceeds customer demands for 'quality, functionality, and prices' in order to sustain the product's competitiveness.

The current study therefore ensures good financial profitability by encouraging continuous and systematic reduction in the product cost.

Empirical Review

Kumar & Vimala (2016) carried out a study on the impact of cost structure on financial performance of manufacturing companies and which was found out that the cost structures of the selected companies were varied from one another during the study period. The average ratio of raw material costs, power and fuel costs, and finance costs in Auropharma as a percentage of net sales were extremely high as well as the costs of employees' wages, sales and administration. It was also seen that depreciation cost and manufacturing expenses as a percentage of net sales were higher than the industry average. Hence, the results were said to have affected the financial performance of the selected companies.

According to the study carried out by Akinbor and Okoye (2012), it was found out that aggressive Strategic Management practices determine the extent to which competitive advantage in the maintaining industry influences the corporate financial performance. Research questions were raised, in addition to the review of related literature. The population of the study consists of Chief Accountants, Chief Executives and Marketing Directors of the quoted manufacturing companies listed on the Nigerian Stock Exchange (NSE) of 2009 fact book. Using tables, bar charts and mean scores for the data analysis, my findings reveal that Strategic Cost Management impacts financial performance of manufacturing firms.

A study carried out by Oyewo and Ajibolade (2019) on Strategic Cost Management concentrated on Nigerian manufacturing companies, identifying the various factors that influence the adoption of Cost Structure Management as a competitive strategy for survival and fostering a better financial performance. It was established that cost structure has significant impact on financial performance of manufacturing companies. Data collected were subjected to statistical procedures using Mann-Whitney test through the data survey analysis. From the findings of this work, there are some challenges limiting the adoption and implementation in Nigeria.

Oluwagbemiga, *et al* (2014) worked on the relationship that exists between cost management practices and firm's performance in the manufacturing companies using data from 40 manufacturing companies listed on the Nigeria stock exchange during the period of 2003 to 2012. The study used the audited financial statements of the selected manufacturing companies. Direct material cost, direct labour cost, production overhead cost and administrative overhead cost were taken as independent cost management variables while profitability (Operating profit) was taken as dependent variable representing the firm"s performance. The result shows that a positive significant relationship exists between cost management practices and firm's performance in the manufacturing organization.

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The relationship between standard costing and cost control in the Nigerian oil and gas industry was explored by Cletus and ThankGod (2015). This was accomplished by doing a review of the existing literature and formulating hypotheses. Petroleum marketing companies registered in the Nigerian Stock Exchange Factbook of 2012 made up the study's population. Both primary and secondary data collection methods were used to get the information needed for this investigation. The primary data was gathered through the administration of a 5-point Likert scale questionnaire, while the secondary data came from the 2011 Nigerian Stock Exchange Factbook.

The study carried out by Muogbo (2013) US investigated the impact of Strategic Cost Management techniques on organizational growth and development in selected manufacturing firms in Anambra state, Nigeria. Descriptive survey design was used to collect detailed data for analysis. The sample was brought out of the population in a cluster mode. In the study, structured questionnaire was used to collect information from targeted respondents. It was found out that Strategic Cost Management was not popular in Anambra state despite its impact on organizational performance.

Okwo and Ugwunta (2012) also assessed the effect of input costs on the profitability of selected brewing firms in Nigeria. The annual financial reports of the firms were sampled for a period of 1999 to 2010. A multiple regression model was applied as explained by Ordinary Least Squares. The Leading ratio used is Ratio of Selling and General Administrative Expenses (RSGAE). This was used to show the impact of company's operating expenses on profitability. The impact was said to be positive.

In Global Communication Limited, Lagos, Nigeria, Balogun and Omotoye *et al* (2020) explored the impact of remuneration on employee performance. It was decided to use a descriptive research design. For data collection, a questionnaire format was used, which was broken down into multiple sections and delivered in 120 copies. For data analysis, descriptive and inferential statistics were used. The findings demonstrated that there is a considerable association between Global Communications Limited's remuneration plan and employee performance, as well as a big problem influencing Global Communications Limited's payment system and employee performance. Global communication limited, according to the study, should utilize more work-related remunerations rewards design to motivate their personnel.

Gaps in Literature

Few of the studies carried out employed primary data. Oguo and ugwunta made use of annual financial reports to show the impact of Cost structure on company's profitability. Oluwagbemiga, *et.al* (2014) also made use of the companies' financial statements, and this was done in Kenya. It is discovered that very few of these studies were done in Nigeria, even the few ones done in Nigeria do not focus on various components of Cost Structure, and hence the need for additional work in Nigeria is necessary. The current study intends to contribute to the existing body of studies through annual financial accounts of the selected manufacturing companies in Nigeria considering the effect of the components of Cost Structure on financial performance of Manufacturing Companies. The hypotheses are stated thus:

Ho1: Direct cost structure has no significant impact on financial performance of manufacturing companies.

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Ho2: Operating expenses cost structure has no significant impact on financial performance of manufacturing companies.

Ho3: Employees cost and allowances cost structure has no significant impact on financial performance of manufacturing companies.

Ho4: Depreciation and amortization cost structure has no significant impact on financial performance of manufacturing companies.

Ho5: Finance cost and tax structure has no significant impact on financial performance of manufacturing companies.

Data and Methods

The study adopted a descriptive statistics such as mean, standard deviation and coefficient of variation. The data were collected from secondary sources such as the audited financial reports of the selected manufacturing companies for the period of 2011-2020, and which were used for the testing of the impact of Cost Structure on financial performance. The population of 12 industrial goods manufacturing companies, out of which 7 companies are sampled out for the research work, was considered. The industrial goods manufacturing companies selected for the study include Berger Paints Nig.Ltd, Better Glass Company, Chemical and Allied Products (CAP), Cutix Nig. Ltd, Lafarge Cement Wapco Nig. Ltd, Meyer Plc and Premier Paints. The sample used truthfully and fairly represented the population.

The measure of central tendency and dispersion for all variables was analysed. Correlational and regression data analysis techniques that show the relationship between Cost Structure and financial performance was used.

Model Specification

The study adopted econometric model in investigating the association between cost structure and financial performance. The econometric model according to Singh, 2019 was written in explicit form as follows;

$FP = f(CS)$ ……..……...…i

$FP = \beta 0 + CSt + \mu$ ……...ii

Equation (i) and (ii) can be modified and proxy as:

$ROA = \beta 0 + \beta 1DIRC_{it} + \beta 2OPEX_{it} + \beta 3EMSA_{it} + \beta 4DEPA_{it} + \beta 5FCOT_{it} + \mu_{it}$… iii

Where:

CS = Cost Structure

FP = Financial Performance

DIRC = Direct cost to revenue expressed in percentage

OPEX = Operating expenses to revenue expressed in percentage

International Journal of Management, Accounting and Economics
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EMSA = Employee and Staff Allowances to revenue expressed in percentage

DEPA = Depreciation and amortization cost to revenue expressed in percentage

FCOT = Finance cost and tax to revenue expressed in percentage

β0 = Slope

β = Coefficient of the variables

U = Error Term

Measurement of Variables

Table 1. shows how the variables are measured.

Table 1. Measurement of variables

S/N	Variables	Description	Measurement	Source
1.	Financial Performance	Firm's performance measured in financial term (Return on Assets) as performance indicators	Profit for the year divided by Total assets	Adigbole and Osemene, 2020.
2.	Direct/variable cost structure in percentage, DIRC	Direct and related cost to production	Cost of sales divided by revenue and expressed in percentage	Novák and Popesko, 2014
3.	Operating expense cost structure in percentage, OPEX	Operating and fixed cost related to production	Operating cost divided by revenue and expressed in percentage	Novák and Popesko, 2014
4.	Employees cost structure in percentage, EMSA	It is the expenses that are expended on labor or man power that aid in the production process	Employee cost divided by revenue and expressed in percentage.	Novák and Popesko, 2014
4.	Depreciation and amortization cost structure in percentage, DEPA	This includes all expenses incurred as a result the usage of assets for production	Depreciation and amortization divided by revenue and expressed in percentage.	Novák and Popesko, 2014
5.	Finance cost and tax structure in percentage, FCOT	This includes all interest expenses charged as a result of core activities	Interest expenses and tax divided by revenue and expressed in percentage.	Novák and Popesko, 2014

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Data Analysis and Discussion of Findings

Descriptive Statistics of the Variables

The descriptive statistics of panel variables aid the understanding of their distribution and also the possibility of outliers, which can affect the robustness of the model estimate. Table 2. report the result of the descriptive statistics of the variables. The average of sampled ROA was 8.5587%, with industry median value of 7.2127. The maximum ROA was 53.9594 and minimum stood at -26.3705. The average variation of the ROA was 15.77, which is more than the mean. This implies that the firm's performance was not uniform and highly dispersed. There are many low performing manufacturing firms in the variables. ROA exhibited positive skewness and the Jarque-Bera result indicates that the variable is normally distributed. This is not an unexpected result, because some firms perform better than others. The operating expenses to revenue of the firms report positive skewness and lepkurtic distribution. It exhibits low degree of variation because the standard deviation is less than the mean. Also, the median and mean of the variable are close, implies that there is less likelihood of encountering outliers in the operating expenses to revenue. Operating expenses to revenue exhibited low dispersion and report an average value of 19.458. The average of direct cost to revenue stood at 66.59 with median value of 63.76. Employee and staff allowances report the maximum value of 21.772. The minimum employee and staff Allowances was 1.5711. The depreciation and amortization cost to revenue report an average of 4.6995. Finance cost and tax to revenue stood at 28.8209 in average DIRC and EMSA variable accept the null hypothesis of normality, while ROA, OPEX, DEPA and FCOT reject the null hypothesis of normality and accept the alternative.

Table 2. Descriptive Statistics

	ROA	DIRC	OPEX	EMSA	DEPA	FCOT
Mean	8.448760	64.59500	19.45870	10.36454	4.699583	28.82090
Median	7.217500	63.76365	16.92435	9.315950	3.497100	22.70600
Maximum	53.95940	79.33180	41.06230	21.77230	15.15220	109.7590
Minimum	-26.37050	48.51330	5.039100	1.571100	0.512600	4.064000
Std. Dev.	15.77903	8.534211	9.756075	4.102061	4.131880	22.56251
Skewness	0.732176	-0.165190	0.515282	0.624710	1.481200	1.707360
Kurtosis	4.132578	1.816230	2.023289	3.180793	3.915495	5.507865
Jarque-Bera	9.995597	4.405510	5.880076	4.648391	28.04066	52.35331
Probability	0.006753	0.110498	0.052864	0.097862	0.000001	0.000000
Observations	70	70	70	70	70	70

Test of Variables

Correlation Matrix

The essence of correlation analysis in this study is to identify the likelihood of multicollinearity. The presence of multicollinerity problem in the least square can leads to false inference. Multicollinearity will make it difficult to isolate the differential effect

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of the variables. The existence of multicollinearity will lead to high correlation between the variables and therefore understates or overstates the standard error of the estimate. In view of this, the study obtained the correlation among the variables as reported in table 3. The correlation results showed that the independent variables were not highly correlated with each other. Form the evidence in the table 3; it was obvious that existence of multicollinearity is less likelihood among the variables.

Correlation Analysis: Ordinary

Table 3. Correlation Analysis: Ordinary

t-Statistic	ROA	DIRC	OPEX	EMSA	DEPA	FCOT
ROA	1.000000					

DIRC	0.260644	1.000000				
	(2.226281)	-----				
OPEX	-0.069462	-0.574459	1.000000			
	(-0.574182)	(-5.787322	-----			
EMSA	0.352716	0.021734	0.322105	1.000000		
	(3.108346)	(0.179264)	(2.805676)	-----		
DEPA	0.319460	0.184545	-0.175662	0.397603	1.000000	
	(2.780004)	(4.567686)	(-1.471428)	(3.573310)	-----	
FCOT	0.620696	0.371537	-0.101059	0.389425	0.293656	1.000000
	(6.528128)	(3.299988)	(-0.837643)	(3.486514)	(6.083381)	-----

Note: t-value of the correlation coefficient in parenthesis

The impact of cost structure on financial performance was analysed in this section as reported in table 4.3. The result of the analysis comprises of both random and fixed effect model. These two models were obtained with a view to determining the best and appropriate model of estimation. Different tests were conducted after the estimation in order to examine the robustness of the model. The first test conducted prior to post estimation is the Hausman test. The tests aid the study in assessing the significant difference between random effect and fixed effect. When the p-value of the Hausman test is less than 0.05, the study prefers fixed effect, but when the p-value is greater than 0.05, random effect is preferable.

Cost Structure and Financial Performance of Quoted Manufacturing Companies in Nigeria

The outcome of the test as in the table 4. shows that fixed effect model is the most appropriate model, because the p-value of the test was less than 0.05. The result of the post estimation test such as Heteroskedasticity LR Test and Serial Correlation Test indicates that the model is robust and frees the problem of Heteroskedasticity and Serial Correlation. The explanatory power of the model as capture by R-squared of the model indicates that 57.74% of the variation in the dependent variable was accounted for by the explanatory variables. The f-value indicates that the variables are jointly different from zero at 5% level of significance.

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Table 4. Regression Analysis of the Estimate

Dependent Variable: ROA						
	Random Effect Model			Fixed Effect Model		
Variable	Coefficient	t-Statistic	Prob.	Coefficient	t-Statistic	Prob.
DIRC	-1.0658	-10.6278	0.0000	-0.7463	-3.9466	0.0002
OPEX	-0.4177	-1.9336	0.0576	0.2796	0.8771	0.3840
EMSA	-0.3425	-1.5418	0.1281	-0.2371	-2.3726	0.0210
DEPA	-0.3723	-4.2327	0.0001	-0.1842	-2.4793	0.0161
FCOT	-0.0007	-0.6907	0.4922	-0.0010	-1.1246	0.2654
C	96.6523	10.7421	0.0000	55.0382	5.2673	0.0000
R-squared	0.6422			0.8025		
Adjusted R-squared	0.6143			0.7651		
F-statistic	22.9826			21.4374		
Prob (F-statistic)	0.0000			0.000000		
Hausman Test	14.3211(0.0005)					
Heteroskedasticity LR Test	9.5833(0.2701)					

Discussion of Findings

According to the analysis of the various cost structure variables in relation to the financial performance of the manufacturing companies, it shows that all the variables all the variables of cost structure have significant impact on financial performance of the manufacturing companies under this study with the use of Fixed Effect Model. The result in table 4. shows that cost structure impacts financial performance of the quoted manufacturing companies considered for this study for direct cost, employees cost and allowances, depreciation and amortization and finance cost and tax only with p-value of 5%while operating expenses has p-value of > 5% using Random Effect Model.

The variable of direct cost exhibited negative relationship with the financial performance of the firms ($t=-1.1041$, $p<0.05$). The coefficient of -0.7463 indicates that direct cost of the firms leads to reduction in the firm performance. Employee expenses had negative statistical relationship with the financial performance of the firms ($t=-2.3726$, $p<0.05$). Rise in employee expenses reduce the firm performance with coefficient of -0.2371. This implies that increasing employee expenses in Nigeria is not favourable for performance of the firms. However, insignificant relationship was discovered between firm performance and direct operating expenses with t-value of 0.8771 Depreciation and amortization cost report negative effect on the financial performance ($t=-2.4793$, $p<0.05$). Depreciation and amortization cost is an essential cost in manufacturing because equipment must surely experience wear and tear. However, finance and tax cost exhibited statistical insignificant relationship with the firm performance at 5% level of significance. In summary, some variables of cost exhibited significant negative relationship with performance of the firms, while some such as operating cost and finance cost failed to exert significant effect on the firm performance. Although, they report negative sign effect, but statistically failed at 5%.

The results revealed by Akinbo and Okoye (2012) support the current findings that a firm's profitability is significantly affected by the increase in cost of input, like material and labour. Also, Oluwagbemiga, *et.al,* (2014) showed that cost management practices have significant impact on the profitability of manufacturing organisations. In the work done by Okwo & Ugwunta (2012) the findings of the current work are supported as cost practices have significant impact on the financial performance of manufacturing companies in Nigeria. The study done by Oyewo (2017) also supports the findings of the current work. The findings of Muogbo (2013) were opposed to the current findings.

The result of the current study shows a significant impact of cost structure on financial performance of the selected manufacturing companies quoted by the Nigeria Exchange Group.

Conclusion and Recommendations

The outcome of the study has been able to point to the objective of this study on determining the impact of cost structure on financial performance of quoted industrial goods manufacturing companies in Nigeria. The study concludes that the impact of the various components of cost structure has been significant on the financial performance of quoted industrial goods manufacturing companies in Nigeria. The users will find it satisfying in adopting cost structure control and management practices to enhance healthy financial performance in their respective companies. The study recommends that there should be conscious effort by management of industrial goods companies to control the cost structure components separately so as to report strong financial performance. There should be geared efforts on the part of the company's management towards analytical assessment of cost structure taking cognizance of burden of each of the components of cost structure in order to determine reasonable profit maximization level that can contribute to the overall performance of the companies.

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